Assessment Report
on the

HAT CREEK

COAL EXPLORATION PROJECT

1976

Conducted by

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

On Coal Licence Numbers

12, 144, 2753-2762, 3003-3004, 3009-3013

NTS Area 92 I/12 & 13

by

C.R. Saunders, P.Eng.

PRELIMINARY GEOLOGICAL INTERPRETATION
OF THE HAT CREEK COAL BASIN
by
B.N. CHURCH and R.D. GILCHRIST

KILMAGE CAMPBELL & ASSOCIATES LTD.
VANCOUVER, CANADA

DOLMAGE CAMPBELL & ASSOCIATES (1975) LTD.
CONSULTING ENGINEERS

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

MAY 13 '77 PM

May 11, 1977

DEPT. OF MINES
AND PETROLEUM RESOURCES

CONFIDENTIAL

4690

Mr. A.R. Corner,
Administrator for Coal,
Department of Mines and Petroleum Resources,
Parliament Buildings,
Victoria, B.C. V8V 1X4

Dear Sir:

Re: Geological Report Accompanying the Submission of Assessment Work on Coal Licences 2753-2762, 3003-3004 and 3009-3013

One copy returned to Dolmage Campbell & Assoc 19/5/77

Two copies of the report "Hat Creek Coal Development Project, 1976" are enclosed. This report, dated 5 May, 1977, is a revised edition of the original report, dated 5 April, 1977, which accompanied the other required submissions in our application to extend the term of the Hat Creek coal licences, (held by British Columbia Hydro & Power Authority).

This revision has been done to satisfy the requirements of your letter of 28 April, 1977. In this regard, the following changes have been incorporated in this revised report.

More evaluation of the rock types and coal in the No. 1 Deposit is included plus an enlarged discussion of the nature and configuration of this deposit. Eleven cross-sections rather than two (not three) are incorporated in the report for more reference. The location of the sections is clearly shown on a reference map. A comment has been made on reserve estimates and the possible effects of the results of the 1976 exploration program on reserves. A recently completed overburden isopach map for the area of the No. 1 Deposit is included. Comments are made on the results of slope stability studies and the summary and conclusions of a report on this subject is appended. Other minor changes have been incorporated.

I would be pleased to hear your comments about this revised report at an early date.

Yours very truly,

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

C.R. Saunders, P.Eng.

CRS/md
Enclosures

HC-HAT CREEK 76(1)B

DOLMAGE CAMPBELL & ASSOCIATES LTD.
CONSULTING GEOLOGICAL & MINING ENGINEERS
1000 GUINNESS TOWER
VANCOUVER 1, B.C.

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5 May, 1977

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DOLMAGE CAMPBELL & ASSOCIATES LTD.
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INTRODUCTION

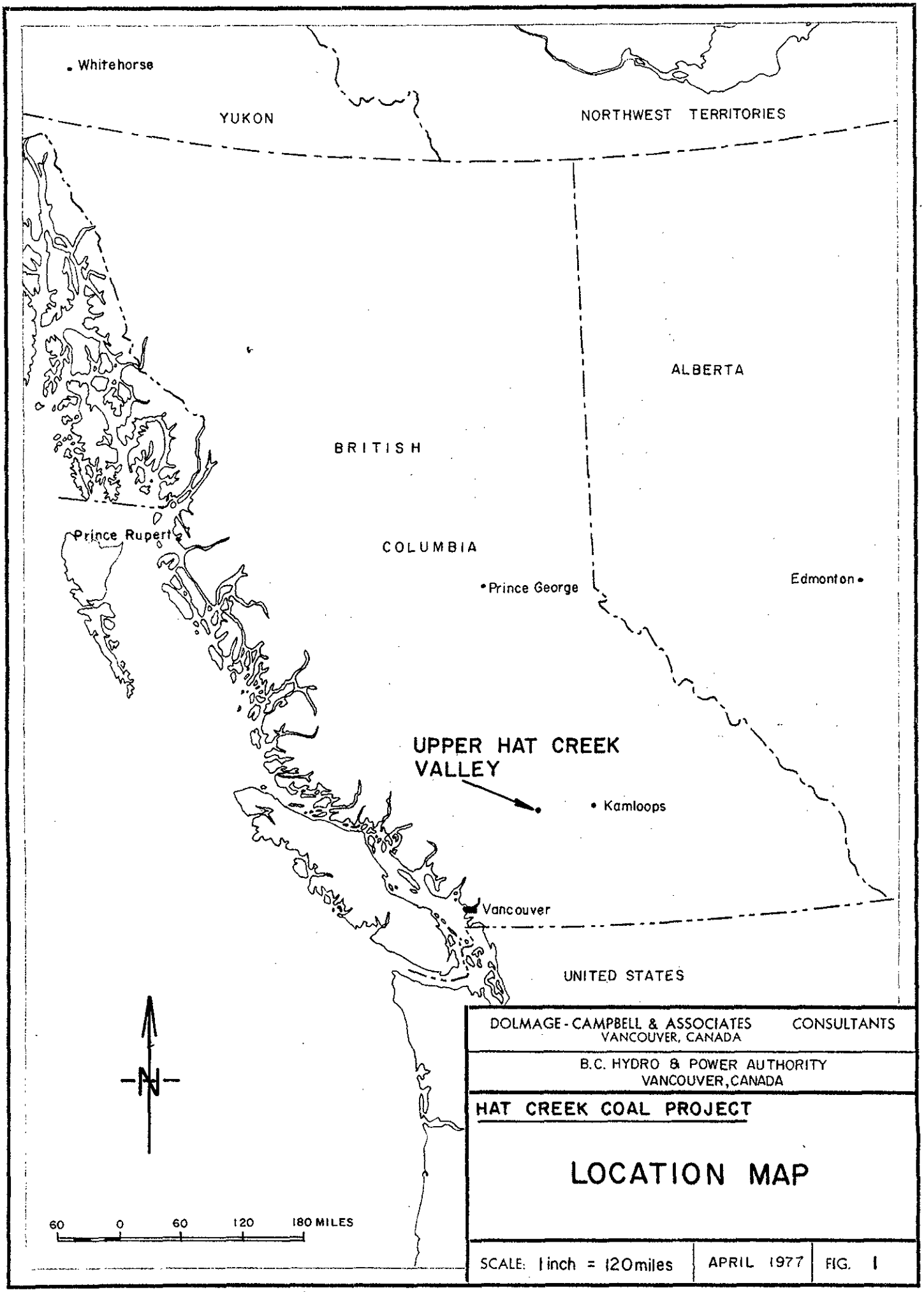
The purpose of this report is to summarize the exploration work conducted by British Columbia Hydro and Power Authority (B.C. Hydro) on coal licences in Upper Hat Creek Valley from May 1976 to May 1977. Field-work has been underway on a reasonably continuous basis since the early summer of 1974 and is still continuing. Consequently, although the assessment period for which this report is filed is 1 May, 1976 to 1 May, 1977, the exploration work conducted and the results obtained which are discussed herein may overlap this period somewhat. However, all costs incurred during the assessment period (and listed in the Application to Extend Term of Licence) have been separated from earlier or later costs for work conducted on the two licence groups for which work assessment has been filed.

The project has been administered and supervised by Dolmage Campbell & Associates Ltd. C.R. Saunders, P.Eng., has been exploration manager and Mr. J.L. Rotzien has acted as resident engineer. Field geologists have included J. Valentinuzzi, M. Morrison, B. Conlin and P. Street. Technicians and field assistants during the assessment period were: P. Northrop, E. Spletzer, P. Imada, H. Svenson, T. Beckett, E. LeNeve, R. Williams, M. Hocevar, G. Dawson and J. Stanecki.

LOCATION

Upper Hat Creek Valley, in which the coal licences are situated, is located 120 miles northeast of Vancouver, B.C., midway between the towns of Lillooet and Ashcroft (Figs. 1 & 2). Railheads can be reached at Pavilion, on the B.C. Railroad, 15 miles to the northwest, and at Ashcroft, on the C.P. and C.N. railroads, 30 road miles to the east. Easiest access to the property is from the Trans-Canada Highway at Cache Creek, 23 road miles to the east, via the secondary highway (No. 12) between Cache Creek and Pavilion. The closest regularly serviced airport is at Kamloops, 68 miles to the east.

The coal licences are situated in the broad, north-trending, grassland valley, about 15 miles in length, through which flows the upstream portion of Hat Creek. From the north end of this valley Hat Creek flows northeastward through a narrow valley into the Bonaparte River, which flows south to join the Thompson River at Ashcroft.



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B.C. HYDRO & POWER AUTHORITY
VANCOUVER, CANADA

HAT CREEK COAL PROJECT

LOCATION MAP

SCALE: 1 inch = 120 miles | APRIL 1977 | FIG. 1

51° 00'

B.C.R.

PAVILION RANGE

Pavilion

Pavilion Lake

Bonaparte River

97

TRACHYTE HILL

12

OUTLINE OF COAL LICENCES

Fig.6

Fig.7

Fig.5

Fig.4

HAT CREEK

Upper Hat Creek

Fig. 3

CLEAR

RANGE

Lillooet

Fraser River

12

50° 30'

Cache Creek

River

97

CNR

CPR

Kamloops Lake

Savona

Ashcraft

Thompson

1

121° 30'

N

2 0 2 4 6 8 MILES

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VANCOUVER, CANADA

HAT CREEK COAL PROJECT

INDEX MAP

SCALE: 1 : 250,000 | APRIL 1977 | FIG. 2

VANCAL - 72

Upper Hat Creek Valley lies within the Interior Dry Belt of British Columbia at a mean elevation of about 3500 feet. The valley is flanked by somewhat subdued mountains that rise to elevations of 6000-7000 feet four miles to the west of Hat Creek and to elevations of 5000-6000 feet six miles to the east. The uplands are covered by thin forests and the valleys are sparsely-treed open ranges of grass and sage.

Rock outcrops are sparse in the floor of the valley. Overburden, consisting of loosely compacted sand and gravel, ranges in depth from 10 to 500 feet in the drilled portions of the coal licences.

COAL LICENCES

All of B.C. Hydro's coal licences in Upper Hat Creek Valley are listed below and shown on Figure 3 although the assessment work, which this report supports, applies only to those licences in groups No. 21 (Orange) and 22 (Red).

	Licence No.	Area (acres)	Location*
	2753	640	31/20/26
	2754	638	E½ of 6/21/26 & E½ of 7/21/26
GROUP	2755	636	18/21/26
No. 21	2756	639	13/21/27
ORANGE	2757	636	14/21/27
	2758	630	11/21/27
	2760	319	W½ of W½ of 12/21/27 & W½ of W½ of 1/21/27
	3003	640	19/20/26
	3004	640	30/20/26
	9 licences	5,418 acres	
	12	640	E½ & E½ of W½ of 1/21/27 & W½ of W½ of 6/21/26
	144	320	E½ of W½ of 6/21/26 & E½ of W½ of 7/21/26
	2759	588	2/21/27
GROUP	2761	640	35/21/27
No. 22	2762	640	36/20/27
RED	3009	640	13/20/27
	3010	320	E½ of 23/20/27
	3011	640	24/20/27
	3012	640	25/20/27
	3013	640	26/20/27
	10 licences	5,708 acres	

	Licence No.	Area (acres)	Location*
	2996	635	30/19/26
	2997	642	31/19/26
	3000	642	6/20/26
GROUP	3001	642	7/20/26
No. 23	3002	640	18/20/26
YELLOW	3005	320	N½ of 25/19/27
	3006	640	36/19/27
	3007	640	1/20/27
	3008	640	12/20/27
	9 licences	5,441 acres	
	2991	320	W½ of 17/19/26
	2992	316	N½ of 18/19/26
GROUP	2993	640	19/19/26
No. 24	2994	321	W½ of 20/19/26
BROWN	2995	320	W½ of 29/19/26
	2998	320	W½ of 32/19/26
	2999	320	W½ of 5/20/26
	3655	641	W½ of 8 & 17/20/26
	8 licences	3,198 acres	
Totals	36 licences	19,765 acres	

* Section/Township/Range (West of the 6th Meridian, Kamloops Land District).

HISTORY

Coal in Upper Hat Creek Valley was reported by Dr. G.M. Dawson of the Geological Survey of Canada in 1877 and 1894. The only coal exposures were along the banks of Hat Creek, where the overburden cover had been removed by creek erosion. By 1925 three shallow shafts and two short adits had been driven into the coal along the creek and seven holes had been bored into it. No further work was done on the deposit until 1933.

From 1933 until 1942 a few hundred tons of coal a year were produced from the property and sold in the nearby towns and villages. No work was done from 1942 to 1957. In 1957 the property was optioned by Western Development and Power Ltd., a subsidiary of B.C. Electric Co. Ltd., at which time one Crown Grant claim was extensively explored by surface diamond drilling.

Following the acquisition of B.C. Electric by the Province of British Columbia, the ownership of the one explored Crown Grant claim and two coal licences comprising the Hat Creek coal property passed to British Columbia Hydro and Power Authority. No further exploration was done on the property until mid-1974, when B.C. Hydro began definitive drilling of the deposit. In 1974 B.C. Hydro acquired coal licences covering most of Upper Hat Creek Valley. One additional licence was acquired in 1975.

GEOLOGICAL SETTING

The valley of Upper Hat Creek is underlain by sedimentary rocks of the coal-bearing Coldwater Formation, of early Tertiary age, flanked by older sedimentary and igneous rocks of the Cache Creek Group, the Spences Bridge Group, and the Mount Lytton batholith, and capped in several places by later Tertiary volcanic rocks. (See Figure 3.)

OVERBURDEN

Bedrock in the valley is for the most part mantled by overburden ranging from a few feet up to 500 feet in thickness, consisting mostly of glacial till, or sands and gravels deposited under conditions associated with the glaciation of the valley. As a result, outcrops generally are sparse, and rocks of the Coldwater Formation, in particular, are exposed in only a very few places, including creek-bed outcrops near the north end of the valley that gave rise to the initial discoveries of coal at Upper Hat Creek. Glacial till extends to the west side of the valley for its full length, and ranges in consistency from a well-compacted, relatively impermeable basal-type boulder-silt till along the centre of the valley to a loosely compacted ablation till towards the west. Much of the east side is blanketed by silt, sand and/or gravel, some of it having been laid down (as in the northeast corner of the valley) in a glacially-dammed lake, or by streams discharging into such a lake.

