WCF

HAT CREEK PROJECT

1977 BULK SAMPLE PROGRAM

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HAT CREEK PROJECT

1977 BULK SAMPLE PROGRAM

INTRODUCTION

The Bulk Sample Program involves: the excavation of two surface trenches at Hat Creek, the performance of numerous mining, handling, and storage tests on site, and the transportation of coal to a powerplant in Alberta for a major burn test.

The two main justifications for the program are:

- A large amount of mine and handling information can be gained by exposing sections of the coal deposit,
- 2.) Burning the fuel in a commercial scale plant will greatly increase the knowledge of the coal, needed for steam generator design specifications in order to ensure operating reliability.

To date, information on Hat Creek fuel has been obtained from: exploratory drilling, laboratory analysis, burn tests in a laboratory scale furnace, and washability tests in a pilot scale beneficiation plant. These methods have all been effective. However, owing to the unique nature of the Hat Creek deposit and the size of the steam generator proposed it is necessary to move from the laboratory scale to a reasonable full scale method of proving fuel quality and behaviour.

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However, other important reasons for conducting this program are of an environmental nature. The actual excavation of a test trench will supply valuable data as to: the best methods of land reclamation after and during mining, the safest procedures for preventing water contamination of local streams and the optimum dust suppression scheme. In short this program will not only provide us with valuable engineering data to ensure feasibility of the total project, but it will also, in conjunction with the Detailed Environmental Studies, supply us with the information required to reduce the environmental impact of the total project.

This program is regarded as a model of the total Hat Creek Project. Although it is relatively small it does mimic the total project with respect to the variety of fields of expertise involved and accordingly the organization of the program has been set up so that its carrying out can be regarded as a trial run for the total Hat Creek Project.

In broad terms the Generation Planning Department is responsible for the planning of the program until approval while the Thermal Division has the actual responsibility of conducting the program, if it is approved. Specifically, the following table indicates which groups have provided input for the various aspects of this detailed program plan:

Mining	Plan	₩		~
Transpo	ortation	MM	£	PCC

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Engineering Tests n

- Powerplant	TE & PCC
- Beneficiation	TE & PCC
- Other	TE & PCC
Public Relations	CCR & GP
Environmental Program	Cons., PCC
Coordination	PCC & GP
Schedule & Costs	PCC, M, MM
Legal and Government	GP, M, L

*Legend:	M	= Mining Department (Thermal Division)
	GP	= Generation Planning
	TE	- Thermal Engineering Department (Thermal Division)
	PCC	- Project Coordination & Control Dept. (Thermal Div.)
	MM	Materials Management
	Cons.	Environmental Consultant
	CCR	= Customer & Community Relations
	L	= Legal

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MEMO TO :	J.	J.	FITZPATRICK
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9 March 1977

FROM : W. C. FOTHERGILL

File: 1301.1-1

SUBJECT : Bulk Sample Program Description "Mining Plan"

1. This description of the "Mining" plan for the bulk sample program of the Hat Creek project is intended to provide the essential facts and detail of the proposed excavations and other related mining responsibilities. The report is to be a part of a presentation to management for approval of the whole project.

2. The Coal Sample

The requirement of the Thermal Plant Department for this bulk sample of coal, is described in their separate report. It calls for an initial 200 tons of material for a flow test followed within one month by the first shipment of 6000 tons of coal with an average calorific value of 5500 - 6000 Btu/lb at 20% moisture content.

If this test burn is not satisfactory, further quantities of 6000 tons of each of the alternate qualities may be required.

Other specifications require the coal to be representative of run-of-mine grade with regard to moisture content (20%) Ash content (30%) and size $(-1\frac{1}{2}")$.

To get the representative run-of-mine grade from four classified coal zones, A, B, C and D, close to surface to minimize digging depth and below water table to give moisture saturation, two separate trenches.are proposed as located on the attached site plan. These two factors of depth of overburden to coal, and depth of water table in the ground limited the available sites - especially in the case of Trench "B" which is in an environmentally sensitive location between the Hat Creek and the road. However, having a maximum exposure of our work to local residents passing by will be a valuable exercise this early in performing the work to strict environmental standards permitted by the Reclamation permit. (It can be done by disciplined control of the contractors!) Memo to: J. J. S. - applek - ?

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3. The Trenches (Refer to Engineering Plan & sections of each)

Trench A - Coal beds A and B.

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Eight test holes to a depth of 20 feet below the proposed bottom of the trench at elevation 3120' will be drilled starting 16 March 1977. These test holes will confirm the position of the coal and its quality before the excavation is started. (Ref Encl.#1 - letter) An alternative site has been selected for Trench A between DDH 59 - 16, 59 - 17 and 57 - 8 in the event that these test holes do not locate suitable coal at the required depth. New test holes would have to be drilled at the alternate site. Estimated Cost Test Drilling \$30,000. A 6000' length of new road will have to be contructed to give access for 30 ton haulage trucks to the stockpile site of Trench A. (Encl. #2 - memo) Estimated Cost Road \$28,000. DDH's 74 - 46 and 76 - 190 indicate that a trench to the depth of 3120' elevation (maximum 80' depth) will give suitable coal below water table. The trench will be +800' long and have three benches and berms. It is expected that +20,000 tons of coal of varying qualities will be extracted and stockpiled from this trench. After the test drill holes are completed a more definite calculation can be made of the total quantity of coal to be mined.

Trench B - Coal beds C and D

DDH's 76 - 152 and 76 - 194 indicate that coal of high calorific value lies at shallow depth between Hat Creek and the main road and Power Line.

There is a potential water problem (See Encl. #3 memo) which is being checked now by digging a backhoe trench and by pumping tests. <u>Estimated</u> <u>Cost \$2,150</u>. Two new test holes will be drilled to 50' depth to complete the information of the coal quality and depth. It may be impossible to find lower quality calorific value coal here.

Good access roads already exist adjacent this site. The maximum depth cut of this trench B is expected to be 40 feet, and the trench will be 500' long from the start of the ramp. It will have two benches and berms. It will have to be kept pumped out during the period of test work, but will fill up with water when the pumps are removed. A protection earth pile will be placed between the pit rim and the road for safety to traffic. The power line may require moving to the East side of the road. B. C. Hydro Cache Creek office have inspected this and quote \$300 per pole X 4 poles = \$1,200 to relocate this power line (if it becomes necessary). No other alternative site has been found to locate this trench B to get the information on the 'D' bed of coal without excessive depths of trenching.

