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COAL PROJECT, WEST-CENTRAL BRITISH COLUMBIA, BULKLEY RIVER PROPERTY

Prepared for

ATNA RESOURCES LTD.

by

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#### SUMMARY

The Bulkley River Property is located in west-central British Columbia. The property comprises an area of 1036 hectares which is presently held under coal licence application. The property is located to cover strata that are known to be coal-bearing but which are relatively untested.

To date, only reconnaissance exploration has been undertaken within the applied for area. Previous work, carried out intermittently between 1900 and 1927, focussed along the west banks of the Bulkley River. Little or no coal exploration has been performed away from the river and no holes have been drilled.

The coal measures in this area are of Lower Tertiary (Paleocene) age. Many coal seams are present, ranging in thickness from a few centimtres to 1.60 metres; five seams have a thickness greater than 0.50 metres. The present lack of detailed outcrop data precludes stratigraphic and The outcrops along the river coal seam correlations. generally exhibit moderate dips to the northeast and A gentle, northerly southeast. trending synclinal structure has been suggested for the basin, but this is complicated by the presence of steeper easterly and northwesterly dips and faulted outcrops.

Analyses performed on 1985 trench samples indicates that the coal is of high volatile A to medium volatile bituminous rank. This agrees with results obtained by Samples obtained from tunnels (circa previous workers. 1916 and 1927) yield medium volatile bituminous rank. Ash contents range considerably, from 19.67% to 54.19% at 1.58% and 1.82% moisture, respectively. Sulphur values are high in the northwestern portions of the property (0.95% to 1.99%) but low in central and southern parts (0.40% to 0.49%). The coal is agglomerating; free swelling indicies of 5, 5 and 7 were obtained from trench samples with 27.20%, 29.32% and 19.99% ash (dry basis), respectively. The coal is, therefore, considered to have good coking potential.

The occurrence of moderately dipping, thin coal seams close presents small-scale to surface open pit mining possibilities. Underground mining potential could also exist for seams greater than one metre in thickness. Additionally, there is the possibility that other coal seams may be present within the stratigraphic section and that already identified thin seams may thicken in other parts of the basin. The limited amounts of data prevent any estimation of coal resources or reserves. The property is very well situated with regard to infrastructure, labour and transportation requirements. Potential product coal could be of metallurgical (coking) or thermal grade.

It is concluded that the property represents a valid coal exploration target. An exploration program consisting of mapping, drilling and sampling is proposed for a total estimated cost of \$45,000. Further drilling should be contingent upon the results of this first phase.

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#### 1.0 INTRODUCTION

The Bulkley River Property is a coal prospect located in west-central British Columbia (see Figure 1). The property is presently under application for coal licences by Atna Resources Ltd.

In March 1986, Coal-Ex Consulting Ltd. was retained to provide an assessment of the exploration potential of the applied for area and to make recommendations for further The assessment presented work. herein is based on observations made during a brief reconnaissance examination of the property and upon reviews of published and unpublished reports. The on-site examination was conducted by Mr. J. H. Perry, P. Geol. (Coal-Ex) accompanied by Dr. T. A. Richards (Atna) and Mr. C. Harivel (Atna) on October 4th, 1984. The main report referred to in this study is by Richards (1986), which details Atna's 1985 exploration activities. Additional information has been obtained from reviews of pertinent regional geological studies, mainly by officers of the Geological Survey of Canada. All diagrams presented in this report have been re-printed, with only minor modifications, from Richards (1986).

# 2.0 LOCATION, ACCESS AND PHYSIOGRAPHY

The property is located some 48 kilometres north of Smithers and 24 kilometres south of Hazelton and is approximately centered on latitude 55° 07.8' N and longtitude 127° 21.5' W. The property lies in a region where coal exploration and coal mining has occurred intermittently since the beginning of the century. Most of the mining took place in the Telkwa area, approximately 55 kilometres to the south. Although no coal mines are operational in this region at present, a major open-pit mine is planned in the Telkwa area by Crows Nest Resources Ltd.

Access to the property is good. Highway 16, which connects Smithers to Hazelton, parallels the western edge of the property (see Figure 2). Branching off from this are various forestry, railroad and farm roads and trails some of which extend into, or lie close to, the property. Access to the eastern side of the Bulkley River is provided by two



bridges located 10 kilometres northwest and 9 kilometres south of the property. These connect with a gravelled forestry road that diagonally transects the property, sub-parallel to the trend of the Bulkley River. The main line of the Canadian National Railroad cuts across the southwest corner of the property. This rail line connects Prince George and other interior communities to the port of Prince Rupert.

