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

Assessment Report
for the

HAT CREEK

COAL EXPLORATION PROJECT

Conducted by

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

On Coal Licence Numbers

2991-3002, 3005-3008, 3655

NTS Area 92 I/12 & 13

by

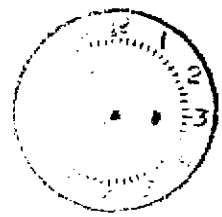
L.T. Jory, Ph.D., P.Eng.

1 May, 1976

DOLMAGE CAMPBELL & ASSOCIATES LTD.
CONSULTING ENGINEERS

1000-1055 W. HASTINGS STREET
VANCOUVER 1, CANADA
MU 1-2345

DEC 10 '75 PM



19 December, 1975.

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

13195

Dear Sir:

Re: Coal Licences 12, 144, 2753-2762, 3009-3013
held by B.C. Hydro and Power Authority

Enclosed is the geological report, "Hat Creek Coal Exploration Project", required as partial fulfillment for the application of assessment work on the above licences. Other required submissions were filed in September, 1975.

Yours very truly,

DOLMAGE CAMPBELL & ASSOCIATES LTD.

L.T. Jory, Ph.D., P.Eng.
Exploration Manager.

LTJ/jd

Enclosure

REFERRED TO	DATE	INITIAL
D.M.		
ADM (M)		
ADM (P)		
C.G.G.		
C.P.R.		
DCGC	12/12	
G.C.		
ACCTS.		
GEOL.		
INSP.		
M. REV.		
M. DEV		
FILE RPT.		
FILE RPT.		

131

NTS 92I/12 & 13

C O A L A C T

(Section 19 & B.C. Reg. #436/75)

Exploration & Development Work Report Cover Sheet

Property name: Hat Creek Coal Map No. 89

Location: Upper Hat Creek Valley Land District Kamloops

Coal Licence No.(s) 12, 144, 2753-2762, 3003-3004, 3009-3013

Licensee: B.C. Hydro & Power Authority

Operator: Dolmage Campbell & Associates

Title of Report: Hat Creek Coal Exploration Project by L. T. Jory Ph.D., P. Eng. December 1, 1975

Period covered by Report: Feb.10 - Sept.23, 1975 and May 16 - Sept.23, 1975

Category of work covered in report

Geological Mapping		$2,326.00
Surveys:	Geophysical	$21,628.00
	Geochemical	
	Other	$3,754.00
Road Construction		$3,514.00
Surface work		
Underground work		
Drilling		$251,607.00
Logging		$43,036.00
Sampling		
Testing		
Reclamation		
Other work		$48,442.00
Total value of work reported		$ 374,307.00

Comments:

Value of work approved $ 374,307.00

Signature: A.R.C. James
Senior Inspector of Mines

Date Jan 7/76

Accepted: [signature]
Chief Gold Commissioner
Mineral Development Branch

Date

(To be prepared in duplicate: Original to be filed with report
Duplicate to be filed on Plan of Operations file)

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LIST OF ILLUSTRATIONS

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INTRODUCTION

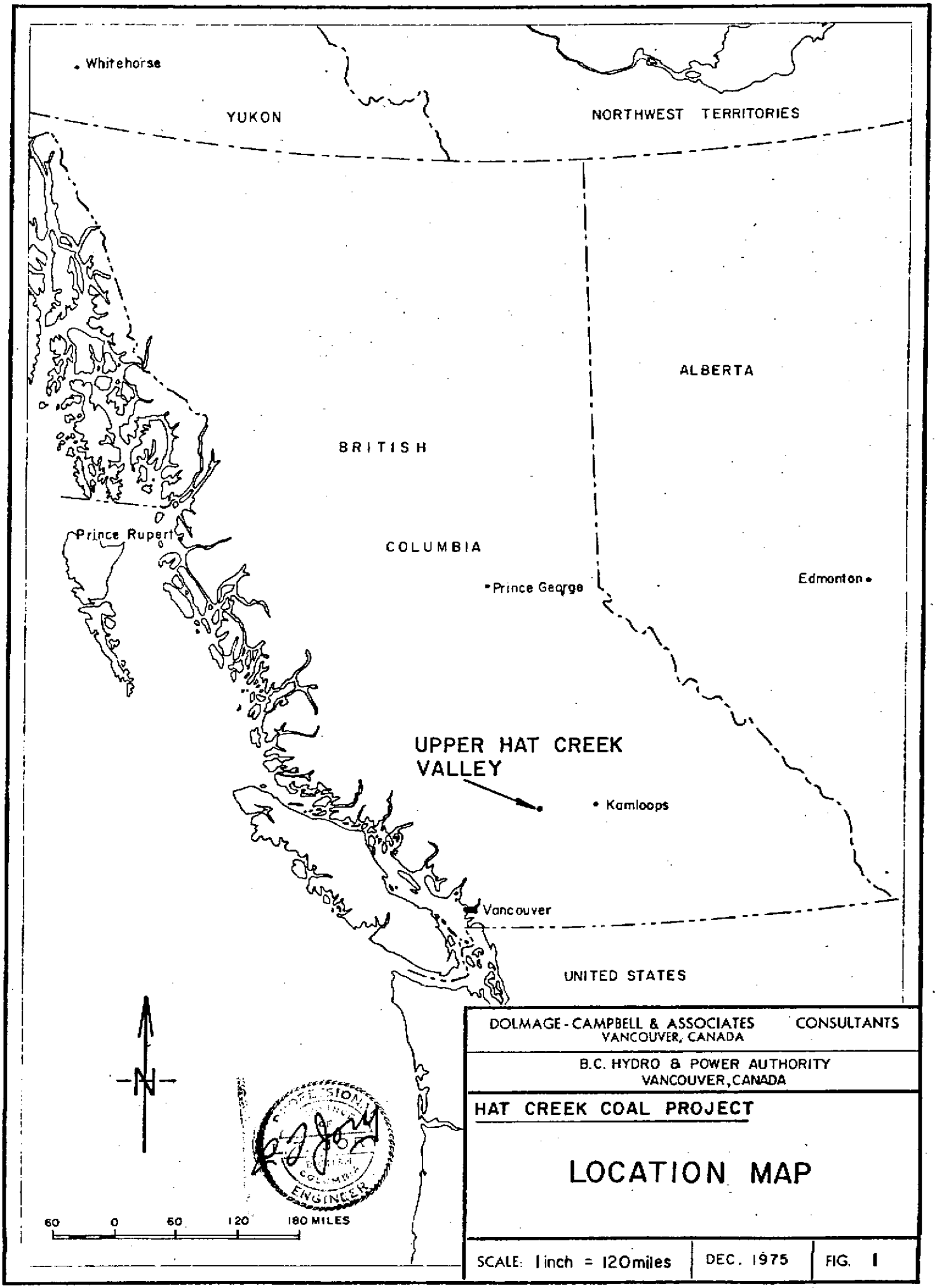
The purpose of this report is to summarize the exploration work conducted by British Columbia Hydro and Power Authority (B.C. Hydro) on coal licences in Upper Hat Creek Valley from May 1975 to May 1976. Fieldwork has been underway on a reasonably continuous basis since the early summer of 1974 and is still continuing. Consequently, although the assessment period for which this report is filed is 1 May, 1975 to 1 May, 1976, 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. L.T. Jory, Ph.D., P.Eng., has been exploration manager and Mr. J. Rotzien has acted as resident engineer. The geological mapping was done by Mr. P.J. Street. Field assistants during the assessment period were: P. Imada, W. Wilmot, H. Svenson, G. Ellis, T. Cunningham, P. Northrop.

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, 24 road miles to the east. Easiest access to the property is from the Trans-Canada Highway at Cache Creek, 19 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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VANCOUVER, CANADA

B.C. HYDRO & POWER AUTHORITY
VANCOUVER, CANADA

HAT CREEK COAL PROJECT

LOCATION MAP

SCALE: 1 inch = 120 miles | DEC. 1975 | FIG. 1

51° 00'

B.C.R.

PAVILION RANGE

Pavilion

Pavilion Lake

Bonaparte River

97

12

TRACHYTE HILL

OUTLINE OF COAL LICENCES

HAT CREEK

CLEAR RANGE

Upper Hat Creek

Fig. 5

Fig. 3, 4

Lillooet

Fraser River

50° 30'

122° 00

Cache Creek

Thompson River

1

Ashcraft

97

CNR

CPR

Kamloops Lake

Savona

121° 30'

N

2 0 2 4 6 8 MILES

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

DOLMAGE CAMPBELL & ASSOCIATES LTD. CONSULTANTS
VANCOUVER, CANADA

B.C. HYDRO & POWER AUTHORITY
VANCOUVER, CANADA

HAT CREEK COAL PROJECT

INDEX MAP

SCALE: 1 : 250,000 | DEC. 1975 | FIG. 2

subdued mountains that rise to elevations of 6000-7000 feet four miles to the west of Hat Creek and to elevations 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 300 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 the ORANGE and RED groups.

	Licence No.	Area (Acres)	Location*
ORANGE GROUP	2753	640	31/20/26
	2754	638	E½ of 6/21/26 & E½ of 7/21/26
	2755	636	18/21/26
	2756	639	13/21/27
	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	5418 acres	
RED GROUP	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
	2761	640	35/20/27
	2762	640	36/20/27
	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	5708 acres	

	Licence No.	Area (Acres)	Location
BROWN GROUP	2991	320	W½ of 17/19/26
	2992	316	N½ of 18/19/26
	2993	640	19/19/26
	2994	321	W½ of 20/19/26
	2995	320	W½ of 29/19/26
	2998	320	W½ of 32/19/26
	2999	320	W½ of 5/20/26
	7 licences	2557 acres	
YELLOW GROUP	2996	635	30/19/26
	2997	642	31/19/26
	3000	642	6/20/26
	3001	642	7/20/26
	3002	640	18/20/26
	3005	320	N½ of 25/19/27
	3006	640	36/19/27
	3007	640	1/20/27
	3008	640	12/20/27
	9 licences	5441 acres	
Totals:	35 licences	19,124 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.

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.

OVERBURDEN

Bedrock in the valley is for the most part mantled by overburden ranging from a few feet up to 400 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. From topography, drilling results, and the known distribution of outcrops, it appears that overburden is relatively shallow over much of the east side of the valley. At the foot of steep limestone bluffs at the north end of the valley, and at the south end near the head of Oregon Jack Creek, talus slopes cover an appreciable area.

BEDROCK

Along the sides of the valley, and in much of the southern half, the Coldwater Formation is also covered by extensive volcanic rocks of Late Tertiary, probably Miocene, age. The varieties of volcanic rocks are described under "Exploration Results - Rock Types".

The sedimentary rocks of Upper Hat Creek Valley are the erosional remnants of a formerly much larger sedimentary basin that may have 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 very likely 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.

Individual rock types are described under "Exploration Results".

DESCRIPTION OF EXPLORATION WORK CONDUCTED

SURVEYING

Vertical aerial photography, ground control and photogrammetric mapping were carried out in Upper Hat Creek Valley in June 1975. The work was contracted to McElhanney Surveying and Engineering Ltd. of Vancouver, B.C.

From the aerial photography, a topographic map was prepared at a scale of 1" = 2000', covering the valley of Upper Hat Creek for a distance of 15.7 miles from north to south, and a width of 6.6 miles. This distance takes in the valley from just north of the junction of the Upper Hat Creek road with Highway 12, to Blue Earth Creek, a tributary of Hat Creek at the south end of the valley. Laterally, the map extends to about the 5,000 foot elevation on the east side of the valley, and 5,000 to 7,000 foot elevation on the west side.

Elevation controls were established by setting up a total of eleven bench marks, and running third-order levels from a Dominion Government geodetic bench mark at Carquile, near the junction of Highways 12 and 97. A total of 17 other stations provided vertical and horizontal control by triangulation.

Before the aerial photography was carried out, all existing drill sites were, where practicable, flagged so as to be visible from the air. The locations and elevations of these drill sites could thus be determined by photogrammetry. The holes drilled after the aerial photography was completed were surveyed by stadia transit from the holes located by photogrammetry.

The grid system of coordinates that had been set up for use in an earlier drilling program in 1957-1959 was re-established in 1974 for the current exploration project. The grid was amended in 1975 by adding 70,000 feet to the northings and 10,000 feet to the eastings, in order to establish a consistent system of positive coordinates for subsequent data processing applications. The 1975 surveying program tied in the control stations and drill holes, as noted above, with this system of coordinates.

An uncontrolled topographic map, at a scale of 1" = 400', covering an area of about 11 square miles, had been prepared in 1974 by Pacific Survey Corporation, of Vancouver, B.C., from aerial photography flown by the Federal Government in 1971. As the exploration program advanced, it required topographic surveying of greater precision and wider areal coverage.

From the 1975 aerial photography, in addition, an orthophotograph was prepared at the same scale as the topographic map (1" = 2000'), covering the same area. Topographic maps and orthophotographs were also made at a scale of 1" = 400', to cover two smaller areas, adjacent to each other, that included the principal exploration drilling targets, i.e. the No. 1 and No. 2 coal deposits.

The base map at 1" = 2000' on which geology and other information is plotted, (Fig. 4), is itself submitted herewith as the product of the above-described survey work for which credit is claimed in the present assessment report.

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 team of horses 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

Sixty-five holes totalling 62,555 feet were drilled during the assessment period, eight on licenses of the "BROWN" group (No. 24) and twenty-eight in the "YELLOW" group (No. 23). Footages, co-ordinates, etc. for these two groups, are listed in the accompanying table. The drilling was contracted to D.W. Coates Enterprises Ltd.

In all instances, overburden was triconed. Bedrock was normally cored continuously, using NQ wireline equipment (Longyear "Super" 38 drills), but at times, in the soft, squeezing ground, tricones were used. Drilling was underway prior to the initial assessment date (1 May, 1975) but ended in mid February, 1976, before the end of the assessment period. Acid etch dip tests were taken in most holes.

DRILLING DETAILS - GROUPS 23 and 24

Hole No.	Lic. Group	Coordinates		Footage			Remarks
		North	East	Over-burden	Coal*	Total	
75- 68	23	53,341	21,577	140	1449	1843	Completed.
- 72	24	29,800	20,550	172	0	886	Abandoned-rods broke.
- 73	23	50,871	22,523	125	1737	1940	Abandoned-bit sheared-off.
- 74	23	48,096	24,458	275	1957	2232	Completed.
- 75	24	21,820	26,380	230	0	398	Abandoned-squeezing.
- 76	24	21,500	25,460	83	0	1300	Completed.
- 78	23	54,334	23,529	130	21	723	Abandoned-squeezing.
- 79	24	45,268	25,453	33	1294	1948	Completed.
- 79A	24	45,281	25,679	13	0	297	Abandoned-caving & squeezing.
- 81	23	55,015	21,067	86	1676	1838	Completed.
- 83	23	50,762	21,367	122	0	808	Completed.
- 83A	23	50,762	21,367	122	0	262	Abandoned-bit sheared-off.
- 86	23	50,718	21,367	170	0	414	Abandoned-squeezing.
- 88	23	55,261	21,715	50	758	918	Stopped in squeezing ground.
- 89	23	55,733	22,081	0	568	713	Abandoned in fault zone.
- 90	23	55,752	20,161	181	467	1508	Completed.
- 92	23	50,868	22,533	97	1458	1832	Completed.
- 93	23	50,498	23,533	80	337	463	Abandoned-squeezing.
- 94	23	47,846	23,155	313	0	313	Abandoned-caving.
- 95	23	49,881	23,925	224	1283	1507	Completed.
- 96	23	45,496	24,704	212	0	332	Abandoned-squeezing.
- 97	23	48,004	23,590	285	1067	1508	Completed.
- 98	23	45,403	24,808	245	0	408	Abandoned-squeezing.
- 98A	23	45,400	24,808	256	0	256	Abandoned-squeezing.
- 99	23	49,881	23,935	225	69	294	Abandoned-squeezing.
-100	24	45,538	26,803	5	521	1507	Completed.
-101	23	45,245	24,223	327	967	1508	Completed.
-103	24	47,912	25,478	150	0	1202	Completed.
-103A	24	47,912	25,473	240	0	667	Abandoned-squeezing.
-104	23	49,791	24,146	90	136	702	Completed.
-105	23	53,539	23,350	190	0	895	Abandoned-squeezing.
-105A	23	53,411	23,393	160	0	315	Abandoned-squeezing.
76-114	23	55,621	23,043	155	0	382	Abandoned-casing broke.
-115	23	53,139	22,587	105	698	1007	Completed.
-116	23	55,621	23,044	160	0	495	Abandoned-squeezing.
-119	23	53,566	21,597	140	628	1007	Completed.

* Total thickness of coal-bearing beds; includes some partings and low quality beds.

GEOPHYSICS

Surface

In the latter half of May 1975 a trial surface gravimeter survey was conducted in the vicinity of a known thick section of coal (drill hole No. 62). The results were considered sufficiently encouraging to justify extending the coverage over the entire southern part of the valley on east-west lines 4000 feet apart. Eventually, similar coverage was extended over the No. 1 deposit and a potential thermal plant site to the north of the No. 1 deposit. Also, one line was extended three miles to the east of the No. 1 deposit in an area where geological mapping showed thin coal beds to be present in favourable Coldwater Series sedimentary rocks.

The gravity fieldwork, carried out by C.A. Ager and Associates Ltd., was completed in late July, 1975. The results are shown on Figure 5. The gravity low generally conforms to the coal-bearing areas of the valley.

Down-hole

As standard practise, all drill holes on the Hat Creek property were electro-logged. Exceptions occurred only when drill hole conditions prevented such logging. 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. 23 (Yellow) and Group No. 24 (Brown) during the assessment period are appended, (Appendix II).

The following table indicates the proportion of drill footage on Groups No. 23 and No. 24 that it was possible to geophysically log.

		GEOPHYSICAL LOGGING FOOTAGE			
Hole No.	Length(ft.)	Gamma Ray	Density	Caliper*	Resistivity*
75- 68	1,843	1,830	1,830	100	100
- 72	886	806	806	---	---
- 73	1,940	1,940	1,940	715	715
- 74	2,232	2,140	1,894	500	780
- 75	398	---	---	---	---
- 76	1,300	1,270	1,270	618	670
- 78	723	610	630	---	---
- 79	1,948	1,930	1,930	---	---
- 79A	297	290	290	---	---
- 81	1,838	1,838	1,838	1,743	1,743
- 83	808	786	786	---	---
- 83A	262	---	---	---	---
- 86	414	---	---	---	---
- 88	918	900	900	640	640
- 89	713	650	650	620	600
- 90	1,508	1,500	1,500	---	---
- 92	1,832	1,750	1,750	---	---
- 93	463	385	385	---	---
- 94	300	---	---	---	---
- 95	1,507	1,490	1,490	---	---
- 96	332	---	---	---	---
- 97	1,508	1,500	1,500	---	---
- 98	256	---	---	---	---
- 98A	408	---	---	---	---
- 99	294	---	---	---	---
-100	1,507	1,500	1,490	---	---
-101	1,508	1,480	1,480	---	---
-103	1,202	1,185	1,185	---	---
-103A	667	---	---	---	---
-104	702	685	685	---	---
-105	895	580	580	---	---
-105A	315	285	285	---	---
76-114	382	---	---	---	---
-115	1,007	990	990	---	---
-116	495	280	280	---	---
-119	1,007	980	980	---	---
Total	34,615	29,580	29,344	4,936	5,248
%	100	85	85	14	15

* Logged in open-hole only; not through drill stem 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 50 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 analyses were obtained for all samples whereas ultimate, F.S.I., grindability, specific gravity, equilibrium moisture, etc. were obtained only for a selected few samples. Some rock tests have also been conducted as well as preliminary mineralogical studies. After the results have been checked they are input to the B.C. Hydro computer. The computer output is in the form of individual samples (at 0% and 20% moisture) and drill hole averages. Further manipulations are possible and have been done. Computer print-outs are appended (Appendix III). Analyses certificates are on file in the offices of Dolmage Campbell & Associates Ltd.

GEOLOGICAL MAPPING

Concurrently with the diamond drilling program, geological mapping of Upper Hat Creek Valley was undertaken. The mapping had been started in the fall of 1974 but was discontinued during the winter months.

In view of time limitations, mapping effort was concentrated on areas in which the relationship of the Coldwater Formation to the later volcanic rocks might be clarified. Thus the northwest, northeast and east-central portions of the valley received the most attention. For geological data pertinent to the western margin and south end of the valley, acknowledgement is made of the courtesy of Dr. N. Church, of the B.C. Department of Mines, who spent several weeks in the Hat Creek-Cache Creek area during the summer of 1975, and kindly made the results of his work available.

Field mapping was carried out mostly by Brunton-compass traverses on foot, using four-wheel-drive vehicles for access to traverse areas. Observations were located on overlays over aerial photographs and the data compiled on a topographic map at a scale of 1" = 2000'.

The geological compilation map submitted with this report (Fig. 3) is of a preliminary nature. A final interpretation will require microscopic examination of rock specimens, and correlation of mapping data with the results of drilling and geophysical surveys.