4. Plans and Sections of Trench Excavation - As attached.

These were drawn to scale $1^{"} = 40^{"}$ and reduced to $\frac{1}{2}$ size for this report. Survey information was obtained by an onsite survey when the trench Memo to: J. J. Fitzpatrick

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345,000 cu. yds.

centreline and perimeter limits were staked out. Also the test drill holes were staked and surveyed.

If no changes are made as a result of the test drilling excavated volumes of the trenches will be:

<u>Total</u> Trench A - Overburden 142,000 cu.yds. Coal Bench 139,000 = 281,000 cu. yds. Trench B - Overburden 57,000 cu.yds. Coal Bench 7,000 = 64,000 cu. yds.

Total

ment

<u>199,000</u>

5. Digging Plan: Methods, Costs & Efficiencies

(a) <u>Overburden</u> Top Bench 20' - 30'. Gravel, silt, boulders. By bulldozer with ripper, and scraper units. Attempt to leave +45° slope angle to the bench for test purposes.

The overburden stripping basic unit costs are roughly:

D - 9 Dozer & Ripper	\$ 60/hr.
34 cu. yd. Scraper	65/hr.
D - 8 Pusher-Dozer	50/hr.
Front End Loader	50/hr.
Supervision	20/hr.
Subtotal	\$245/hr.

Efficiency of 340 cu. yd/hr. (As detailed in Encl. #7 attached)

Co	ost per cu. yd. = $\frac{245}{340}$	- 0.72
+	50% indirect costs	0.36
+	30% profit margin	<u>0.24</u>
	Total	<u>\$1.32</u> /cu. yd.

(b) <u>Coal Benches</u> - 20' height. Non-blasted coal in situe. Digging by 5 yd. bucket-shovel or RH60 Hydraulic Mining Shovel (Backhoe type) (Attempt 60° slope angle)
 2 - 30 Ton Haul Trucks
 Clean up and assist by Front End Loader & Dozer

Basic	unit.	COSTS	for di	Leging	Denches	are:
				-000		

1 Shovel or Mining Hydraulic	Shovel \$ 80/hr.
2 - 30 Ton Trucks @ \$35	70/hr.
1 Front End Loader	50/hr.
1 Dozer	50/hr.
Supervision	20/hr.
. S t	ubtotal \$270/hr.

Efficiency of 300 cu. yd. per hour. (Detail in, Encl. #7 attached) Cost per cu. yd. = $\frac{270}{300}$ = \$ 0.90 + 50% Indirect costs 0.45 + 30% profit margin 0.30 Total \$1.65/cu. yd.

(c) Other Work in Trenches (by Contractor)

Pumping & Drainage Road maintenance

Costs for these included in the 50% 'Indirect' above

6. Stockpile Sites & Drainage

And

Each trench will have a stockpile yard prepared on levelled ground with drainage ditches, and a run off to a collecting pond. In the case of Trench B, the expected large quantities of water in the pit will be pumped to a prepared dam in the "Dry Lake" 1000' West of the trench where evaporation will take place.

Stockpile sites will be divided into "coal" and "waste" areas and piles of selected quality materials of each will be heaped by dozer and front end loader.

Cost of this site preparation work will be:

Stockpile Site - Trench A (2 acres)

 Dozer levelling
 10 hours @ \$50 = \$ 500

 Dozer ditching
 5 hours @ \$50 = 250

 Dozer Pond-dam wall 5 hrs @ \$50 = 250

 F.E. Loader Pond-dam

 wall 5 hours @ \$50 = 250

 Total
 \$1,250

Stockpile site - Trench B

Dozer - ditching	5 hours @ \$50	\$	250
Dozer - Pump sump	5 hours @ \$50		250
Dozer - Settling Pond	at Dry Lake		250
F. E. Loader - Settlir	ng Pond at Dry Lake		250
	Total	<u>\$1</u>	,000

Sorting and Piling Waste and Coal Allowing 300 cu. yds. per hour Dozer or Front End Loader @ \$50/hr. Cost/cu. yd. * \$0.17

7. Coal Crushing - requirement is for - 12" size.

A 7X7 Bradford Breaker is being purchased for \$23,000 and will be erected at Trench 'A' stockpile site. Installion Cost estimated = \$15,000 Total capital & installation cost = $\frac{$40,000}{1000}$ Coal from Trench B will be trucked to Trench A site for crushing and loading.

Coal Crushing Operating Costs - (Ref. detail Encl. #6 by J. Irvine)

Includes:

Rental of Diesel Electric Generator & Operating Costs	\$ 4,500
Rental of short conveyor for feed to Breaker	2,000
Equipment operator - load & feed breaker	4,400
Breaker - crusher operator & helper	5,500
Maintenance Electrician & Mechanic (Part-time)	3,300
Crushed coal moving & stockpiling	4,400
Crushed coal loading to haulage trucks	6,000
Total Operating Cost for 6,000 Tons @ 500/T.	\$ <u>30,100</u>

Capital Cost Coal Crushing

Purchase of 7 X 7 Bradford Breaker	\$23,000
Freight & installation Bradford Breaker	15,000
Construction of 50 Ton Coarse Coal Bin	5,000
Installation of conveyor belt Feed	1,000

Memo to: J. J. Fitzpatrick

- 6 -

Capital Costs Coal Crushing continued...

Construction of Chute for crushed coal to pile1,000Preparation of collecting road & pit3,000

Trucking of 2000 Tons Coal from Trench B to Trench A stockpile site for crushing @ \$1.50/T _3,000

Total Capital Costs = \$51,000

Capital & Operating Costs - 6000 Tons <u>\$81,000</u>

or \$13.50/Ton for Crushing

8. <u>Manpower List</u>

(a) Mining - Excavation (2 shifts per day X 10 Hrs.)

Contractor:

Supt.	1
Shiftboss (Foreman)	2
Clerk - 1st Aid	2
Supplies-Pickup Driver	1
Dozer Operators	4
Scraper or Shovel Operators	2
Front End Loader Operators	2
Truck Drivers	- 4
Mechanics	2
Electrician	1
Utility & Labour	2
Stockpile Yard Operators	2

Total 24

(b) <u>B. C. Hydro & Camp</u>

Staff Engineer1Geologist1Student labour1-sampler & surveyor2Cook - caretaker - Honkekeeper1Environment - Reclamation16

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<u>Coal Crushing Crew</u> (2 shift basis)

Dozer - Loader Operators2Crusher Operator2Crusher Helper2Mechanic - Maiwtenance1Electrician18

<u>Note:</u> It is proposed to specify in the contract tender that the contractor provide his own catering services, office, and washrooms. Also recommend that labour will commute into work from adjacent towns.

