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The Technical and Research Committee on Reclamation

TRENCHING TECHNIQUES AT THE B.P. SUKUNKA PROJECT

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INTRODUCTION

This discussion outlines the trenching programs on our Sukunka property. In addition to detailing the equipment utilized, geological information obtained, and reclamation procedures, a cost comparison of different machines will also be derived.

The Sukunka property is located in northeastern B.C., approximately 60 kilometres south of the village of Chetwynd (Figure 1). The lease occupies 165 square kilometres and is known to contain significant reserves of metallurgical coal. Located in the Inner Foothills belt, access to the property is by a logging road up the Sukunka River Valley (Figure 2).

The area is in the Sub-boreal Forest Region and contains rugged terrain with diverse vegetation patterns: from the alpine tundra zone atop Bullmoose Mountain; through Sub-alpine Engelmann Spruce - Alpine Fir zones in major valleys; to Sub-boreal White Spruce - Alpine Fir zones in the Sukunka Valley. Elevations range from 725 to 2025 metres.

Two mine portals, both located on outcrop, have been developed to access the reserves: the Sukunka Main Mine and the Number 1 Mine.

Coal exploration has taken place on the property since 1969; however, B. P. did not actively explore the lease until the summer of 1977.

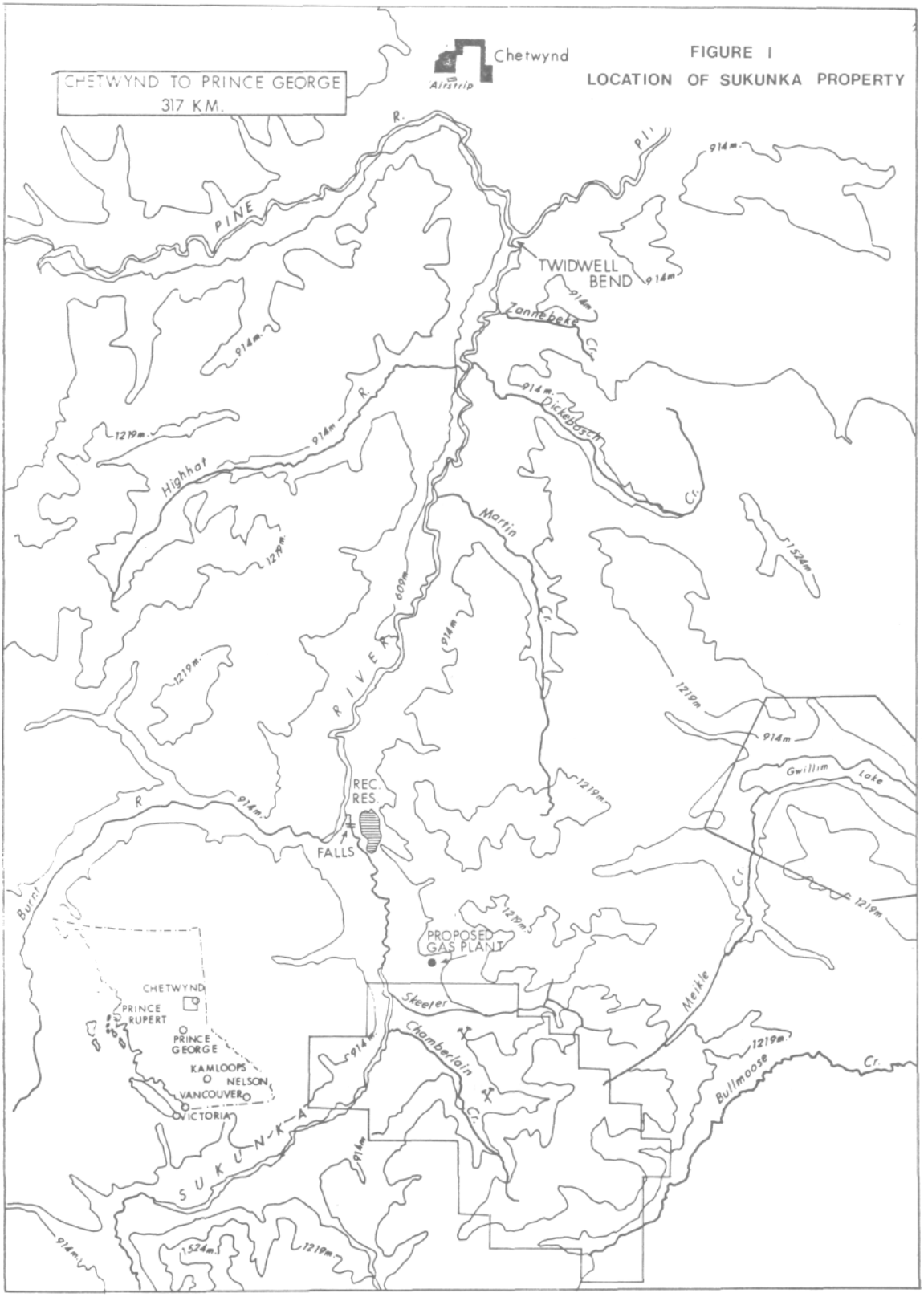
FIGURE I
LOCATION OF SUKUNKA PROPERTY
CHETWYND TO PRINCE GEORGE
317 KM.
Chetwynd
Airstrip
PINE R.
TWIDWELL BEND
914m
Zanmbeke Cr.
Dickebosch Cr.
Highhat
Martin Cr.
1219m
1524m
609m
RIVER
REC. RES.
FALLS
Gwillim Lake
Burnt R.
PROPOSED GAS PLANT
Steeler
Chamberlain Cr.
Meikle
Bullmoose Cr.
CHETWYND
PRINCE RUPERT
PRINCE GEORGE
KAMLOOPS
NELSON
VANCOUVER
VICTORIA
SUKUNKA