EXPLORATION RESULTS

ROCK TYPES

a) Basement

Cache Creek Group - Permian:

This group is divided into 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. 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. In Upper Hat Creek Valley, this is observed in the massive limestone bluffs just north of the road leading to Oregon Jack Creek, and it is a familiar feature of the limestone deposit being worked by Steele Bros. Ltd. in their quarry near Crown and Pavilion lakes. Much of the Marble Canyon limestone is so massive that bedding cannot be determined, but at the north end of the valley, there is evidence of bedding striking approximately north to northwest, with very steep to vertical dips. By contrast, on the east-central margin of the valley, dips are also steep but the bedding strikes approximately east-west.

Spences Bridge Group - Cretaceous

Rocks of this group are exposed along the west-central and southwest margins of the valley. The few outcrops seen in the course of mapping consist mostly of dacite and andesite volcanics showing a moderate degree of alteration. They were not seen in contact with the Tertiary sedimentary rocks.

Mount Lytton Batholith - Cretaceous

Granodiorite and diorite intrusive rocks 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.

b) Coldwater Formation - Eocene (Early Tertiary)

Although outcrops are rare, it is known from diamond drilling that the entire valley of Upper Hat Creek is underlain by 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.

Coldwater beds are more abundantly exposed in an area that straddles Highway 12 several miles to the northeast of Upper Hat Creek, but the rocks seen in that location probably belong to a portion of the stratigraphic section lower than that seen in drilling in Upper Hat Creek Valley. They consist of a cyclical sequence of conglomerate, sandstone, and siltstone, with minor shale and volcanics, of which four cycles totalling about 4500 feet in thickness were mapped by Dr. T. Hoy of the B. C. Department of Mines in 1974.

Of these, the uppermost 1000 feet may correspond to the "basal" beds, intersected by drilling in Upper Hat Creek Valley, that underlie the coal-bearing beds. 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 just noted (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 minor siltstone and sandstone.

This thickness for the coal is derived by tentative correlation of coal strata from a number of drill holes in No. 1 deposit. However, in No. 2 deposit there may also be a true thickness of coal of around 2200 feet, but this is made up of a principal layer up to 1500 feet thick, and another layer (of lower quality than the former) of about 700 feet in thickness. The top of the principal layer has been recognized in several holes by the gradational character of its contact with overlying clayey siltstones, but no drill hole has yet traversed the entire thickness of this coal layer. As the two layers appear to be in fault contact, it cannot be entirely certain that there is no stratigraphic overlap.

The coal sequence is overlain by at least 1000 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 could thus be up to 9300 feet thick, as follows:-

Siltstone or claystone with overlying conglomerate	2000	5800'
Coal	2200	
Coarser clastics, including volcanogenic sandstones and conglomerates	1600	
Remainder of coarse cyclical clastics as in northeast block	3500	
	9300	

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

c) Volcanic Rocks

These 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 siltstone, sandstone and conglomerate.

The most northerly exposure of this rock is in the nose of the low hills immediately east of the upper road and just north of Medicine Creek, where westerly-dipping (40-45°) tuffaceous sandstone and siltstone appear to be roughly conformable with basalts and dacites that flank these hills. This rock is seen again in a series of exposures in the wooded hills of the east-central portion of Upper Hat Creek Valley, close to the road, from White Rock Creek for perhaps three miles to the north. They include lapilli tuff (with small 'nodules' of darker volcanics in a white matrix), massive dense tuffaceous sandstone, and silty to sandy tuffs that include conglomerates and clearly show water-laid, horizontal stratification. One such exposure even has large angular, rafted blocks of older basalts within well stratified tuffs. One occurrence of white rhyolite with very distinct flow banding, lying within a few hundred feet of a (probable) fault contact with Cache Creek Group limestones northeast of the head of White Rock Creek, probably also belongs to this unit.

No estimate of total thickness of the rhyolite volcanics 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.

These rocks flank the low hills that run northward from the White Rock Creek area to Ambusten Creek, and may include the area between Ambusten and Medicine creeks. In only two places are they actually exposed on the tops of these hills. They probably include the breccias resembling mud-flows that are seen along Upper Hat Creek road just south of Ambusten Creek. They may also include basalt breccias near Finney and Aleece lakes (NW margin of Upper Hat Creek Valley).

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.

These rocks are seen almost exclusively flanking the hills just east of the road north of Medicine Creek, and because of their steep westerly-dipping flow structure and parting planes, at first seem roughly conformable with the nearby Coldwater beds intersected in DDH 74-36, and thus old enough to have undergone deformation along with the Coldwater Formation. However, the flow structure is probably an initial, not a secondary or deformational, structure, and these rocks are most likely to be part of the late Tertiary (Miocene) vulcanism.

iv) Basalt flows, dark brown, very fresh-looking, commonly with fine-grained olivine phenocrysts. These rocks are partially preserved as a capping of the line of hills in ii) above, and in a small area just north of Harry Lake (NE margin of Upper Hat Creek Valley), where they form a series of three or more sill-like ledges with abruptly stepped edges.

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, uphill to the west of the Houth meadows (NW corner of Upper Hat Creek Valley).

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, ie. they probably correspond generally to the Kamloops group of volcanic rocks seen near Cache Creek and between there and Kamloops. One is tempted to suggest that the striking linearity of the "flanking" volcanics along the eastern slopes of Upper Hat Creek Valley could be linked to a system of volcanic vents and fissures, perhaps controlled by the same fault systems that produced the Hat Creek graben structure. However, other than this partly-linear distribution of volcanic outcrops there is no evidence to support the suggestion.

CORRELATION

Correlation of coal and other rock types from drilling results is difficult from the amount of data presently available. Lithological and down-hole geophysical logging and proximate analytical results are all employed where available. Physical problems encountered are wide hole spacing (due to the early stage of exploration, topographic conditions, and land ownership) and hole squeezing (which results in non-completion of some holes and the inability to geophysically log others). Geological hindrances 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 marker horizons.

Gross correlations can be based on coal versus 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 non-consistent even over short lateral intervals.

It is expected that as more data becomes available from closer spaced drilling, correlations within the coal deposits will become easier and the configuration of the coal seams will be much better understood.

NATURE AND CONFIGURATION OF COAL

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 the RED and ORANGE Groups was all done in and about the north end of the No. 2 deposit.

The No. 1 deposit contains two major coal layers; No. 1 Seam, 400 to 600 feet in thickness, and No. 2 Seam, about 1600 feet in thickness. At least three major, steeply-dipping normal faults have dislocated the coal-bearing strata into several blocks which have yet to be positively correlated stratigraphically with one another.

The No. 1 deposit consists principally of a one-mile north-trending length of No. 2 Seam which is dipping steeply westward, flattening in dip at a depth of about 1600 feet. The deposit is terminated on the south and east by block faults and rises gradually to the surface to the north and west (as No. 1 Seam). The main body of the coal deposit, represented by No. 2 Seam, is approximately 5000 feet in length and 3000 feet in width at the surface and reaches its maximum depth below surface of about 1600 feet at its south end.

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	28.4
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	5814
Sulphur (%)	1.9	0.0	1.9	0.13

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

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

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

As more data becomes available these figures may alter slightly. As well, results for the No. 1 and No. 2 deposits will be determined separately.

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

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, the RED group and the ORANGE group, during the periods 16 May to 23 September, 1975 and 10 February to 23 September, 1975 has helped to indicate the extent, limits, configuration, and quality of the No. 2 deposit and, to a much lesser degree, of the No. 1 deposit.

Diamond drilling results (lithologic logs, geophysical logs and analyses) have provided the most definitive information about the coal characteristics and configuration. The geological mapping has contributed to a better understanding of relationships of various rock units and of the composition and structure of the individual units. The gravity survey results have shown that the two known deposits occur in a distinct linear gravity low; it can therefore be postulated that more deposits or coal occurrences may be situated elsewhere within this anomalous zone.

Exploration of the deposits and the valley is continuing.

Respectfully submitted,

DOLMAGE CAMPBELL & ASSOCIATES LTD.

L. T. Jory, Ph.D., P.Eng.
Exploration Manager.

DOLMAGE CAMPBELL AND ASSOCIATES LTD

(1)

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates : 60,185' N, 23,054' E
Reference Elev. : 3528'
Ground Elev. : 3526'
Length : 1000'
Azimuth : —
Dip : 90°
Core Size : NQ
Hole No. : 75-63
Date : MARCH 1975
Logged by : J. Roizien
Sheet : 1 of 5

ELEVATION in FEET	DEPTH in FEET	STRATIGRAPHY: STRAT. PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE No.	ASH AT 20% MOISTURE
	0		Datum		Note: Original ground elev. 3526'			
			OVERBURDEN					
	20							
	40		Sand and gravel					
	60							
	80							
	100							
	120		Interbedded clay and sand					
3400								
	140		Coarse gravel					
	160		Sand and gravel					
	180							
	200							
	220		Clay					
	240							
			SILTSTONE					
	260		Grey to grey brown, moderately hard to soft, with fissile zones and interbedded clst	?	Tricone			
	280		Grey brown					
	300				(0.2) buff soft clst			
					Soft			
	320				Moderately hard, fossils			
3200					Light grey, moderately hard			
					Moderately hard			
					(0.8) Light grey, soft clst			
	340		Grey moderately hard		(0.3) buff, soft, rubbly clst			
					(0.3) light grey, soft clst			
				60				
					Light grey, soft clst			
	360		Grey moderately hard to hard, massive					
	380				(0.5) buff, hard, rubbly clst			
			Grey to grey brown, moderately hard, slightly fissile					
	400				(0.7) buff soft clst			
			Grey - brown, moderately hard, slightly fissile	60				
	420				(0.4) buff hard clst			
					(0.2) buff soft clst			
	440		Grey - brown to blue grey, soft to moderately hard, slightly fissile	60				
					(0.2) buff soft clst			
	460		Grey moderately hard					
					Grey soft, clst and sst			
	480		Grey soft		(0.5) light grey sst			
				20	Light grey hard			
				50	Grey, hard with carb fragments			
					(0.2) buff, soft			
	500							
	520				2(0.2) buff soft, sandy sh/f bed			
					Grey-brown to buff soft clst			
3000					(0.2) buff soft			
			Grey moderately hard	20	(0.5) buff soft pulverized clst with rusty			
	540				(0.1) rusty brown clst			
					Buff to light grey, moderately hard clst			
	560			50				
					(0.3) buff, soft			
					Soft to moderately hard			
	580				(0.3) buff hard clst			
	600				Grey soft, clst			
					Soft to moderately hard			
	620							
	640							
	660							
					(0.7) buff, moderately hard clst			
	680			50	(0.2) buff soft clst			
					(0.1) buff hard clst			
					(0.1) buff hard clst			
					With putrerised zones			
	700							
	720							
2800								
	740							
	760				(0.1) buff			
					(0.5)			
			CLAYSTONE					
	780		Grey, moderately hard massive. Dominant joint sets 20°, 45° to C.A. w.h. parting planes 60° to C.A					
	800				Buff			
	820				(0.3) buff hard			
	840				Buff, soft			
				60				
	860							
	880							
	900				0.1; Buff, soft			
					Buff, soft			
	920							
2600								
	940				(0.2) buff			
	960				(0.3) buff, hard			
				50				
					(0.2) buff, soft			
	980							
					(0.1) buff, soft			
	1000		END OF HOLE AT 1000 feet					

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DRILL HOLE : 75-63
SHEET No. : 5 OF 5

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

(2)

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates : 97,627'N
22,979'E
Reference Elev. : 3618'
Ground Elev. : 3613

Length : 490'
Azimuth : —
Dip : -90°
Core Size : HQ

Hole No. : 75-64
Date : APRIL 1975
Logged by : J. Rotzen
Sheet : 1 of 3

ELEVATION in FEET	DEPTH in FEET	STRATIGRAPHY: STRAT PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE No.	ASH AT 20% MOISTURE
	0		Datum		Note: Original ground elev. 3613'			
			OVERBURDEN					
3600	20							
	40							
	60							
	80							
	100							
	120							
	140							
	160							
	180							
	200							
3400			CLAYSTONE		Triconed			
	220		Grey to grey brown, moderately hard massive clst with joints at 60° and 80° and numerous slips at 40°. Traces of carb fragments		Grey brown			
	240				Grey			
					(0.1) buff, soft			
					Grey			
					Buff, soft tuffaceous			
	260				Grey, moderately hard			
					(0.3) grey, soft, highly sheared.			
					Grey, moderately hard.			
	280				Grey, soft, sheared			
	300				Grey, moderately hard, with minor slips			
	320							
	340				(0.4) light grey, moderately hard Grey, moderately hard silt. (0.3) grey, moderately hard, lam silt. Grey moderately hard.			
					Grey, moderately hard to soft intensely sheared.			
	360				Grey, moderately hard			
	380				(0.3) fault gauge Grey, moderately hard (0.3) buff, moderately hard			
					Grey, moderately hard to hard			
3200	420							
	440				Grey, moderately hard			
	460							
	480		END OF HOLE AT 490 feet					
	500							

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DRILL HOLE : 75-64
SHEET No. : 3 OF 3

3

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates : 57,560'N, 22,867'E
Reference Elev. : 3607'
Ground Elev. : 3604'
Length : 549'
Azimuth : —
Dip : -90°
Core Size : NQ
Hole No. : 75-64A
Date : MAY 1975
Logged by : J Rotzien
Sheet : 1 of 3

ELEVATION IN FEET	DEPTH IN FEET	STRATIGRAPHY: STRAT. PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE No.	ASH AT 20% MOISTURE
	0		Datum		Note : Original ground elev. 3604'			
3600			OVERBURDEN					
			Sand and gravel					
	20		Boulders					
	40		Sand					
	60		Boulders					
	80							
	100		Gravel					
	120		Boulders					
	140		Sand and clay					
	160							
	180							
			CLAYSTONE		Triconed			
	200		Dark grey, moderately hard. Dominant joint sets : 40° and 60° to C.A. - minor beds buff, hard slst.					
3400								
	220				(0-3) grey brown moderately hard slst.			
				40	(0-3) buff, soft clst			
	240				(0-5) grey brown, hard, brittle slst			
	260			40	(0-2) buff to rust - brown, hard slst			
	280				(0-5) light grey brown to buff, hard, rubbly slst			
	300			40	(0-1) buff, hard, tuff. slst			
					Grey brown, hard slst			
	320				Soft intensely sheared (35° to C.A.)			
	340			40	(0-1) light grey, moderately hard clst			
	360				(0-2) buff, hard slst			
	380				Soft, intensely sheared (35° to C.A.)			
	400				Soft, rubbly, highly sheared (30° to C.A.)			
3200					Numerous zones of soft highly sheared clst slips (30° to C.A.)			
	420				Grey brown moderately hard slst with slickensided slips (30° to C.A.)			
	440			40	(0-1) buff, hard slst			
	460							
	480				(0-2) grey brown, hard slst			
					Grey brown, moderately hard slst with numerous slickensided slips containing traces of fault gouge. (10°-30° to C.A.)			
	500			40	(0-5) light grey, mod. hard, slst laminated			
				40	(1-0) grey brown mod. hard, with slickensided slips (40° to C.A.)			
					Light grey, moderately hard			
	520				(0-2) buff, hard tuff. slst			
					Light grey to grey brown, mod. hard with numerous slickensided slips (45°-50° and 20° to C.A.) also with lime carb. fragments			
	540				END OF HOLE AT 549 feet			
	560							

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4

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates : 56,297' N, 24,335' E
Reference Elev. : 3788'
Ground Elev. : 3786.5'
Length : 740'
Azimuth : —
Dip : -90°
Core Size : NQ
Hole No. : 75-65
Date : MAY 1975
Logged by : J. Rotzien
Sheet : 1 of 4

ELEVATION IN FEET	DEPTH IN FEET	STRATIGRAPHY: STRAT PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE NO.	ASH AT 20% MOISTURE
	0		Datum		Note: Original ground elev. 3768.5'			
			OVERBURDEN Clay and gravel					
	20		Gravel					
	40							
	60		Clay and gravel					
	80		Clay					
3700			Gravel					
	100							
	120		Fine sand					
			Clay and gravel					
	140		Sand					
	160		SILTSTONE Grey green, soft to moderately hard, blocky to pulverised, intensely sheared. Many chloritized, slickensided minor slips containing traces of gouge - orientation 5°/65° to C.A.		Tricored			
3600	180							
	200				Tricored			
	220							
	240				30 Soft			
	260				(0-1) sst			
	280				(0-1) lmst			
	300				25 Moderately hard			
	320							
	340							
	360				Soft with moderately hard areas.			
3400	380				(0-5) white, rubbly, hard lmst with clay infilled fractures Moderately hard			
	400				Soft			
	420				30 Moderately hard			
	440				Soft			
	460		SANDSTONE Hard, very fine, less intense shear, ng, slip surfaces: 60°'s		Moderately hard			
	480				(0-2) hard clst, intensely veined with calcite Dark grey green hard, sandy (0-2) hard clayey lmst			
	500				Soft sandy (0-5) white, very hard, blocky lmst Soft			
			INTERBEDDED SANDSTONE AND CONGLOMERATE Grey to grey brown with max. grain size 1.5"		Grey brown, hard, congl. 50 Grey brown, moderately hard sst			
	520				Grey, hard, calc. congl.			
					(0-5) grey, mod hard sst with coal fragments Grey brown to black, mod hard sst with coal			
	540		FAULT ZONE Grey green to green, soft, clayey slst with angular fragments of black chert and lmst.		Grey green, cherty slst			
	560				Grey green, mod. hard slst Green slst Grey, hard mixture of angular lmst and slst. Green slst with chert fragments			
	580				(0-5) hollow, green and brown soft clay with chert fragments Moderately hard to hard mixture of clay and subrounded to angular basalt fragments. Rich in calcite.			
3200					Soft, grey brown to brown mixture of clay, silt and basalt fragments.			
	600				Blue grey to grey green, soft mixture of clay and subangular basalt fragments.			
	620				Grey green, hard to very hard mixture of clay and angular to subangular lmst and basalt fragments.			
	640							
	660				Grey green, moderately hard slst with subangular to angular basalt and lmst fragments			
	680							
	700				Light grey to dark green, soft to hard sst with varying amounts of silt.			
	720				Light grey, moderately hard to hard mixture of clay and sub-rounded to subangular basalt and lmst fragments. Moderately hard silty sst. Dark green, as 597'-620'			
	740		END OF HOLE AT 740 feet					

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DRILL HOLE : 75-65

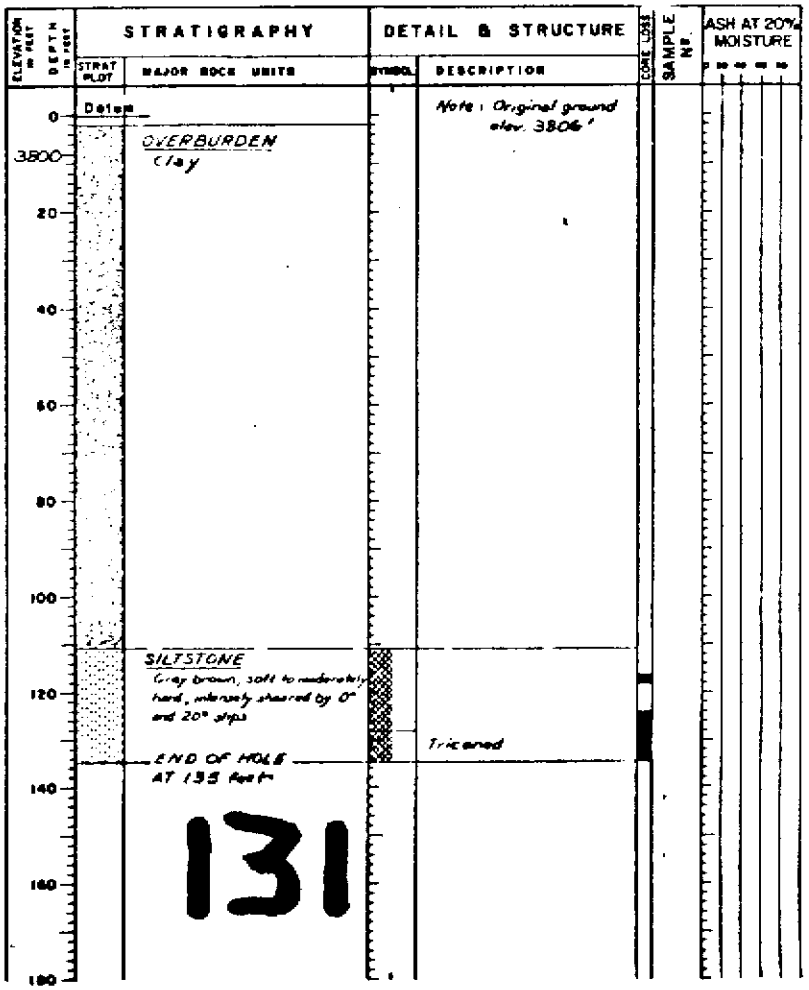
DOLMAGE CAMPBELL AND ASSOCIATES LTD.