BEDROCK

Along the sides of the valley, and in much of the southern half, the Coldwater Formation is covered by extensive volcanic rocks of Late Tertiary, probably Miocene, age.

The sedimentary rocks of Upper Hat Creek Valley may be the erosional remnants of a formerly much larger sedimentary basin that extended for some hundreds of miles along the eastern flank of the Coast Range mountains that were undergoing tectonic uplift during Early Tertiary time. The existing coal deposits of the Princeton, Tulameen, Merritt and Cariboo (south of Quesnel) areas may have had a common origin in river-delta swamps along the shoreline of a continental sea that trended northwest-southeast along the flank of the emerging Coast Range mountains.

The Coldwater Formation in Upper Hat Creek occupies a "basin" in a geomorphologic sense only; tectonically, it lies in a "graben", or down-

dropped fault block. On the east, west and north, the block is bounded by major longitudinal fault systems, and is cut in several places by oblique transverse faults, some of which transect and offset the longitudinal fault zones. Within these fault blocks, the coal-bearing sedimentary rocks are broadly folded, forming a southward-plunging syncline near the north end of the valley, and a complex of anticlines and synclines further south. As a result of this faulting and folding, the coal beds of the Coldwater Formation lie at widely-varying depths below the surface of bedrock, the depth changing abruptly within a few tens of feet of horizontal distance.

DESCRIPTION OF EXPLORATION WORK CONDUCTED

SURVEYING

A number of surveys were conducted during 1974 and 1975 to provide topographic maps and control for exploration work. They comprised vertical aerial photogaphy, photogrametric mapping and ground control.

Elevation controls were established by running third-order levels from a Dominion Government geodetic bench mark at Carquile, near the junction of Highways 12 and 97. Bearings were derived by solar observations.

In October, 1976 more survey control was established in the north end of Upper Hat Creek Valley by McElhanney Surveying & Engineering Ltd. These control points were required because of the more intense and detailed exploration (primarily diamond drilling) being conducted in the area. Figure 4 is a copy of the survey control.

DRILLING SITE RECLAMATION

As a matter of routine all drill sites were cleaned-up and levelled after drilling finished. The drilling mud was pumped out of the pits and trucked to a central disposal pit.

The seeding and harrowing of drill sites was completed by using a horse to pull the harrows. This proved to be much more practical than a tractor in the restricted space of the typical drill site. The seeding was completed in the late fall so that the spring moisture would enhance the growth.

Drill-hole collars were marked by 4" x 4" posts, painted white and stencilled with the numbers of the drill holes.

DRILLING

Extensive drilling in the forms of diamond coring, rotary and percussion was conducted on the Hat Creek property during the summer and autumn of 1976. The following table indicates the amount and general purpose of this work.

TYPE	No. of HOLES - FOOTAGE			PURPOSE
	Total	Group 21 (Orange)	Group 22 (Red)	
Coring	89 - 67,908'	1 - 977'	31 - 27,240'	coal exploration
Coring	28 - 10,950'	14 - 6201'	2 - 1,345'	slope stability and general exploration
Rotary	17 - 4,192'	5 - 818'	8 - 2,504'	slope stability and general exploration
Percussion	30 - 2,259'	22 - 1586'	2 - 135'	water level studies

Skid-mounted Longyear 44 and "Super" 38 drills were used for the diamond coring, a truck mounted Speed Star FS 15 air-flush drill for the rotary holes, and a truck-mounted Becker hammer drill for the percussion drilling. The exploration drilling was done by D.W. Coates Enterprises Ltd., the slope stability core holes by Tonto Drilling Co., the rotary holes by A & H Construction Ltd. (subcontracting to Tonto), and the percussion holes by Becker Drills Ltd.

NQ wireline down-hole equipment was used for the exploration drilling. In most instances, overburden was triconed; bedrock was continuously cored except at times, in soft, squeezing ground, tricones were used.

The slope stability core holes were drilled with HQ wireline equipment and, in most cases, overburden as well as bedrock was cored.

All core is stored on the property.

Details of the holes drilled on Group 21 (Orange) and Group 22 (Red) are listed in the accompanying table. Graphic lithologic logs are appended, (Appendix I). Hole locations are shown on Figure 5.

GROUP 21

GROUP 22

CG 83912 E

19,500'E (Fig.9)

82,000'N (Fig.18)

81,000'N (Fig.17)

80,500'N (Fig.16)

80,000'N (Fig.15)

79,500'N (Fig.14)

79,000'N (Fig 8)

78,500'N (Fig.13)

78,000'N (Fig.12)

77,000'N (Fig.11)

76,000'N (Fig.10)

10,000 E

20,000 E

30,000 E

80,000'N

FINNEY L

Medicine

2000 1000 0 2000 4000

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HAT CREEK COAL DEVELOPMENT

DRILL HOLE LOCATIONS

00138 ①

SCALE 1"= 2000'	APRIL 1977	FIG. 5

DRILLING DETAILS - GROUPS 21 AND 22

HOLE NUMBER	LIC. GP.	COORDINATES		FOOTAGE			REMARKS
		LAT.(N)	DEP.(E)	OVER-BURDEN	COAL * ZONES	TOTAL	
EXPLORATION CORE DRILLING							
76 - 121	22	78,981	22,454	294	0	908	Completed.
- 123	22	78,467	22,018	107	0	795	Completed.
- 126	22	77,952	21,493	112	370	1173	Stopped in squeezing ground.
- 128	22	79,992	22,014	260	385	1000	Completed.
- 129	22	77,035	16,980	100	30	341	Abandoned - caving.
- 130	22	76,988	21,011	169	0	1818	Completed.
- 131	22	77,035	16,984	100	0	223	Abandoned.
- 132	22	77,000	17,021	100	130	614	Completed.
- 134	22	75,987	17,991	81	300	1271	Abandoned - severe caving.
- 137	22	77,027	17,512	43	390	1242	Completed.
- 139	22	75,955	20,006	217	570	1674	Abandoned - rods stuck.
- 141	22	77,001	18,517	62	800	1257	Completed.
- 144	22	76,991	20,595	130	805	1088	Completed.
- 145	22	76,989	19,510	134	605	1257	Completed.
- 149	22	75,981	19,003	177	550	1547	Completed.
- 153	22	81,008	21,519	236	435	826	Completed.
- 154	22	79,984	22,516	394	0	1001	Completed.
- 157	22	81,485	21,523	268	460	806	Completed.
- 159	22	81,012	22,023	380	20	409	Abandoned.
- 162	22	80,995	21,964	353	440	847	Completed.
- 164	22	79,504	22,010	245	200	475	Stopped in squeezing ground.
- 165	22	81,984	22,033	388	255	1039	Completed.
- 168	22	79,994	21,469	120	635	846	Completed.
- 170	21	82,965	24,038	578	0	977	Completed.
- 173	22	75,999	16,999	74	70	445	Completed.
- 174	22	78,474	21,484	96	430	524	Completed.

- 176	22	76,498	16,995	95	95	417	Completed.
- 178	22	78,474	21,487	86	0	296	Completed.
- 179	22	75,986	17,495	32	330	937	Completed.
- 181	22	80,497	21,507	214	570	837	Completed.
- 201	22	79,491	21,497	71	865	991	Completed.
- 206	22	76,990	21,005	188	145	336	Completed.
SLOPE STABILITY CORE DRILLING							
76 - 801	22	73,377	21,326	274	0	600	Completed.
- 802	21	73,261	15,985	24	0	590	Completed.
- 803	22	75,190	20,390	142	0	745	Completed.
- 804	21	75,863	15,097	51	0	437	Completed.
- 805	21	79,253	14,429	10	0	295	Completed.
- 807	21	78,106	12,426	90	0	209	Completed.
- 810	21	83,287	16,337	218	0	354	Completed.
- 812	21	82,998	19,028	46	0	398	Completed.
- 813	21	84,552	19,058	518	0	655	Completed.
- 814	21	83,506	20,041	342	70	700	Completed.
- 815	21	78,982	23,489	402	0	672	Completed.
- 816	21	78,956	24,624	311	0	884	Completed.
- 818	21	82,788	15,552	16	0	247	Completed.
- 819	21	83,733	15,716	246	0	318	Completed.
- 820	21	69,184	22,872	28	0	176	Completed.
- 821	21	75,507	22,929	63	0	238	Completed.
ROTARY DRILLING							
RH76- 5	21	78,118	12,416	60	0	250	Slope indicator.
- 6	21	79,226	14,452	21	0	200	Slope indicator.
- 7	21	81,087	15,640	63	0	200	Slope indictor.
-10	22	76,011	18,008	81	0	184	Permeability test.
-11	22	76,983	17,528	43	0	150	Caving.
-12	22	77,016	18,490	62	0	170	Permeability test.
-16	22	76,552	19,885	115	0	400	Pump test observation.

RH76-16A	22	76,561	19,879	115	0	400	Pump test observation.
-17	22	76,312	20,145	90	0	400	Pump test observation.
-18	22	76,733	19,710	150	0	400	Pump test observation.
-19	22	76,477	19,959	100	0	400	Well for pump test.
-20	21	75,277	23,211	65	0	105	Piezometer.
-21	21	75,507	22,929	63	0	63	Completed.
PERCUSSION DRILLING							
P 76- 1	22	79,042	22,484	58	--	58	Completed.
- 2	21	79,001	23,948	104	--	104	Completed.
- 3	21	78,942	24,985	83	--	83	Completed.
- 4	21	77,908	24,023	52	--	52	Completed.
- 6	21	76,768	24,813	61	--	61	Completed.
- 7	21	77,002	23,251	114	--	114	Completed.
- 9	21	75,023	23,185	59	--	59	Completed.
-10	21	81,192	23,879	132	--	132	Completed.
-11	22	80,991	21,414	77	--	77	Completed.
-12	21	77,987	24,797	54	--	54	Completed.
-13	21	83,012	20,021	99	--	99	Completed.
-14	21	83,088	21,978	98	--	98	Completed.
-17	21	84,503	16,353	46	--	46	Completed.
-18	21	84,518	14,801	58	--	58	Completed.
-18A	21	84,523	14,781	58	--	58	Completed.
-19	21	85,154	16,090	62	--	62	Completed.
-20	21	85,348	15,322	102	--	102	Completed.
-21	21	85,536	15,890	58	--	58	Completed.
-21A	21	85,480	15,820	10	--	10	Completed.
-22	21	86,000	15,767	74	--	74	Completed.
-23	21	85,015	14,279	82	--	82	Completed.
-24	21	79,781	24,434	79	--	79	Completed.
-26	21	80,492	23,578	30	--	30	Completed.
-27	21	87,885	20,704	71	--	71	Completed.

* Approximate cummulative footage of coal-bearing beds including some waste partings and low quality beds.

GEOPHYSICS

Surface

In the late summer of 1976 a VLF-EM survey was conducted over a portion of the Hat Creek property by R.O. Crosby & Associates, consulting geophysicists. Figure 6 is a contour plan of the filtered E.M. 16 results which forms part of the report "VLF Electromagnetic Survey on the Hat Creek Property" by Richard O. Crosby, dated 5 October, 1976. This report and an accompanying appendix are on file with Dolmage Campbell & Assoc. Ltd.

A portion of the survey was done on Group No. 22 (Red): 19,900 ft. of a total of 63,000 ft.

Down-hole

As standard practise, all exploration drill holes on the Hat Creek property were electro-logged. Exceptions occurred when drill hole conditions prevented such logging, when drill holes did not reach bedrock or when non-exploration holes were drilled in areas known to be devoid of coaly material. The major problem encountered was squeezing of the hole walls which prevented passage of the logging equipment (and might have resulted in the loss of the down-hole equipment). To minimize the problem, most holes were logged through the casing and/or drill rods before they were pulled out of the hole. Open-hole logging was attempted after the drill rods and/or casing were pulled. However, where squeezing became excessive, even the drill stem could not be left in the hole and thus, geophysical logging was impossible.

All down-hole electro-logging was completed by Roke Oil Enterprises Ltd. employing a truck-mounted recorder and probe winch. The two most common logs recorded were density and gamma ray. Because the caliper (hole diameter) and resistivity logs could not be obtained through the drill stem, they were less commonly obtained. Results were recorded on transparent logs with a scale of 1 in. = 20 ft. These were later reduced to 1 in. = 40 ft. for convenience of handling.

The geophysical logs for the holes drilled on Group No. 21 (Orange) and Group No. 22 (Red) during the assessment period are appended, (Appendix II).

The following table indicates the proportion of drill footage on Groups No. 21 and No. 22 that it was possible to geophysically log.

DOWN-HOLE GEOPHYSICAL LOGGING RECORD

HOLE NUMBER	LIC. GP.	HOLE DEPTH	GEOPHYSICAL LOGGING FOOTAGE			
			DENSITY	GAMMA	RESISTANCE*	CALIPER*
76-121	22	908	580	580	407	250
-123	22	795	760	750	555	750
-126	22	1173	1160	1160	1081	1160
-128	22	1000	970	970	670	670
-129	22	341	210	210	--	--
-130	22	1818	1760	1780	--	--
-131	22	223	--	--	--	--
-132	22	614	590	590	--	--
-134	22	1271	1240	1240	--	--
-137	22	1242	1200	1210	--	--
-139	22	1674	748	748	526	526
-141	22	1257	1220	1220	--	--
-144	22	1088	1040	1060	592	542
-145	22	1257	1210	1230	700	620
-149	22	1547	1500	1520	--	--
-153	22	826	804	810	556	554
-154	22	1001	960	980	--	--
-157	22	806	780	800	515	--
-159	22	409	--	--	--	--
-162	22	847	800	820	--	--
-164	22	475	210	210	--	--
-165	22	1039	1000	1020	385	285
-168	22	846	810	830	366	--
-170	21	977	950	970	--	--
-173	22	445	402	422	--	--
-174	22	524	490	510	--	--
-176	22	417	300	410	--	--
-178	22	296	290	290	--	--
-179	22	937	884	904	--	--
-181	22	837	814	834	618	618
-201	22	991	966	986	776	776
-206	22	336	298	318	--	--
-801	22	600	590	590	--	--
-802	21	590	580	590	340	--
-803	22	745	558	790	--	--
-804	21	437	95	425	--	--
-805	21	295	270	290	--	--

			Density	Gamma	Resist.	Caliper
76-807	21	209	200	194	200	--
-810	21	354	352	352	--	--
-812	21	398	392	396	146	144
-813	21	655	640	640	--	--
-814	21	700	675	690	--	--
-815	21	672	655	655	655	230
-816	21	884	860	876	--	--
-818	21	247	237	248	--	--
-819	21	318	--	--	--	--
-820	21	204	--	--	--	--
-821	21	238	--	--	--	--
Total		35,763	31,050	32,118	9088	7125
%		100	87	90	25	20

* Resistance and Caliper logs were obtained only in open holes. (They cannot be obtained through the drill rods or casing.)