The licence application area covers gently rolling topography within the Bulkley River valley. Elevations range between 335 to 550 metres; most of the valley floor, however, lies between 400 and 500 metres. The land surface slopes gently from the valley sides towards the river, which has carved escarpments along its banks. In the northern parts of the property these escarpments vary in height between 5 and 15 metres while towards the south they attain heights of 30 to 45 metres. The northwest flowing Bulkley River provides the major drainage through the property; secondary drainage is provided by several westerly flowing creeks. Only two creeks of any size cross the property; Sharp Creek in the north and an un-named creek in the centre. The southern areas are drained by a creek which lies just outside the property boundary. These creeks are fed by the snow melt from Mount Seaton further to the east.

The land is presently covered by forest composed of poplar, cottonwood and spruce with a thick undergrowth of hazelbush, rosebush, elder and alder. No permanent or semi-permanent dwellings are known in the area. Present activities within the property boundaries appear to be limited to logging withing Lots 1468 and 1470. Past logging in these lots has left many clear cut areas.

#### 3.0 COAL LANDS

The land which comprises the Bulkley River Property is Presently under application for coal licences. This application was made by Mr. A. Mullen (Director, Atna) in January, 1986. It is recorded by the British Columbia Ministry of Energy, Mines and Petroleum Resources as Application No. 208. Mr. Mullen holds 100% of these

interests in trust for Atna Resources Ltd.

The property is in the Cassiar Land District and consists of four lots numbered 1468 to 1470 and 1473. Each lot measures 259 hectares, for a total area of 1036 hectares. The property is illustrated in Figure 2; the location of the lots as shown on the drawings which accompany this report have been taken from N.T.S. Map 93M/3.

It should be noted that this land forms part of the British Columbia Agricultural Land Reserve. Therefore, coal licences covering this area can only be issued upon approval of the Agricultural Land Commission. As no farming is presently being undertaken within this area and as no dwelling places are known to exist, it appears reasonable to expect that approval of exploration activities can be obtained and, consequently, coal licences issued.

Once coal licences are granted annual rental fees of \$5/hectare will be assessed, for a total of \$5180.

#### 4.0 PREVIOUS WORK

Almost all of the coal exploration carried out within or around the Bulkley River property was conducted between 1900 and 1927. Other than reconnaissance work by Atna during 1985 very little, if any, recent exploration has been done.

Coal was first reported from this area by Dawson (1881) while Leach (1911) provided the first documentation of coal exploration. The search for coal was prompted by construction of the Grand Trunk Pacific Railway (now the C.N.R.), which spurred coal exploration throughout northand west-central British Columbia. Work conducted on or around the property up to 1910 included prospecting, tunnelling and "stripping". It is not known precisely what form this "stripping" took, but it may refer to the exposing of coal seams along the river banks. Leach (1911) reports that "stripping" in the northwest extremity of the basin uncovered eleven coal seams while six seams were exposed near the centre of the basin. These seams were



quite thin, ranging between 0.30 to 1.02 metres in thickness.

In 1916, Wright Coal Company undertook exploration and development work on several coal seams located along the Bulkley River in the vicinity of Seaton. Development work included a 70 metre tunnel along the main, "No.1" seam with a cross-slope to the surface. Prospect tunnels were also driven along two or three other seams, (Galloway, 1917).

The last development work in this area was by the Bulkley Valley Coal Mines Syndicate in 1927. Activities included prospecting and mining for a trial shipment. The tunnel on "No. 1" seam was extended by 14 metres and the slope was cleaned out. A 4.6 metre drift was run on a "No. 2" seam and a 21.3 metre tunnel was excavated within a "No. 3" seam. These coal seams varied between 0.43 and 1.37 metres in thickness. A shipment of 20 tons was made from the No. 3 seam, presumably to the railroad (Lay, 1928; Kindle, 1954).

Apparently, all past exploration has been conducted along the river, concentrating on the west bank. It would appear that no drilling has been carried out on the property nor within the rest of the basin.

Atna Resources Ltd. undertook reconnaissance mapping along the Bulkley River in 1985 as part of a regional program. This work located a number of coal seams exposed in the cut-banks of the river; these seams were described, sampled and tested. As a result of this work, coal licences to cover the main portion of the coal-outcrop area were applied for.