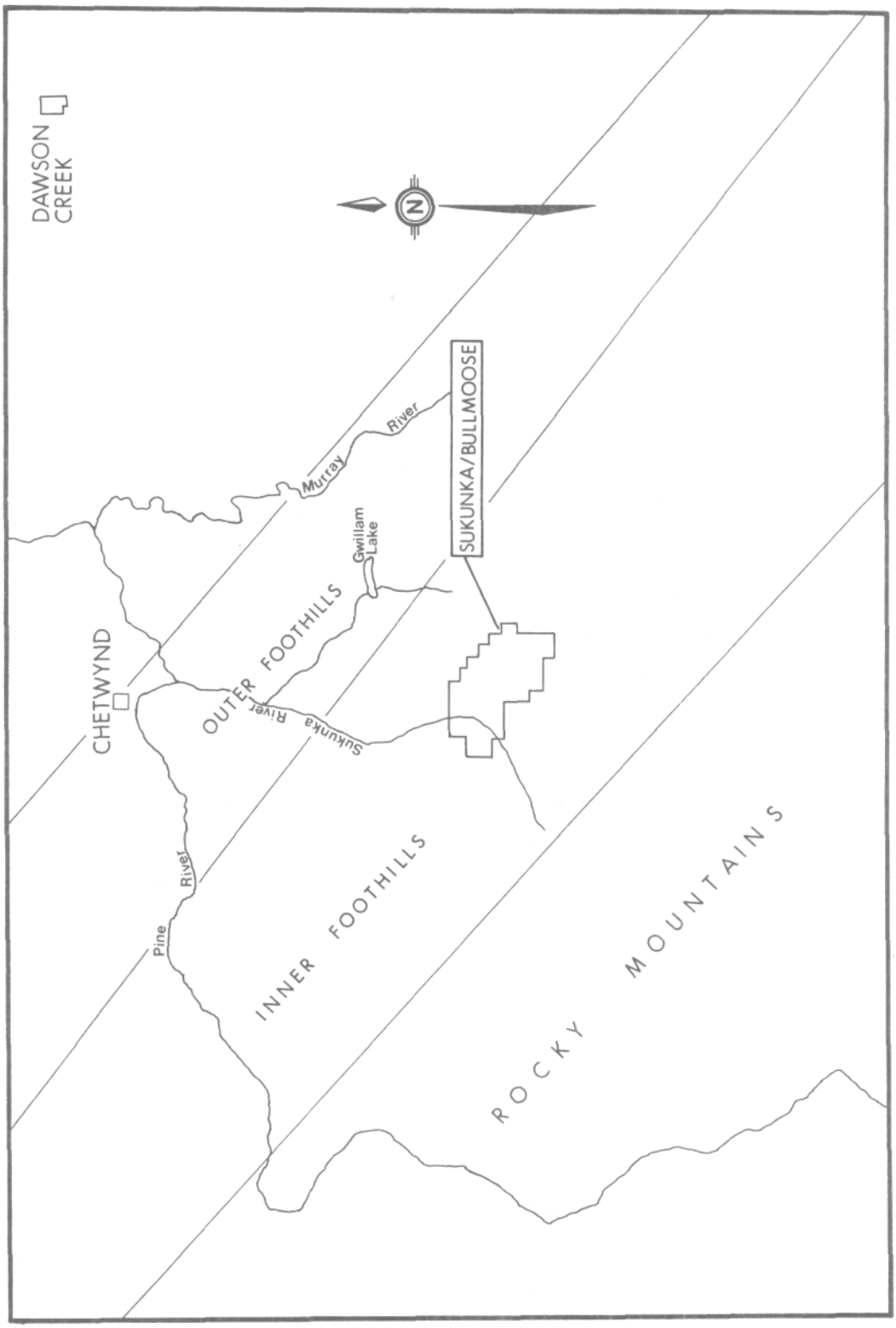

FIGURE 2
TECTONIC SETTING OF
NORTHEASTERN BRITISH COLUMBIA

TRENCHING ACTIVITIES

During the summer of 1978, exploration consisted of *a* combined program of drilling, trenching and field mapping. The duration of the program was approximately four months, from mid-May through to mid-September. The majority of reclamation work associated with these activities also took place in the summer of 1978.

Trenching provided valuable geological information on structure, stratigraphy and coal quality. Structural information obtained included a description of jointing, cleavage, bedding and faulting. Stratigraphic information included mainly a detailed description of roof and floor contacts not easily observed in drill cores. In addition, although unweathered sections of outcrop are not exposed during trenching, information on raw ash, moisture, volatiles, calorific value and a qualitative assessment of coking properties was obtained.

Generally, trenches were located in three types of locations. First, outcrops along roadsides were trenched to expose a physically undisturbed section. Secondly, to verify previously obtained information, old outcrop strips were trenched at 300 metre intervals, or less if warranted by the geology. And finally, areas of unknown, but inferred, outcrop were trenched to locate the exact position of seams. These trenches were largely unsuccessful due to the excessive depth of overburden.

TRENCHING MACHINES

Within the 1978 exploration program, considerable emphasis was placed on trenching. Therefore, relatively inexpensive and mobile trenching machines were required. This made the choice of machines critical. Six parameters were considered when evaluating the available alternatives:

1. Mobility - the lease area contains an extensive network of roads and outcrop strips, which allows the use of fast rubber-wheeled vehicles, however, the area also contains steep and difficult terrain, necessitating the use of tracked vehicles;
2. Physical size - for maximum mobility and flexibility, machinery had to be small enough to manoeuver in tight spots but large enough to trench in difficult areas;
3. Depth capability - machinery had to be capable of trenching to a depth of 4 to 5 metres;
4. Width of trench - to reduce surface disturbance, a bucket width of just over half a metre was desirable;
5. Cost — all machinery was commissioned on a per hour basis;
6. Availability - it was necessary to work within the limits of machines available in the Chetwynd region.