(5)

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates	55,087' N	Length	135'	Hole No.	75-66
	19,655' E	Azimuth	-	Date	MAY 1975
Reference Elev.	3808'	Dip	-90°	Logged by	J. Ratzlaff
Ground Elev.	3806'	Core Size	NQ	Sheet	1 of 1



DRILL HOLE : 75-66

SHEET NO : 1 OF 1

DOLMAGE CAMPBELL AND ASSOCIATES LTD

(6)

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates	55,197'N 15,736'E	Length	715'	Hole No.	75-67
		Azimuth	—	Date	MAY 1975
Reference Elev.	3727'	Dip	-90°	Logged by	J. Ritzie
Ground Elev.	3725'	Core Size	NQ	Sheet	1 of 4

ELEVATION IN FEET	DEPTH IN FEET	STRATIGRAPHY: STRAT. PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE NO.	ASH AT 20% MOISTURE
	0		Datum		Note: Original ground elev. 3725'			
			OVERBURDEN Boulders and silt					
	20		Clay					
	40							
	60		Gravel and cobbles					
			FAULT ZONE Dark green, soft to moderately hard, chloritic, silt and sand with angular to subangular basalt fragments.		Triconed.			
	80							
	100							
	120		SANDSTONE Light grey green, moderately hard to hard, silty sst; probably of granitic origin, minor chloritization; usually slickensided slips; joint sets: 80°, 30°					
3600								
	140			50				
				40				
	160							
	180			65				
				60				
	200							
				40				
	220							
	240			65				
	260							
	280			50	Gradational contact with basalt.			
			BASALT Grey to grey green very hard, vesicular basalt with some malachite stains; slips frequent and usually chloritized: 30° and 40°		Volcanic cobble congl., moderately hard.			
	300							
	320							
3400			INTERBEDDED DETRITAL ROCK Grey to grey green, soft to hard, sst and volcanic congl. highly chloritized matrix; dominant joint set: 30°	50	Soft, pebble congl. Soft sst			
	340			50	Pebble congl. with basaltic boulders. Sst grading into a grit at 351'.			
			CONGLOMERATE Grey green, moderately hard, volcanic pebble congl.; highly chloritized matrix; 3" maximum grain size; a few minor sst interbeds; dominant joint set: 30°					
	360			60	Hard, minor chloritized			
	380				Soft			
	400							
					Soft			
	420				Sst			
	440				Grit Soft sst Soft sandy			
	460				Conglomeratic sst			
	480				Moderately hard to soft Sst			
	500				Soft			
	520				Sst with minor congl.			
3200								
	540		SANDSTONE Grey green, moderately hard sst, with minor congl. beds; volcanic and some chloritic matrix; minor slips: 40°; joint sets: 40°, 60° and 30°		Occasional congl. beds			
	560							
	580				Pebble congl.			
	600			90				
	620			30	Hard, pebble congl. With congl. beds			
	640				Pebble congl. Graded bed from pebble congl. to fine sst			
	660			55	With minor conglomeratic beds.			
	680				Grey, soft pebble congl. With minor conglomeratic beds.			
	700							
			END OF HOLE AT 715 feet		Grey, hard pebble congl.			
	720							
3000								

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DRILL HOLE : ....75:67.....
SHEET NO. : ..A OF ..A...

DOLMAGE CAMPBELL AND ASSOCIATES LTD

(7)

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates : 95,770' N, 19,738' E
Reference Elev. : 3414'
Ground Elev. : 3412'
Length : 1338'
Azimuth : —
Dip : -90°
Core Size : NQ
Hole No. : 75-69
Date : JUNE 1975
Logged by : J. Ratzlaff
Sheet : 1 of 7

ELEVATION IN FEET	DEPTH IN FEET	STRATIGRAPHY: STRAT PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE NO.	ASH AT 20% MOISTURE
	0		Datum		Note : Original ground elev. 3414'			
			OVERBURDEN					
3400	20		Clay					
	40							
	60							
	80		Sand and boulders					
	100		Sand and gravel					
			CLAYSTONE					
	120		Dark grey to light grey, moderately hard, massive					
	140				Buff, soft slst			
	160							
	180							
					(0-2) buff, soft slst			
	200							
3200					Buff, soft slst			
	220							
	240							
	260							
	280				Buff, very hard slst			
	300							
	320							
					(0-1) light grey hard calc. sst			
	340							
	360							
	380							
	400		Continued					
3000					Buff, sst			
	420				(0-5) light grey, very hard slst			
	440				(0-3) buff, hard slst			
	460				(0-2) buff, soft slst			
	480							
	500				(0-3) buff, hard slst			
	520							
	540				(0-2) light grey, soft sst			
	560							
	580							
	600							
2800	620							
	640				(0-4) buff slst (0-1) buff, hard slst (0-4) buff, hard slst			
	660				(0-2) buff, hard slst (0-2) buff, hard slst			
	680				Buff, laminae at 50°			
	700							
	720				(0-2) buff, hard slst (0-1) buff slst			
	740							
	760							
	780				(½") clean coal			
	800							
2600	820							
	840				(0-1) buff (0-1) buff slst			
	860							
	880							
	900				(0-1) buff, soft slst			
	920				(0-1) buff slst			
	940							
	960							
	980				(0-1) buff, hard slst			
	1000							
2400	1020				(0-1) buff, hard slst			
	1040				(0-2) buff to light grey, hard slst Hard			
	1060				(0-1) buff slst			
	1080				Hard to soft			
	1100				(0-1) buff, soft slst			
	1120				Hard, weakly fossile with occassional laminae			
	1140							
	1160							
	1180							
	1200				Blue grey, hard with minor interbeds of brown, soft slst.			
2200	1220							
	1240				Hard			
	1260							
	1280				(0-1) buff, soft, with very fine biotite Blue grey, hard, weakly fossile			
	1300				Hard			
	1320							
	1340		END OF HOLE AT 1338 feet					

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DRILL HOLE : 75-69
SHEET No. : 1 OF 7

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

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BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates : 51,254' N, 19,788' E
Reference Elev. : 3456'
Ground Elev. : 3454'
Length : 1280'
Azimuth : —
Dip : -90°
Core Size : NQ
Hole No. : 75-70
Date : JUNE 1975
Logged by : J. Ratzlaff
Sheet : 1 of 6

ELEVATION IN FEET	DEPTH IN FEET	STRATIGRAPHY: STRAT. PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE No.	ASH AT 20% MOISTURE
	0		Datum		Note: Original ground elev 3454'			
			OVERBURDEN					
	20		Gravel and boulders					
	40		Boulders					
3400			Gravel and Boulders					
	80		Boulders					
	100		CLAYSTONE Grey to grey brown, soft to moderately hard, massive with minor interbeds of buff slst and clst and carb. fragments.		Triconed			
	120				With 2 minor buff slst beds			
	140							
	160							
	180							
	200							
	220							
	240							
3200	260							
	280							
	300				Buff (0·2) buff slst			
	320							
	340							
	360							
	380				(0·2) rusty slst			
	400				(0·3) buff lam. slst			
	420				(0·1) buff slst (0·5) buff slst			
	440							
3000	460							
	480							
	500				(0·2) buff slst			
	520				(0·1) buff slst			
	540				(0·3) buff slst with magnetite			
	560				(0·2) buff			
	580							
	600							
	620				(0·5) buff (0·2) buff			
	640							
2800	660				(0·2) buff (0·3) light grey			
	680				(0·2) buff			
	700				(0·4) buff (0·2) light grey, hard slst (0·4) slst Very soft (0·2) buff			
	720							
	740				Dark grey to white interbedded slst, silt and sst (0·5) buff			
	760				(0·3) buff slst			
	780				(0·2) (light grey slst (0·2) buff Grey brown, hard, lam. slst			
	800				(0·2) buff slst			
	820				With 4 minor beds buff slst (0·1) buff, hard slst			
	840							
2600	860				(0·4) buff (0·2) light grey hard slst (0·2) buff, hard slst			
	880				Light grey to buff, hard slst (0·2) buff, soft slst			
	900				(0·3) buff, hard slst			
	920				(0·2) buff, hard calc. slst (0·5) buff, hard slst (0·2) buff, hard slst			
	940				Light grey			
	960				Buff, hard slst (0·4) buff, hard slst Two bands (0·1 and 0·2) buff			
	980				(0·2) buff, hard slst			
	1000				(0·2) buff, hard slst			
	1020				2(0·2) buff, hard slst			
	1040				(0·2) buff, soft slst (0·1) buff (0·2) buff, moderately hard slst			
2400	1060				(0·2) buff slst			
	1080				Buff, soft slst (0·1) buff, hard slst			
	1100				(0·1) buff, hard slst			
	1120				(0·1) rusty, hard slst			
	1140							
	1160				(0·2) buff, hard slst			
	1180				Buff, soft slst (0·2) buff, hard slst			
	1200				(0·4) buff, hard slst			
	1220							
	1240				Minor interbeds of dark grey brown clst			
2200	1260							
	1280		END OF HOLE AT 1280 feet		(0·1) buff, hard slst			

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DRILL HOLE : 75-70
SHEET NO. : 6 OF 6

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DOLMAGE CAMPBELL AND ASSOCIATES LTD

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates	55,295' N	Length	1001'	Hole No.	75-71
	17,911' E	Azimuth	—	Date	JUNE 1975
Reference Elev.	3566'	Dip	-90°	Logged by	J. Rolzien
Ground Elev.	3566'	Core Size	NQ	Sheet	1 of 5

ELEVATION in FEET	DEPTH in FEET	STRATIGRAPHY: STRAT PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE NR.	ASH AT 20% MOISTURE
	0		Datum		Note - Original ground elev. 3566'			
			OVERBURDEN					
			Clay and cobbles					
	20							
	40							
	60		Sand and gravel					
	80							
	100							
	120		Boulders and gravel					
			Clay					
	140		Clay with boulders					
	160							
3400								
	180		Sand and gravel					
	200							
	220		Clay					
	240							
	260		CLAYSTONE Dark grey, soft to mod hard with fine grained carb. fragments.		Tricone			
	280							
	300							
	320				(0·1) buff, soft			
	340				(0·1) buff, mod hard			
3200	360				Buff, mod hard s/st			
	380				(0·4) buff, hard, blocky s/st			
					(0·3) buff, hard s/st			
	400				(0·1) buff, hard s/st			
					(0·5) buff, hard to soft, s/st			
	420							
	440				(0·8) buff, soft			
					(0·1) buff, soft s/st			
	460				(0·1) buff, hard s/st			
					(0·1) buff, hard s/st			
	480							
	500				(0·2) brown, soft s/st			
	520				Buff, hard s/st			
	540							
	560							
3000					Buff, hard to soft, interbedded s/st and c/st			
	580				(0·1) buff, soft s/st			
					(0·3) buff, soft			
	600							
	620							
	640				(0·3) buff, soft			
	660							
	680				Buff, soft			
	700							
	720				(0·1) buff, soft			
	740							
	760				(0·1) buff, soft			
2800					(0·2) buff, hard s/st			
	780							
	800				(0·3) buff, hard s/st			
	820							
	840				Buff, soft, sandy s/st			
					(0·1) buff, soft s/st			
	860							
	880							
			SILTY SANDSTONE		Lt grey, hard fine grained			
	900		SILTSTONE Dark grey, hard massive		Interbedded s/st and s/st with carb. laminae			
					(0·1) grey brown, soft c/st			
	920				(0·3) buff, hard c/st			
	940				(0·3) buff, soft c/st			
					(0·6) light grey brown, med. hard			
2600	960				(0·3) buff hard			
	980							
					(0·2) buff, soft			
	1000		END OF HOLE AT 1001 feet		(0·1) buff, soft			
	1020							

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DRILL HOLE : 75-71
SHEET NR. : 5 OF 5

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY (10)

HAT CREEK PROJECT — DRILL RECORD

Coordinates:	59,714 N / 20,655 E	Length:	1846'
		Azimuth:	—
Reference Elev.:	3350'	Dip:	-90°
Ground Elev.:	3346'	Core Size:	NQ
Hole No.:	75-77	Date:	JULY 1975
Logged by:	J. Rotzien	Sheet:	1 of 9

Columns: ELEVATION IN FEET | DEPTH IN FEET | STRATIGRAPHY (STRAT PLOT, MAJOR ROCK UNITS) | DETAIL & STRUCTURE (SYMBOL, DESCRIPTION) | CORE LOSS | SAMPLE No. | ASH AT 20% MOISTURE

Stratigraphy — Major Rock Units

- 0 – Datum
- OVERBURDEN – Cobbles and gravel
- Boulders and gravel
- Gravel
- Boulders
- Boulders and gravel
- Clay and gravel
- Clay
- COAL – Black, very hard to soft, clean coal with silty coal and carb. slst
- CLEAN COAL – Black, very hard with occassional resin beads
- CLEAN AND SILTY COAL – Black, very hard to hard, finely interbedded, with minor interbedded coaly slst
- CLEAN COAL – Black, very hard with minor interbedded of carb. slst to silty coal
- SILTSTONE – Grey brown, soft, with interbedded silty coal
- MIXED COAL UNIT – Black to dark grey, hard to moderately hard, interbedded silty coal, coaly and carb. slst
- COAL – Black, very hard to soft, interbedded silty and clean coal, carb. and coaly slst, and slst
- CLEAN COAL – Black, very hard with interbedded carb. slst, and minor silty coal
- MIXED UNIT – Black to grey brown, very hard to soft, interbedded clean and silty coal and carb. and coaly slst
- CLEAN COAL – Black, very hard, with interbedded silty coal and coaly slst
- END OF HOLE AT 1846 feet

Depth marks: 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400, 420, 440, 460, 480, 500, 520, 540, 560, 580, 600, 620, 640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 860, 880, 900, 920, 940, 960, 980, 1000, 1020, 1040, 1060, 1080, 1100, 1120, 1140, 1160, 1180, 1200, 1220, 1240, 1260, 1280, 1300, 1320, 1340, 1360, 1380, 1400, 1420, 1440, 1460, 1480, 1500, 1520, 1540, 1560, 1580, 1600, 1620, 1640, 1660, 1680, 1700, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860

Elevation marks: 3200, 3000, 2800, 2600, 2400, 2200, 2000, 1800, 1600

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Detail & Structure — Description (with Sample No.)

Note: Original ground elev. 3348'

Triconed

Sample 1

Soft coaly clst
Silty
Silty
With occassional buff slst lam.

Sample 2

Friable, silty
Soft, coaly slst

Sample 3

With buff slst laminae
Silty with interbedded coaly slst

Sample 4

With minor beds of coaly slst
Finely interbedded clean and silty

Sample 5

Sample 6

Irregular buff clst lam. And carb clst
Finely interbedded clean and silty
(0.2) buff, hard sandy slst

Sample 7

Interbedded with silty coal and coaly slst
With minor silty coal

Sample 8

Silty
Coaly slst

Sample 9

(0.4) buff, hard slst
Silty
Buff to grey hard slst lam.

Sample 10

Buff to grey, hard slst lam.
Grey coaly slst
Silty
Silty coal and coaly slst
(0.3) grey brown, soft clst
(0.5) buff, hard slst

Sample 11

Dark brown, soft, carb. slst
Dark brown, soft, carb. clst
Banding

Sample 12

Sample 13

(0.7) brown, soft clst

Sample 14

(0.4) soft silty
(0.3) (0.2) soft silty

Sample 15

Dark brown soft carb slst

Sample 16

(0.4) hard silty
Hard black silty coal with minor coaly slst

Sample 17

With chunks of silty coal

Sample 18

Hard silty coal
With coal chunks
Clean coal
Soft to hard interbedded
Clean coal
Silty coal

Sample 19

Coaly slst
Silty coal
(0.2) buff, hard slst
(0.3) grey, hard slst
Finely interbedded
Slightly carb. slst

Sample 20

Light grey, calcified wood fragments clean coal
Soft carb. slst
With buff to white slst laminae

Sample 21

Silty
Carb. slst
Silty
Carb. slst
(0.1) buff, hard slst
Carb. to coaly slst

Sample 22

Finely interbedded clean and silty

Sample 23

Dark grey to black, finely interbedded carb. slst and clean coal
Clean coal and carb. slst

Sample 24

Black to grey brown, finely banded bed of clean coal and carb. slst 70% coal
Same as above, only 30% coal.

Sample 25

Clean coal
Finely interbedded slst, carb. slst, silty coal and clean coal

Sample 26

Clean coal
Finely banded clean and silty coal and white clst. Clst increases with depth.
Slst to clean coal

Sample 27

Carb. slst grading down to clean coal
Finely interbedded silty coal and carb. to coaly slst

Sample 28

Clean with white clst laminae
Finely interbedded silty coal and carb. to coaly slst

Sample 29

(0.6) white, very hard clst with irregular coaly laminae
Finely interbedded silty and clean coal and coaly and carb. slst
(0.3) white clst
Coaly slst

Sample 30

Silty
Carb. slst
Silty coal with minor carb. slst and clean coal

Sample 31

Coaly slst
Calc. slst

Sample 32

Sample 33

Dark grey to black carb. slst with finely interbedded silty coal
Silty coal with minor clean coal and carb. slst

Sample 34

(0.2) buff slst
Silty
(0.3) white clst

Sample 35

Grey to black, finely interbedded silty coal and carb. slst with minor clean coal

Sample 36

Sample 37

Sample 38

Clean
Silty
(0.6) grey, calcified wood
Coaly slst
Clean
(0.3) white clst
Interbedded silty coal and carb. slst
(0.6) white clst

Sample 39

Silty

Sample 40

(0.2) buff clst
Finely interbedded silty coal, carb. slst and clean coal

Sample 41

Grey brown calc. slst
Clean with interbedded silty coal

Sample 42

(0.3) buff slst
Silty
Buff slst lam.
With irregular buff slst lam.

Sample 43

Silty coal and coaly slst
Finely interbedded silty coal and coaly slst
(0.7) buff very hard slst
Coal and coaly slst
Slightly carb. slst
Silty coal