9. Summary of Mining Costs

Capital - Exploration Budget 3B

Test hole drilling & sample analysis	\$ 40,000
Trench B - water flow tests	2,000
Road access to Trench A	<u>28,000</u> -/
	A 70 000

Total Exploration § 70,000

Direct Costs - Bulk Sample Budget for Approval

Site Preparation: Trench A - Stockpile site & Pond Preparation 1,250 Trench B - Stockpile site & Pond Preparation 1,000 Trench B - Powerline relocation 1,200 Trench B - Pumping to Dry Lake-pumps & piping 5,000 See End *8 See End *8 Coal Crushing Plant Site_ - Total 50,000

Total Site Prep.: \$58,450

Excavation	Costs:			<u>cu. yds</u>			
	Trench	A	- Overburden removal	142,000	6	\$1.32 •	= 187,440
		A	- Bench & Coal	139,000	0	\$1.65	229,350
	Trench	B	- Overburden removal	57,000	@	\$1.32 •	75,240
		B	- Bench & Coal	7,000	0	\$1.65	11,550
				345,000	0	\$1.46	\$503,580

Memo to: Mr. J. J. Fitzpatrick - 8 -

Direct Costs continued ..

Crushing Costs - Capital & Operating Costs

6,000 Tons @ \$13.50/Ton	81,000	47
<u>Coal Sampling & Analysis</u> Tests & Labour	30,000	V J 673,030
Total Direct	\$731,480	8.68% 58 450
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Indirect Costs:

B. C. Hydro Camp & Catering (2months)20,000Reclamation - physical material moving20,000Geotechnical Tests - (Golder & Assoc.)20,000Dolmage Campbell & Assoc. - Services20,000Miscellaneous & Contingency20,000

Total Indirect \$100,000

Recapitulation Summary

Exploration 3B	\$ 70,000 🛩
Total Direct	731,480 -
Total Indirect	<u>100,000</u>

Mining Costs Total = \$901,480 + 203

Note: Rail Shipping to Powerplant not included.

List of Attached Enclosures

#1 Memo JJF to Dolmage Campbell re Test Drilling File 1301.3
#2 Memo WCF to JJF - Access Road to Trench A 1301.1
#3 Memo WCF to JJF - Preparatory Work Water Problems Tr. B 1301.1
#4 Letter to JJF by Golder Associates re Geotechnical Aspects
#5 Letter to JJF by Dolmage Campbell re Bulk Testing Program
#6 Memo J. R. Irvine to WCF - Coal Crushing Costs
#7 Detail on Excavating Efficiencies by WCF
#8 Detail on B. C. Hydro campsite preparations.

WCF:rak

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

744 WEST HASTINGS STREET, STE. 500, VANCOUVER, B.C. V6C 1A5

2 March 1977 File: 1301.3

TELEX: 04-54456 TWX: 610-922-6438

TEL. (604) 663-2212

Dr. D.D. Campbell Dolmage Campbell and Associates Ltd. 1000 - 1055 W. Hastings Street Vancouver, B.C. V6E 2E9

Dear Doug,

Drilling for bulk sampling program

It is understood that there are sufficient funds in last year's 3B drilling budget for a small drill program. It is planned to drill 8 holes having a depth of 100 feet each. These holes will be 100 feet apart and extend in a line east or northeast from DDH-74-46. Two additional holes of 50 feet each are planned south of DDH-76-194 and between the road and Hat Creek. The exact locations of the holes and trenches will be given to Joe Rotzien on Thursday and Friday when a party from B.C. Hydro visits the site. Drilling should be done with HQ Triple tube and overburden coring will be necessary on some or all of the holes. Additional holes (probably less than 80 feet deep) may be necessary for the installation of prezometers around the DDH-74-46 trench site.

D.W. Coates Enterprises should do the drilling as an extension of the 3B contract although at a new cost. The engineering cost scale suggested by Don Coates appears to be reasonable.

The drilling program should commence about the middle of March and be completed by the first week in April. Analytical results and drill logs from this program will be required promptly for planning purposes.

J.J. Fitzpatrick Manager, Mining Department

PIM/las

cc: W.C. Fothergill,

Encl. # 2 Itama 1 of 3

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MEMO TO	:	J. J. FITZPATRICK	8 March 1977
FROM	:	W. C. FOTHERGILL	File: 1301.1-1
SUBJECT	:	Bulk Sample Program Access Road to Site Trench "A"	

 On Friday, 4 March the site for Trench "A" at Hat Creek Coal was visited, and a survey was made of the proposed trench location near DDH₅76-46, 76-190 and 76-205 on the N. W. slope.

The centre line and perimeter outline of Trench "A" was staked and marked, also the proposed nine test drill holes.

- 2. No suitable good access road exists to the site at present; only rough cat trails made to the exploration drill hole sites in past years allow access by four-wheel drive vehicles.
- 3. An existing private road connects from Ed Lehman's property up to the good "logging road" (Savona's) which passes the Trench "A" site, but we have been advised not to route our traffic past Lehman's house.
- 4. It is proposed to have a new road constructed, about 6000' in length, from the Savona logging road at the 3200 elevation contour to the Trench "A" site, and extend it on down to the selected stockpile site at the 3100[†] elevation adjacent to DDH 76-191 on the East side of the proposed excavation.
- 5. This road will be made to as good a standard of construction as the 'Savona' Logging Road, and will be suitable for the easy travel by the 30 Ton Trucks hauling the coal sample to railhead for shipment. Maximum gradient is to be 10%.
- 6. A cost estimate submitted by Ed Lehman to Dolmage Campbell & Associates for this 6000¹ of new road construction is based on an hourly rate of equipment and operator and supplies as follows: -

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	Cost Per Hour
Bulldozer Case 1450 (D6)	\$43.00
Bulldozer Case 1150 (D5)	\$33.00
Bulldozer Case 1000 (D4)	\$27.00
Road Grader Adams 612	\$25.00
Truck - Gravel Haul (10yds)	\$26.00
Backhoe Case 450	\$18.00

Estimated total time period - 24 days Estimated Bulldozer time period - 20 days Estimated Trucking of gravel - 11 days

Approximate total cost figure is \$28,000.

7. Dolmage Campbell & Associates have used Ed Lehman with his equipment during past years to do the road making and site preparation for the diamond drilling work. It was done on a cost per hour of equipment basis.