In the 1978 program, two machines were utilized: a rubber-tired John Deere 510 backhoe and a wide-pad Caterpillar D4. The big advantage of the 510 was its mobility between trench sites, travelling at speeds of 15 to 20 kilometres per hour depending on road conditions. The 510 backhoe also had an effective reach of 5 metres and a heavy boom. The disadvantage of the 510 was its immobility on steep or wet terrain; this necessitated bulldozer support and elevated the cost of trenching substantially. Costs for the John Deere 510 backhoe were 48 dollars per hour.

Under adverse conditions, a wide-pad Caterpillar D4 with a detachable backhoe was utilized. This machine, although slow between trenching sites, proved to be very effective on wet and steep terrain. The backhoe part of the machine had a slightly shorter reach (about 4 metres) and a lighter boom than the 510; however, this was more than offset by its ability to get into otherwise inaccessible areas. A big advantage of the D4 was that in areas where heavy bush was encountered, only a slashed trail was needed for

access. A slashing crew went ahead and cut a trail just wide enough for the machine (about 4 metres), bucking the timber into short, 2 metre lengths. When the D4 came in to trench, it walked the bucked timber into contact with the ground. This procedure eliminated the need for road building, and prevented disturbance of the mineral soil and subsequent elaborate reclamation. Costs for the D4 when utilizing the backhoe were 38 dollars per hour; however, when the backhoe was not being used, this cost was reduced to 32 dollars per hour.

TRENCHING METHOD

The actual technique of trenching using either the 510 or D4 was as follows. The trench sites were flagged in geologically pertinent areas as determined by field mapping and, in some cases, drilling. If a trail or road to the trench site did not exist, a trail was flagged and slashed. A 0.7 metre wide bucket was used on all equipment. The material from the trench was piled as close as possible to the trench, usually within the radius of the boom, so that backfilling could be facilitated. Close supervision was exercised during all trenching so that unnecessary work would be eliminated. The trench was usually logged directly after it was opened, so that further cleaning out would not be necessary, and it could be backfilled and levelled before the backhoe moved to the next site.

Materials were immediately backfilled in the reverse order of extraction, which offered a number of reclamation advantages. First mineral and organic components of the soil could be restored in approximately their original order. Secondly, pH and microblal activity in the soil could be retained; and, finally, soil loss through erosion could be minimized. After backfilling, the standard Minei; and Petroleum Resources seed mixture (percent by weight) for forested areas was applied and subsequently fertilized at a rate of 44 kilogrammes per hectare:

1. Boreal Creeping Red Fescue - 40%
2. Climax Timothy - 20%
3. Redtop - 15%
4. Alsike Clover - 25%

Cost Comparison between 1977 and 1978 Programs

During the 1977 exploration program, a Caterpillar D6 or D8 was used extensively for trenching. A cost comparison between this type and backhoe trenching has been made (Figure 3). All cost comparisons are based on dollar values during the respective year of operation - 1977 or 1978. Costs are only a comparison between the actual trenching activities; no costs for site access have been included.

In 1977, approximately 80 hours of Cat time were used to cut four trenches to a total length of 178 metres, which varied in width from 10 to 15 metres. In 1978, approximately 82 hours of backhoe time were used to cut 53 trenches to a total length of 153 metres, which had a maximum width of one metre. Costs per linear metre of trench were much lower in 1978 than 1977: Cat work averaged 201 dollars (201.24 dollars) per metre; backhoe worked averaged only 23 dollars (22.53 dollars) per metre.

SUMMARY

In summary, significant savings can be realized with the use of rubber-tired or wide-track backhoes for trenching. In addition, since the area of surface disturbance is greatly minimized compared to bulldozer trenches and an equal return of geologic information is obtained, the resultant environmental impacts and reclamation costs can be significantly reduced.

FIGURE 3

COST COMPARISONS OF TRENCHING

USING BULLDOZER AND BACKHOE
TECHNIQUES

YEAR	EQUIPMENT TYPE	TOTAL LINEAR METRES	COST/M
1977	D8 & D6	178 metres	$201.00
1978	D4 Backhoe	153 metres	$22.50
	510 Backhoe		

DISCUSSION RELATED TO BOB REDGATE

AND W. NYLANDS' PAPER

There was no discussion about this paper.