#### 5.0 GEOLOGY

5.1 Regional Geology

The west-central portions of British Columbia are underlain by Upper Palaeozoic to Mid-Cenozoic igneous and sedimentary rocks that comprise part of the Intermontane Belt of the Canadian Cordillera. Coal seams are found in strata that range in age from

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Upper Jurassic to Lower Tertiary. Coal measures of the Upper Jurassic to Mid-Cretaceous were developed within a regional-scale sedimentary basin (the Bowser Basin). Late-Cretaceous to Lower Tertiary coal measures occur within fault controlled "graben" basins of local extent, which are developed both within and peripheral to the Bowser Basin. Regional structures trend northwest-southeast and are dominated by high-angle faults (see Figure 3).

The geology of the region which contains the Bulkley River Property has been mapped and described by Sutherland Brown (1960), Tipper and Richards (1976), Eisbacher (1981) and Richards (1981, 1986). Bed-rock geology comprises four main units; the Bowser Lake Group (Middle to Upper Jurassic), Skeena Group (Lower Cretaceous), Brian Boru (Kalsalka) to Middle Volcanics and a sequence of Late-Cretaceous to Lower Tertiary sediments and volcanics. The Bulkley River Property covers coal-bearing Tertiary strata that deposited within a north-trending graben were structure now occupied by the Bulkley River. This basin extends north, from near the village of Moricetown (mid-way between Hazelton and Smithers), for some 15 kilometres and is approximately 3 kilometres wide. The sides of the basin are defined by the abrupt break in slope between the valley floor and mountain sides, and by the marked linearity of this transition. The coal property is located in the northern half of the basin; the geology of the property and coal occurrences are discussed below.

#### 5.2 Property Geology

Data relating to the property geology and coal occurrences has been taken from an unpublished report by Richards (1986) as well as reviews of historical published work by Leach (1911), Galloway (1917) and Lay (1928).

The geology of the property is illustrated in Figure 4. Most of the applied for area is underlain by coal-bearing Tertiary strata. The age of this sedimentary assemblage has been dated as Paleocene, based on leaf fossils (Sutherland Brown, 1960). Upper Jurassic Bowser Lake Group lithologies are



Bulkley River Property Ominaca Mining Division



# Figure 4 PROPERTY GEOLOGY

Bulkley River Coal Licence Area,

Licence Boundary, Geologic Setting and Coal Occurrences of Tertiary Sedimentary Basin.

Hazelton Map-arez (93M-3), Omineca M.D., Cassiar Land District



🗢 Cut-bank Outcrop; Tertiary Sedimente

L H60: Lot Number Taken from Richards (1986)

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present in the northeast corner of Lot 1470, where they are in fault contact with the Paleocene coal measures.

Outcrops on the property are restricted to cut-banks along the Bulkley River; these exposures comprise less than 10% of the river margins. Consequently, very little is known about the overall stratigraphy of the Lower Tertiary in this area. The outcrops are composed of thinly interbedded (up to two metres) fluvial sequences of sandstone, pebble sandstone, siltstone and shale with minor coal seams and conglomerate. The thickness of the strata has been estimated at 120 to 153 metres (Leach, 1911). Volcanic rocks are noted by Richards (1986) to be present in the southern part of the basin but have not been reported on the property.

It is apparent from the examination of outcrops and reports, that the property covers known bearing strata. Coal seams have been mapped old coal-bearing strata. along both sides of the Bulkley River, throughout the length of the applied for area. Most of the work conducted to 1927 concentrated in the Seaton area. (1911) reports that, northwest of Seaton, a Leach of eleven seams, ranging in thickness between total 0.30 and 1.02 metres are contained within 153 metres of strata. In the immediate Seaton area, six seams of a similar thickness range were uncovered. Development work was conducted on three seams in 1916 and again in 1927. The thickest seam was located approximately 366 metres south of Seaton, alongside the river, and varied in thickness from 1.19 to 1.37 metres. The two other seams were 0.43 metres and 0.91 metres in thickness (Galloway, 1917; Lay, 1928).

Mapping by Atna has identified a 1.60 metre seam in the morthwest corner of the property. This seam contains two thin shale bands measuring 0.15 and 0.20 metres and is located in Lot 1468 at Sample Location CH 1-3 (see Figure 4). Many other, thinner seams are present in this outcrop most are no more than 0.20 metres thick, but four seams attain thicknesses of 0.30 to 0.65 metres. Two 0.30 metre seams from the central and southern portions of the property are represented by samples PS-189 and PS-190. Richards (1986) states that the coal seams form part of a rythmic depositional sequence comprising, from the bottom, brownish sandstone with pebble lenses, grading upwards to siltstone which, in turn, is overlain by shale then coal with more shale at the top.