Sample 44

Finely interbedded carb. and coaly slst with minor silty coal

Sample 45

(0.2) buff, very hard slst

Sample 46

Coaly slst

Sample 47

(0.1) buff, very hard, irreg. slst

Sample 48

(0.5) buff, very hard, calc. slst

Sample 49

(0.7) buff, very hard, calc. slst

Sample 50

Sample 51

Sample 52

(0.2) dark grey, very hard slst
Fissile

Sample 53

(0.3) buff slst

Sample 54

Sample 55

Buff, calc. slst laminae
(0.2) buff slst
White, very hard slst laminae

Sample 56

Sample 57

Sample 58

Sample 59

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

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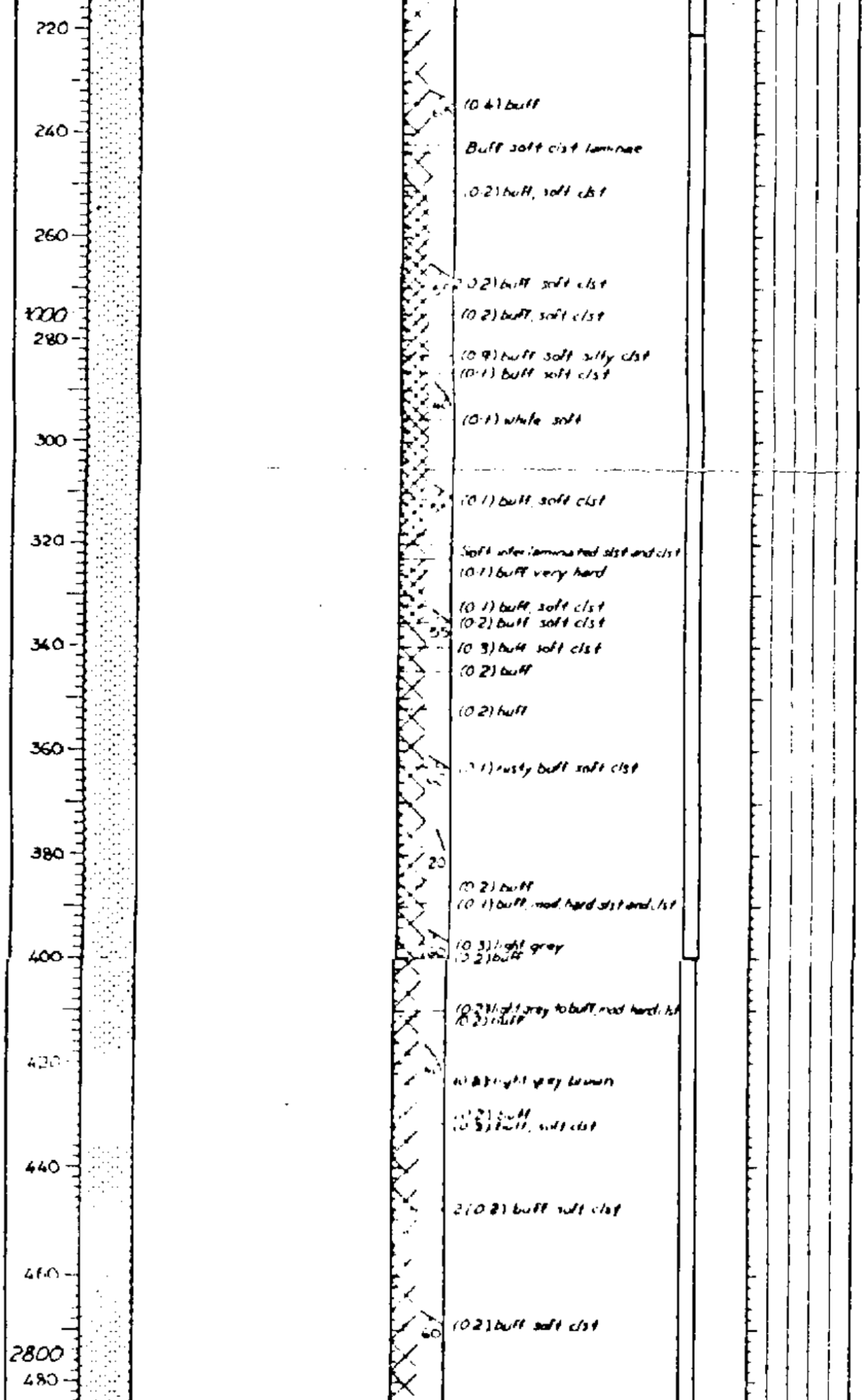
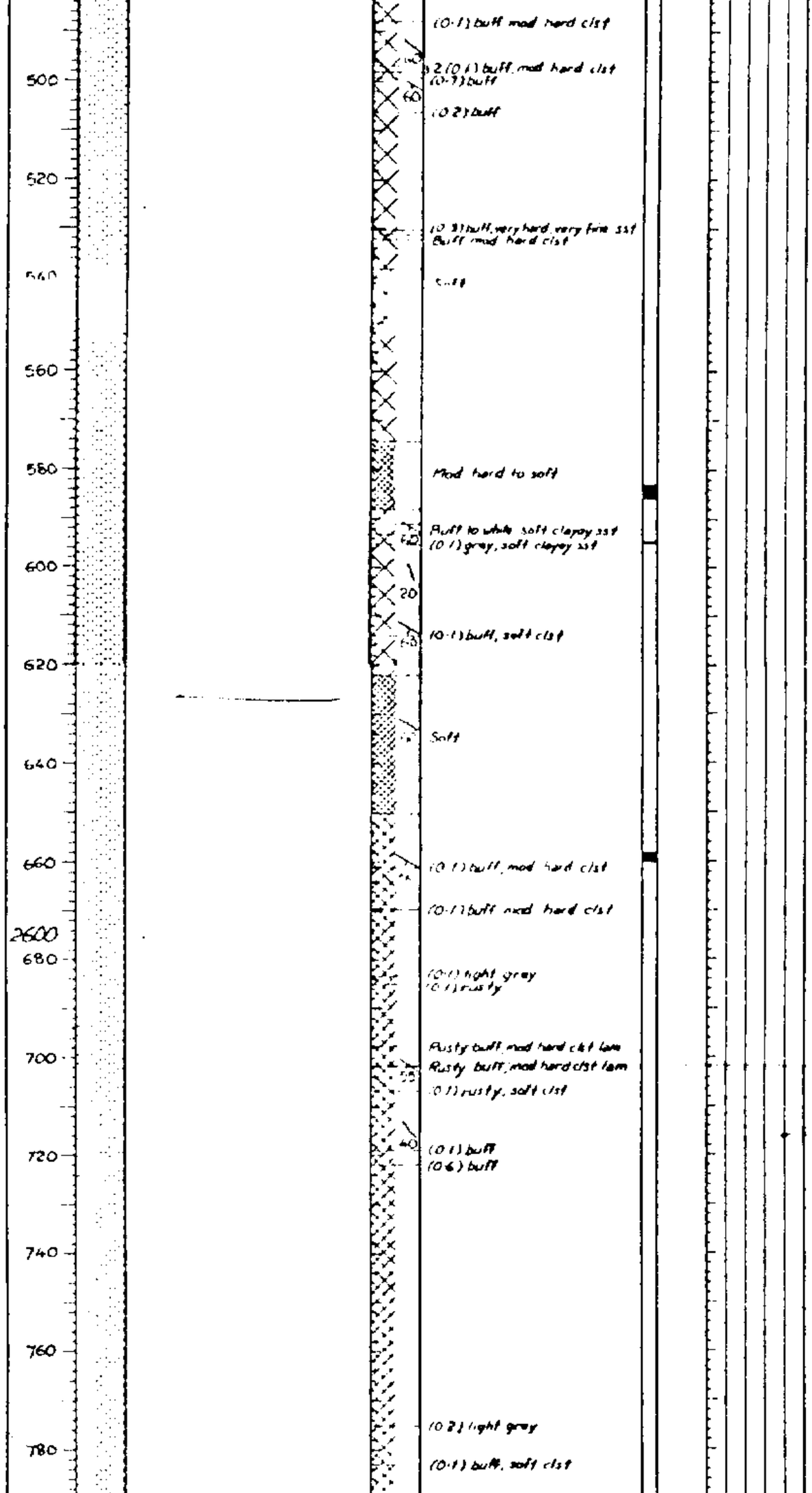
BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

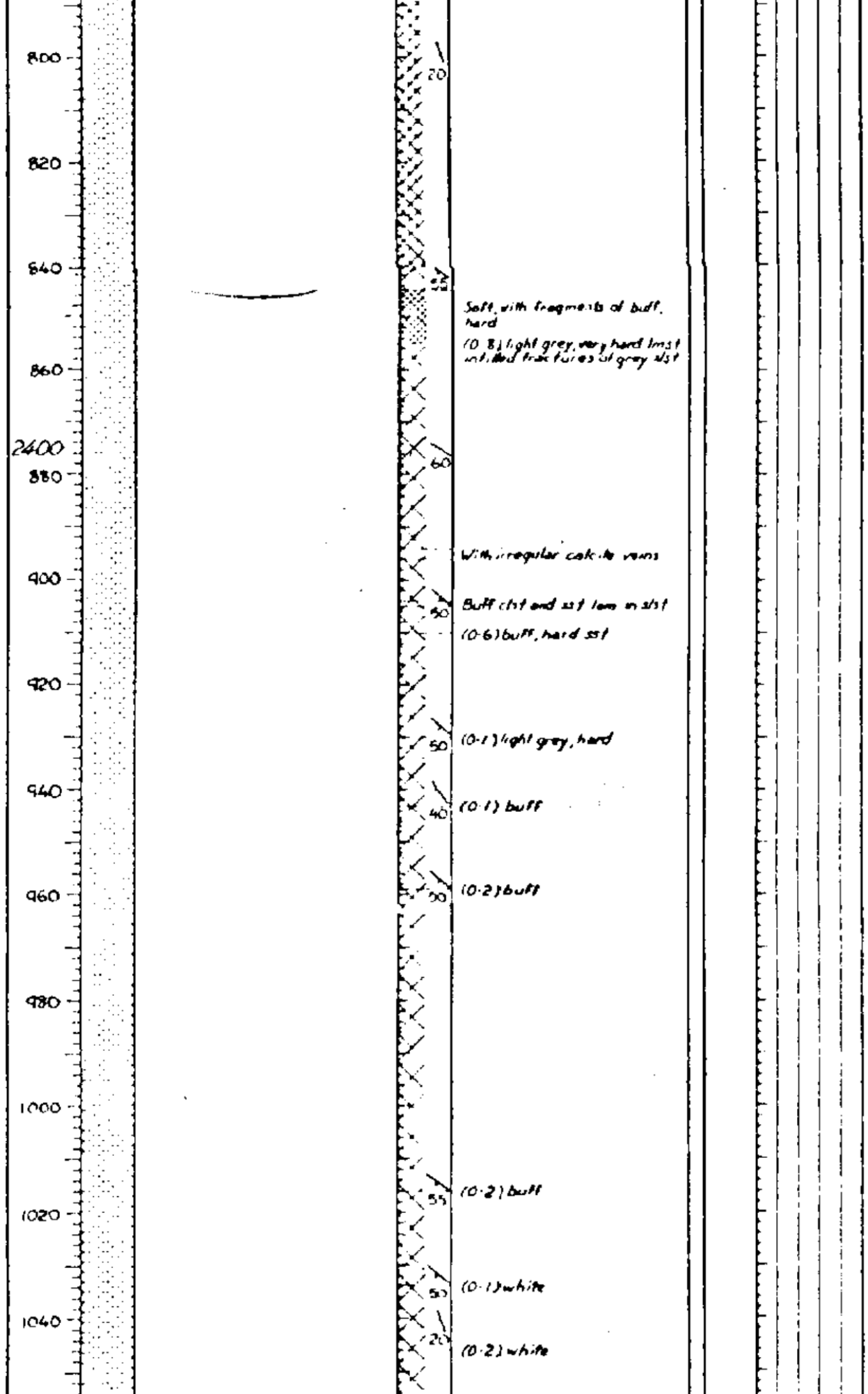
HAT CREEK PROJECT — DRILL RECORD

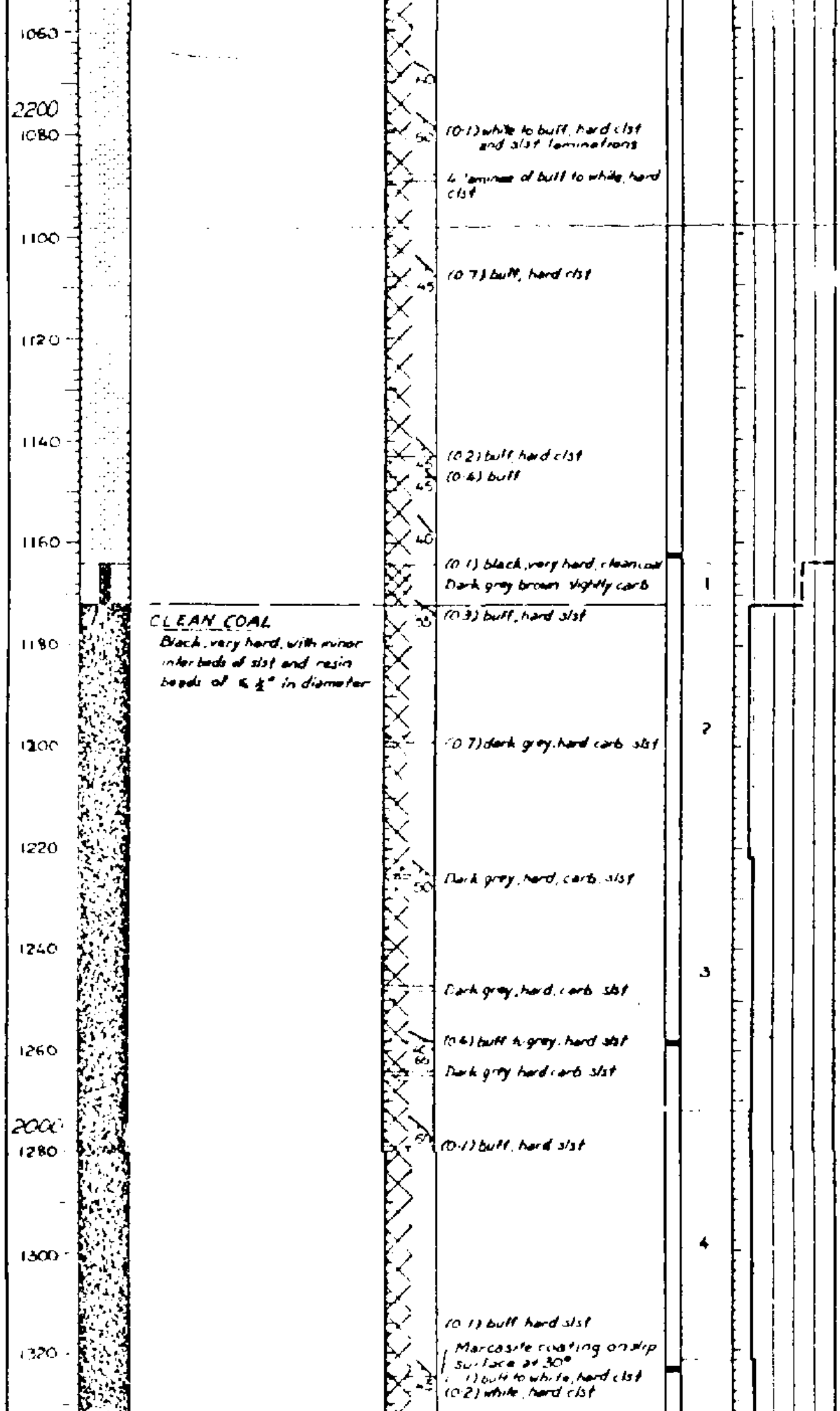
Coordinates	63,242' N	Length	1752'	Hole No.	75-80
	20,075' E	Azimuth	–	Date	JULY 1975
Reference Elev.	3275'	Dip	-90°	Logged by	J. Rotzien
Ground Elev.	3273.5'	Core Size	NQ	Sheet	1 of 9

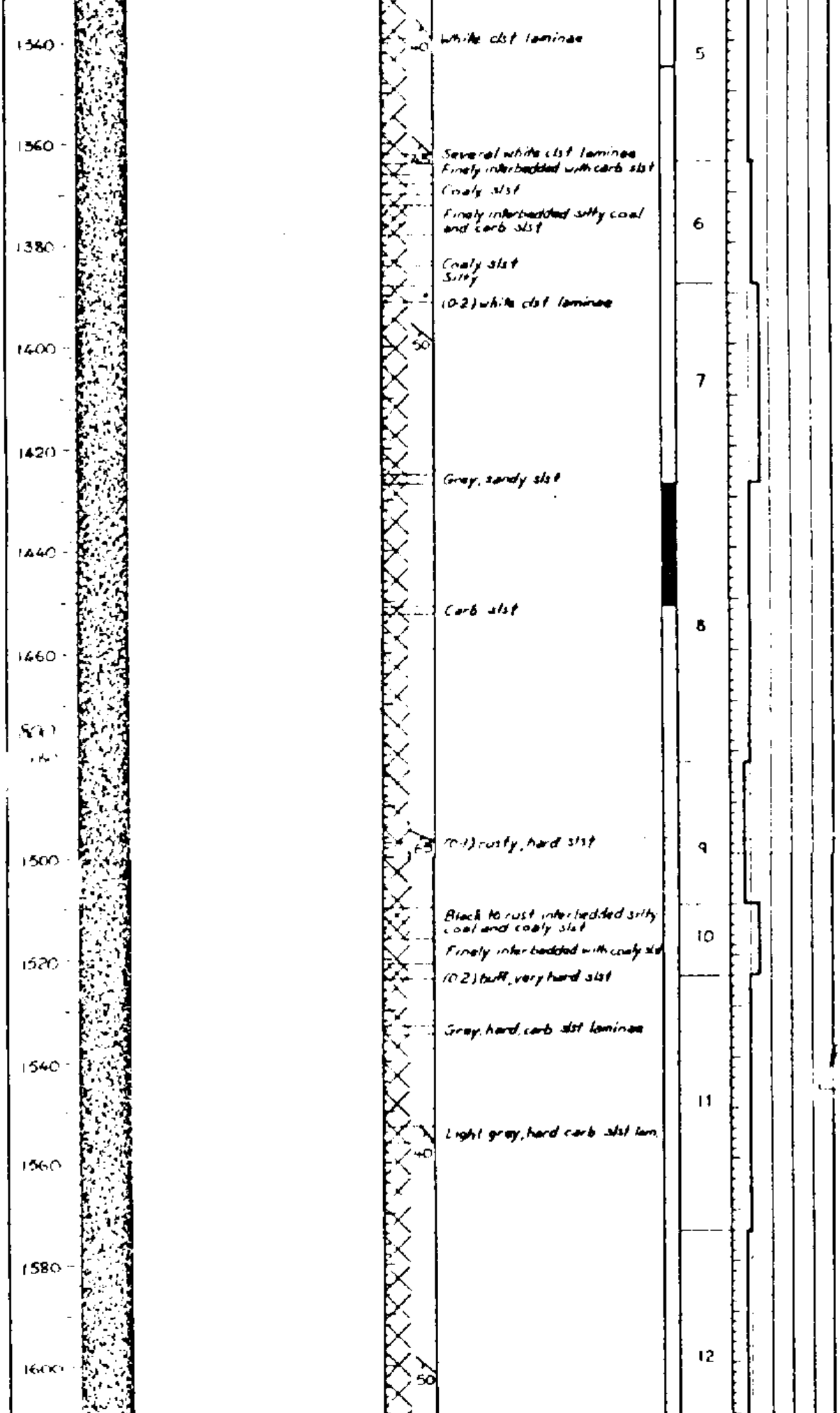
ELEVATION IN FEET	DEPTH IN FEET	STRATIGRAPHY: STRAT PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE No.	ASH AT 20% MOISTURE
	0	Datum			Note: Original ground elev 3275'			
	20		OVERBURDEN Large boulders					
	40		Mud					
	60		SILTSTONE Grey, moderately hard to hard with light grey and buff slst and clst beds and traces of carb fragments.	65	2 laminae of light grey, soft			
				40				
3200	80				(0.2) buff, soft clst Several lam of buff, soft clst			
					(0.2) buff, mod hard clst			
					(0.2) buff mod soft clst (0.1) buff, soft			
	100							
					(0.1) buff (0.1) light grey, mod hard clst			
	120							
	140				(0.3) buff soft clst			
					(0.5) buff			
	160							
	180				(0.4) buff, soft clst			
					Buff, soft clst			
	200							

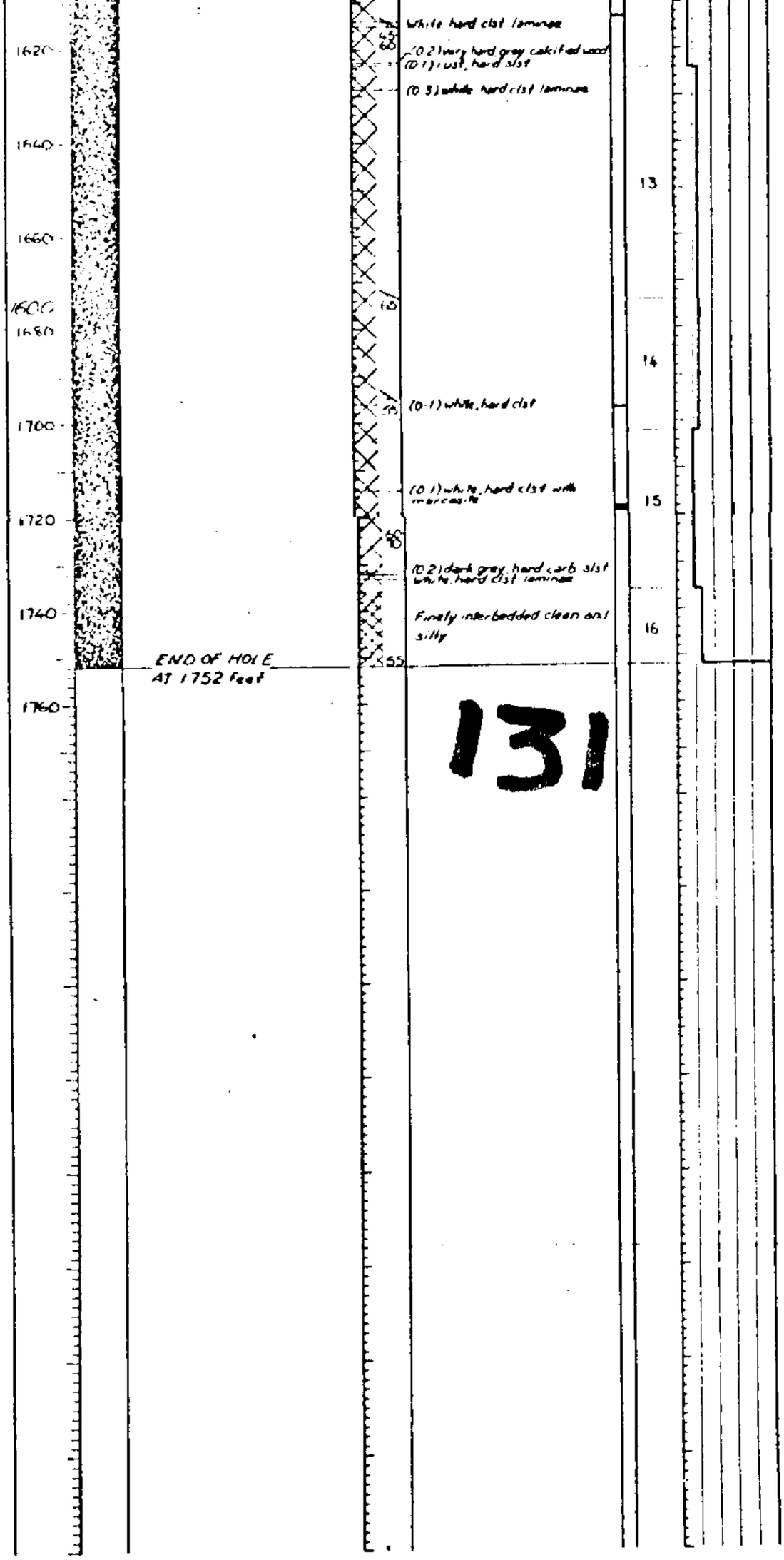

220
240
260
1200
280
300
320
340
360
380
400
420
440
460
2800
480
(0.4) buff
Buff soft clst laminae
(0.2) buff, soft clst
(0.2) buff soft clst
(0.2) buff, soft clst
(0.9) buff soft silty clst
(0.1) buff soft clst
(0.1) white soft
(0.1) buff, soft clst
Soft wtr laminated slst and clst
(0.1) buff very hard
(0.1) buff, soft clst
(0.2) buff soft clst
(0.3) buff soft clst
(0.2) buff
(0.2) buff
(0.1) rusty buff soft clst
20
(0.2) buff
(0.1) buff, mod hard slst and clst
(0.3) light grey
(0.2) buff
(0.2) light grey to buff, mod hard clst
(0.2) buff
(0.8) light grey brown
(0.2) buff
(0.5) buff, soft clst
2 (0.2) buff soft clst
60
(0.2) buff soft clst