Although the gravel hauling trucks would be hired on the individual basis, the whole job would be coordinated by Joe Rotzien and Ed Lehman.

8. It is proposed that approval for this job to be done should be part of the Management approval for the whole bulk sample program scheduled for 15 March. Work on constructing this 6000' of road would start as soon as possible after 15 March because the permit for such work exists on last years' notice of work to the Dept. of Mines and the exploration permit.

- 9. The completed road access to the site will then be ready by the time the main contract tenders are awarded and the selected contractor moves in to start on the excavation.
- 10. This three week time saving by completing the site access road before start of the digging on 2 May 1977 is critical to the time schedule for the burn test. Although the main contractor would undoubtedly prefer to make the road himself, we cannot afford the time after awarding the contract.
- 11. Attached map shows the proposed road access to Trench "A".

WCF:rak cc. P. T. McCullough Attachment



Encl. # 3 Tage 1 07 2

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MEMO TO : J. J. FITZPATRICK

File: 1301.1

7 March 1977

FROM : W. C. FOTHERGILL

SUBJECT : Hat Creek Coal Bulk Sample Authority Request for preparatory work

<u>Trench 'B'</u> - the proposed site at the North end, lying between the Hat Creek and the main Hat Creek road has a potential water problem that could make it impossible to dig this pit.

It is believed that the ground water level is only 12 feet below the surface of collar elevations of the Drill holes 76 - 194 and 76 - 152 where the proposed trench is to be excavated. The creek water is flowing at an elevation of 8 feet below these drill hole collars. If there are any water courses or high permeability zones between the creek bed and the proposed trench excavation, it is possible that flooding of the excavation will take place making further digging impossible.

Before going ahead with mobilization, test drilling, and contractor commitment to the excavation of this trench a good test of such ground water flows would be to dig a 12 foot deep trench 80 feet long, 3 feet wide in the site with a backhoe. The first cut of 4' would be done by bulldozer. If any water flows are encountered, it would be tested by pumping with a medium capacity (say 100 gpm) gas driven pump.

Cost estimates for this work are quoted at \$450 for the backhoe machine (\$18.00 per hour) and \$200 for the bulldozer - total \$650. This includes operator and supplies.

Dolmage Campbell and Associates will have the work done by Harry Sveinson and Ed Lehman as part of the existing Stage 3B exploration budget. Because Sveinson is going off on holidays by March 11th, it is necessary to give quick verbal authority for the work - today if possible.

If the work shows that the water problem is not unmanageable then this test trench will become part of the larger excavation, and planning will proceed. If the water is too much then the hole will be filled in and the site abandoned.

It is recommended that we take on the challenge of digging fairly large amounts of water for the experience of such work, because even after Hat Creek is diverted for the future major open pit excavation, there will probably always be heavy ground water in this site where the entry decline has to be made. then tot 3. J. Fitzpatrick

No other suitable alternative site for a test trench to get into the ... C and D coal beds close to surface has been found.

I understand that financial control for this kind of work is at present done by Generation Planning Dept. : Bob Woodley or Jack Edwards. Can you get their quick approval for a verbal authorization to Joe Rotzien of Dolmage Campbell and Associates at Hat Creek?

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WCF:rak

cc. P. T. McCullough

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Golder Associates

CONSULTING GEOTECHNICAL ENGINEERS

E/77/302 March 8, 1977

Mr. G. Fitzpatrick, B.C. Hydro & Power Authority, 744 West Hastings St., Vancouver, B.C.

Re: Hat Creek Coal Sample Excavations

Dear Gerry,

Attached herewith is the proposal requested by Mr. Fothergill on the geotechnical work which we would recommend in connection with the Hat Creek coal sample excavations.

I hope that this is what you require. Should you need any further data or clarification we should be glad to help you.

With kind regards.

Yours sincerely,

GOLDER BRAWNER & ASSOCIATES LTD.

Graham Kartings .

G. E. Rawlings, Project Engineer

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GER/1d ENCL: V77828

GOLDER, BRAWNER & ASSOCIATES LTD., 224 WEST 8th AVE., VANCOUVER, B.C., V5Y IN5 CANADA . PHONE: (604) 879-9266 TELEX: 04-508800

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HAT CREEK COAL SAMPLE IMCAVATIONS

1. INTRODUCTION

This proposal contains the recommendations for geotechnical work which should be carried out in connection with the trench excavations for sampling purposes proposed in the valley bottom and west side of the Hat Creek open pit area. The work would obtain data to enable the excavations to be designed and would permit an assessment of the likely ground water problems which might be encountered. In addition maximum use would be made of the excavations to verify the geotechnical conclusions reached during the feasibility study. Fresh undisturbed faces would be available for sampling and description purposes, and the spoil would similate some types of waste material which would be ultimately dumped.

2. TRENCH A

Trench A location is shown on the sketch dated February 1977 provided to Golder Associates (GA) by B.C. Hydro. It lies on the flat bench to the west of Hat Creek and is below the toe of the slide area. The coal of the A and B-zones are overlain by glacial deposits, possibly disturbed, comprising granular till and possibly some sands and gravels. Some disturbed Coldwater sediments could also be present. The regional piezometric surface is between 150-200 ft. in depth in this area although local perched water tables are obviously also present.

The following work is recommended:

Coring and sampling of the surficial deposits to enable the slope to be designed;



/c.

√d.

Installation of standpipe piezometers in the area surrounding the trench to monitor ground water in the surficials and coal before and during excavation; Monitoring of the water pumped from the trench; Geotechnical mapping of the exposed faces of the trench;

/e. Description of the material behaviour during excavation;

f. Examination and sampling of the dumped waste

(possibly including an in situ permeability test).

3. TRENCH B

′ d.

Trench B whose location is shown on the sketch also dated February 1977 lies in the bottom of the Hat Creek valley. Coal of the D-zone is overlain by alluvial sands and gravels, possibly with some beds of silt. The water table in the surficial materials lies below creek level which is apparently perched.

The following work is recommended:

- Obtain samples of the surficial materials during drilling
 of the initial exploratory holes;
 - b. Installation of standpipe piezometers in the exploratory holes to monitor ground water and hence assess the dewatering problem during excavation;
 - c. Installation of standpipe piezometers in the coal on the margins of the trench to monitor ground water during excavation;

Monitoring of the water pumped from the trench; - Excavation of shallow holes to monitor the ground water in the surficials;

Examination of the dumped waste;

Sampling of material in spoil and description of its behaviour.