The coal measures contained within the graben-basin have been subjected to Late-Tertiary deformational events. Outcrops along the Bulkley River commonly dip between 20° and 40° to the northeast or southeast. Occasional steeper dips (up to 60°) are present, as are steep dips to the northwest. Richards considers the overall structural pattern to be that of a gentle syncline with strata dipping towards the centre of the valley. He does, however, note complications to this pattern, as evidenced by the areas of steep dip and faulted outcrops.

#### 6.0 COAL RESOURCE POTENTIAL

The Bulkley River Property is located in a region which has seen significant exploration efforts for coal, by both major and junior mining companies, over the last six years. Most of the activity has focussed along the northern, eastern and southern edges of the Bowser Basin (see Figure 5). A number of projects are on-going, and it is anticipated that this region will continue to be one of the more active for coal exploration in the Province of British Columbia.

historical expoloration and review of recent and A that a large number of coal development work indicates seams are present within the Bulkley River Property. While these too thin many of are to warrant further consideration, several seams are of sufficient thickness and quality to justify further work. These seams range in thickness from 0.60 to 1.60 metres. Three have been located by Atna in the northwestern corner of the property (sample locations PS-191/CH-1, CH-3 and CH-5) while two were the focus of early work ("No.l" and "No.3" seams) in the vicinity of Seaton.



Very little information is presently available upon which to base meaningful estimates of the potential coal resources. Lack of outcrop data across the property prevents correlation of the coal seams and a detailed understanding of the structural geology. Similarly, there is no data regarding the lateral extent of the seams across the basin (or valley floor). However, the coal seams have been shown to maintain their thickness and development over short distances by the excavation of tunnels within "No. 1" seam (84 metres) and "No. 3" seam (21 metres).

While exploration to date has identified only relatively thin coal seams, where they lie at or near surface and/or are developed stratigraphically close to one another, they may present possible open-pit mining opportunities. If these conditions are not met then potential still exists for underground mining on the thickest seams. There is also the possibility that the coal seams could increase in thickness across the basin or that other, as yet undiscovered, seams might be present which could support development of the resource.

Coal quality data has been reported by Atna from their recent reconnaissance work (Richards, 1986). Samples were obtained from coal seam outcrops along the Bulkley River; the sample locations are illustrated in Figure 4. The results indicate that the coal is of high volatile A medium volatile bituminous bituminous to rank (as calculated by ASTM methods). This is consistent with the rank determinations of early workers. It is interesting to note that the coal samples obtained in 1916 and 1927 from the tunnels are all of medium volatile bituminous inside rank. These, presumably unoxidized, samples may more coal in this area. accurately reflect the rank of the Analytical results from the thickest seams are presented in Table 1.

Ash contents range considerably, from 19.67% to 54.19% at moisture levels of 1.58% and 1.82%, respectively. The highest ash value is obtained from Sample CH-3, the 1.6 metre seam which contains two rock bands 0.15 and 0.20 metres in thickness. Sulphur contents are variable. In the northwest they are high (0.95% to 1.99%) while thin seams in the central and southern parts of the property

# TABLE 1

# BULKLEY RIVER COAL SEAM ANALYSES (AIR-DRIED BASIS)

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SAMPLE NO.	SEAM THICKNESS   (Metres)	MOISTURE (%)	ASH (%)	VOLATILE MATTER (%)	FIXED CARBON (%)	SULPHUR (%)	HEAT CONTENT (Btu/1b)
PS-191 *	0.65	1.58	19.67	24.04	54.71	1.00	12,025
CH-1 *	0.65	1.65	26.75	24.50	47.10	0.95	10,884
CH-3	1.60	1.82	54.19	26.03	17.96	0.95	5,512
СН-5	0.60	1.54	28.87	23.52	46.07	1.99	10,582
"No.l" Seam	1.37	1.8	43.8	17.7	36.7	_	-
"No.3" Seam	0.91	1.4	35.7	19.5	43.4	-	-

Note: - \* Samples PS-191 and CH-1 are taken from the same seam.

exhibit much lower values of 0.40% to 0.49% (samples PS-189 and PS-190, respectively). The coal has a high heat content; sample PS-191 provides 12,218 B.t.u's per pound, at 19.99% ash (dry basis). Coal of high volatile A to medium bituminous rank is commonly agglomerating (i.e. able to form a coke). Free swelling index tests were performed on samples CH-1 (27.20% ash, d.b.), CH-5 (29.32% ash, d.b.) and PS-191 (19.99% ash, d.b.). They provided buttons of 5, 5 and 7, respectively. These preliminary tests, performed on outcrop samples, indicate that the coal has good coking potential and corroborates observations by earlier workers.