SAMPLING AND ANALYSES

The core from all drill intersections of coal, shaly coal and coaly shale was sampled and analysed. Sample intervals varied from a minimum of about 5 feet (occasionally less) to a maximum in the order of 20 feet. The interval was generally determined by lithology except where lengthy homogeneous sections were encountered; in such cases the maximum interval was applied. The core was split lengthwise by diamond sawing with one half sent for analyses and the other half retained in the core boxes (which are stored on the site).

Analyses were done by Commercial Testing & Engineering Co., Loring Laboratories Ltd. and General Testing Laboratories with check samples from each being sent to the other two.

Proximate anlyses were obtained for all samples whereas ultimate, F.S.I., grindability, specific gravity, equilibrium moisture, etc. were obtained only for a selected few samples. Sink-float tests were done on a number of samples and some of the products were analyzed in a similar manner to the standard field core samples. (See Appendix III for coal analyses schedules.)

Some palynological and preliminary mineralogical studies were also conducted. This work was done on samples specifically collected for these purposes.

EXPLORATION RESULTS

ROCK TYPES

Basement

The basement rock in the Upper Hat Creek area comprise three major units: (1) the Cache Creek Group of Permia age, (2) the Spences Bridge Group of Cretaceous age, and (3) the Mount Lytton Batholith of Cretaceous age.

The Cache Creek Group consists of two components: The Marble Canyon Formation, consisting of massive limestone, in places recrystallized; and an unnamed mixed suite of greenstones, phyllites, cherts and other sedimentary and volcanic rocks displaying slight to moderate low-grade metamorphism. The Marble Canyon limestones are in fault contact with Tertiary rocks on the northwest, north, east-central and southeast margins of Upper Hat Creek Valley (Fig.3). The mixed suite abuts against Tertiary sedimentary rocks on the northeast margin, i.e. on the western slopes of the Trachyte Hills, but the nature of the contact is not clear. The Marble Canyon limestones in some places enclose small lenses or pockets of the greenstone suite.

Rocks of the Spences Bridge Group are exposed in a very few outcrops along the west-central and southwest margins of the valley. They consist mostly of dacite and andesite volcanics showing a moderate degree of alteration.

Granodiorite and diorite intrusive rocks of the Mount Lytton Batholith flank the northwest corner of Upper Hat Creek, but appear to be separated from the Tertiary sedimentary rocks in the valley by a narrow septum of Cache Creek limestones of the Marble Canyon Formation.

Coldwater Formation - Eocene (Early Tertiary)

General: Although outcrops are rare, it is known from diamond drilling that the entire valley of Upper Hat Creek is underlain by shales, claystones, siltstones, sandstones, conglomerates and coal that make up the Coldwater Formation. Also, numerous exposures of rhyolitic tuffaceous rocks, in the east-central portion of the valley, may form part of this unit. Knowledge of the Coldwater Formation in Upper Hat Creek Valley comes mostly from drill cores.

The drilled portion of the Coldwater section may total as much as 5800 feet of conglomerate, siltstone, shale and coal; of this the "basal" 1000 feet (in very general figures) includes appreciable sandstone and conglomeratic sandstone of volcanic origin, some of the enclosed pebbles apparently being derived from older volcanics, such as the pre-Tertiary Spences Bridge Group. Of

this 5800 feet, up to 2200 feet consists of coal with some intercalations of claystone, siltstone and sandstone. This thickness for the coal sequence is derived by (tentative) correlation of coal strata from drill holes in both the No. 1 Deposit and the No. 2 Deposit.

The coal sequence in the No. 1 Deposit is overlain by about 2000 feet of uniform siltstone which may or may not have thin coal or coaly beds intercalated with it immediately above the main coal layer. This may be equivalent to a thick monotonous section (1000-2000 feet thick) of claystone that is adjacent to a fault zone that truncates No. 2 Deposit on its west side. The claystone here is overlain by interbedded siltstone and conglomerate.

The Coldwater Formation in Upper Hat Creek Valley could thus be up to 5800 feet thick, as follows:

Siltstone or claystone (with overlying conglomerate)	2000
Coal sequence	2200
Coarser clastics, including volcanogenic sandstones and conglomerates	1600

An eroded surface was developed on this sequence, and this in turn was covered in part by Late Tertiary volcanic rocks.

No. 1 Deposit: From the recently completed drilling in and about the No. 1 Coal Deposit, a better understanding of the type and inter-relationships of the Coldwater rocks is evolving. (See Figure 8 to 18 for reference.) The finest grained units can variously be termed claystones, mudstones or shales. They are generally massive, only rarely exhibiting poorly defined bedding, unless carbonaceous material is present in which case the bedding is more reddily visible. From these very fine grained rocks, textures range through a continuous spectrum of silty, sandy, gritty and conglomeratic sizes. Marl is locally present; as well, calcareous sections are not uncommon, particularly in the coarser units (sandstone, gritstone, conglomerate). Ash beds occur throughout much of the coal section and, because of their generally distinctive appearance, they should be useful for correlation purposes. They are generally less than a half foot in thickness, light buff to tan colored and have a very low specific gravity. Also, initial petrographic study indicates that a significant portion of the finer grained sediments may be of tuffaceous (ash) origin although this material is not always distinguishable macroscopically.

As noted above, the Coldwater sediments occur in three major units: siltstone (2000 ft.) overlying the coal sequence; coal sequence (1400 ft. in No. 1 Deposit); basal coarser clastics (1000+ ft. below No. 1 Deposit). The overlying siltstones occur principally in a down-dropped fault block on the southeast side of

the No. 1 Coal Deposit where they comprise a very monotonous section of principally siltstone which locally grades to claystone or fine grained sandstone. It is only weakly to moderately lithified. (See drill hole 76-130, Fig. 11).

The coal sequence occurs as a fault-modified syncline with maximum stratigraphic thickness in the order of 1400 feet. In the central portion of the deposit the sequence comprises about 70% coal, (drill holes 76-135 and 76-136, Fig. 9); to the west the proportion of coal decreases but to the east it increases in both percentage of total sequence and quality.

(More details about the coal sequences are given in a following section, "Nature and Configuration of Coal Deposits.)

The basal coarser clastics, termed "Mixed Detrital Rocks" at Hat Creek, conformably underly the coal sequence. This sequence contains all clastic sedimentary rock types which occur in the Coldwater Formation but the fine grained varieties (claystone, siltstone) are not as common as the intermediate to coarse grained varieties. Sandstone is the most common rock type. Graded bedding is not unusual. The sequence has a distinctive pale olive (light yellowish green) color although some variations towards grey and brown are present. The rocks are moderately lithified; where calcified they are more competent. Although this sequence is obviously more heterogeneous than the siltstones which overlie the coal sequence it is, in gross terms, rather monotonous. In the stratigraphic interval drilled to date, approximately 1000 feet, no significant trends or changes with depth have been noted.

Volcanic Rocks

The volcanic rocks, all probably of later Tertiary, e.g. Miocene age, comprise several phases whose interrelationships may be surmised, but cannot be proven because of the lack of contacts between rocks of different phases.

From older to younger (probable order), they are:

i. Flow rhyolite and rhyolite tuff, lapilli tuff, tuffaceous siltstones, sandstone and conglomerate. No estimate of total thickness can be made, but if the cliffs of conglomeratic tuff in Medicine Creek are part of this unit, they may be at least 150 to 200 feet thick.

ii. Interfingered breccias and flows of basalt, or of reddish brown volcanic rocks of slightly less basic composition. In places the breccia matrix consists of well-lithified material of composition comparable with that of the fragments; elsewhere (but commonly in close association with the former) it is of a more friable, less cohesive material resembling a volcanic mud.

iii. Dacites and/or andesites, in flows and breccias, medium to light greenish brown or green, in places with a pronounced platy parting habit that may reflect flow-structure or the cooling of sheets of molten flow material. In places they are almost cherty.

iv. Basalt flows, dark brown, very fresh-looking, commonly with fine grained olivine phenocrysts.

v. Basalt scoria and breccias, of relatively fresh appearance, partly surrounding the "Dry Lake" of the No. 1 coal deposit area, and forming a short ridge or bench about one mile northwest of Dry Lake.

Amygdaloidal basalts that underlie a prominent elongate hill immediately south of Finney Lake appear to be old enough possibly to be Early Tertiary in age, perhaps older than the Coldwater Formation.

Until radioactivity-dating of these various volcanics is available, it is reasonable to suggest that all of them (except the last-mentioned) formed part of a series of volcanic episodes that followed Coldwater deposition in late Tertiary time, i.e. they probably correspond generally to the Kamloops Group of volcanic rocks seen near Cache Creek and between there and Kamloops.

Overburden

An isopach of overburden thickness has been produced for the more intensely drilled No. 1 Deposit (Fig. 7). Thickness ranges from near zero feet to over 500 feet with a general average in the order of 50-150 feet over much of the deposit. To the northeast the overburden cover increases to over 300 feet. A few apparently anomalous areas observable on the isopach have not yet been checked or confirmed. They could be due to the Coldwater-overburden contact being incorrectly chosen during core logging. Such a mistake is not difficult to make because: the poorly lithified siltstones and sandstones are often very similar to the overlying silts and sands; some of the uppermost Coldwater beds appear to have been disturbed (crushed, etc.) by glacial over-riding; some coal chunks (up to two feet thick) are present in the glacial till.

The overburden is composed of glacial till over most of the No. 1 Deposit except for the northeast where glacio-fluvial deposits predominate.

SLOPE STABILITY

Results of slope stability studies conducted during 1976 are contained in a report titled "Report No. 4, Hat Creek Geotechnical Study, Interim Conclusions" by Golder Associates of Vancouver. This report, comprising 25 pages and 3 figures, is on file with B.C. Hydro; only the Summary and Conclusions are appended to this report, (Appendix IV).

The major factors affecting slope stabilities are weak rocks, high groundwater levels, and low permeability of the rock mass. More local problems are created by one active and several inactive landslides which will have to be stabilized.

CORRELATION

Correlation of coal and other rock types from drilling results can be done with confidence only within the closely drilled No. 1 Deposit. Elsewhere correlation is difficult due to the paucity of data presently available. Physical problems encountered are wide hole spacing (outside the area of the No. 1 Deposit) and hole squeezing (which results in non-completion of some holes and the inability to geophysically log others). Geological hinderances to correlation are faulting, lensing of units along strike and/or dip, folding, variation in ash or carbonaceous components in coal and coaly rock, and lack of good marker horizons.

Gross correlations can be based on surface geophysical trends (VLF-EM), on coal verus non-coal sections, and on conglomerate or conglomeratic sandstone zones. More detailed correlations generally must rely on geophysical signatures of rock units which, because of the reasons noted above, are often inconsistent even over short lateral intervals. Within the No. 1 Deposit, rock types, bedding and tectonic features can be employed for local correlations. As well, it is possible to subdivide the coal sequence into four zones (termed A, B, C, D) on the basis of quality and geophysical signature and thereby somewhat simplify the correlation procedure.

NATURE AND CONFIGURATION OF COAL DEPOSITS

Exploration conducted since the early summer of 1974, and still continuing, has indicated two separate coal deposits in Upper Hat Creek Valley. The No. 1 Deposit is situated near the north end of the valley, and the No. 2 Deposit in the approximate north-south centre of the valley (Fig. 3). The drilling filed as work-assessment on Groups No. 21 (Orange) and No. 22 (Red) was all done within and about the No. 1 Deposit.

No. 1 Deposit

The No. 1 Deposit consists of four major coal zones in the form of a fault-modified, southerly plunging syncline. (See figures 8 and 9.) The zones are defined primarily on the basis of geophysical signature which reflects coal quality and rock units. The two key zones are B and D which are both composed of good quality coal (for Hat Creek). Zones A and C, although containing some

LEGEND FOR GEOLOGICAL SECTIONS

ROCK TYPES

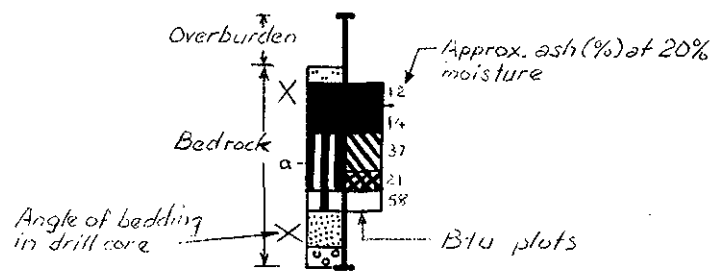
- Overburden
- Coal (< 1/3 apparent waste)
- Coal and rock (1/3 - 2/3 apparent waste)
- Rock and coal, carbonaceous rock (< 1/3 coal)
- Claystone, mudstone, shale
- Siltstone
- Sandstone
- Conglomerate
- Detrital rocks
- Shale
- Limestone, Marl
- Volcanic ash/tuff
- Volcanic flow
- Volcanic breccia/agglomerate
- Sedimentary breccia
- Fault breccia

ABBREVIATIONS

ob	Overburden
cly	Clay
C	Coal
c/s	Claystone
s/s	Siltstone
ss	Sandstone
cgl	Conglomerate
sh	Shale
lms	Limestone
b	Bentonite
?	Volcanic ash/tuff
vf	Volcanic flow
vb	Volcanic breccia/agglomerate
sb	Sedimentary breccia
cal	Calcareous
carb	Carbonaceous
bx	Breccia, brecciated
G	Gouge
F	Fault (F (6', 45°))
f	Fracture zone
lc	Lost core
	Shearing (at angle noted)
Ⓕ	Fossil
m	Marl

CALORIFIC VALUE (BTU)

7300 and greater
5700 - 7300
4100 - 5700
2500 - 4100
< 2500
Not sampled



74 - 26 — Drill hole no.
(45' N) — Distance away from sect.
(-86°) — Last dip test of vert. hole

Date: April 1979

good quality coal, contain all the remainder of the coal sequence and are thus "wastebasket" zones. The B and D zones exhibit only minor changes in gross quality wherever they are present in the deposit. The quality and coal content of the A and C zones on the other hand vary considerably in different areas of the deposit. In particular the amount of coal present in these two zones decreases markedly to the west and to the south.