(0·1) buff mod hard clst
2 (0·1) buff, mod hard clst
(0·1) buff
(0·2) buff
(0·3) buff, very hard, very fine sst
Buff mod hard clst
Soft
Mod hard to soft
Buff to white soft clayey sst
(0·1) grey, soft clayey sst
(0·1) buff, soft clst
Soft
(0·1) buff, mod hard clst
(0·1) buff mod hard clst
(0·1) light grey
(0·1) rusty
Rusty buff, mod hard clst lam
Rusty buff, mod hard clst lam
(0·1) rusty, soft clst
(0·1) buff
(0·6) buff
(0·2) light grey
(0·1) buff, soft clst
500
520
560
580
600
620
640
660
2600
680
700
720
740
760
780
20
40


800
820
840
860
2400
880
900
920
940
960
980
1000
1020
1040
20
Soft, with fragments of buff, hard
(0·8) light grey, very hard lmst infilled fractures of grey slst
60
With irregular calcite veins
40
Buff clst and sst lens in slst
(0·6) buff, hard sst
50
(0·1) light grey, hard
40
(0·1) buff
50
(0·2) buff
55
(0·2) buff
50
(0·1) white
20
(0·2) white


1060
2200
1080
1100
1120
1140
1160
1180
1200
1220
1240
1260
2000
1280
1300
1320
(0·1) white to buff, hard clst and slst laminations
4 laminae of buff to white, hard clst
(0·7) buff, hard clst
(0·2) buff, hard clst
(0·4) buff
(0·1) black, very hard, clean coal
Dark grey brown slightly carb
CLEAN COAL
Black, very hard, with minor inter beds of slst and resin beads of ≤ ½" in diameter
(0·3) buff, hard slst
(0·7) dark grey, hard carb slst
Dark grey, hard, carb. slst
Dark grey, hard, carb slst
(0·4) buff to grey, hard slst
Dark grey hard carb slst
(0·1) buff, hard slst
(0·1) buff hard slst
Marcasite coating on slip surface at 30°
(0·1) buff to white, hard clst
(0·2) white, hard clst
1
2
3
4


1340
1360
1380
1400
1420
1440
1460
1500
1520
1540
1560
1580
1600
40
White clst laminae
5
Several white clst laminae
Finely interbedded with carb slst
Coaly slst
Finely interbedded silty coal
and carb slst
6
Coaly slst
Silty
(0-2) white clst laminae
50
7
Gray, sandy slst
Carb slst
8
(0-1) rusty, hard slst
9
Black to rust interbedded silty
coal and coaly slst
Finely interbedded with coaly slst
10
(0-2) buff, very hard slst
Gray, hard, carb slst laminae
11
Light gray, hard carb slst lam.
40
12
50



131

DRILL HOLE : 75-80

SHEET Nº : 9 OF 9

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

(12)

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates :	59,812' N / 19,806' E	Length :	1727'	Hole No. :	75-82
Reference Elev. :	3478'	Azimuth :	—	Date :	AUG. 1975
Ground Elev. :	3476'	Dip :	-90°	Logged by :	J. Rotzien
		Core Size :	NQ	Sheet :	1 of 9

Depth (ft)	Stratigraphy – Major Rock Units
0	Datum. OVERBURDEN — Gravel and clay
20	Gravel and boulders
50	Sand and boulders
90	Sand with gravel
125	Sand and gravel with boulders
150	Gravel and boulders
170	Clay, gravel and boulders
178	Clay
180	SILTSTONE — Grey to grey brown, mod. hard to soft, with traces of very fine coal fragments
460	... SILTSTONE — Black, very hard
477	COAL — Black, very hard clean coal with small interbeds of silty coal and coaly slst; Resin beads occur throughout
567	MIXED UNIT — Black to dark grey brown, very hard to soft, interbedded clean and silty coal and coaly and carb. slst
627	SILTY COAL — Black, hard, silty coal with interbedded carb. to coaly slst and minor clean coal
717	CLEAN COAL — Black very hard, clean coal with interbedded silty coal and coaly slst and carb slst
750	MIXED COAL UNIT — Black, hard to soft, finely interbedded clean and silty coal with grey brown, soft carb slst
868	SILTSTONE — Grey brown, soft to mod. hard calc. with up to 5% carb. content. Solution cavities exist in the more calc. areas. Carb content increasing
925	COAL — Black, very hard to soft, clean and silty with interbedded slst and carb. slst; Resin beads scattered throughout
1000	MIXED UNIT — Black to light grey, soft to very hard, interbedded coal and detrital rock
1150	COAL AND SILTSTONE — Black, hard to very hard, clean coal with interbedded slst
1313	MIXED UNIT — Black to light grey, hard to very hard, interbedded coal and detrital rock
1437	SILTSTONE — Grey, hard, laminated with interbedded sst. Abundant variable amounts of carb. laminae <10%
1606	INTERBEDDED COARSE DETRITAL ROCKS — Grey to light grey, hard to soft, interbedded congl and sst with the laminations being carbonaceous
1727	END OF HOLE AT 1727 feet

Detail & Structure – Description (top to bottom)

Note: Original ground elev. 3478'

(0·1) buff, soft clst; 2 laminae buff clst; (0·2) buff, hard; (0·3) buff, soft clst; (0·2) buff, hard; (0·7) buff, hard; (0·3) buff, soft clst; (0·2) buff, mod. hard; (0·1) buff, soft; (0·3) buff, hard; (0·2) buff, soft clst; Buff, hard; Buff soft clst; (0·3) buff

Soft carb. slst; Dark grey to black carb. and coaly slst; White cbt, joint fillings; (0·1) buff slst; Very hard to soft, finely interbedded clean and silty coal and coaly slst; White to grey clst laminae in clean coal; Clean; Clean; (0·7) grey, very hard, calcified wood; Interbedded clean and silty; Dark grey, coaly slst; Clean with minor silty coal; (0·4) buff to grey, calc. slst; Finely interbedded clean and silty coal with occasional white clst laminae; Dark grey brown, soft carb. slst; (0·4) buff to grey hard slst; (0·2) buff to grey, hard slst; Clean; Finely interbedded silty coal and coaly slst; Finely interbedded silty coal and carb. slst; (0·1) rusty hard slst; Clean; (0·1) buff, hard slst; Lamination of rusty slst; Finely interbedded clean and silty; Mixture of clean coal and slst; (0·2) grey brown clst; Finely interbedded clean coal and carb. slst; (0·3) buff, hard clst; With minor carb. slst

(0·3) buff, very hard slst; Coaly slst; Finely interbedded clean and silty coal; Clean coal with silty interbeds; Carb. to coaly slst; Finely interbedded clean and silty coal with minor carb. slst; Slightly carb. slst; Silty; Finely interbedded clean and silty coal with minor beds of carb and coaly slst; Finely interbedded clean and silty; (0·2) grey, very hard slst; Clean and silty; Soft carb. slst

Solution cavities; Very hard clean coal; Finely interbedded clean coal and carb. slst; Clean; Grey brown slst; Finely interbedded silty coal and carb. slst; Clean; Clean with minor slst interbeds; (0·4) buff, hard slst; (0·4) buff to grey, very hard slst; (0·2) buff to grey, very hard slst; Grey brown, soft carb. slst; Dark grey brown, very hard coaly slst; Calc. sst with small interbeds of carb. slst

Silty; (0·3) grey, hard slst; Clean; (0·6) grey, soft slst; Clean; Finely interbedded clean and silty coal and carb to coaly slst; Clean; Finely interbedded silty coal and carb. to coaly slst; Light grey, hard, tuffaceous sst; (0·5) clean coal; Finely interbedded clean coal and slightly carb. slst; Clean with occasional white clst laminae; Clean with numerous irregular white to grey slst laminae; Clean with minor silty beds; Finely interbedded silty coal and coaly slst; (0·1) rusty, very hard slst; (0·6) grey brown, very hard, calc. wood; Clean; With minor beds, fragments and laminae of clean coal

(0·1) buff, very hard slst; With minor carb. slst beds; Slightly carb. with coaly lam.; (0·1) rusty hard slst; (0·2) buff very hard, calc. slst with occasional white clst laminae; (0·1) grey brown hard carb slst; Slst with minor coal; (0·5) tuffaceous sst; Grey brown, calc. slst with minor clean coal; Coaly slst; Silty coal grading down to slightly carb. slst; Finely interbedded clean coal to clean slst; Finely interbedded clean and silty coal with carb. slst; Grey brown hard carb. slst

Slst with carb. zones; (0·6) silty coal; (0·5) clean coal; Clean coal with finely interbedded silty coal and carb. slst; (0·1) rusty, hard slst; With coal fragments; Interbedded clean and silty; Slst; Volcanic tuff; Slst; Interbedded slst and silty coal; Clean and silty coal with irregular white to grey clst lam.; Slst; Interbedded carb slst and silty coal; Silty; Carb.

Laminae sst; Laminated sst; Carb.; Laminated sst; Grit congl; Laminated sst; Laminated, very finely interbedded slst and sst

Samples No. 1–30.

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DRILL HOLE : 75-82
SHEET No : 1 OF 9

DOLMAGE CAMPBELL AND ASSOCIATES LTD.

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

(13)

HAT CREEK PROJECT — DRILL RECORD

Coordinates : 60,139' N, 21,472' E
Reference Elev. : 3355'
Ground Elev. : 3355'
Length : 621'
Azimuth : 090°
Dip : -60°
Core Size : NQ
Hole No. : 75-84
Date : AUG 1975
Logged by : J. Rolzien
Sheet : 1 of 3

ELEVATION IN FEET	DEPTH IN FEET	STRATIGRAPHY: STRAT. PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE No.	ASH AT 20% MOISTURE
	0		Datum		Note: Original ground elev. 3355'			
			OVERBURDEN Gravel					
	20		Gravel and boulders					
	40							
			Clay and sand					
	80							
			Boulders, clay and gravel					
	100							
			Clay and gravel					
	120							
			Gravel and boulders					
	140							
			Gravel					
	160							
			Gravel and boulders					
3200			Boulders					
	180							
			Gravel and cobbles					
			Clay					
	200		SILTSTONE Grey to grey brown, hard					
	220			20	(0.6) buff			
	240							
	260							
	280			20	(0.2) buff			
	300							
				45				
	320							
	340							
	360							
	380							
	400			45	(0.2) buff, soft clst			
3000								
					(0.1) buff, mod. hard clst			
	420				(0.5) buff			
					(0.9) buff			
					(0.2) buff			
	440							
	460							
	480							
	500				Calcitic laminae and joint infillings in slst			
				20	(0.1) buff, soft clst			
	520							
	540							
	560							
	580				With many minor shears at 5° - 20° and soft zones, intensely sheared at 20°			
	600							
2800	620		END OF HOLE AT 621 Feet					

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DRILL HOLE : 75-84
SHEET No. : 3 OF 3

DOLMAGE CAMPBELL AND ASSOCIATES LTD

14

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates	60,139' N	Length	892'	Hole No.	75-85
	21,472 E	Azimuth	270°	Date	AUG 1975
Reference Elev.	3355'	Dip	-90°	Logged by	J. Rotzien
Ground Elev.	3353'	Core Size	NQ	Sheet	1 of 5

ELEVATION IN FEET	DEPTH IN FEET	STRAT PLOT	MAJOR ROCK UNITS	SYMBOL	DESCRIPTION	CORE LOSS	SAMPLE No.	ASH AT 20% MOISTURE
	0		Datum		Note : Original ground elev. 3353'			
			OVERBURDEN					
	20		Clay with gravel					
	40							
	60		Boulder					
3300								
	80		Clay with gravel					
	100							
	120							
	140		Clay and sand					
	160		Boulder and gravel					
			Sand and clay					
	180		Gravel					
3200			Boulders					
	200		Boulders and gravel					
			Gravel					
	220		SILTSTONE Grey to grey brown, mod hard to soft, with carb. material		Trimmed			
					Buff, hard			
	240				(0-2) buff, soft			
	260							
	280							
	300							
	320							
					(0-1) buff, soft			
	340							
	360							
	380				(0-1) buff, soft clst			
					Buff, clst showing minor slips at 10°			
	400				(0-1) buff, soft clst			
					(0-2) buff, mod hard			
	420							
3000					(0-1) buff, soft clst			
	440				(0-3) buff, soft clst			
	460							
	480				Variable, grd (0-3) bed of light grey hard			
					(0-1) buff, soft			
	500				(0-1) buff, very hard			
	520				(0-3) light grey, very hard			
	540							
	560				(0-1) buff, hard (0-3) buff, very hard			
	580							
	600				(0-1) buff, very hard			
	620				(0-1) buff, hard (0-2) buff			
					(0-1) buff			
					(0-2) buff			
					(0-3) white, very hard, calc.			
	660				(0-1) buff			
2800	680				(0-2) buff			
					(0-1) buff			
	700				2(0-2) buff (0-3) light grey hard, fine grained sst			
	720				(0-2) buff (0-1) white grey hard sst		1	
	740		CARB. CLAYSTONE Grey brown to brown soft					
			CLEAN COAL Black, very hard, with minor interbeds of silty coal and a few resin beds		(0-2) clean coal			
	760				Soft, silty (0-1) rusty, hard sltst		2	
	780				White clst laminations (0-5) soft, silty			
	800				silt to clst laminae		3	
					Hard to soft silty coal and carb. sltst			
	820				(0-2) buff to rusty very hard sltst with marcasite			
					hard to soft, finely interbedded silty coal and carb. sltst		4	
	840						5	
	860				Clean and silty			
					Clean and silty with minor carb. sltst		6	
	880		END OF HOLE AT 892 feet					
	900							

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DRILL HOLE : 75-85

SHEET No. : 5 OF 5

DOLMAGE CAMPBELL AND ASSOCIATES LTD

15

BRITISH COLUMBIA HYDRO AND POWER AUTHORITY

HAT CREEK PROJECT — DRILL RECORD

Coordinates : 65,489' N, 21,266' E
Reference Elev. : 3166'
Ground Elev. : 3165'
Length : 1000'
Azimuth : —
Dip : -90°
Core Size : NQ
Hole No. : 75-34
Date : FEB. 1975
Logged by : J Rotzien/Md Quadros
Sheet : 1 of 5

ELEVATION in FEET	DEPTH in FEET	STRATIGRAPHY: STRAT PLOT	STRATIGRAPHY: MAJOR ROCK UNITS	DETAIL & STRUCTURE: SYMBOL	DETAIL & STRUCTURE: DESCRIPTION	CORE LOSS	SAMPLE No.	ASH AT 20% MOISTURE
	0		Datum		Note : Original ground elev. 3165'			
			OVERBURDEN Gravel with boulders					
	20		Sand					
			CLAYSTONE Grey brown to grey, massive poorly indurated clst with zones of hard, well indurated fissile shale, parting plane 45° - 80°, major joint set 2:		Tricored			
	40							
	60				Shale fissile			
					Shale fissile			
	80							
	100							
	120							
	140				Finely interbedded soft clst & hard shale fissile			
					Buff			
					(0.3') hard buff			
					clst & shaly clst			
					(0.3') hard buff			
3000	160				Clst and shaly clst			
	180				(0.2') soft buff			
					Clst and shaly clst			
	200							
	220							
	240							
	260							
	280							
					Light grey, bedded			
	300				Very broken dark grey			
					Light grey			
	320				Dark grey			
					Buff			
	340				Grey to dark grey			
2800	360				(0.3') brown			
	380				Grey to dark grey, soft to cobbly			
	400							
	420				Buff silty			
	440							
	460				Dark grey to grey soft fissile			
	480							
					White soft, friable mushy			
	500				Grey soft, friable mushy			
			Light to dark grey, rubbly to crumbly clst clean soft rough 70° to ½ - ¾ apart homogeneous					
	520							
	540							
	560							
2600								
	580							
	600							
	620							
	640				(0.3') white (0.3') buff			
	660							
	680							
					Tuffaceous gritty silt			
	700				(0.3') buff (0.3') buff			
	720							
	740				Light grey to greyish white			
					Buff silt			
2400	760							
	780							
	800							
	820				Buff, silty			
	840				Buff silty			
					Light grey, very soft mushy			
	860							
	880							
	900							
	920				(0.3') buff			
	940							
	960							
2200	980				Light brown silty			
	1000		END OF HOLE AT 1000 feet					

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DRILL HOLE
SHEET NO. OF

APPENDIX II
GEOPHYSICAL LOGS

ROKE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO

LSD
SEC
TWP
RGE
W4 M

COMPANY DOLMAGE, CAMPBELL AND ASSOC.

WELL 75-63

LOCATION 60,155'N 23,054'E

FIELD HAT CREEK

PROVINCE BRITISH COLUMBIA

Other Services: DENS

Permanent Datum: GROUND LEVEL — Elev. 3626'
Log Measured from: TOP OF CASING 2 Ft. Above Perm. Datum
Drill Depth Measured from: TOP OF CASING

K.B.
Csg.
G.L.

Run No.	ONE
Date	28 MAR 1975
First Reading	974
Last Reading	000
Footage Logged	974
Depth Reached	977
Depth Driller	1000
Depth Logger	270
Casing Driller	270
Casing Logger	MUD
Fluid Type	
Liquid Level	37/8
Bit Diam.	
Rm @ °F	
Operating Time	3 hrs.
Truck No	30

Recorded By ED JARDS K Witnessed By ROTZIEAL

Remarks HOLE LOGGED THROUGH DRILL RODS 974-270, THROUGH CASING 270-000 TOOL # 175

DDH 75-63

131

(6)

Depths

GAMMA RAY API

0 — 5 — 50

3528

CASING

100

3400

200

O.B.

CASING
RODS

300

3200

400

500

3000

600

700

2800

800

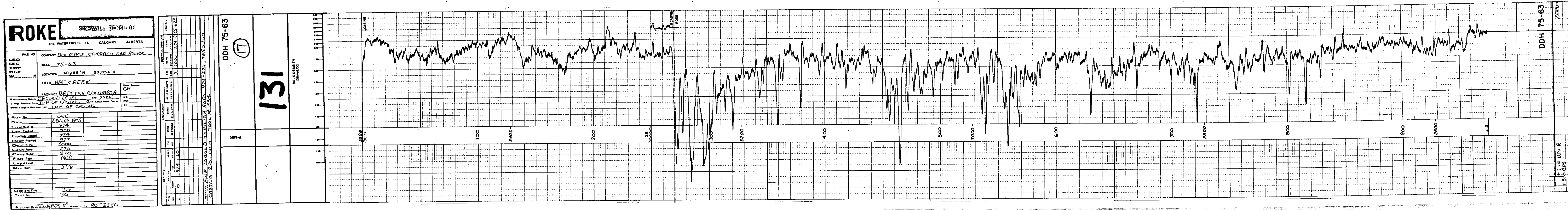
900

2600

F.R.

DDH 75-63

E-ZERO ← 50 CPS


ROKE
SIDEWALL DENSILOG
OIL ENTERPRISES LTD. CALGARY, ALBERTA
COMPANY DOLMAGE, CAMPBELL AND ASSOC.
WELL 75-63
LOCATION 80,185'N 23,054'E
FIELD HAT CREEK
PROVINCE BRITISH COLUMBIA
GROUND LEVEL Elev. 3338
DDH 75-63
17
131
BULK DENSITY (GAMMA)
DEPTHS
3338
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
DDH 75-63

ROKE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO

LSD
SEC
TWP
RGE
W ___ M

COMPANY DOLMAGE CAMPBELL AND ASSOCIATES

WELL 75-85

LOCATION 60 139 N 21 472 E

FIELD HAT CREEK

PROVINCE BRITISH COLUMBIA

Permanent Datum GROUND LEVEL Elev 3353

Log Measured from TOP OF CASING 2 Ft. Above Perm. Datum

Alm Depths Measured from TOP OF CASING

K.B.
CSG
G.L.