#### 7.0 CONCLUSIONS AND RECOMMENDATIONS

The Bulkley River Property contains known coal measures which, to date, have seen only limited exploration efforts. This work has, however, located several seams which range thickness between 0.60 to 1.60 metres. Outcrop is in cut-banks of the Bulkley limited to River and no information available coal seam development is on throughout the rest of the basin. Potential therefore exists for the presence of other, thicker coal seams within the stratigraphic section and/or for thickening of the identified to date, across the applied for licence seams area. No estimates can yet be made for the potential coal resources contained within the property. However, the occurrence of these thin seams close to ground surface provides possibilities for small-scale open pit mining. exist for seams Underground mining opportunities could greater than one metre in thickness and having gentle or moderate dip.

The coal produced could be used as either a thermal or coking coal. Its ultimate usage would depend upon a number of factors such as coking characteristics, cleaning costs and markets. Run-of-mine coal would have to be cleaned; product thermal coal might need only a simple screen and water-jig process while coking coal would require a more sophisticated plant. The property is very well situated for infrastructure and labour requirements and is located considerably closer to port facilities than most existing coking coal and thermal coal producers.

Good quality coking coals command substantially higher prices than most thermal coal. While coking coal prices have slipped over recent years due to the decreased demand for steel, well priced metallurgical coal should penetrate most markets. Excellent coal shipping facilities have already been established at Ridley Island, near Prince Rupert, to service off-shore customers. Good quality thermal coal can also be shipped off-shore or find markets in the Pacific Northwest and locally for either domestic power generation or the manufacture of cement. heating, Coal from the Bulkley River Property could also be used for blending with coking or thermal coals presently being shipped through Prince Rupert.

It is concluded, therefore, that the property represents a valid coal exploration target. A work program comprising geological mapping, hand-trenching, rotary drilling, logging, sampling and testing is recommended. geophysical Such a program should be designed to explore for other coal seams along the Bulkley River and its tributaries and to drill away from the river to test for the development of coal seams in previously unexplored areas of the basin. Geological mapping should preceed the drilling in an effort further identify stratigraphic to and structural Initial drilling should total approximately constraints. 500 metres distributed between four of five holes. Samples obtained from this program should be analysed to determine basic coal quality parameters.

It is estimated that work of this scope will cost approximately \$45,000; detailed costs are presented in Section 8.0. Further drilling will be contingent upon the results obtained from this work.

### 8.0 1986 BUDGET ESTIMATE

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a)	Geological Mapping and Supervision	\$ 3,000
b)	Equipment Rentals and Supplies	1,000
c)	Drilling 500 metres @ \$58/metre	29,000
d)	Geophysical Logging	2,000
e)	Travel, Accomodation, Truck Rental	1,500
f)	Coal Analyses	2,500
g)	Consulting and Report Production	2,000
h)	Contingencies	4,000
		\$45,000

These cost estimates do not include fees which may be required for coal licence renewal or reclamation bond(s). Respectfully submitted,

JHP COAL-EX CONSULTING LTD.

J. H. Perry, P. Geol.



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#### CERTIFICATE

I, J. H. Perry, do hereby certify:

- 1. That I am a consulting geologist with a business office at 806, 402 West Pender Street, Vancouver, British Columbia, V6B 1T6, and am President of JHP COAL-EX CONSULTING LTD.
- 2. That I hold a B.Sc. (Hons) degree in Geology from Exeter University (1972) and that I undertook post-graduate study at the University of Calgary (1972-1976).
- 3. That I am a Registered Professional Geologist in the Association of Professional Engineers, Geologists and Geophysicists of the Province of Alberta.
- 4. That I am a Fellow of the Geological Association of Canada, a Fellow of the Geological Society (London) and a Member of the Canadian Institute of Mining and Metallurgy.
- 5. That I have practiced my profession as a geologist for the past ten years.
- 6. That the information, opinions and recommendations in the attached report are based on research of published and private geological maps and reports combined with a site-visit.
- 7. That I own no interest in the subject property nor in the shares or securities of Atna Resources Ltd.
- 8. I consent to the use of this report in its complete form only in a Statement of Material Facts or Prospectus by Atna Resources Ltd.

H. Perry