In the northeast portion of the deposit the D zone, and what is probably good quality C zone, form a thick (100-550 ft.) section of relatively shallow dipping, high quality coal overlain by up to 400 feet of overburden. This section of the deposit is separated from the main synclinal portion of the No. 1 Deposit by a steeply dipping, NNW striking fault (Mag Fault) with relative upward displacement of this eastern block.

The eastern or southeastern side of the No. 1 Deposit, including the section discussed immediately above, is truncated by a major steeply dipping normal fault (Trig Fault) which has a relative vertical displacement in the order of 2000 feet. Some A zone coal is present to the east of this fault. (See drill hole 74-26 on section 79,000 E, Fig. 8.) However, precise location of the Trig Fault and correlation of coal intersections located near it are still questionable.

In the main synclinal deposit, the A and C zones become progressively lower in coal content westerly from the central axis along the west limb of the syncline. The proportion of clastic sediments increases to the point where it is no longer reasonable to define the material above the B zone and between the B and D zones as A and C coal zones.

To the south, the coal zones also become progressively lower in coal content and difficult to accurately define. Data in this area is sparse and until more is available the nature of the deposit in this area will be questionable.

No. 2 Deposit

The No. 2 Deposit is not well understood as yet. It is elongated in a NNW direction; total length is approximately 19,000 feet and average width about 2500 feet. It locally subcrops at bedrock surface but elsewhere may be overlain by up to 600 feet of fine grained clastic sedimentary rocks. Maximum drilled vertical thickness is 1950 feet. Present, rather sparse, information suggests that the coal may occur as a gentle anticline with axis approximately along the elongate centre of the deposit. Both limbs may be disrupted or terminated by steeply-dipping normal faults.

COAL ANALYSES

Results of proximate analyses indicate the following characteristics for the Hat Creek coal deposits, (at 20% moisture):

	Maximum	Minimum	Range	Mean
Ash (%)	65.7	9.6	56.1	26.4
Volatile Matter (%)	39.1	9.9	29.2	26.8
Fixed Carbon (%)	39.4	1.7	37.7	23.9
Gross Calorific Value (Btu/lb.)	9013	519	8494	6300
Sulphur (%)	1.9	0.0	1.9	0.41

Moisture (%) - in situ moisture is estimated to be 20%.

The relationship between ash and calorific value can be expressed by the following regression equation:

$$\text{Ash (\%)} = 13080 - 160.6 \times \text{CV (Btu/lb.)}$$

The rank of the coal is Subbituminous B; it is non-coking.

The massive amount of analytical data obtained as a result of the drilling programs is being input to the B.C. Hydro computer so that it can eventually be manipulated, transformed and otherwise processed into many useable forms. However, at present the output is rather limited and thus it is not yet possible to clearly define the coal quality characteristics of the two deposits or areas and zones within the deposits.

COAL RESERVES

The determination of coal reserves at Hat Creek is a difficult and complex process, being dependent upon the nature and configuration of the deposit, mining methods and volumes, boiler fuel requirements, coal washability, and so forth. The process is so complex and the volume of data so large that it can only be undertaken by computer calculation. Programs for these calculations are being developed but will not be available for some time yet. Consequently, no detailed determination of coal reserve tonnages has been undertaken for the Hat Creek deposits.

A number of somewhat simplified estimates of geological reserves for the No. 1 Deposit have been done in the past. Such estimates do not consider mining economics, plant feed requirements, etc., except in a most general

manner. The estimates have generally resulted in a geological reserve in the order of 700 million tons. Recent work suggests that the proportion of the No. 1 Deposit in each coal zone is (very approximately): A = 30%, B = 15%, C = 20%, D = 35%.

The exploration conducted during 1976 has probably not contributed to any significant change in the geological reserves except for the northeast area which was expanded somewhat. However, when reserves are calculated, data from the 1976 exploration program will form a major portion of the input for the No. 1 Deposit.

DOLMAGE CAMPBELL & ASSOCIATES LTD.
CONSULTING GEOLOGICAL & MINING ENGINEERS
1000 GUINNESS TOWER
VANCOUVER 1, B.C.

CONCLUSIONS

At least two major coal deposits, termed No. 1 and No. 2; occur in Upper Hat Creek Valley within coal licences held by British Columbia Hydro and Power Authority. Exploration work conducted within portions of these licences, Group No. 21 and Group No. 22, during the period 1 May, 1976 to 1 May, 1977 has helped to indicate the extent, limits, configuration, and quality of the No. 1 Deposit.

The data acquired during the 1976 drilling program (lighology, down-hole geophysics, coal analyses, etc.) have not significantly altered the known quantity or quality of coal in the No. 1 Deposit. They have, however, enhanced the earlier data and thereby provided a firmer understanding of the nature and configuration of the deposit. Correlation and interpretation can now be done with more confidence although, due to the complex nature of the deposit, many questionable situations still exist and thus more exploration will be necessary.

Geotechnical studies have indicated the generally weak nature of the Coldwater rocks and the resultant low angle that will be required for pit walls. However, more study is necessary before final design criteria are available.

The VLF-EM survey results have indicated a number of linear trends within the No. 1 Deposit which may reflect faults or, in some instances, subcrop traces of particular rock types.

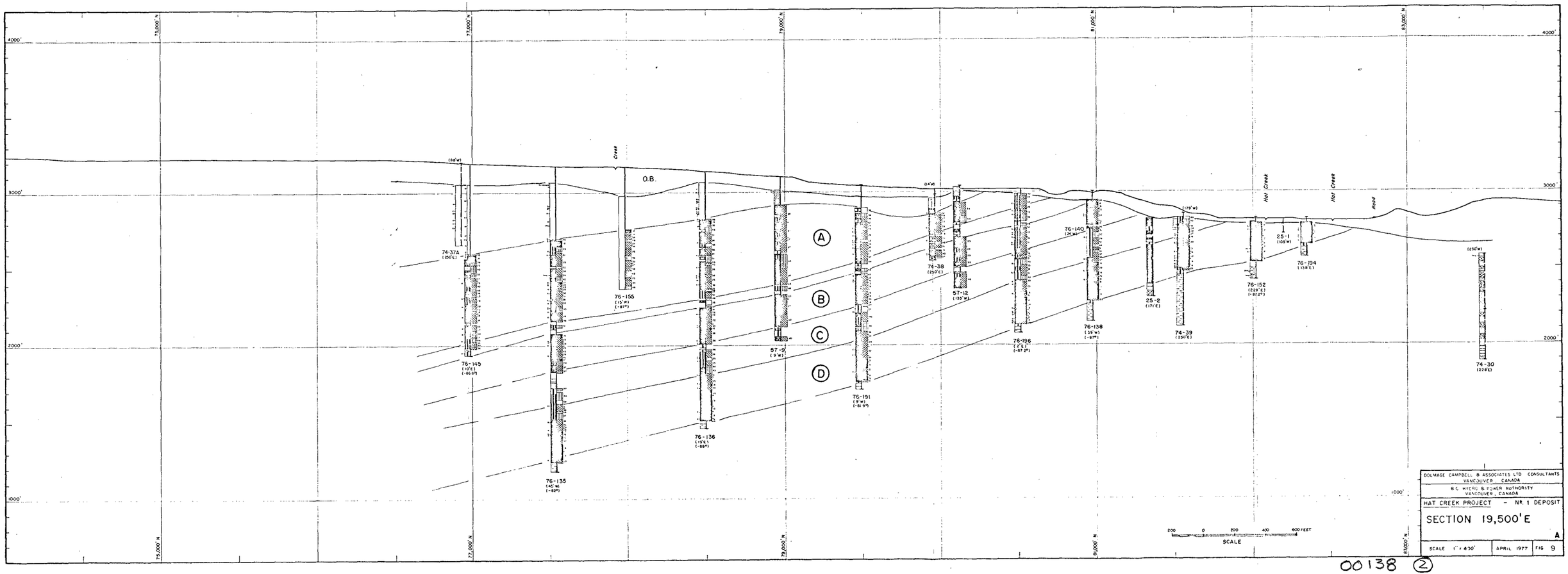
In summary, the 1976 exploration program provided considerable additional data about the coal quality, rock types, slope stability and configuration of the No. 1 Deposit. These data allow greater confidence in various aspects of the deposit assessment and indicate that more exploration is required before the deposit is sufficiently understood to allow more definitive planning for the overall Hat Creek Coal Development project.

Exploration of the No. 1 Deposit is continuing.

Respectfully submitted,

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

C.R. Saunders, P.Eng.
Exploration Manager


75,000' N
77,000' N
79,000' N
81,000' N
83,000' N
4000'
3000'
2000'
1000'
O.B.
Creek
Hat Creek
Hat Creek
Road
A
B
C
D
74-37A
(250'E)
76-155
(15'W)
(-87')
76-145
(10'E)
(-86.9')
76-135
(45'W)
(-82')
76-136
(95'E)
(-88')
57-9
(9'W)
76-191
(9'W)
(-81.9')
74-38
(250'E)
57-12
(135'W)
76-196
(2'E)
(-87.2')
76-140
(2'W)
76-138
(39'W)
(-87')
25-2
(17'E)
74-39
(250'E)
76-152
(228'E)
(-82.2')
25-1
(105'W)
76-194
(133'E)
74-30
(224'E)
200 0 200 400 600 FEET
SCALE
DOLMAGE CAMPBELL & ASSOCIATES LTD CONSULTANTS
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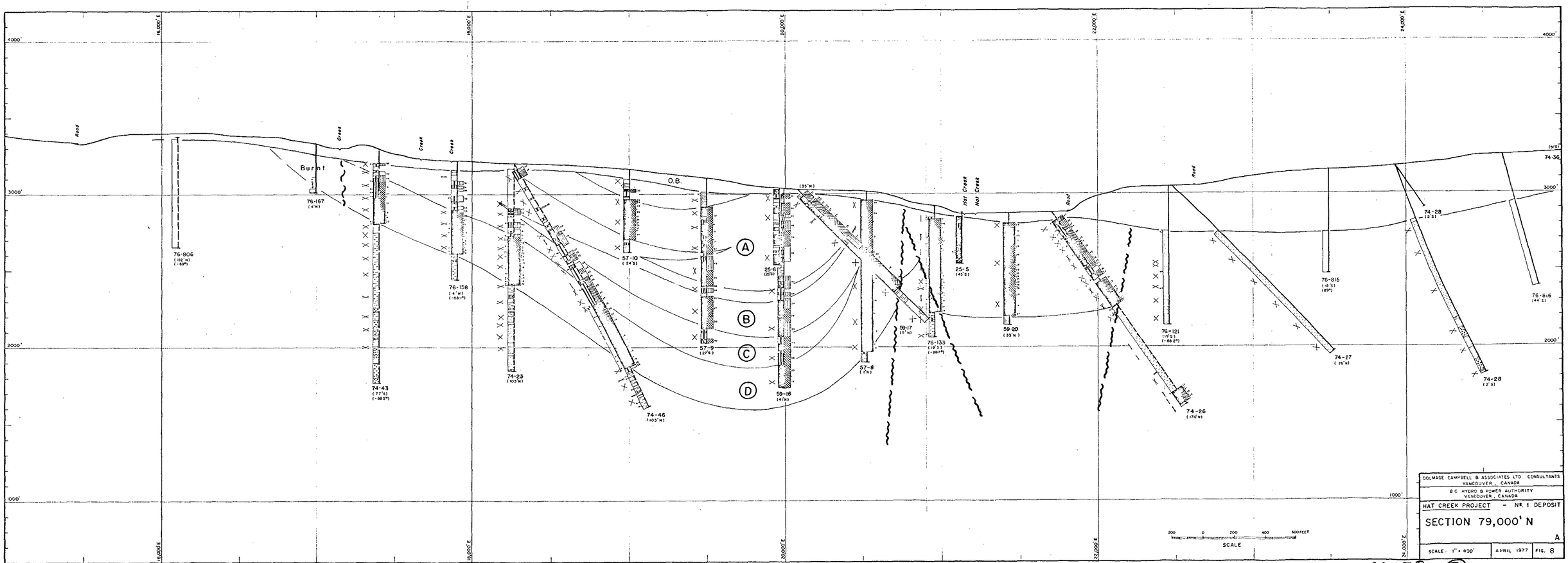
VANCOUVER, CANADA
HAT CREEK PROJECT - NR. 1 DEPOSIT
SECTION 19,500'E
A
SCALE 1" = 400'
APRIL 1977
FIG 9

00138 (2)



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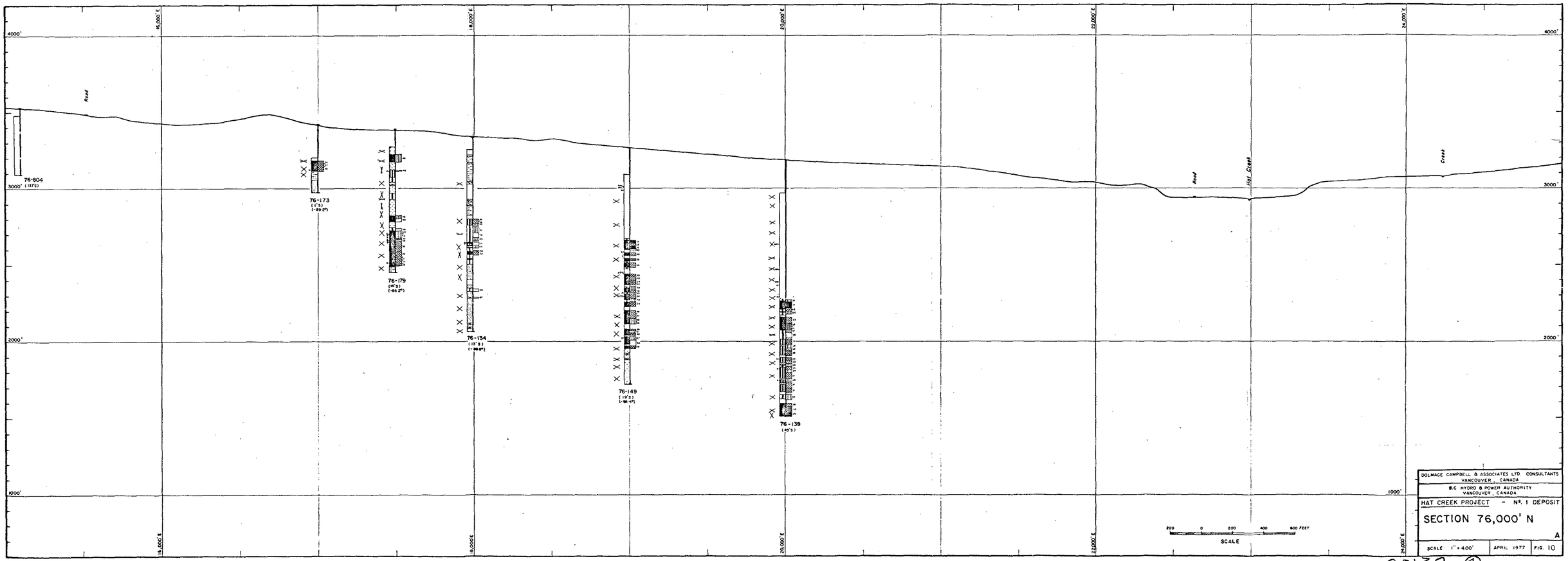
HAT CREEK PROJECT - NR. 1 DEPOSIT