Other Services

Run No.	ONE
Date	19 AUGUST
First Reading	870
Last Reading	000
Footage Logged	870
Depth Reached	873
Depth Driller	894
Casing Rate	219
Casing Driller	219
Fluid Type	MUD
Liquid Level	
Min. Diam.	3 1/8
Operating Time	5 hr
Truck No.	102-502

Recorded By EDWARDS K Witnessed By ROTZIEN

GENERAL				GAMMA RAY				SIDEWALL DENSILOG			
RUN NO	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	T.C. SEC	SENS SETTINGS	ZERO DIV.L OR R	API G R UNITS PER LOG DIV.	T.C. SEC	SENS SETTINGS	ZERO DIV.L OR R	GPS/DIV
1	0	870	10					3	1000	2R	16.103
1	0	870	18	3	100	0	5				

REMARKS ANGLE HOLE -050° AZIMUTH 270° HOLE LOGGED THROUGH DRILL RODS @ 870 - 219 THROUGH CASING 219-000
TOOL # 554 TOOL # 283

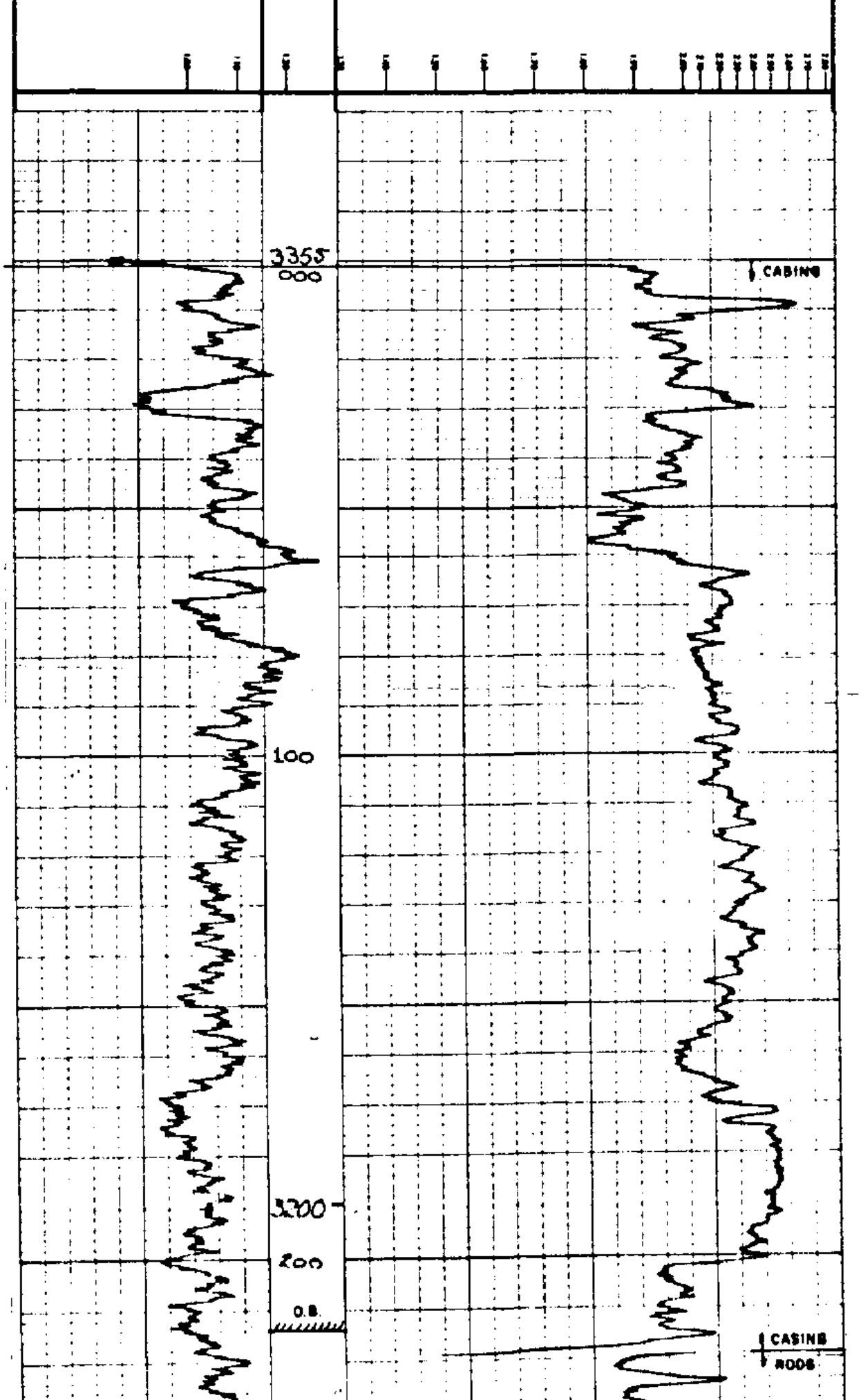
DEPTHS

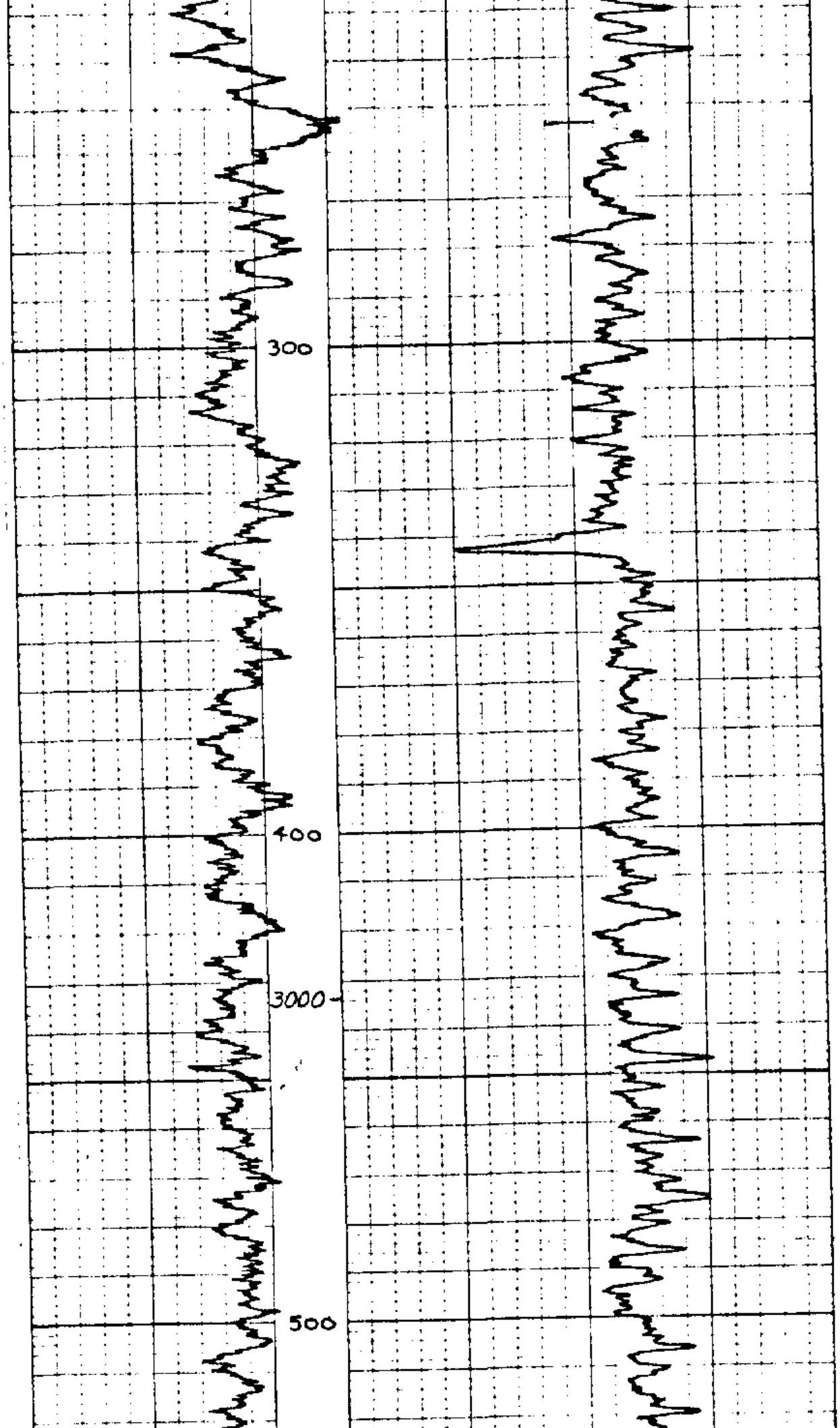
DDH 75-85

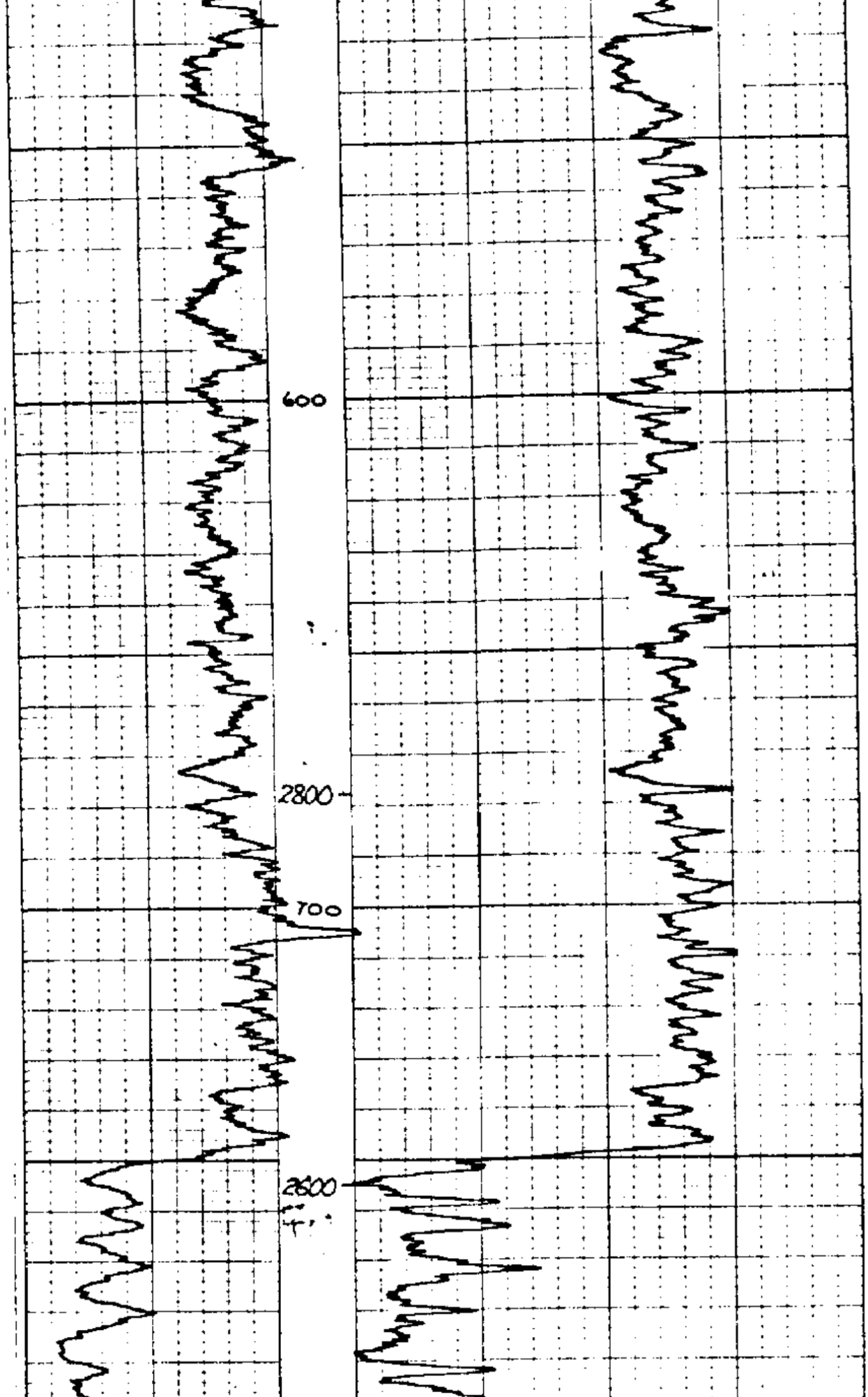
GAMMA RAY
API
5
0 50

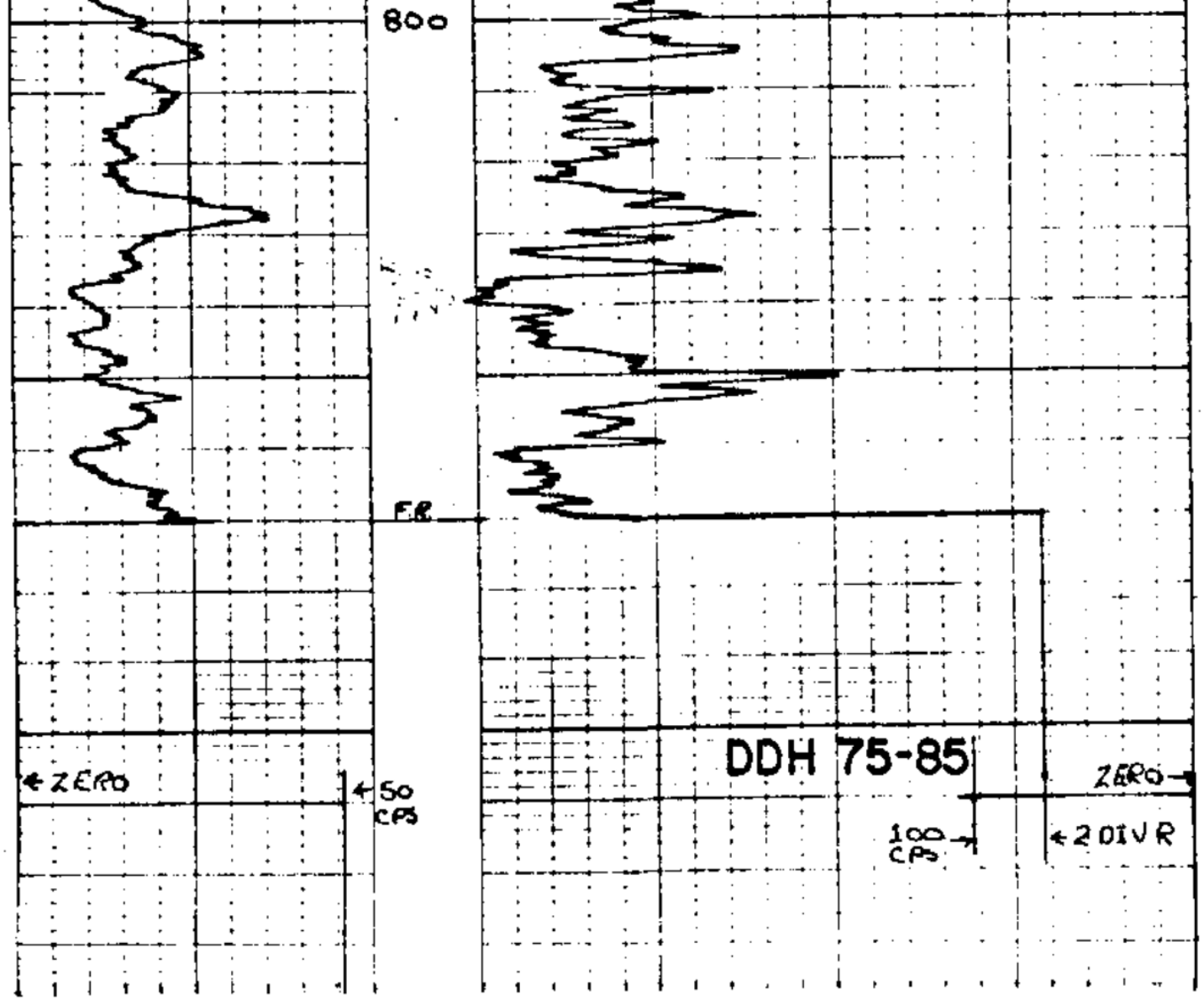
131 (18)

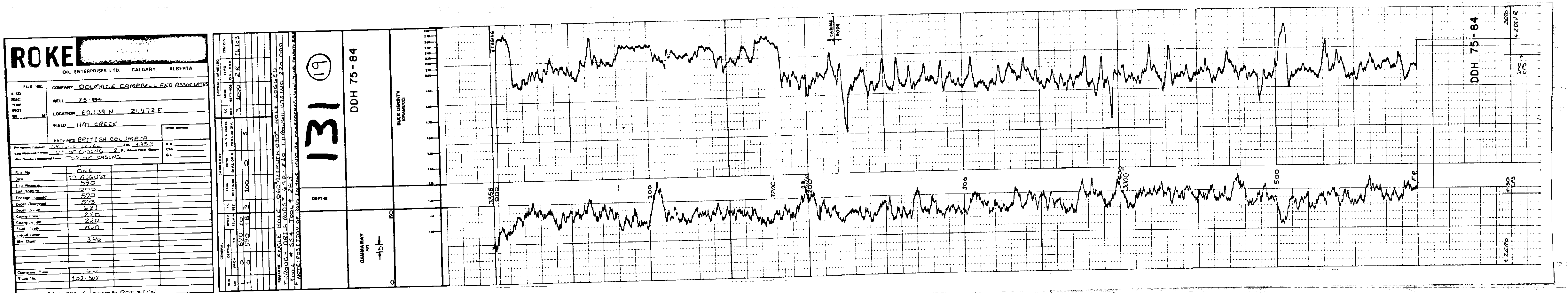
BULK DENSITY
(GRAMS/CC)

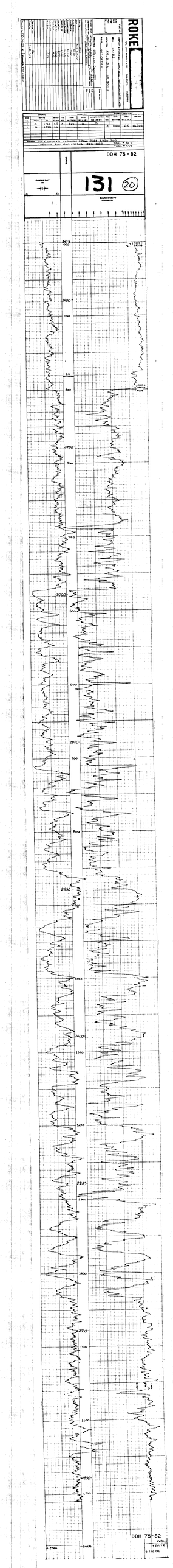

3355
000
CASING
100
3200
200
O.B.
CASING
RODS


300
400
3000
500


600
2800
700
2800


800
F.R.
DDH 75-85
← ZERO
← 50 CPS
ZERO →
100 CPS →
← 2 DIV R


ROKE
OIL ENTERPRISES LTD. CALGARY, ALBERTA
COMPANY DOLMAGE, CAMPBELL AND ASSOCIATES
WELL 75-84
LOCATION 60.139 N 21.472 E
FIELD HAT CREEK
PROVINCE BRITISH COLUMBIA
131 (19)
DDH 75-84
DEPTHS
GAMMA RAY
BULK DENSITY (GRAM/CC)
CASING SHOE
CASING ROOF
DDH 75-84
ONE
13 AUGUST
590
592
627
220
220
MUD
3 7/8
102-502


ROKE
DDH 75-82
131
20
GAMMA RAY
BULK DENSITY (GAMMA)
DDH 75-82

ROKE
OIL ENTERPRISES LTD. CALGARY, ALBERTA

File No.	
Company	DOLMAGE CAMPBELL AND ASSOC.
Well	75-67
Location	55.197 N 15.736 E
Field	HAT CREEK
Province	BRITISH COLUMBIA
Other Services	GR-RES, DENS, CAL
Permanent Datum	GROUND LEVEL Elev. 3725
Log Measured from	TOP OF CASING 2 Ft. Above Perm. Datum
Depths Measured from	TOP OF CASING
Run No.	ONE
Date	2 JUNE 1975
First Reading	670
Last Reading	000
Footage Logged	670
Depth Reached	673
Depth Driller	715
Casing Driller	78/380
Casing Rope	78/380
Fluid Type	MUD
Min Diam	3 7/8
Operating Time	4 hr
Truck No.	104-SU3
Recorded By	EDWARDS K
Witnessed By	ROTZIEN

Run No.	Depths From	Depths To	Speed FT/MIN	Gamma Ray T.C. Sec.	Sens Settings	Zero Div. L or R	API G.R. Units per Log Div.	Sidewall Densilog T.C. Sec.	Sens Settings	Zero Div. L or R	CPS/Div
1	670	0	10					3	1000	2 R	16.103
1	670	0	18	3	100	0	5				
1	670	200	18	3	100	0	5				

REMARKS HOLE LOGGED THROUGH RODS 670-380 THROUGH CASING 380-000. TOOL # SS4 TOOL # 13 REPEAT SECTION RUN DUE TO UNUSUAL GAMMA RESPONSE USING TOOL # 175 RUN THROUGH RODS AND CASING