Note: We would recommend that the trench be slightly realigned to ensure that the piezometer nest in RH 76-15 remains undisturbed.

METHOD OF WORK

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g.

We would anticipate that all of the piezometer installations would be carried out in holes drilled during the further exploration of the trench areas i.e. in diamond drill holes. Because piezometers in the Hat Creek deposits have been shown to take a considerable time to reach equilibrium it is desirable that they be installed in air or water-flushed holes and not in holes on which there is a mud-cake. Additionally the instruments should be installed as soon as possible. The actual installation would be supervised by a GA hydrologist.

All other recommended operations would be carried out by an experienced soils engineer or geologist.

COSTS Engineering Senior Specialist Engineer 50 hrs. @ \$42.00/hr. \$ 2,100 -Senior Hydrologist 76 hrs. @ \$37.50/hr. \$ 2,850 Intermediate Engineer 140 hrs. @ \$28.00/hr. \$ 3,920 Junior Engineer 280 hrs. @ \$22.00/hr. \$ 6,160

Reimbursable Expenses

Four-wheel drive pick-up. \$700/month	\$ 700
Car hire.	\$ 180
Fares, etc.	\$ 700
Report	\$ 2,000
	\$18,610

. Equipment

Piezometer pipe, bentonite, gravel, labour for installation and extras for 14 piezometers of total length 690 ft.

\$ 1,400 \$ 1,400

COMMENTS

a.)

6.

The costs shown above have been calculated on the basis that accommodation would exist at Hat Creek.

b. As the work being supervised would be intermittent it is possible that the GA Junior Geologist could also perform other functions for BCH, or alternatively his function could be partly performed by BCH personnel.

c. Although it has been assumed in the costing that all holes would be drilled by the diamond drill rig, it is likely to be more economical if a separate air-flush rig were mobilized to install the piezometers. This would result in a lower footage rate, less rig-move and standing time and much reduced time for supervision.*

*It is estimated that the total drilling costs for a 75 ft. hole including standing time for piezometer installation, would be approximately \$1,700.

The cost of rig standing time while the piezometers are being d. installed has not been included. It is estimated from previous experience that three standpipe piezometers installed in each 75 ft. deep hole would take approximately 5 hours. During the excavation of the pit it is likely that the cone. tractor will be stopped frequently whilst the faces are examined and the effect of the plant on the materials is checked. Due allowance should be made for this in the contract.

As so few natural exposures are available at Hat Creek this exercise would provide an invaluable opportunity to view and test the materials in bulk in their undisturbed and disturbed states. This proposal has been formulated with that in mind. We should be glad to provide any further information if it is required.

Yours very truly,

GOLDER BRAWNER & ASSOCIATES LTD.

David B. Campbell, P. Eng.

GER/sm

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DOLMAGE CAMPBELL & ASSOCIATES (1975) LTD.

CONSULTING ENGINEERS

SUITE 1000-1055 W. HASTINGS STREET VANCOUVER. CANADA V6E 2E9 TELEPHONE (604) 681-2345

March 4, 1977

Mr. J. J. Fitzpatrick, B.C. Hydro and Power Authority, 744 West Hastings Street, Vancouver, British Columbia

Dear Sir:

Re: Hat Creek Coal Development – Proposed Trenching For Burn

A. Operational Aspects

Diamond Drilling

The trenching is to be preceded by the drilling of a number of closely spaced diamond drill (core) holes along the axis of each proposed trench. The total footage will be in the order of 800 feet. It is proposed that this drilling be done as a part of the Stage 3B drilling contract by the original 3B contractor, D.W. Coates Enterprises Ltd. The funding is also to come from the Stage 3B budget.

The contractor has been alerted and has the equipment and crews available for an early start-up; a tentative date of 15 March has been set for commencement of drilling. The direct drilling costs (contractor only) are difficult to estimate accurately but should be in the order of \$20-30,000. Other costs associated with, or attributable to, the drilling and trenching (analyses, some supervision and labour, etc.) which would also be funded from the Stage 3B budget could amount to \$10-20,000.

The drill holes will be HQ size (approximately $2\frac{1}{2}$ inch diameter core and 3 3/4 inch diameter hole) and a triple-tube core barrel will be used to enhance core recovery. After geological logging the coal should be sampled at 5 foot intervals.

Surveying

Careful topographic surveys, possibly employing a plane-table, should be done i) prior to trenching, ii) at the 'top of coal' and, iii) immediately after the trenching is completed. The data obtained will provide a basis for contractor payment (possibly), overburden and coal quantities, and control for slope stability and reclamation studies. DOLMAGE CAMPBELL & ASSOCIATES LTD.

Haulage Access

Present roads to the proposed trench sites are not suitable for large, heavily loaded trucks and therefore some upgrading and (re)construction will be required. Some of this work can get underway immediately that access routes and road requirements (widths, grades, etc.) are determined.

B. Technical Aspects

From a geological point-of-view, the drilling and trenching will provide data about the nature and configuration of the coal, rock partings, structure and so forth.

The trenches will be geologically mapped; some sampling will also be required.

The five-foot core samples and any samples taken from the trenches should receive the following minimum analyses: proximate, sulphur, pyritic sulphur, calorific value, CO₂. As well, consideration should be given to obtaining more extensive analyses such as ultimate, analysis of ash, ash fusion, grindability and abrasiveness on some of the individual core samples of composites. Analytical results will give some measure of the lateral variability of coal quality. When the trenching has been completed, determinations will be made of in situ moisture and in situ density.

Representative sampling will be required for the burn sample. Overall aspects of on-site and/or off-site sampling should be discussed.

54.7

Wash tests should be undertaken on selected material from the ample tonnage available. The results will have some bearing on questions relating to variability in quality of plant feed, elective mining, materials handling, etc.

Yours very truly,

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

C.R. Sounders, P.Eng.