SECTION 79,000' N

A

SCALE: 1" = 400' | APRIL 1977 | FIG. 8

00138 (3)



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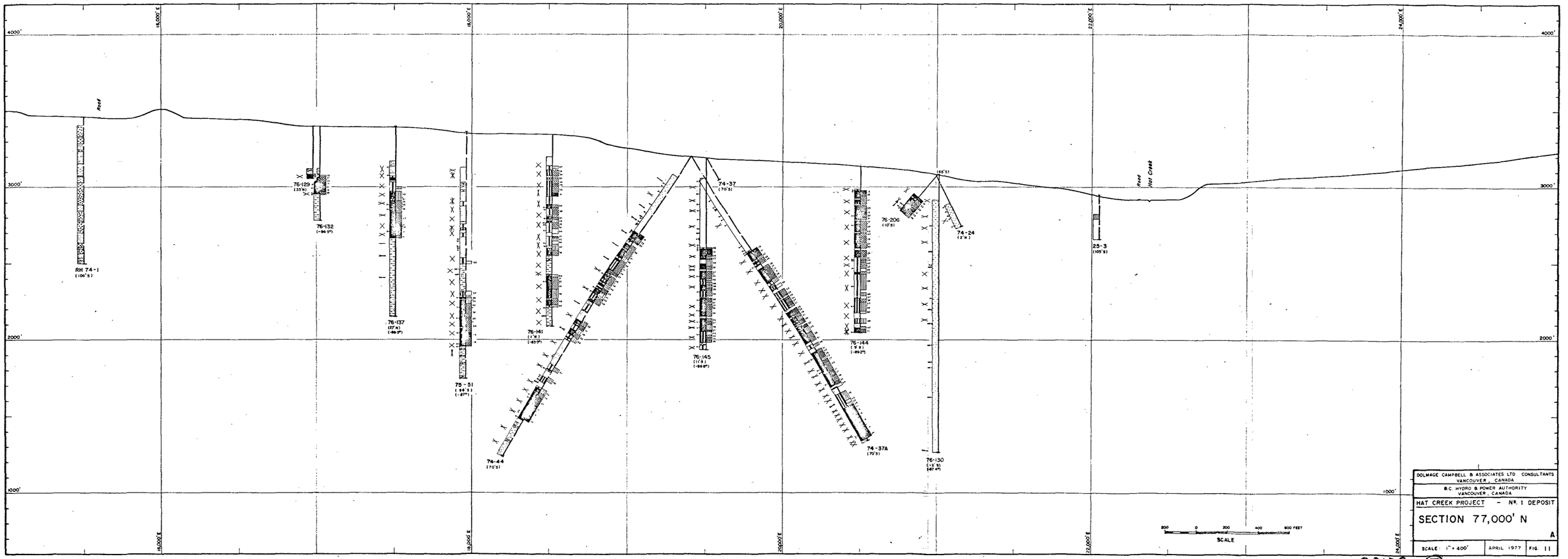
HAT CREEK PROJECT – NR. 1 DEPOSIT

SECTION 76,000' N

A

SCALE 1" = 400' | APRIL 1977 | FIG. 10

00138 (9)



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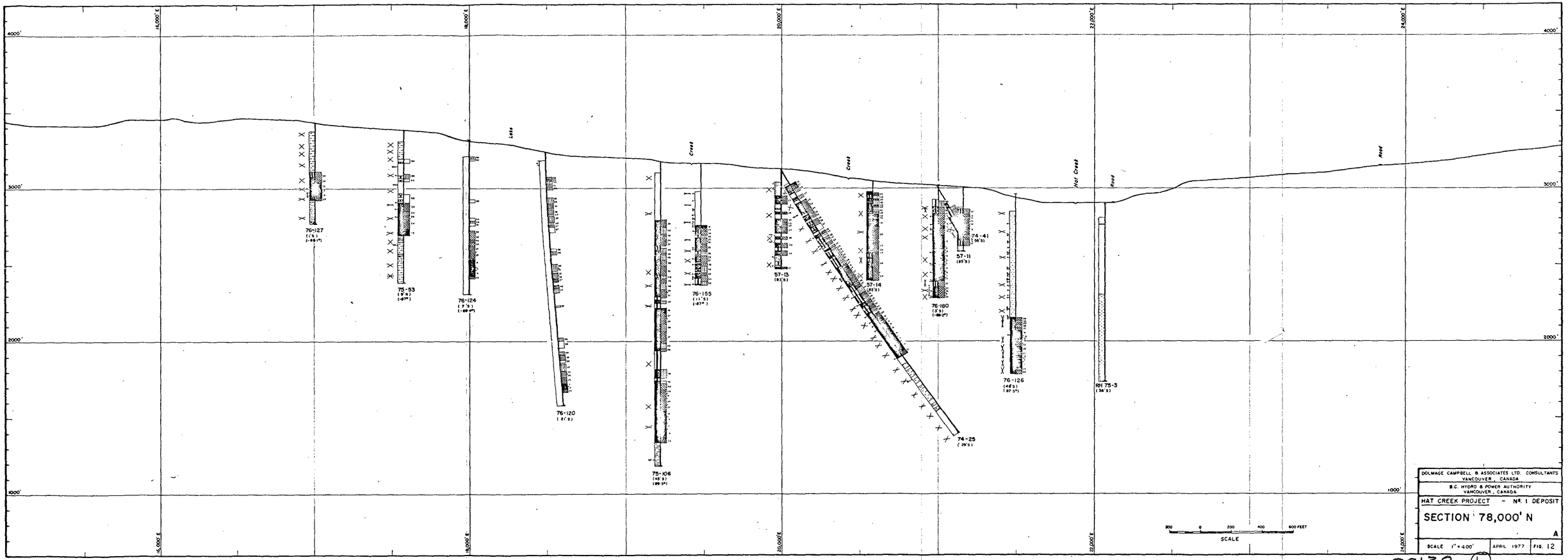
HAT CREEK PROJECT – NR. 1 DEPOSIT

SECTION 77,000' N

A

SCALE: 1" = 400' | APRIL 1977 | FIG. 11

00138 (5)



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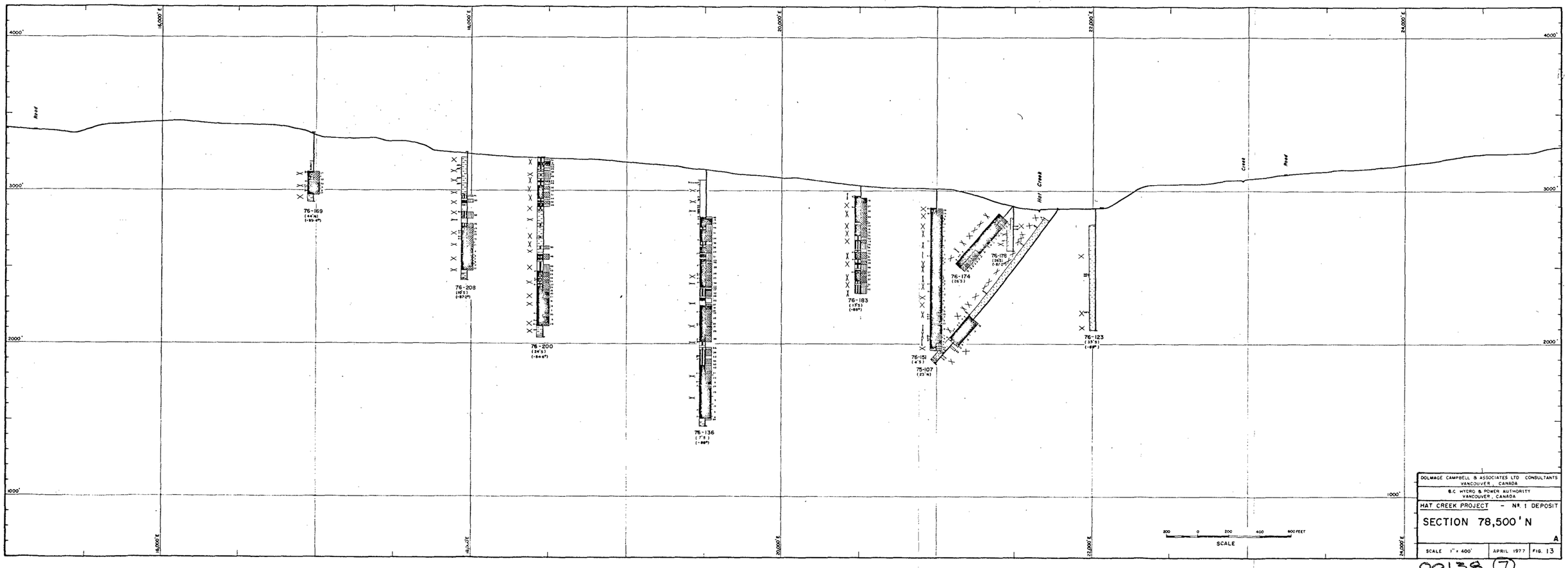
HAT CREEK PROJECT - NR. 1 DEPOSIT

SECTION 78,000' N

A

SCALE 1" = 400' | APRIL 1977 | FIG. 12

00138 (6)



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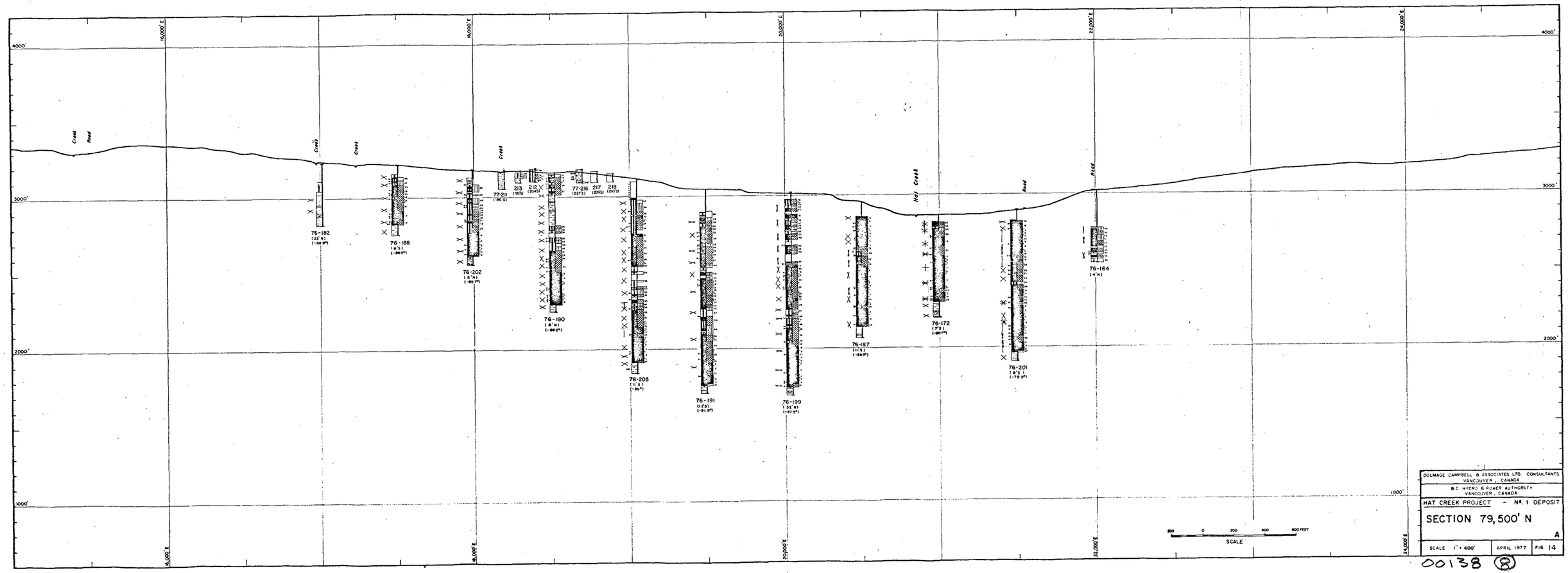
HAT CREEK PROJECT – NR. 1 DEPOSIT

SECTION 78,500' N

A

SCALE 1" = 400' | APRIL 1977 | FIG. 13

00138 (7)