DDH 75-67

131 (21)

GAMMA RAY API

BULK DENSITY (GRAMS/CC)

ROKE

GAMMA RAY RESISTANCE LOG

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO
LSD
SEC
TWP
RGE
W ____ M

COMPANY DOLMAGE, CAMPBELL AND ASSOC.
WELL 75-67
LOCATION 55,197N 15,736E
FIELD HAT CREEK
PROVINCE BRITISH COLUMBIA

Other Services
DENS, GR
DENS, CAL

Permanent Datum GROUND LEVEL Elev 3725' K.B
Log Measured from TOP OF CASING 2 Ft. Above Perm. Datum CSG
Well Depths Measured from TOP OF CASING G.L

Run No.	ONE
Date	2 JUNE 1975
First Reading	520
Last Reading	380
Footage Logged	140
Depth Reached	523
Depth Driller	715
Casing Roke	78/380
Casing Driller	78/380
Fluid Type	MUD
Liquid Level	
Min. Diam	3 7/8
Rm @ °F	
Operating Time	1 hr
Truck No	104 - SU3

Recorded By EDWARDS K. Witnessed By ROTTEN

Remarks OPEN HOLE LOG TOOL # 13

DDH 75-67

RESISTANCE

OHMS 400 20K 0

22

Depths

131

GAMMA RAY API 100 0

DDH 75-67

400 ← 100 Ω ← ZERO

500 ← 100 GPS ← ZERO

ROKE OIL ENTERPRISES LTD. CALGARY, ALBERTA

COMPANY	DOLMAGE CAMPBELL AND ASSOC.
WELL	75-80
LOCATION	63,242N 20,075E
FIELD	HAT CREEK
PROVINCE	BRITISH COLUMBIA
Permanent Datum	GROUND LEVEL, Elev. 3275
Log Measured From	TOP OF CASING 1.5 Ft. Above Perm. Datum
Drill Measured From	TOP OF CASING

Run No.	ONE
Date	26 JULY
First Reading	1720
Last Reading	000
Footage Logged	1720
Depth Reached	1723
Depth Driller	1752
Casing Driller	155
Casing Logger	155
Fluid Type	MUD
Max. Temp.	3/8
Truck No.	104-SJ3
Operating Time	3 hr

Recorded By EDWARDS K. Witnessed By ROTZIEN

GENERAL				GAMMA RAY				SIDEWALL DENSILOG			
RUN NO	DEPTHS FROM	TO	SPEED FT/MIN	T.C. SEC	SENS SETTINGS	ZERO DIV L OR R	API G.R. UNITS PER LOG DIV.	T.C. SEC	SENS SETTINGS	ZERO DIV L OR R	CPS/DIV
1	0	1720	10					3	1000	2R	16.103
1	0	1720	18	3	100	0	5				

REMARKS HOLE LOGGE THROUGH DRILL RODS 1720-155 THROUGH RODS PLUS CASING 155-000 TOOL # 554 TOOL # 13

DDH 75-80

131 (23)

GAMMA RAY API 0 —|5|— 50 DEPTHS BULK DENSITY (GRAMS/CC)

DDH 75-80

ROKE [redacted]
OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO
L.SD
SEC
TWP
RGE
W ____ M

COMPANY DOMAGE, CAMPBELL AND ASSOCIATES
WELL 75-77
LOCATION 59.714N 20.655E
FIELD HAT CREEK
PROVINCE BRITISH COLUMBIA

Other Services: DENS, CAL GR, DENS

Elevation Datum: GROUND LEVEL Elev. 3244'
L. log Measured from TOP OF CASING 2 Ft. Above Perm. Datum
Other Depths Measured from TOP OF CASING

K.B.
C.S.D.
G.L.

Run No.	ONE
Date	24 25 26 JULY 77
First Reading	656
Last Reading	100
First Logged	556
Depth Reached	559
Depth Driller	1844
Casing Size	100
Casing Driller	100
Fluid Type	MUD
Fluid Level	OKO
Rm @ Meas. Temp	3.1 @
Rmf @ Meas. Temp	
Rmc @ Meas. Temp	
Operating Time	11 hr
Truck No	504-503

Recorded By E. DUNLOP Witnessed By ROTZLER

Remarks: TOOL # 13

24

131

RESISTANCE OHMS DDH 75-77

Depths

GAMMA RAY

DDH 75-77

+100Ω +ZERO

+100 CPS +ZERO

ROKE OIL ENTERPRISES LTD CALGARY, ALBERTA

FILE NO

COMPANY DOLMAGE CAMPBELL AND ASSOCIATES

WELL 75-77

LOCATION 59,714 N 20,655 E

FIELD HAT CREEK

PROVINCE BRITISH COLUMBIA

Other Services: BCHS GR GR-RES

Permanent Datum GROUND LEVEL Elev. 3344'

Log Measured from TOP OF CASING 2' Above Perm. Datum

Drlg Depths Measured from TOP OF CASING

Run No.	ONE
Date	17/18/19 JULY
First Reading	656
Last Reading	100
Footage Logged	556
Depth Reached	1876
Depth Driller	1876
Casing Rdrs	100
Casing Driller	100
Fluid Type	MUD
Liquid Level	000
Rdrs Diam	3 1/8
Operating Time	2 hr
Truck No.	104 - SU1

Recorded By EDWARDS K Witnessed By RATZIEN

BOREHOLE RECORD

RUN	FROM	TO	BIT SIZE	T.C.
1	100	656	10	

CASING RECORD

	SIZE	WEIGHT	GRADE	TOP	BOTTOM
1	6 5/8	20	J-55	2	656

GAMMA RAY: ZERO, API G.R. UNITS, 200 LOG DIV.

GAMMA RAY: ZERO, DIVS. USED, SENS

SPECIAL: SPEED, T.C. (TIME CONST. SEC)

REMARKS TOOL # 554

CBL/GR: ZERO, DIVS. USED, CBL DIV 36.63

DDH 75-77

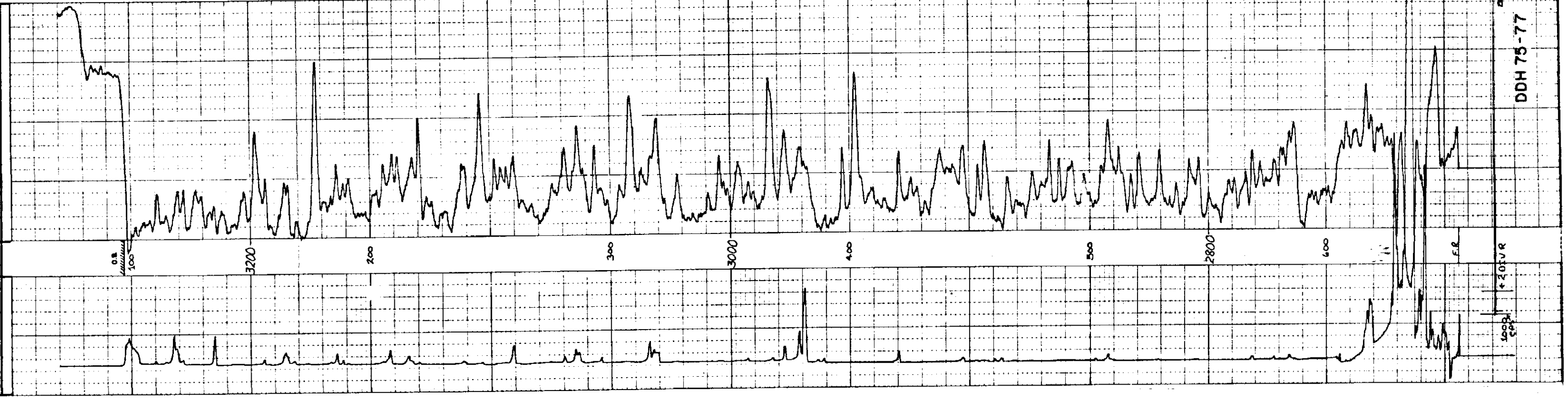
131

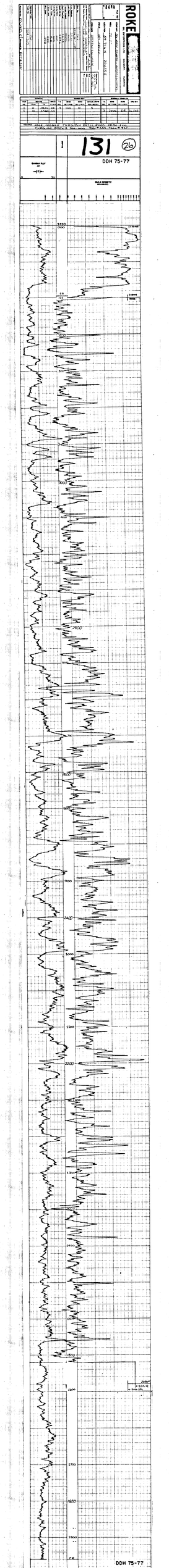
25

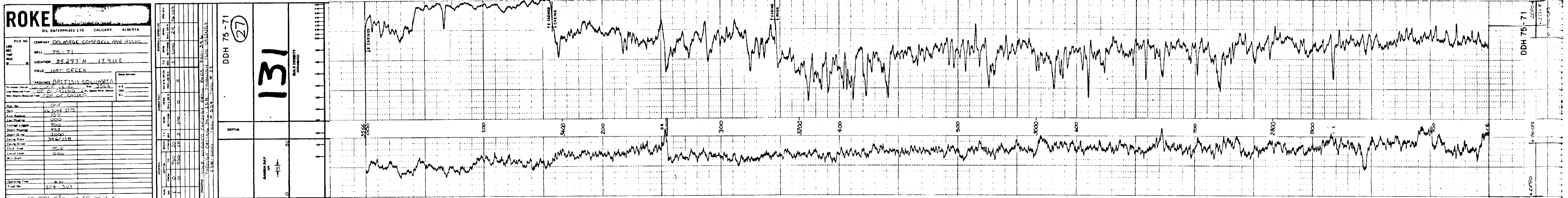
CALIPER (DIAMETER - INCHES)

BULK DENSITY (GAMMA-GG)

DEPTHS




ROKE
131
26
DDH 75-77
GAMMA RAY API
BULK DENSITY KG/M3/M3
3750
3700
3650
3600
3550
3500
3450
3400
3350
3300
3250
3200
3150
3100
3050
3000
2950
2900
2850
2800
2750
2700
2650
2600
2550
2500
2450
2400
2350
2300
2250
2200
2150
2100
2050
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
DDH 75-77


ROKE
OIL ENTERPRISES LTD CALGARY, ALBERTA
COMPANY DOLMAGE CAMPBELL AND ASSOC
WELL 75-71
LOCATION 55 29' N 179 11' E
FIELD HAT CREEK
PROVINCE BRITISH COLUMBIA
DDH 75-71
27
131
DEPTH
GAMMA RAY
BASE CURRENTLY ADVANCED
12 CASING
8 CASING
CASING SHOE
DDH 75-71

ROKE

OIL ENTERPRISES LTD. CALGARY ALBERTA

FILE NO
LSD
SEC
TWP
RGE
W

COMPANY DOLMAGE CAMPBELL AND ASSOCIATES
WELL 75-70
LOCATION 51,254 N 19,788 E
FIELD MAT CREEK
PROVINCE BRITISH COLUMBIA

	ONE
Run No	
Date	18 JUNE 1975
Bottom Driller	176
Bottom Logger	000
Top Logged Interval	176
Drilling Fluid Used	180
Depth Driller	1280
Casing Size	20
Casing Depth	20
Fluid Type	MUD
Fluid Level	21
Max. Rec. Temp.	3 1/8
Time Since Circ.	
Max. Rec. Temp.	
Equipment No.	
Location	
Recorded By	1 hr
Witnessed By	104-503

Other Services
GR DENS/CAL
GR DENS

KB
DF
GL

Remarks: HOLE LOGGED IN OPEN HOLE REPEAT SECTION RUN DUE TO UNUSUAL RESISTANCE RESPONSE TOOL # 13

131

Depths

RESISTANCE (28)

DDH 75-70

GAMMA RAY API

0 100

OHMS

0 20 400

3456
000

3400

O.B.
100

EOL

← ZERO 100 CPS → ZERO ← 100 Ω

DDH 75-70

REPEAT SECTION

DDH 75-70

3456
000

3400

100

DDH 75-70

ROKE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO

LSD
SEC
TWP
RGE
W... M

COMPANY DOMAGE, CAMPBELL AND ASSOCIATES

WELL 75-70

LOCATION 51,254 N — 19,788 E

FIELD HAT CREEK

PROVINCE BRITISH COLUMBIA

Permanent Datum GROUND LEVEL Elev. 3454
Log Measured from TOP OF CASING 2 Ft. Above Perm. Datum
Well Depths Measured from TOP OF CASING

K.B.
D.F.
G.L.

Other Services
GR. RES
DENS. GR

Rec. No.	
Date	DAY
First Reading	170
Last Reading	000
Footage Logged	170
Depth Reached	175
Depth Driller	1280
Casing Rate	20
Casing Driller	20
Fluid Type	MUD
Liquid Level	21
Max. Diam.	3 7/8
Operating Time	
Truck No.	

Witnessed By ROLFSEN

SIDEWALL DENSILOG

RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	GAMMA RAY T.C. SEC.	GAMMA RAY SENS SETTINGS	GAMMA RAY ZERO DIV.L OR R	GAMMA RAY API G.R. UNITS PER LOG DIV.	SIDEWALL DENSILOG T.C. SEC.	SIDEWALL DENSILOG SENS SETTINGS	SIDEWALL DENSILOG ZERO DIV.L OR R	SIDEWALL DENSILOG CPS/ DIV
1	0	170	10					3	1000	2R	3663

REMARKS OPEN HOLE LOG. TOOL # 554 TOOL # 459

29

DDH 75-70

131

CALIPER
(DIAMETER — INCHES)

2 4 6 8 10

DEPTH

BULK DENSITY
(GRAMS/CC)

3456
000

3400

G.B.
100

F.P.

DDH 75-70

2600

K 20 UR

K 50 S CPS

ROKE OIL ENTERPRISES LTD. CALGARY, ALBERTA

FILE NO.
LSD
SEC
TWP
RGE
W ___ M

COMPANY DOLMAGE, CAMPBELL AND ASSOCIATES
WELL 75-70
LOCATION 51,254 N 19,788 E
FIELD HAT CREEK
PROVINCE BRITISH COLUMBIA

Permanent Datum	GROUND LEVEL Elev. 3554
Log Measured from	TOP OF CASING 2 ft. Above Perm. Datum
Drill. Depth Measured from	TOP OF CASING

Run No.	ONE
Date	18 JUNE 1975
First Reading	898
Last Reading	000
Footage Logged	898
Depth Reader	890
Depth Driller	1280
Casing Feet	110/180
Casing Bitz	110/180
Fluid Type	MUD
Fluid Level	21
Rm @ Meas. Tem	3 3/6
Operating Time	5 hr
Truck No	104 - SU3

Recorded EDWARDS K Witnessed by ROTHEN

DDH 75-70 (30)

131

DEPTH

GAMMA RAY 0 — 50

BULK DENSITY (GAMMA-GAMMA)

DDH 75-70
4 CPS
4 ICPS
4 CPS

ROKE OIL ENTERPRISES LTD. CALGARY, ALBERTA

GAMMA RAY SIDEWALL DENSILOG

FILE NO.
COMPANY DOLMAGE CAMPBELL AND ASSOC.
WELL 75-69
LOCATION 55,770 N 19,738 E
FIELD HAT CREEK
PROVINCE BRITISH COLUMBIA
LSD SEC TWP RGE W
Other Services
Permanent Datum GROUND LEVEL Elev. 3412
Log Measured from TOP OF CASING 2 Ft. Above Perm. Datum
Well Depths Measured from TOP OF CASING
K.B.
CSG
G.L.

Run No.	ONE
Date	16 JUNE 1975
First Reading	1320
Last Reading	000
Footage Logged	1320
Depth Reached	1323
Depth Driller	1338
Casing Logger	110/640
Casing Driller	110/640
Fluid Type	MUD
Fluid Level	6 feet
Min. Diam.	3 7/8
Operating Time	7½
Truck No.	104-SU3

Witnessed by: D. ZATZEN

GENERAL				GAMMA RAY				SIDEWALL DENSILOG			
RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	API G.R. UNITS PER LOG DIV.	T.C. SEC.	SENS SETTINGS	ZERO DIV. L OR R	CPS/DIV
1	0	1320	10					3	1000	2R	16,103
1	0	1320	18	3	100	0	5				

REMARKS HOLE LOGGED THROUGH DRILL RODS 1320-110 THROUG RODS AND CASING 110-000 TOOL #554
TOOL # 13

DDH 75-69
(31)

131

GAMMA RAY API —|5|— 0 50
DEPTHS
BULK DENSITY (GRAMS/CC)

ROKE

OIL ENTERPRISES LTD. CALGARY, ALBERTA

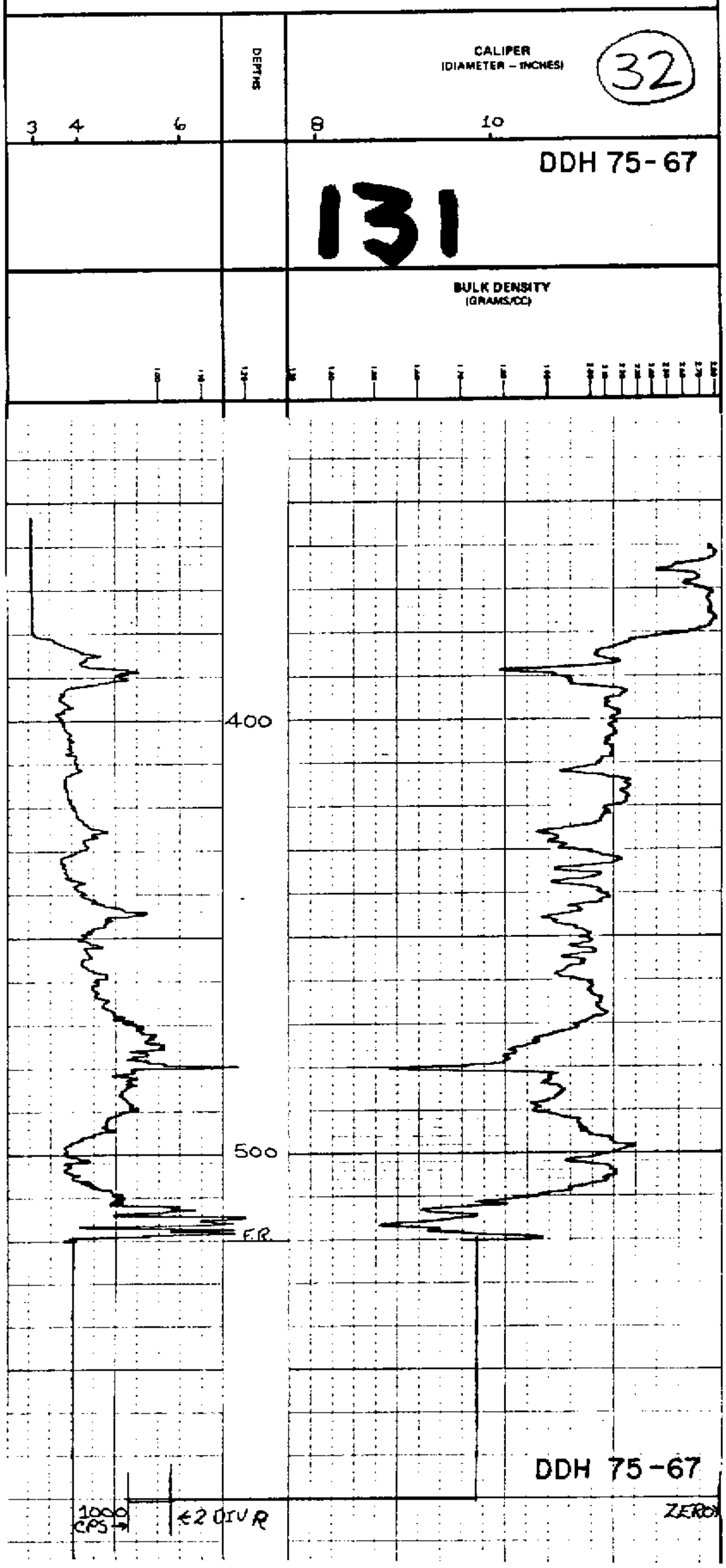
FILE NO	
LSD / SEC / TWP / RGE / W ___ M	
COMPANY	DOLMAGE, CAMPBELL AND ASSOC.
WELL	75-67
LOCATION	55,197 N 15,736 E
FIELD	HAT CREEK
PROVINCE	BRITISH COLUMBIA
Other Services	GR, DENS, GR-RES
Permanent Datum	GROUND LEVEL Elev. 3725
Log Measured from	TOP OF CASING 2 Ft. Above Perm. Datum
Well Depths Measured from	TOP OF CASING
K.B.	
CSG	
G.L.	