CRS/md

cc: R.M. Woodley W. Fothergill

inter-office memo MEMO TO: W.C. Fothergill 10 March 1977 FROM: J.R. Irvine SUBJECT: Hat Creek Project, Bulk Sample Coal Crushing, Stockpiling and Loading Costs. The following is a preliminary list of costs for crushing and stockpiling 6000 tons of coal from the proposed Bulk Sample Trenches at Hat Creek and for loading the coal into C.P. trucks. The capital and shipping costs of the Bradford Breaker are not included. Feed to Breakers - rental of small front end loader and operator a) 4.400 (\$40/hr., 10 hrs/day, 22 days @ 50%) - construction of Coal bin 5,000 - rental of 100 TPH conveyor 40' long for 2,000 1 month plus transportation and installation - transportation of approximately 2000 tons 3,000 of coal from trench B to breaker b) Breaker Operation i.Diesel generator - transport, set up and dismantle 1.000 - 1 month rental @ \$1,250/month for 8 hour day and @ \$1,875/month for 16 hour day 1,750 - fuel and oil costs @ \$8/hr for 10 hr day, 1,760 22 days 3,300 ii.Electrician - maintenance man \$15/hr, 10 hr/day, 22 days 2,640 Tradesman - \$12/hr, 10 hr/day, 22 days Labourer - \$10/hr, 10 hr/day, 22 days 2,200 - rental of small front end loader and operator c) Stockpiling 4,400 (\$40/hr, 10 hr/day, 22 days @ 50%) 3,000 - excavation of breaker unloading pit **d**) Loading C.P. Trucks - large loader and operator (120 hrs @ \$50/hr) 6,000 \$ 40,450 Total or (based on 6000 tons) per ton: 6.74 **Ş**

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(Encl # 7) W.C. Folkergill March 8/77 HAT CREEK COAL PROJECT Excaveling Efficiencies PULK SAMPLE PROGRAM Webca 333ft O Excavation of overburden by Screper (34 cn yd) or D-64161 Dozer + Ripper Assume 50 minutes perhour 1000 ft one way hand 5 mins per trip " Pusher assist Front End Loadon Cleanup. : 10 Trips por How × 34 cyd = 340 cu yde per Hour pour scrager machine 3 Excavation of Benches - Coal & silts 5 Grigd bucket Shavel - 550 Tons/Hr = 350 migds/Hr or 8 Grigd a Shavel - 800 4 4 = 500 --/" 1 Syd should can feed 2 × 20 c.yd Trucks at 300 yd/lho 1 Syd a 3 × 20 a a at 500 -Trucking 30 Ton or 20 cuyd Truk -load time 3.0 Tum o. 5 Dump average 1000 ft trauddist 1.0 10 Travelout Travel back 1.0 6.5 min/tvip Total 160 c.yohth 8 Trips per Hour x 20 yds -= 320 cm. yd/H 2 Truck - 480 c ys/th 3 Trucks (3) Time - Days required to do the work. Allow 9 hours effective digging por shift × 2 Shifts - 18 hrs/day 11 300 curyards per hour - 5400 curyard for day Total cu yards to be excavated = 345,000. There of

End. 48. W. Fottergill/ HAT CREED THL PRATECT March 9/17 BULL SAMPLE PROGRAM Detail of estimated Costs for Campsite Preparation (Does not indude Diamond Drilling Exploration programme for Summer 1977 - which is Dolmage Campbell Acr. control) Renarchion & addition to BCHydro Trailer Camp (existing) Sleeping sliving accommodation for . full time - 10 percon 3 clean up essisting p Visiting (overnight) 5 " 3 trailure **.** 🌮 2000 Catering facilities - Kitchen obing from . Rental. 10000 Washroom & Sewarage additions 5000 Gaubage disposal - (Pits) 2000 Water Supply - well prime stank. coscRecreation ; yard, power supply, miscellanen 3000 Total \$ 30,000 Site preparation and mobilischim (at Site 2. Coal Conshing Plant and Sampling Lab (not included in Bradford Breaker ~ Accessionies Installation) Site - yard - Drainage. Road Rental - Trailer Laboratory (3 months) 1000 2020 and Furnish with coal sampling component. 4000 Electric power supply 2000 . Water Supply Outhouse _ toilet. 2 000 19-00 8 15,000 3. Contractors Campsita Vard and facilities prevision by BCKylos. Pour Supply relatic 5.000 Share in catoring , ? \$ 50,000 Total









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HAT CREEK PROJECT

1977 BULK SAMPLE PROGRAM

TRANSPORTATION

The attached CP Rail quotation involves: transporting the coal in trucks from Hat Creek to Ashcroft and delivering the coal by rail to the Battle River powerplant in Alberta. The trucks will utilize tarpaulin to suppress dust and the rail cars, if required, will be fitted with polyethylene sheeting to suppress dust emission. It is important to note that the road trucks that will be used are identical to the ones employed for handling copper concentrate from the Bethlehem mine to Clinton and from the Lornex mine to Ashcroft. Therefore the increased trucking volume through Cache Creek and Ashcroft should not make any significant impact.

Regarding traffic safety, the Department of Highways has been contacted, and detailed planning between the Department of Highways, CP Rail, and B.C. Hydro will be completed prior to initiation of transportation. The prime concerns will be the junctions of Highway 12 and Highway 97, and of Highway 1 and the road entering Ashcroft.

Attached are two maps, one depicts the trucking route from Hat Creek to Ashcroft, and the other one shows the location of the powerplant in Alberta.

CPRail

Marketing & Sales Granville Square, 200 Granville Street, Vancouver, British Columbia V6C 2R3

February 9, 1977

File: 4.2.7

Mr. E.C. Ellis General Freight Agent BC Hydro Railway 260 - 12th Street NEW WESTMINSTER, B.C.

Dear Mr. Ellis:

Subject: Test movement of thermal coal from Hat Creek, B.C. to Cordel, Alta.

Confirming our conversation, CP Rail is pleased to quote a rate of \$20.50/short ton from Hat Creek to Cordel, Alta. This rate is based on the following assumptions:

- BC Hydro will ensure adequate road access to Hat Creek.
- BC Hydro will load the trucks on arrival to 30-35 tons(within 30 minutes).
- CP-will arrange for trucking from Hat Creek to Ashcroft and load railcars.
- 10 car lots of 75-80 tons/car 3 times per week.
- 348000 series longitudinal gondolas.
- Unloading at Cordel and delivery to the plant is Alberta Power's responsibility.
- 5,000-6,000 tons total movement
- Movement to take place between June 1-21/77.
- 1 month's advance advice as to movement, so car supply can be arranged.

B. C. Hydro & Power Authority FREIDH INAFFIC DEPT. FEB 1/1977 FILE No. NEW WESTMINSTER, B.C.

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This quotation is valid for 30 days, subject to your if it acceptance. Upon receiving advice of BC Budget in your acceptance. Upon receiving advice of BC Hydro's acceptance of this quotation, we would like to arrange a meeting between BC Hydro, Arrow Transport and CP Rail to arrange the operating details of this movement.