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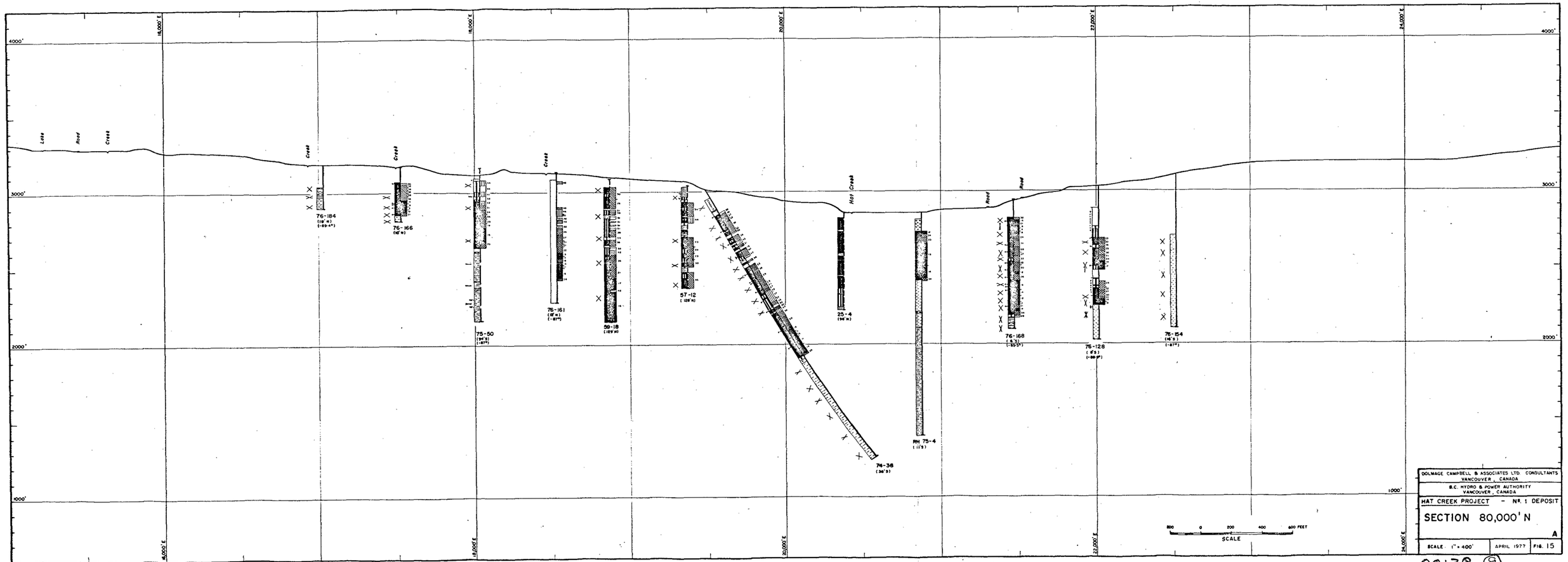
HAT CREEK PROJECT - NR. 1 DEPOSIT

SECTION 79,500' N

A

SCALE 1" = 400' | APRIL 1977 | FIG. 14

00138 (8)



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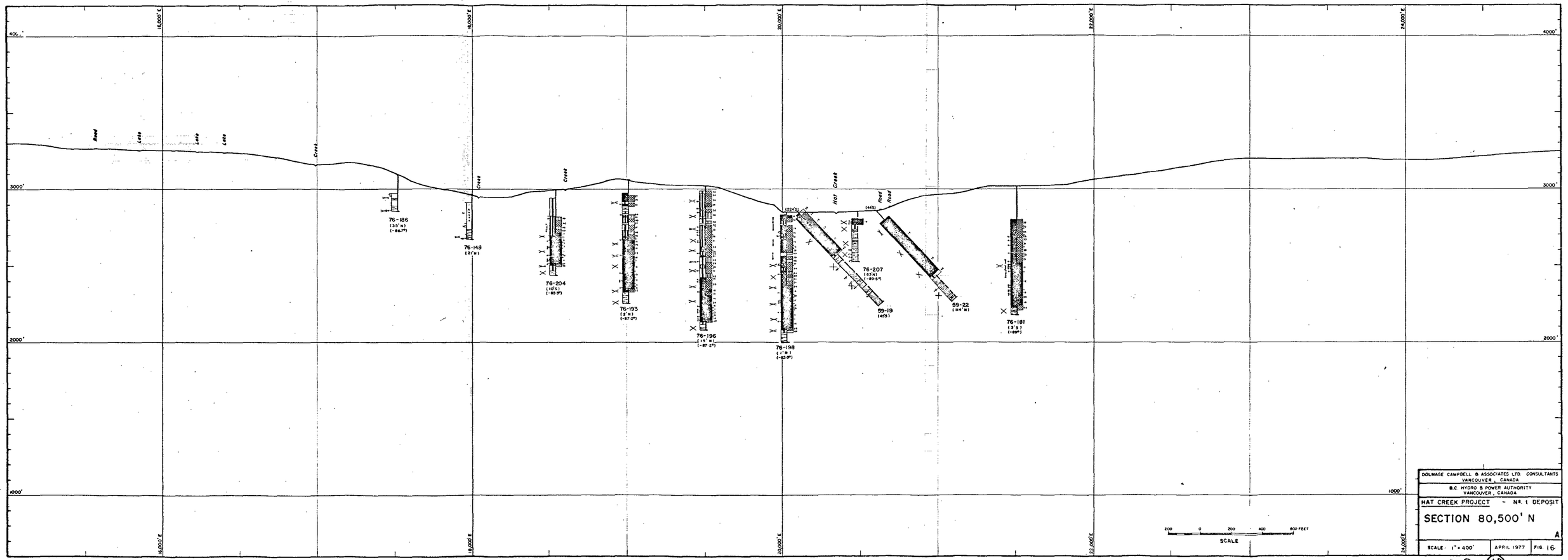
HAT CREEK PROJECT – NR. 1 DEPOSIT

SECTION 80,000' N

A

SCALE: 1" = 400' | APRIL 1977 | FIG. 15

00138 (9)



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VANCOUVER, CANADA

B.C. HYDRO & POWER AUTHORITY
VANCOUVER, CANADA

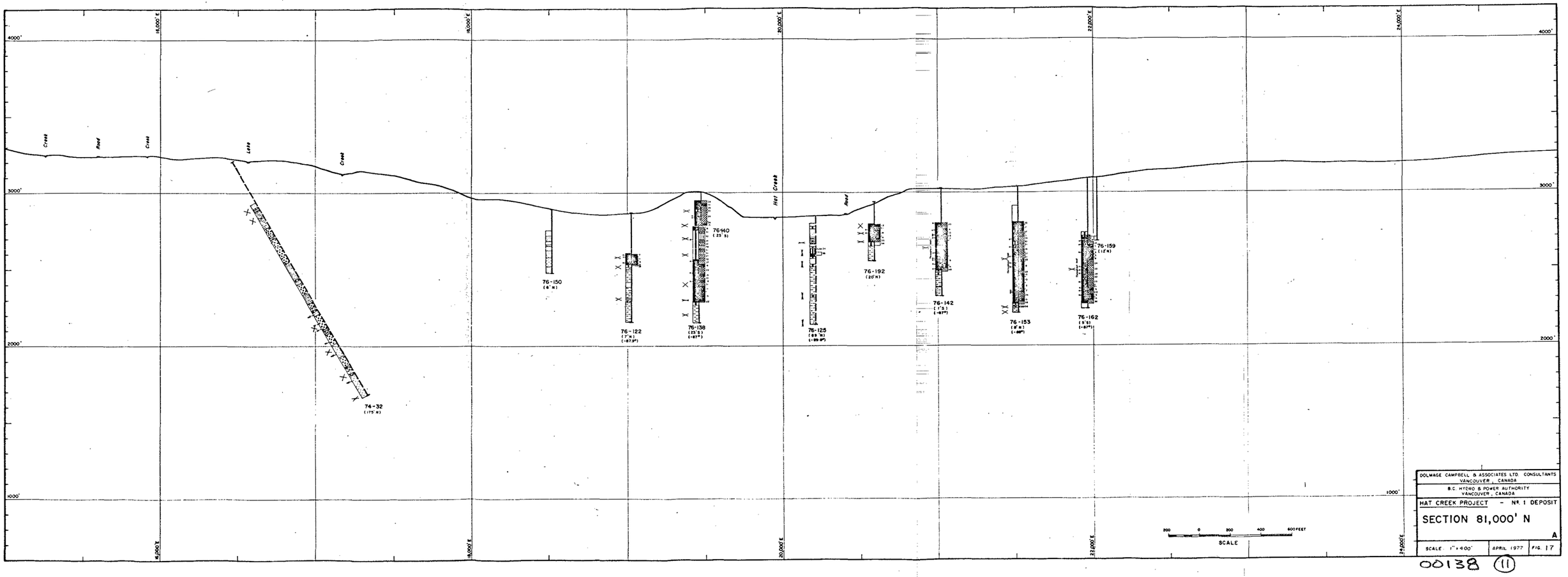
HAT CREEK PROJECT - NO. 1 DEPOSIT

SECTION 80,500' N

A

SCALE: 1" = 400' | APRIL 1977 | FIG. 16

00138 (10)



DOLMAGE CAMPBELL & ASSOCIATES LTD. CONSULTANTS
VANCOUVER, CANADA

B.C. HYDRO & POWER AUTHORITY
VANCOUVER, CANADA

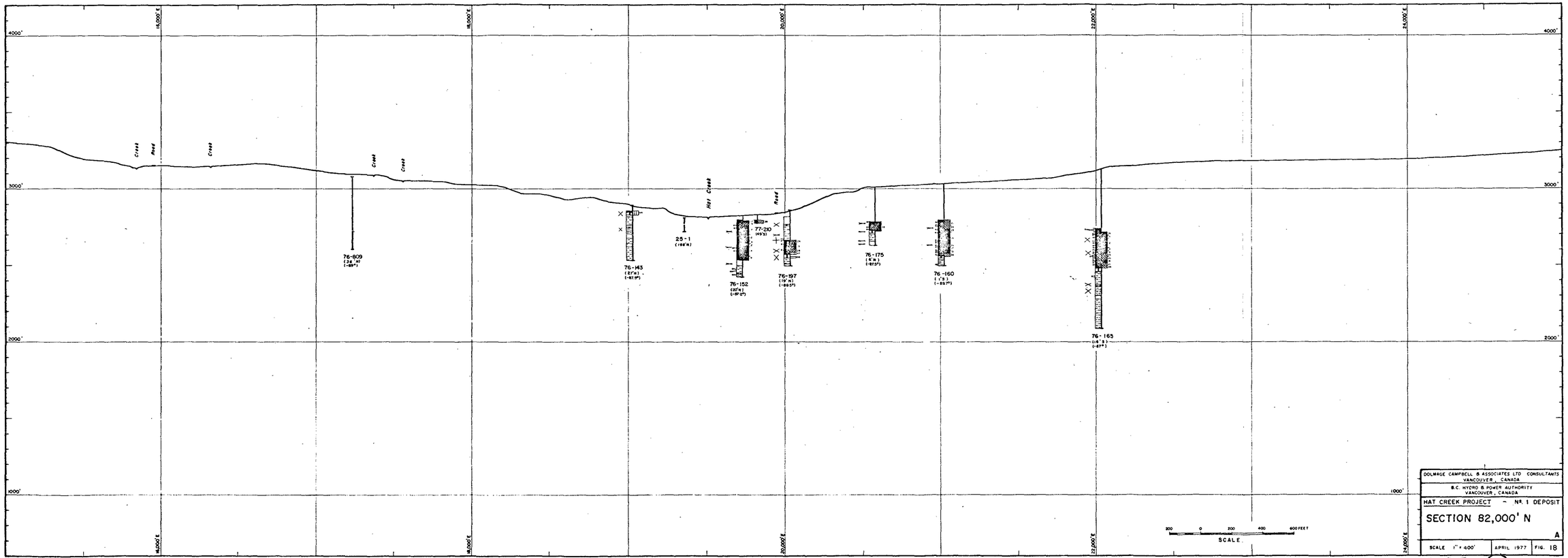
HAT CREEK PROJECT - No. 1 DEPOSIT

SECTION 81,000' N

A

SCALE 1" = 400' | APRIL 1977 | FIG. 17

00138 (11)



DOLMAGE CAMPBELL & ASSOCIATES LTD CONSULTANTS
VANCOUVER, CANADA

B.C. HYDRO & POWER AUTHORITY
VANCOUVER, CANADA

HAT CREEK PROJECT - NR. 1 DEPOSIT

SECTION 82,000' N

A

SCALE 1" = 400' | APRIL 1977 | FIG. 18

00138 (12)

APPENDIX I

GRAPHIC LITHOLOGIC LOGS

The following lithologic logs (scale 1" = 40') were appended to one copy of the geological report filed with the Department of Mines and Petroleum Resources.

76-121	76-174
76-123	76-176
76-126	76-178
76-128	76-179
76-129	76-181
76-130	76-201
76-131	76-206
76-132	
76-134	76-801
76-137	76-802
76-139	76-803
76-141	76-804
76-144	76-805
76-145	76-807
76-149	76-810
76-153	76-812
76-154	76-813
76-157	76-814
76-159	76-815
76-162	76-816
76-164	76-818
76-165	76-819
76-168	76-820
76-170	76-821
76-173	

NOTE

Survey coordinates for most of these drill holes are slightly in error. A resurvey of all holes was recently undertaken but corrections have not yet been completed for all affected records.

APPENDIX II

GEOPHYSICAL LOGS OF DRILL HOLES

The following geophysical logs (scale 1" = 40') were appended to one copy of the geological report filed with the Department of Mines and Petroleum Resources.

HOLE NO.	GAMMA	DENSITY	CALIPER	RESISTIVITY
76-121	2	2	1	1
-123	2	2	1	1
-126	2	2	1	1
-128	2	2	1	1
-129	1	1	-	-
-130	1	1	-	-
-131	-	-	-	-
-132	1	1	-	-
-134	1	1	-	-
-137	1	1	-	-
-139	2	2	1	1
-141	1	1	-	-
-144	2	2	1	1
-145	2	2	1	1
-149	1	1	-	-
-153	2	2	1	1
-154	1	1	-	-
-157	2	2	-	1
-159	-	-	-	-
-162	1	1	-	-
-164	1	1	-	-
-165	2	2	1	1
-168	2	2	-	1
-170	1	1	-	-
-173	1	1	-	-
-174	1	1	-	-
-176	1	1	-	-
-178	1	1	-	-
-179	1	1	-	-
-181	2	2	1	1

76-201	2	2	1	1
-206	1	1	-	-
-801	1	1	-	-
-802	2	2	1	1
-803	1	1	-	-
-804	1	1	-	-
-805	1	1	-	-
-807	4	4	1	1
-810	1	1	-	-
-812	2	2	1	1
-813	1	1	-	-
-814	1	1	-	-
-815	2	2	1	1
-816	1	1	-	-
-818	1	1	-	-
-819	-	-	-	-
-820	-	-	-	-
-821	-	-	-	-

APPENDIX III

COAL ANALYSES SCHEDULES

Analyses certificates are on file with Dolmage Campbell & Associates Ltd. They have not been appended because of their number and resulting bulk. Instead, Coal Analysis Schedules and letters of instruction to the analytical laboratories have been appended. The following table indicates the number of analytical samples by assay schedule:

	Number of Analytical Samples					
		High	Assay Schedule			
Source	Total	Ash	1	2	3	4
DDH 76-135, 136	337	27	310	-	-	-
To 60,000' drilling	1454	136	-	632	568	118
60,000' to 67,908' drilling	454	83	-	-	279	92
Totals	2245	246	310	632	847	210

The number of analytical samples is less than the number of field samples, namely 2485, because for hole Nos. 76-135, 136 and 200 certain pairs of field samples were combined to form a lesser number of analytical samples.

HAT CREEK DEVELOPMENT

COAL ANALYSIS SCHEDULE No. 1 - STAGE 3B

DRILL HOLES 76-135 and 136
(July - August, 1976)

1. Every analytical sample (Every field sample or composite field sample).

   a. Proximate, calorific value, sulphur, air dry moisture.
   b. Ultimate including chlorine, oxygen by direct determination.
   c. Analysis of ash including Mn, V.
   d. Sulphur forms.
   e. CO_2.
   f. 8 - pt. ash fusion temperatures.
   g. Sink-float tests at 1.3, 1.5, 1.7 gravities on 3/8" x 0 coal.

2. All of above analyses on float fractions as follows:

   A Zone - 1.3 float - every 3rd sample.
   - 1.5 float - every 9th sample.
   B Zone - 1.3 float - same as A Zone.
   - 1.5 float - same as A Zone.
   C Zone - 1.3 float - on two out of every three samples.
   - 1.5 float - on one out of every three samples.
   D Zone - 1.3 float - same as A Zone.
   - 1.5 float - same as A Zone.
   (Note: "1.5 float" is all material floating at 1.5).

3. Water soluble alkalies; Hardgrove grindability indices.

   On 11 selected samples from each drill hole.

4. Small field specific gravity samples.

   a. Total (psuedo equilibrium) moisture.
   b. Ash

5. Other on 49 samples, not included above, from two thick high-ash beds in each hole.

   a. More than 75% ash, dry basis: ash and moisture only on most samples; ash analysis and CO_2 on a few.
   b. Less than 75% ash, dry basis: full analyses listed under No. 1 above.

Notes:
(1) Schedule applies only to samples from holes 76-135 and 136.
(2) Schedule is reproduced from a letter to C.Guelke from L.T.Jory, dated July 9, 1976.

HAT CREEK DEVELOPMENT

COAL ANALYSIS SCHEDULE No. 2 - STAGE 3B
(July - August, 1976)

1. Samples containing more than 75% ash, dry basis.
   - a. Total (as received) moisture.
   - b. Ash.

2. Samples containing less than 75% ash, dry basis.
   - a. Proximate, calorific value, sulphur, air dry moisture.
   - b. Ultimate including chlorine; oxygen by difference.
   - c. Sulphur forms.
   - d. CO_2.
   - e. Analysis of ash including Mn, V.
   - f. 4-pt. reducing ash fusion temperatures.
   - g. Sink-float tests at 1.3, 1.5, 1.7 gravities on 3/8" x 0 coal.

3. 1.3 gravity float.

   4-pt. reducing ash fusion.

4. Small field specific gravity samples.
   - a. Total (psuedo equilibrium) moisture.
   - b. Ash.

Notes:
(1) This schedule is reproduced from a letter to C. Guelke from L.T. Jory, dated July 9, 1976.

(2) The schedule is applicable to all samples from drill holes other than Nos. 76-135 and 136. Following discussions with the laboratories, work on Schedule No. 2 was terminated early in September except for completion of specific items of work well advanced for any drill hole.

HAT CREEK DEVELOPMENT

COAL ANALYSIS SCHEDULE No. 3 - STAGE 3B

September 7, 1976

1. Samples containing more than 75% ash, dry basis.
   - a. Residual moisture (Reporting of as received moisture at discretion of laboratory).
   - b. Ash.

2. Samples containing less than 75% ash, dry basis.
   - a. Residual moisture (As for 1.a. above).
   - b. Ash.
   - c. Calorific value.
   - d. Sulphur and pyritic sulphur.
   - e. CO_2.
   - f. 4-pt. reducing ash fusion temperatures.

3. Samples from above for which I.D. reducing temperature is 2600°F or less.
   - a. Volatile matter.
   - b. Ultimate including chlorine; oxygen by difference.
   - c. Analysis of ash including Mn, V.
   - d. Sink-float tests at 1.3, 1.5, 1.7 gravities on 3/8" x 0 coal.

4. 1.3 sink - 1.5 float fraction.
   - a. Analysis of ash including Mn, V.
   - b. 4-pt. reducing ash fusion temperatures.

5. Small field specific gravity samples.
   - a. Total (psuedo equilibrium) moisture.
   - b. Ash.

Notes:
(1) Schedule No. 3 replaces Schedule No. 2.

(2) The schedule is interim and subject to change at anytime by B.C. Hydro.

HAT CREEK DEVELOPMENT

COAL ANALYSIS SCHEDULE No. 4 - STAGE 3B

September 7, 1976

1. Samples containing more than 75% ash, dry basis.
   - a. Residual moisture (Reporting of as received moisture at discretion of laboratory).
   - b. Ash.

2. Samples containing less than 75% ash, dry basis.
   - a. Residual moisture (As for 1.a. above).
   - b. Ash.
   - c. Calorific value.
   - d. Sulphur and pyritic sulphur.
   - e. CO_2.
   - f. 4-pt. reducing ash fusion temperatures.

3. Small field specific gravity samples.
   - a. Total (psuedo equilibrium moisture).
   - b. Ash.

Notes:

(1) Schedule No. 4 is an abbreviated version of Schedule No. 3.

(2) The schedule is applicable in place of Schedule No. 3 at the discretion of L.T.Jory to coal samples as follows:

   (a) Samples from holes drilled northeast of the original No. 1 coal deposit.
   (b) Samples from below the 2400 foot elevation.
   (c) All samples, at some future time, should it appear possible from cost projections that total assay costs may exceed the budget estimate for such costs.

COMMERCIAL TESTING AND ENGINEERING

HAT CREEK COAL SAMPLES

Coal samples are to be analysed according to the following schedules unless otherwise directed.

Schedule No. 1

DDH Nos. 135 and 136.

Schedule No. 2

DDH Nos. 124, 129, 132, 141, 144, 149 and 153.

Schedule No. 3

DDH Nos. 161, 164, 172, 175 and 179.

Schedule No. 4

DDH No. 157, 162.

Schedule Nos. 3 and 4

DDH No. 168: Schedule 3 - Samples 1 to 22; Schedule 4 - Samples 23 to 34.

DDH No. 181: Schedule 3 - Samples 1 to 22; Schedule 4 - Samples 23 to 30.

DDH No. 187: Schedule 3 - Samples 1 to 24; Schedule 4 - Samples 25 to 38.

Notes:

(1) If the above is not in agreement with telephoned instructions, please advise.

(2) For any drill hole not listed above, please check with L.T. Jory before commencing analyses.

(3) Schedule Nos. 3 and 4 are subject to change.

September 20, 1976

LORING LABORATORIES LTD.

HAT CREEK COAL SAMPLES

Coal samples are to be analysed according to the following schedules unless otherwise directed:

Schedule No. 2

DDH Nos. 120, 125, 128, 134, 138, 140, 142, 145, 152, 156, 158 and 163.

Schedule No. 3

DDH Nos. 173, 176, 817, 180 and 186.

Schedule No. 4

DDH No. 165

Notes:

(1) If the above is not in agreement with telephoned instructions, please advise.

(2) For any drill hole not listed above, please check with L.T. Jory before commencing analyses.

(3) Schedule Nos. 3 and 4 are subject to change.

September 20, 1976

GENERAL TESTING LABORATORIES

HAT CREEK COAL SAMPLES

Coal samples are to be analysed according to the following schedules unless otherwise directed:

Schedule No. 2

DDH Nos. 122, 126, 127, 133, 137, 139, 143, 147, 151 and 155.

Schedule No. 3

DDH Nos. 814, 166, 169, 171, 174, 177, 183 and 188.

Schedule No. 4

DDH No. 160.

Notes:
(1) If the above is not in agreement with telephoned instructions, please advise.

(2) For any drill hole not listed above, please check with L.T. Jory before commencing analyses.

(3) Schedule Nos. 3 and 4 are subject to change.

October 26, 1976

Mr. R. Houser,
Commercial Testing and Engineering Co.,
147 Riverside Drive,
North Vancouver, B.C. V7H 1T6

Dear Mr. Houser:

This letter will confirm telephoned instructions and discussions held during the past two to three weeks.

Assay schedules for the remaining drill holes are as follows:

Schedule No. 3

DDH Nos. 76-191, 192, 197, 204, 207 and 208; all samples.
76-200; samples 1 to 82 incl.

Schedule No. 4

DDH No. 76-200; samples 83 to 109, incl.

For drill hole No. 76-200, the following pairs of samples are to be combined to form single analytical samples and the results are to be reported under the first sample number:

2-3; 11-12; 13-14; 16-17; 18-19; 20-21; 24-25; 27-28; 37-38; 40-41; 42-43; 46-47; 50-51; 52-53; 54-55; 57-58; 59-60; 62-63; 64-65; 68-69; 70-71; 72-73; 74-75; 83-84; 85-86; 87-88; 89-90; 91-92; 93-94; 95-96; 97-98; 99-100; 101-102; 103-104; 105-106 and 107-108.

Enclosed is a list showing the elevations and inclinations for drill holes from No. 76-179 up.

I understand that Commercial expects to complete all presently assigned analytical work by the end of December. Please advise me at the earliest of any altera-

tion to this schedule. If you can advance the completion date, it will be appreciated. Insofar as practical, please prioritize the work such that proximate, calorific value, sulphur forms and CO_2 analyses are completed and reported first on a progress, by drill hole basis.

By special arrangement you are determining ash fusibility temperatures on samples sent to you by General Testing. Please report the results to this office as well as to General.

To avoid delays in the fusibility tests or in other work, you are authorized to have a portion of the work carried out in associated laboratories if necessary.

From time to time, please report to me by drill hole the numbers of high ash samples and the numbers of samples for which the I.D. reducing temperature is less than 2600°F.

Yours truly,

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

Lisle T. Jory, Ph.D., P.Eng.

LTJ/md
Enclosure

DOLMAGE CAMPBELL & ASSOCIATES (1975) LTD.
CONSULTING ENGINEERS

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

October 26, 1976

Mr. Loring McIsaac,
Loring Laboratories Ltd.,
629 Beaverdam Road, N.E.,
Calgary, Alberta T2K 4W2

Dear Loring:

This letter will confirm my telephoned instructions concerning assay schedules for the remaining drill holes on which you will be carrying out analyses. The schedules are as follows:

Schedule No. 3
DDH Nos. 76-190, 194, 198 and 206; all samples
76-201; samples 1 to 28, incl.

Schedule No. 4
DDH No. 76-201; samples 29 to 50, incl.

Enclosed is a list showing the elevations and inclinations for drill holes from No. 76-173 up.

I understand that you expect to complete all presently assigned analytical work by December 10. Insofar as practical, please prioritize the work such that proximate, calorific value, sulphur forms and CO_2 analyses are completed and reported first on a progress, by drill hole basis.

From time to time, please report to me by drill hole the number of high ash samples and the numbers of samples for which the I.D. reducing temperatures is less then 2600°F.

Yours sincerely,

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

Lisle T. Jory, Ph.D., P.Eng.

LTJ/md
Enclosure

Mr. J.W. Merks,
General Testing Laboratories,
#1220 - 355 Burrard Street
Vancouver, B.C. V6E 2G8

Dear Mr. Merks:

This letter will confirm the results of telephone discussions with Mr. Roberts during your absence.

The assay schedules for the remaining drill holes are as follows:

Schedule No. 3

DDH Nos. 76-193, 202 and 203; all samples.
76-196; samples 1 to 54
76-199; samples 1 to 42
76-205; samples 1 to 50

Schedule No. 4

DDH Nos. 76-196; samples 55 to 66
76-199; samples 43 to 79
76-205; samples 51 to 80

Enclosed is a list showing the elevations and inclinations for drill holes from No. 76-183 up.

I understand that General will undertake to complete all presently assigned analytical work by the end of December. If the completion date can be advanced, it will be appreciated.

Should it appear doubtful at any time for General to meet the completion date, please advise me immediately so that we can discuss alternatives.

Please prioritize insofar as practical the work such that proximate, calorific value, sulphur forms and CO_2 analyses are completed and reported first on a progress, by drill hole basis.

From time to time, please report to me by drill hole the numbers of high ash samples and the numbers of samples for which the I.D. reducing temperature is less then 2600°F.

Yours very truly,

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

Lisle. T. Jory, Ph.D., P.Eng.

APPENDIX IV

GEOTECHNICAL STUDY

Only the Summary and Conclusions of the geotechnical report are appended. The full report is on file with B.C. Hydro and Power Authority.

Golder Associates

consulting geotechnical engineers

GOLDER ASSOCIATES LTD.
IN ASSOCIATION WITH
PD-NCB CONSULTANTS LTD.
&
WRIGHT ENGINEERS LTD.

REPORT NO. 4
HAT CREEK GEOTECHNICAL STUDY
INTERIM CONCLUSIONS

SUMMARY

The geotechnical study described in this interim report was carried out as part of a feasibility study on the mining of the Hat Creek No. 1 coal deposit down to an elevation of 2400 feet.

The results obtained to date indicate that:

a. The rock types in which the ultimate pit slopes will be mined are generally very weak and steep slopes are unlikely to remain stable for long periods of time.

b. High groundwater levels exist in the proposed open pit area and the low permeability of the rock mass will make drainage difficult and expensive.

c. One active landslide and several areas of previous landslide movement have been identified in the pit and waste dump areas and special precautions will have to be taken to stabilise these landslide materials.