Yours very truly,

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L.M. ALLEN Director-Market Development /mos

HAT CREEK PROJECT

1977 BULK SAMPLE PROGRAM

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ENGINEERING TESTS

Coal Characteristics Required

The selection of coal for the burn test results from the various tests done at CCRL. It is now known that the Hat Creek coal with a calorific value of 6000 BTU/1b and a moisture content of about 20% will flow through chutes and bunkers, whereas coal with a calorific value of 5000 BTU/1b and 20% moisture does not flow readily. The coal selected for the burn tests will have a C.V. range of 5500 - 6000 BTU/1b, a range which provides sufficient latitude to the recovery operation.

All coal recovered for the burn tests will be processed through a pilot plant B'adford breaker and the result will be and end product with a particle size of minus 1-3/4 inch. The prime purpose of the Bradford breaker is to separate the free clay from the coal and will result in a coal which has characteristics of the worst type of fuel that is now envisaged for the Hat Creek thermal plant.

Powerplant

The attached table indicates the tests that will be conducted in the 30 MW powerplant.

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BULK SAMPLE POWERPLANT TESTS

DESIGN AREAS	COAL CHARACTERISTICS	TEST DESCRIPTION	COAL SAMPLE
Burners & Furnace	Ignition Flame Stability Flame Profile	Large Scale Burn Test on 30 MW Battle River Unit	5000-ton sample (2) 4-day tests
Heat Transfer Surfaces	Slagging Fouling Erosion Low Temp. Corrosion		
Precipitators	Flue Gas Characteristics	Pilot Scale Precipitator Test in Conjunction with Large Scale Burn Test	
Pulverizers	Grindability	Grind Coal from Selected Seam at two Different Drynesses in a Pulverizer on the 150 MW unit	Approx. 400 tons from selected seam

BULK SAMPLE POWERPLANT TESTS

DESIGN AREAS	COAL CHARACTERISTICS	TEST DESCRIPTION	COAL SAMPLE
Bunkers, Feeders & Chutes	Packing, Angle of Repose	Observation of flow through Bunkering system on 150 MW unit. Using coal from selected zone.	Same sample as used in grindability test above
	Spontaneous Combustion	Temperature & Monitoring of coal during above test	Same sample as used in grindability test above
Preparation Plant		Pilot Scale Beneficiation Run, by E.M.R. in Edmonton	100 tons of selected sample

Beneficiation

A 100-ton sample will be shipped to a pilot washing plant operated by Energy, Mines and Resources in Edmonton. They will conduct a series of tests in this C.W. cyclone plant developed by the Canadian Federal Government for the beneficiation of coal, especially highly friable coals of the type found in Western Canada. The objective of this test is to produce a dry clean coal to specification, a dewatered reject for stockpiling and a reconditioned plant water for recirculation, at a maximum return in dollars per ton of rum of mine coal. These test results will be applicable to the Hat Creek powerplant and any alternative use of Hat Creek coal.

	inter-	office memo
MEMO TO	: J. J. FITZPATRICK	10 March 1977
FROM	: W. C. FOTHERGILL	File: 1301.1-1
SUBJECT	: Bulk Sample Program Description Mining - "Tests"	

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Object:

As with the "Mining Plan" description to be submitted for Management approval of the Bulk Sample Program, this memo serves to provide the requested description of proposed tests related to the mining aspect of the program.

The taking of a 6,000 ton coal sample of specified quality is only one reason for the trench excavations.

Dolmage Campbell & Associates have given a very good detailed description of the other tests and reasons for the trenches in their earlier report.

For convenience a copy of the pages 7 & 8 of their report is attached to this memo. It is titled "Investigations related to Test Trenches".

The estimated cost of \$20,000 has been included in the cost summary given in the Mining Plan report.

WCF:rak

Attachment

Wolterrey

INVESTIGATIONS RELATED TO TEST TRENCHES

Advantage should be taken of the exposures in the sample trenches as well as the materials-handling involved in their excavation to collect data pertinent to the design of the plant and the mine. These investigations will necessitate the trenches being left open for at least one year, ie, one full cycle of seasons. The most important investigations that are recommended for the test trenches are summarized below:

COAL:

(1) Washability tests on trench mined samples.

Jig plant test on trench coal.

(3) Examination for "niggerheads" (petrified wood) and for the frequency of large coal chunks requiring pit breaking.

(4) Correlation between analyses of the trench coal and analyses of the 1957-59 drill cores crossed by the trenches.

(5) Correlation between analyses of the trench coal and the 1957–59 average analyses of each coal seam.

(6) Rebound of coal floor.

(7) Stability of various slopes of excavated coal faces under different loadings of overburden.

(8) Permeability of coal.

(9) Mineability of coal, (Bulldozer blade, ripper or shovel?)

(10) Reaction of coal floor to tyred and tracked heavy vehicle traffic.

OVERBURDEN & WASTE:

(1) Water table and permeability of overburden.

(2) Quality of overburden for aggregate use.

(3) Mineability of overburden and shale-sandstone beds.

(4) Stability of overburden slopes.

(5) Stability and density of overburden-waste test embankments. (Reclamation)

OTHER:

It is likely that other avenues of investigation may be conceived that will prove useful to the plant or mine design. These can be introduced at anytime, provided the trenches are left open. Since the above-listed slope stability tests will require the trenches to remain open for at least one year this will provide ample opportunity for ancillary sampling or testing.

COSTS:

Most of the above-listed tests require only technical supervision, design, surveys and observation. In slope stability and drainage observations some minor instrumentation may be desired. Grindability tests would be performed in a Vancouver laboratory.

A provision to cover the above incidental costs and report compilation etc. is estimated to be approximately \$20,000.00.

No trench reclamation costs have been included here because the above test program requires the trenches and embankments to remain undisturbed until mid-1976, and since overburden stripping for the pit would commence in that year the trenches would be obliterated at that time. Other Tests

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Samples of 50 - 400 lbs will be sent to manufacturers of equipment for handling, processing and burning of coal so that they will be able to conduct test with their own laboratory equipment.

Hat Creek Bulk Sample Public Information Program

March

8

Approval of Hat Creek Community Relations Bulk Sample Program by Management Committee.

15

Approval of Bulk Sample Information Bulletin.

Approval of Hat Creek Bulk Sample Program by Management Committee.

21

Advertise upcoming Open Houses. Contact Regional District, Town Councils, local newspapers and local interest.

Letter to Environment and Land Use Committee Secretariat re: Bulk Sample Program (include Bulk Sample Information Program).

Letters to Indians and Ranchers re: upcoming meeting concerning bulk sample program.

Letters to 1. regional district, 2. town councils, 3. interest groups re: bulk sample program (include Bulk Sample Information Bulletin).

Meeting ELUC Secretariat and agencies - presentation - site evaluation - presentation - conceptual design - report progress of environmental studies - presentation on test burn.

28

24

Approval of Hat Creek Information Bulletin #2.

28,29 Meetin

Meetings with Indians and Ranchers. Provide Bulk Sample Information Bulletin.

April

1 2 Press release.

Hat Creek Advisory Committee tour of Valley and Information Exchange session. Possible use of airplane. Provide Bulk Sample Information Bulletin and Hat Creek Information Bulletin #2.

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Open House - Ashcroft

April

5	Open House - Cache Creek
6	Open House - Clinton
18	Open House - Lillooet
19	Open House - Lytton
20	Open House - Kamloops

May

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Excavation Begins.

Local Contact Person.

9-13 Possible Tour(s) of Valley by Hydro Directors, Government Ministers, Media.

- 2

June

27 continuing Possible Hat Creek Information Office on to Sept. 5 location (subject of later submission).

File: 1301.1-1

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ENVIRONMENTAL CONCERNS AND TESTING TO BE CARRIED OUT

AS PART OF THE BULK SAMPLE PROGRAM

Associated with the trenching, mining and transportation activities outlined above are several concerns of an environmental nature. These include a potential dusting problem, the disposal of waste waters and noise impacts from the operation of heavy equipment. In addition, the trenching program will provide an excellent opportunity to obtain firm data on a wide variety of environmentally related subjects.

The production of large quantities of overburden and other waste materials will enable large scale and realistic test plots to be developed for the study of future reclamation. Soil characterization will take place as the function of depth, and long term test plots will be established in two locations with different slope characteristics based on geotechnical data. Data on water quality and quantity from the coal and waste piles and from the trench itself will be determined. Some groundwater sampling will also be undertaken. Dust monitors are presently in operation in the Valley, and an extensive program of dust monitoring will be undertaken to determine and quantify the extent of this problem. Noise from mining equipment and trucks will be monitored throughout the trenching program.

In order to coordinate this environmental test work it is proposed to retain a consultant who will provide an environmental officer in the field for the full duration of the coal mining and transportation parts of the Bulk Sample Program. In addition to this coordination role, the environmental officer will be expected to deal with the day-to-day environmental problems as they arise. Acres Consulting Services are presently studying the disposal of waste materials from the mine and powerplant for the Detailed Environmental Studies, and will be directly involved in the planning and design of the reclamation test plots described above.

Future environmental monitoring following the completion of the present program may be required. The need and form that this would take would be determined later. An environmental report on the test trench program will be compiled indicating the environmental implications of the test program and documenting the tests carried out and the results thereof.

Prepared by: F.G. Hathorn 9 March 1977

cc: P.R. Willis

inter-office memo (

TO: P.R. Willis

Date: 21 February 1977

FROM: F.G. Hathorn

File: 1301.1

TEST BURN - Environmental Tests

The following lists the testing we would like to see carried out as part of the Test Burn Program. The work is in the most part applicable to the full scale mining operation or will supply much needed data for waste disposal methods.

1) Land Disturbances

a) Soils characterisation

- Data on the overburden solls character as a function of depth (horizon) is required. If no obvious physical differences occur with depth sampling and analysis should be done every 5 - 10 feet. Parameters to be determined include:

- i) electrical conductivity
- ii) sodium adsorption ratio
- iii) saturation percentage
- iv) phosphorus and nitrogen content

Overburden material will have to be stockpiled by physical type and the above tests done as soon as possible after the trench face is exposed.

b) Long term growth testing plots should be established using the waste material produced. Detailed design of these plots will depend on the material available. Taking account of the tests in a) and, the Growth tests done by Acres Consulting Services as part of the Detailed Environmental Studies, a variety of native and agronomic plant species should be growth tested.

2) Water Considerations

- a) Pit Waters
 - The quality and quantity of waters collecting in the pit should be monitored.
- b) Coal and Waste Pile Runoff
 - Waste waters from these piles should be collected and contained. Water quality from these sources are required and ground water quality, in the region of the piles, should be determined both before and following stockpiling. Monitoring should specifically take account of rainstorms.
- c) Evaporation rates should be noted.

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3) Dust Monitoring

a) A dust monitor will be located south of the trenches and a mobile monitor will be operated north of the trenches.

b) Dust monitoring along highway 12 will be carried out extensively before, during, and immediately after coal transportation.

4) Noise

a) Monitoring of noise at the trenches, along highway 12, and in the region of the Bonaparte Indian Reserve # IR 1 should be undertaken. This could most usefully be done by Acoustical Engineering who have been involved in the Detailed Environmental Studies.

5) Test Burn Itself

a) Gas analysis for the following flue gas constituents should be carried out using, if at all possible, continuous analysers:

Sulphur Dioxide Nitric Oxide Oxygen Carbon Monoxide Carbon Dioxide

(It is assumed that dust loadings and fly ash resistivities
will be specified by those concerned with the precipitator tests.)
b) Coal analyses as follows:

Ultimate coal analyses of representative samples of coal i) into the pulverisers

ii) from the pulverisers

iii) from the pyrite rejection hoppers and concurrent SO₂ concentration in the flue gas should be determined in duplicate for each coal type tested.

c) Waste Disposal

- The character of sluiced fly ash ahould be noted including leachate and dewatering potential.

d) It is requested that one barrel of bottom ash and of unwetted fly ash from each coal type tested be retained for further testing.

Alathoen.

FGH/las

cc: R.M. Woodley J.J. Fitzpatrick R.M. Dundas D.K. Whish C.S. White

HAT CREEK PROJECT

1977 BULK SAMPLE PROGRAM

COSTS

Mining (901,000 + 20% Contingency) \$1,080,000 Transportation (146,000 + 20% Cont.)175,000 Environmental 75,000 Beneficiation (150 The fample) 35,000 Powerplant Test Costs 100,000 Boiler Laboratory Tests 50,000 Crushing & Handling Laboratory Tests 100,000 **Precipitator Tests** 100,000 Other 15,000 Provision for Additional Sample Preparation at Site 60,000 TOTAL \$1,790,000

DEC.	JAN.	FEB.	

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