As a result of these conditions it is concluded that:

a. Overall final slope angles of 15^{o} to 16^{o} should be used as a basis for the determination of stripping ratios for the evaluation of the cost of mining this deposit.

b. Drainage of surface water collected in small lakes and ponds on the western side of the deposit will be necessary in order to improve the stability of the landslide debris.

c. Sub-surface drainage will be required in critical areas such as the access ramp slopes and it may permit significant steepening of the slopes in other areas. The cost and economic benefits of a large scale sub-surface drainage program should be evaluated as part of the detailed mine design studies.

d. Small scale bench failures will be a regular occurrence during the mining of this deposit but these failures will generally be slow moving and are not expected to pose a threat to men and equipment in the mine. The mine design proposed by PD-NCB Consultants is considered ideal because it has been designed to accommodate such small scale bench failures.

e. The waste dump site in Houth Meadows is unsuitable for large volumes of materials and it is recommended that carefully engineered berms be placed across the toe of this waste dump area and that the poor materials and landslide debris from the western side of the open pit be placed in this dump area. The dump face should be established at a slope of approximately 1 in 10.

Adequate capacity for disposal of better quality waste materials exists in the Medicine Creek valley.

The size of the Hat Creek coal deposit and the complexity of the geological history of the area precludes the possibility of a precise pit design, and it is strongly recommended that provision be made for on-going design studies during the life of the pit. The recommendations presented in this report are believed to provide a reliable basis for feasibility studies. Experience suggests that knowledge gained during early phases of mining provides the most reliable basis for slope design in a rock mass such as that being considered at Hat Creek. It is probable that significant improvements in slope angle can be achieved if the mining program is flexible enough to accommodate these improvements.

of the dump in Medicine Creek could be reduced to about El. 4000 and about 150 million cu.yds. of the waste material dumped to the north of the pit as planned in the PD-NCB Report No. 2.

6.0 CONCLUSIONS

At this stage in the Hat Creek Geotechnical Study with the 1976 field work complete and the laboratory testing program approximately half finished the following broad conclusions have been reached:

1. The final mine slopes of 15-16° as recommended in the PD-NCB mine feasibility studies will be possible provided that some drainage is employed. The cost of drainage of the low permeability materials is likely to be high.
2. The range of rock shear strengths, the distribution of materials in the slopes and the variation in slope heights indicate that some slopes will be considerably more sensitive to failure than others. It will be necessary therefore to concentrate drainage measures in certain areas of the pit.
3. Local steepening of the slopes will be possible where it can be shown reliably that materials with higher than average strengths will be present.
4. Removal of surficial materials on the west bank and the subsequent excavation of the pit could re-activate old slides. A continuous program of drainage and monitoring of movement will probably be necessary from the commencement of work on the pit.

5. Due to the presence of old flow slide debris, waste dumps formed only of weak surficial materials should be dumped in Houth Meadows.

6. An adequate site for the dumping of the major portion of the waste materials exists in Medicine Creek; the proposed small dump to the north of the pit is satisfactory.

7. Many of the waste materials will be bentonitic and will deterioriate rapidly on exposure. Handling problems may result and special measures may have to be employed to alleviate the difficulties.

8. It will be essential that special drainage measures be undertaken to ensure the stability of the 25° access ramp slopes.

9. Drainage of many of the small lakes on the western side of the proposed pit will be necessary in order to improve the stability of the flow slide materials adjacent to the pit perimeter.

Until our studies are complete we are unable to comment on the problems that might be encountered with bentonite in a coal preparation plant.

Our laboratory testing is continuing and will permit us to refine our ideas on rock strengths in due course. This data is unlikely to affect our main conclusions.

OUTLINE OF COAL LICENCES

№. 1 DEPOSIT

№. 2 DEPOSIT

GROUP № 21 (Orange)
Nine Licences
5418 Acres

GROUP № 22 (Red)
Ten Licences
5708 Acres

GROUP № 23 (Yellow)
Nine Licences
5441 Acres

GROUP № 24 (Brown)
Eight Licences
3198 Acres

Medicine Fault

MAG Fault

West Boundary Fault

East Boundary Fault

2767 2756 2755 2758 CGI 83912E 2754 2759 2761 2762 2763 3013 3012 3004 3010 3011 3003 3009 3002 3656 3008 3001 3007 3000 2999 3006 2997 2998 3005 2996 2993 2994 2992 2991

N

SCALE
0 4000 8000 FEET

LEGEND

OVERBURDEN

LATE TERTIARY (MIOCENE?)
Volcanic rocks

EARLY TERTIARY (EOCENE)
Coldwater formation

CRETACEOUS
Spences Bridge Group

Mtn. Lytton Batholith

PERMIAN
Marble Canyon Limestone
(and Chert-Greenstone to NE)

FAULTS

ALL GROUPS
36 Licences
19,765 Acres

138 (13)

GEOLOGICAL COMPILATION
UPPER HAT CREEK VALLEY

HC-HAT CREEK 76 (1) B.

APRIL 1977

FIG. 3

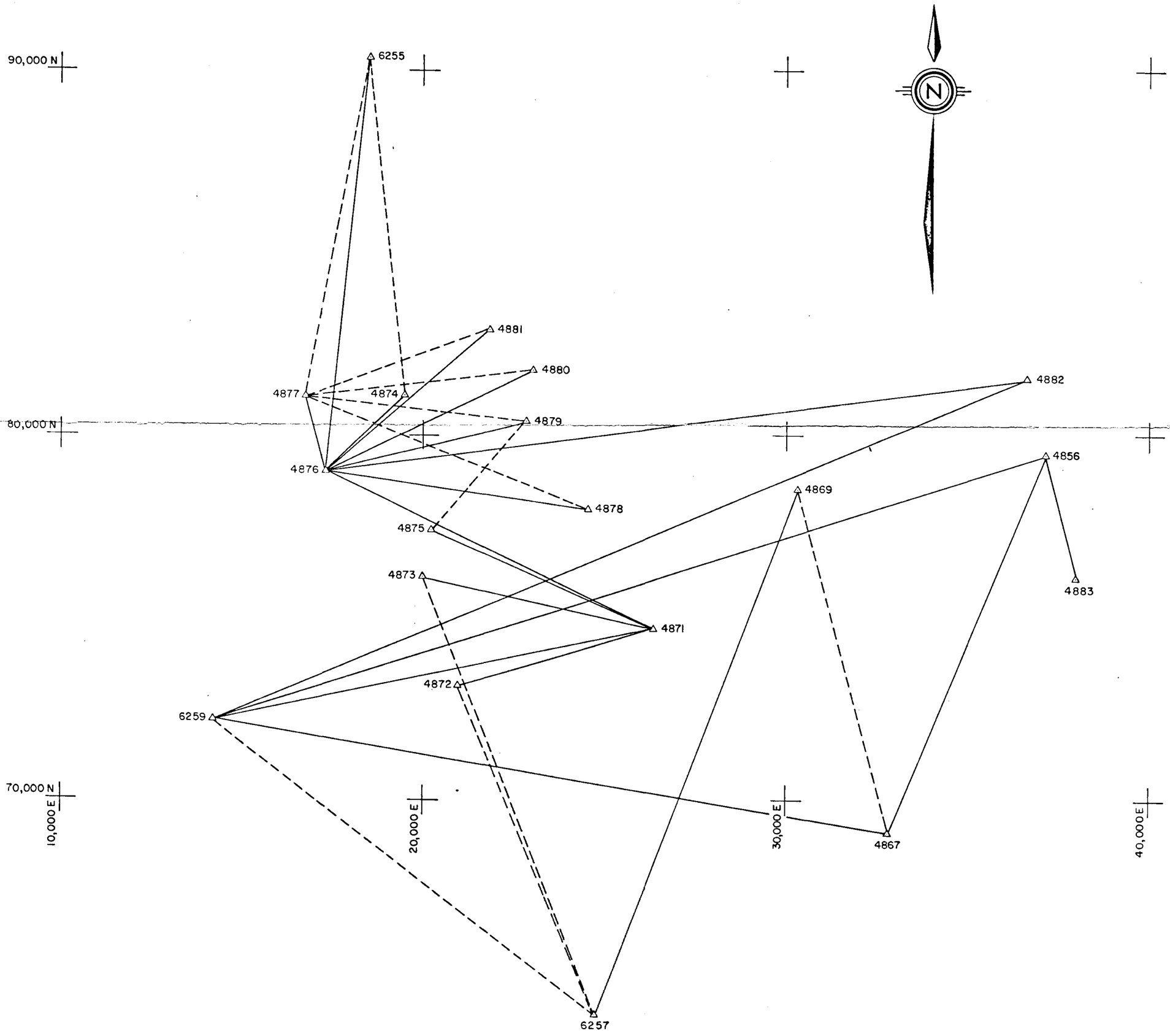


TABLE OF CO-ORDINATES (Feet)			
STATION	NORTH	EAST	ELEVATION
4871	74,681.5	26,341.1	3392.5
4872	73,169.7	20,963.8	3236.2
4873	76,099.6	19,988.5	3186.2
4874	81,094.1	19,494.6	2992.5
4875	77,429.4	20,222.8	3142.9
4876	79,006.4	17,296.9	3318.2
4877	81,072.0	16,754.1	3219.6
4878	77,958.7	24,307.4	3218.3
4879	80,415.9	22,798.9	3183.4
4880	81,836.7	22,973.5	3197.3
4881	82,889.5	21,808.5	3128.4
4882	81,597.5	36,646.2	4731.3
4883	76,085.7	37,963.3	3902.32
6255	90,358.6	18,485.8	3076.6
6257	64,137.5	24,735.0	3809.8
6259	72,193.8	14,195.6	3699.1
4856	79,447.8	37,149.9	4705.8
4867	69,105.5	32,791.5	4203.6
4869	78,490.7	30,295.5	4005.1

LEGEND

Bearings are astronomic and were derived by solar observation referred to the meridian through Station 6259.

Elevations are geodetic and were brought in from geodetic bench mark 563-J (Elevation 1646.64) at Cariboo by third order spirit levels.

Horizontal distances are reduced to elevation 3000'.

Co-ordinates are "D.C.A." datum.

△ 4871 Denotes triangulation station with numbered identification tag.

138 (14)

HC.- HAT CREEK 76(1)B.

REV NO	DATE	REVISION	DR.	CH.	APP.

DOLMAGE CAMPBELL & ASSOCIATES LTD.

PLAN OF CONTROL SURVEY

McELHANNEY SURVEYING & ENGINEERING LTD.
Vancouver, B.C.

DESIGNED J.W.K.S.	SCALES HOR. 1" = 2000' VERT.
DRAWN H.M.P.	DATE OCTOBER, 1976
CHECKED J.W.K.S.	JOB NO. 08320-0
APPROVED D.S.M.	
CLIENT DWG. NO.	MSEL DWG. NO. 'B' REV.

FIG. 4

17 000 18 000 19 000 20 000 21 000

L 82 000 N
L 81 750 N
L 81 500 N
L 81 250 N
L 81 000 N
L 80 750 N
L 80 500 N
L 80 250 N
L 80 000 N
L 79 750 N
L 79 500 N
L 79 250 N
L 79 000 N
L 78 750 N
L 78 500 N
L 78 250 N
L 78 000 N
L 77 750 N
L 77 500 N
L 77 250 N
L 77 000 N
L 76 750 N
L 76 500 N
L 76 250 N
L 76 000 N
L 75 750 N

POWER LINE

DIRECTION TO FISH CREEK, WASHINGTON

17 000 18 000 19 000 20 000 21 000 22 000 23 000

18 000 19 000 20 000

L 82 000 N
L 81 750 N
L 81 500 N

DIRECTION TO CUTLER, MAINE

FRASER FILTERED DATA
E.M. – 16
ELECTROMAGNETIC DATA
CUTLER, MAINE 17.8 KHz
SCALE: 1" = 400'
FEET 0 250 500 750 FEET

138 (15)

HC - HAT CREEK 76 (12) B.

PLATE I

DOLMAGE, CAMPBELL
&
ASSOCIATES LIMITED

HAT CREEK PROPERTY
CACHE CREEK AREA, KAMLOOPS M.D. B.C.

CONTOUR PLAN

FILTERED
E.M. 16
ELECTRO MAGNETIC SURVEY
SEATTLE 18.6 KHz

Scale:
1 inch = 400 feet

FEET 0 250 500 750 1000 FEET

DATE OCT. 5, 1976

RICHARD O CROSBY & ASSOCIATES

FIG. 6

16,000' E

75,000' N

77,000' N

79,000' N

81,000' N

83,000' N

18,000' E

20,000' E

22,000' E

76-806 20

76-810

74-32 60 100

76-173 100 76-176 76-129,131 76-171 100 76-127, R-13 76-169 76-167 200 76-182 76-184 100

76-132

R-9

76-809 20

R-14 R-8

76-179 20 76-137 R-11 75-53 74-43 76-188 76-166 76-186

76-808

75-52 76-134 R-10 75-51 160 76-124 76-208 76-158 76-202 R-23 75-50 76-148

76-811 40 25-7 100 74-31 200 300 400 500

74-23 77-211 77-213 77-212 77-214 77-215 77-216 77-217 77-218 R-24 74-46 R-22 76-190 76-141 R-12 76-195 20 76-120 76-200 76-161 76-204 76-150 80

59-18 76-146 76-143 76-812 76-813

74-48 76-149 57-10 76-205 76-193 76-122 100 59-21 74-30

75-106 74-39 25-1

74-37A 57-15 57-12 76-138 76-140

74-44 76-145 76-135 76-155 460 76-136 57-9 76-191 74-38 76-196 25-2 76-194

R-18 R-28 76-152 77-209 R-27 R-15 77-210 R-25

R-16, 16A R-19 R-17 100 25-6 59-16 20 59-17 76-199 76-198 76-817 R-26 76-197 76-189 76-814

57-13 74-25 59-19 76-125 74-40

76-803 76-144 76-203 57-14 76-183 57-8 76-187 25-4 76-207 76-177 76-175 76-185 340

59-22 76-192 74-29

76-206 R-4

74-33 76-147 76-180 74-41 76-151 76-133 76-172 76-142 76-156 76-160 76-163

76-130 74-24 57-11 25-5 40

160 76-126 76-174 59-20 76-201 76-168 76-181 76-153 76-157

76-178 76-107 74-26 360

100 76-123 76-164 76-128 76-162 76-159 76-165 74-35

25-3 R-3 80 100 74-34 76-121 76-154 200 74-27 300

76-821, R-21 R-20

138

16

DOLMAGE CAMPBELL & ASSOCIATES LTD. CONSULTANTS
VANCOUVER, CANADA

B.C. HYDRO POWER & AUTHORITY
VANCOUVER, CANADA

HAT CREEK COAL DEVELOPMENT

OVERBURDEN ISOPACH

HC.- HAT CREEK 76 (1) B.

SCALE 1" = 400' | APRIL 1977 | FIG. 7