Run No.	ONE
Date	2 JUNE 1975
First Reading	520
Last Reading	380
Footage Logged	140
Depth Reached	523
Depth Driller	715
Casing Roke	78/380
Casing Driller	78/380
Fluid Type	MUD
Liquid Level	
Min. Diam.	3 7/8
Operating Time	1 hr
Truck No.	104-303

Recorded By EDWARDS K Witnessed By ROT ZEIN

GENERAL				GAMMA RAY				SIDEWALL DENSILOG			
RUN NO.	DEPTHS FROM	DEPTHS TO	SPEED FT/MIN	T.C. SEC	SENS SETTINGS	ZERO DIV. L OR R	API G.R. UNITS PER LOG DIV.	T.C. SEC	SENS SETTINGS	ZERO DIV. L OR R	CPS/DIV
1	520	380	10					3	1000	2R	3663

REMARKS OPEN HOLE LOG TOOL # 554 TOOL # 459



APPENDIX III

COAL ANALYSES SUMMARIES

DIAMOND DRILL HOLE 75-077

LAB I/D	DRL HOLE #	I/D #	SAMPLE DATA FOOTAGE FROM	TO	LENGTH	MOISTURES % EQUIL	% AS RECVD	DRY BASIS % ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS	ESTIMATED IN-SITU MOISTURE OF 20.00% % ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS
	77-301		2.0	97.0	95.0		10.00	99.99													
	77-302		97.0	101.0	4.0		10.00	99.99													
CT	77-001		101.0	139.0	38.0		30.05	22.27	36.67	41.06	9518	0.71			17.82	29.34	32.85	7615	0.57		
CT	77-002		139.0	167.0	28.0		28.25	24.57	38.09	37.34	9088	0.72	.459	.221	19.66	30.47	29.87	7271	0.58	.368	.177
CT	77-003		167.0	188.0	21.0		28.28	29.80	37.10	33.10	8192	1.05			23.84	29.68	26.48	6553	0.84		
CT	77-004		188.0	210.0	22.0		28.90	33.81	32.56	33.63	7896	0.53			27.05	26.05	26.90	6317	0.43		
CT	77-005		210.0	227.0	17.0		26.24	43.38	29.79	26.83	6518	0.47			34.71	23.83	21.46	5215	0.38		
CT	77-006		227.0	240.0	13.0		29.46	20.61	37.55	41.83	9715	0.38			16.49	30.04	33.47	7772	0.31		
CT	77-007		240.0	260.0	20.0		28.02	37.77	31.41	30.81	7160	0.42			30.22	25.13	24.65	5728	0.33		
CT	77-008		260.0	283.0	23.0		30.82	26.24	34.85	38.91	8865	0.53			20.99	27.88	31.13	7092	0.43		
CT	77-009		283.0	289.5	6.5		28.06	56.17	23.89	19.93	4807	0.33			44.94	19.12	15.95	3845	0.27		
CT	77-010		289.5	339.5	50.0		27.59	33.19	35.00	31.82	7848	0.64	.554	.252	26.55	28.00	25.46	6279	0.51	.443	.202
CT	77-011		339.5	389.5	50.0		26.48	34.87	32.74	32.39	7618	0.92			27.90	26.19	25.91	6095	0.74		
CT	77-012		389.5	443.0	53.5		27.04	28.15	34.44	37.40	8562	0.73			22.52	27.55	29.92	6850	0.58		
CT	77-013		443.0	501.0	58.0		26.97	31.07	33.51	35.42	8193	0.64			24.86	26.81	28.34	6554	0.51		
CT	77-014		501.0	541.0	40.0		26.53	30.82	33.58	35.61	8401	0.68			24.65	26.86	28.49	6721	0.54		
CT	77-015		541.0	581.0	40.0		26.97	25.87	35.16	38.97	8968	0.88			20.69	28.13	31.18	7174	0.70		
CT	77-016		581.0	618.5	37.5		25.73	36.38	32.93	30.69	7558	0.69			29.10	26.35	24.55	6046	0.55		
CT	77-017		618.5	629.5	11.0		21.88	65.19	22.38	12.43	3150	0.52			52.16	17.90	9.94	2520	0.42		
	77-303		629.5	649.5	20.0		10.00	99.99													
CT	77-019		649.5	697.0	47.5		21.03	48.85	27.16	23.98	5582	0.58			39.08	21.73	19.19	4465	0.47		
CT	77-020		697.0	717.0	20.0		11.35	69.86	24.61	5.53	1663	0.28			55.89	19.69	4.42	1330	0.23		
CT	77-021		717.0	737.0	20.0		21.35	34.01	32.69	33.30	7542	0.61			27.21	26.15	26.64	6034	0.49		
CT	77-022		737.0	753.0	16.0		21.48	46.10	28.91	24.99	6012	0.87			36.88	23.13	19.99	4810	0.69		

HAT CREEK COAL PROJECT - STATISTICAL ANALYSIS OF PROXIMATE TEST DATA
DIAMOND DRILL HOLE 75-077

		SAMPLE DATA			MOISTURES	DRY BASIS							ESTIMATED IN-SITU MOISTURE OF 20.00%						
LAB I/D	DRL HOL #	FOOTAGE I/D #	FROM	TO	LENGTH	% EQUIL	% AS RECVD	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS
CT	77-023		753.0	773.5	20.5		22.26	22.87	35.64	41.48	9595	0.72			18.30	28.52	33.19	7676	0.58		
CT	77-024		773.5	811.0	37.5		19.77	34.36	30.94	34.70	7852	0.84			27.49	24.75	27.76	6282	0.67		
CT	77-025		811.0	847.0	36.0		18.55	42.43	29.04	28.53	6546	0.65			33.94	23.23	22.83	5237	0.52		
CT	77-026		847.0	884.0	37.0		12.76	57.97	27.56	14.48	3480	0.36	.313	.487	46.37	22.04	11.58	2784	0.28	.250	.390
CT	77-027		884.0	904.0	20.0		16.75	60.25	21.85	17.90	4143	0.66			48.20	17.48	14.32	3314	0.53		
CT	77-028		904.0	928.0	24.0		19.22	43.85	27.90	28.25	6572	0.56			35.08	22.32	22.60	5258	0.45		
CT	77-029		928.0	953.0	25.0		18.28	54.28	26.38	19.33	4749	0.78			43.43	21.11	15.47	3799	0.63		
CT	77-030		953.0	969.0	16.0		19.69	46.13	29.05	24.82	5964	0.73			36.91	23.24	19.85	4772	0.59		
CT	77-031		969.0	984.0	15.0		19.25	46.02	29.54	24.45	5981	0.57			36.81	23.63	19.56	4785	0.46		
CT	77-032		984.0	992.0	8.0		17.10	56.76	23.09	20.16	4250	0.99			45.40	18.47	16.13	3400	0.79		
CT	77-033		992.0	999.0	7.0		15.64	71.60	18.14	10.27	2262	0.36			57.28	14.51	8.21	1809	0.28		
CT	77-034		999.0	1033.0	34.0		19.30	44.40	27.97	27.63	6506	0.76	.480	.373	35.52	22.37	22.11	5204	0.60	.384	.298
CT	77-035		1033.0	1040.0	7.0		16.54	44.28	26.74	28.97	6325	0.99			35.43	21.39	23.18	5060	0.80		
CT	77-036		1040.0	1064.0	24.0		16.29	59.06	22.35	18.59	4231	0.57			47.25	17.88	14.87	3385	0.46		
CT	77-037		1064.0	1085.0	21.0		18.25	46.28	27.61	26.12	6073	0.49			37.02	22.09	20.89	4859	0.39		
CT	77-038		1085.0	1094.0	9.0		21.63	26.18	34.32	39.49	9252	0.51			20.95	27.46	31.59	7402	0.41		
CT	77-039		1094.0	1104.0	10.0		16.63	47.69	29.70	22.61	5748	0.32			38.15	23.76	18.09	4598	0.26		
CT	77-040		1104.0	1138.0	34.0		19.31	45.53	28.27	26.20	6220	0.33			36.43	22.61	20.96	4976	0.27		
CT	77-041		1138.0	1156.0	18.0		10.69	59.56	36.92	3.53	2471	0.26			47.65	29.53	2.82	1977	0.21		
CT	77-042		1156.0	1196.0	40.0		20.26	45.03	26.57	28.39	6412	0.34	.486	.378	36.03	21.26	22.71	5130	0.27	.389	.303
CT	77-043		1196.0	1234.0	38.0		22.02	33.05	35.82	31.14	7975	0.35			26.44	28.65	24.91	6380	0.28		
CT	77-044		1234.0	1253.0	19.0		20.50	43.62	28.70	27.67	6148	0.26			34.90	22.96	22.14	4919	0.21		
CT	77-045		1253.0	1287.0	34.0		18.71	43.23	29.75	27.03	5359	0.25			34.58	23.80	21.62	4287	0.20		
CT	77-046		1287.0	1327.0	40.0		21.68	37.51	30.52	31.97	7472	0.29			30.01	24.41	25.58	5978	0.23		

DIAMOND DRILL HOLE 75-077

LAB	DRL	SAMPLE DATA			MOISTURES		DRY BASIS							ESTIMATED IN-SITU MOISTURE OF 20.00%						
		FOOTAGE																		
I/D	HOL #	I/D #	FROM	TO	LENGTH	% EQUIL	% AS RECVD	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS
CT	77-047		1327.0	1357.0	30.0	24.46		29.20	34.22	36.58	8864	0.28			23.36	27.38	29.26	7091	0.22		
CT	77-048		1357.0	1387.0	30.0	23.05		30.44	33.20	36.36	8704	0.22			24.35	26.56	29.09	6963	0.18		
CT	77-049		1387.0	1437.0	50.0	25.53		27.90	34.66	37.44	8949	0.24			22.32	27.73	29.95	7159	0.19		
CT	77-050		1437.0	1487.0	50.0	21.84		27.06	36.87	36.07	9015	0.23	.438	.097	21.65	29.50	28.85	7212	0.18	.351	.078
CT	77-051		1487.0	1537.0	50.0	21.01		33.98	32.62	33.40	8128	0.20			27.18	26.10	26.72	6502	0.16		
CT	77-052		1537.0	1579.0	42.0	21.38		22.48	38.15	39.38	9807	0.19			17.98	30.52	31.50	7845	0.15		
CT	77-053		1579.0	1621.0	42.0	22.62		22.87	37.19	39.93	9838	0.19			18.30	29.75	31.95	7871	0.16		
CT	77-054		1621.0	1632.0	11.0	19.96		28.16	33.21	38.63	8841	0.22			22.53	26.57	30.90	7072	0.18		
CT	77-055		1632.0	1682.0	50.0	18.80		35.06	33.03	31.91	7853	0.20			28.05	26.42	25.53	6283	0.16		
CT	77-056		1682.0	1732.0	50.0	20.47		28.24	35.27	36.49	9014	0.28			22.59	28.22	29.19	7211	0.22		
CT	77-057		1732.0	1782.0	50.0	23.52		18.93	36.94	44.13	10513	0.22			15.15	29.55	35.30	8410	0.18		
CT	77-058		1782.0	1814.0	32.0	19.90		18.33	38.01	43.66	10725	0.24	.381	.066	14.66	30.41	34.93	8580	0.19	.305	.053
CT	77-059		1814.0	1846.0	32.0	23.46		20.77	36.58	42.64	10380	0.24			16.62	29.27	34.12	8304	0.19		

DIAMOND DRILL HOLE 75-077

SAMPLE TYPE	TOTAL LENGTH	COUNT	MOISTURES		DRY BASIS							ESTIMATED IN-SITU MOISTURE OF 20.00%						
			% EQUIL	% AS RECVD	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS
SERIES 1-199 :	1725.0	58																
SERIES 201-299 :	0.0	0																
SERIES 301-399 :	119.0	3																
SODA & POTASH TESTS:		7																
MAXIMUM				30.82	71.60	38.15	44.13	10725	1.05	0.554	0.487	57.28	30.52	35.30	8580	0.84	0.443	0.390
MINIMUM				10.69	18.33	18.14	3.53	1663	0.19	0.313	0.066	14.66	14.51	2.82	1330	0.15	0.250	0.053
RANGE				20.13	53.27	20.01	40.60	9062	0.86	0.241	0.421	42.62	16.01	32.48	7250	0.69	0.193	0.337
WEIGHTED MEAN (EXCLUDING SERIES 301-399)		58		22.42	35.63	32.39	31.97	7614	0.48			28.51	25.91	25.58	6091	0.39		
ARITHMETIC MEAN (SERIES 1-199)		58		21.89	38.52	31.37	30.11	7156	0.50	0.444	0.268	30.81	25.09	24.08	5725	0.40	0.356	0.214
STANDARD DEVIATION				4.65	13.42	4.83	9.36	2176	0.24	0.078	0.155	10.74	3.86	7.49	1741	0.20	0.063	0.124
COEFF. OF VARIATION %				21.23	34.84	15.40	31.09	30.41	48.70			34.84	15.40	31.10	30.41	49.37		

REGRESSION EQUATIONS (DRY BASIS): $Y = + 82.43 - 0.00613X$ WHERE Y = PERCENTAGE OF ASH,

$X = +13426.70 - 162.87Y$ X = GROSS BTU PER POUND.

LINEAR CORRELATION COEFFICIENT = -0.9868

<><> NOTE: IN DERIVING THE ABOVE REGRESSION EQUATIONS FROM THE 1-199 SERIES SAMPLES, ONLY THE 49 SAMPLES CONTAINING ASH VALUES < 55.00% HAVE BEEN USED. (55.00% DRY ASH = 44.00% ASH AT 20.00% MOISTURE)

HAT CREEK COAL PROJECT - STATISTICAL ANALYSIS OF PROXIMATE TEST DATA
DIAMOND DRILL HOLE 75-080

LAB	DRL		SAMPLE DATA			MOISTURES		DRY BASIS						ESTIMATED IN-SITU MOISTURE OF 20.00%						
			FOOTAGE								GROSS						GROSS			
I/D	HOL #	I/D #	FROM	TO	LENGTH	% EQUIL	% AS RECVD	% ASH	% V.M.	% F.C.	BTU /LB.	% SULFR	% SODA	% POTAS	% ASH	% V.M.	% F.C.	BTU /LB.	% SULFR	% SODA	% POTAS
	80-301		1.5	50.0	48.5		10.00	99.99													
	80-302		50.0	1172.0	1122.0		10.00	99.99													
LL	80-002		1172.0	1222.0	50.0		17.28	21.01	36.22	42.77	9669	0.62			16.81	28.97	34.22	7735	0.49		
LL	80-003		1222.0	1272.0	50.0		17.08	26.03	35.81	38.17	8795	0.62			20.82	28.64	30.54	7036	0.49		
LL	80-004		1272.0	1322.0	50.0		16.78	24.86	35.27	39.87	9120	0.71			19.89	28.21	31.90	7296	0.57		
LL	80-005		1322.0	1364.0	42.0		15.48	26.46	34.77	38.77	8900	0.70			21.16	27.82	31.02	7120	0.56		
LL	80-006		1364.0	1388.0	24.0		13.86	30.18	33.31	36.51	8442	0.55			24.15	26.64	29.21	6754	0.44		
LL	80-007		1388.0	1427.0	39.0		15.32	38.04	31.19	30.77	7137	0.66			30.43	24.95	24.62	5710	0.53		
LL	80-008		1427.0	1482.0	55.0		17.50	25.98	33.72	40.30	8975	0.76			20.78	26.98	32.24	7180	0.61		
LL	80-009		1482.0	1510.0	28.0		17.02	19.72	36.53	43.76	9902	0.72	.179	.026	15.77	29.22	35.01	7922	0.58	.144	.020
LL	80-010		1510.0	1524.0	14.0		16.70	36.73	32.63	30.64	7307	0.64			29.39	26.10	24.51	5846	0.51		
LL	80-011		1524.0	1574.0	50.0		14.76	24.94	35.85	39.21	9172	0.72			19.95	28.68	31.37	7337	0.57		
LL	80-012		1574.0	1624.0	50.0		17.42	20.89	36.19	42.92	9947	0.61			16.71	28.96	34.33	7957	0.48		
LL	80-013		1624.0	1674.0	50.0		17.48	32.43	32.82	34.75	8038	0.71			25.94	26.25	27.80	6430	0.57		
LL	80-014		1674.0	1702.0	28.0		17.64	33.16	28.86	37.98	8322	0.61			26.53	23.09	30.38	6658	0.49		
LL	80-015		1702.0	1731.5	29.5		16.48	24.74	36.12	39.14	9331	0.74			19.79	28.90	31.31	7465	0.59		
LL	80-016		1731.5	1752.0	20.5		16.34	35.03	30.92	34.04	7924	0.72	.182	.077	28.03	24.74	27.23	6339	0.57	.146	.062

HAT CREEK COAL PROJECT - STATISTICAL ANALYSIS OF PROXIMATE TEST DATA
DIAMOND DRILL HOLE 75-080

SAMPLE TYPE	TOTAL LENGTH	COUNT	MOISTURES % EQUIL	MOISTURES % AS RECVD	DRY BASIS % ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS	ESTIMATED IN-SITU MOISTURE OF 20.00% % ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS
SERIES 1-199 :	580.0	15																
SERIES 201-299 :	0.0	0																
SERIES 301-399 :	1170.5	2																
SODA & POTASH TESTS:		2																
MAXIMUM				17.64	38.04	36.53	43.76	9947	0.76	0.182	0.077	30.43	29.22	35.01	7957	0.61	0.146	0.062
MINIMUM				13.86	19.72	28.86	30.64	7137	0.55	0.179	0.026	15.77	23.09	24.51	5710	0.44	0.144	0.020
RANGE				3.78	18.32	7.67	13.12	2810	0.21	0.003	0.051	14.66	6.13	10.50	2247	0.17	0.002	0.042
WEIGHTED MEAN (EXCLUDING SERIES 301-399)		15		16.57	27.07	34.35	38.58	8854	0.68			21.65	27.48	30.86	7083	0.54		
ARITHMETIC MEAN (SERIES 1-199)		15		16.48	28.01	34.01	37.97	8732	0.67	0.181	0.052	22.40	27.21	30.37	6986	0.53	0.145	0.041
STANDARD DEVIATION				1.13	5.89	2.35	4.03	865	0.06	0.002	0.036	4.71	1.88	3.22	692	0.05	0.001	0.030
COEFF. OF VARIATION %				6.86	21.03	6.90	10.61	9.91	9.52			21.03	6.90	10.61	9.91	9.59		

REGRESSION EQUATIONS (DRY BASIS): Y = + 86.53 - 0.00670X WHERE Y = PERCENTAGE OF ASH.
X = +12912.16 -149.21Y X = GROSS BTU PER POUND.

LINEAR CORRELATION COEFFICIENT = -0.9844

<><> NOTE: IN DERIVING THE ABOVE REGRESSION EQUAT ONS FROM THE 1-199 SERIES SAMPLES, ONLY THE 15 SAMPLES CONTAINING ASH VALUES < 55.00% HAVE BEEN USED.
(55.00% DRY ASH = 44.00% ASH AT 20.00% MOISTURE)

DIAMOND DRILL HOLE 75-082

LAB	DRL	SAMPLE DATA			MOISTURES	DRY BASIS							ESTIMATED IN-SITU MOISTURE OF 20.00%						
		FOOTAGE							GROSS							GROSS			
I/D	HOL #	I/D #	FROM	TO	LENGTH	% EQUIL	% AS RECVD	% ASH	% V.M.	% F.C.	BTU /LB.	% SULFR	% SODA	% POTAS	% ASH	% V.M.	% F.C.	BTU /LB.	% SULFR	% SODA	% POTAS
	82-301		2.0	182.0	180.0		10.00	99.99													
	82-302		182.0	476.5	294.5		10.00	99.99													
LL	82-002		476.5	507.0	30.5		24.32	15.76	39.30	44.94	10262	0.62			12.61	31.44	35.95	8209	0.50		
LL	82-003		507.0	542.0	35.0		17.94	28.66	32.67	38.67	8444	0.74			22.93	26.14	30.93	6755	0.59		
LL	82-004		542.0	565.0	23.0		17.12	38.82	31.30	29.89	6731	0.42			31.05	25.04	23.91	5385	0.34		
LL	82-005		565.0	598.0	33.0		15.50	45.09	26.76	28.15	6070	0.65			36.07	21.41	22.52	4856	0.52		
LL	82-006		598.0	634.0	36.0		20.30	33.75	32.84	33.41	7364	0.70			27.00	26.27	26.73	5891	0.56		
LL	82-007		634.0	673.5	39.5		20.60	36.90	30.96	32.14	6929	0.65			29.52	24.77	25.71	5544	0.52		
LL	82-008		673.5	700.0	26.5		18.00	39.21	28.67	32.12	7004	0.73			31.37	22.94	25.70	5603	0.59		
LL	82-009		700.0	715.5	15.5		15.18	35.42	34.58	30.00	6816	0.54	.273	.067	28.33	27.66	24.00	5452	0.43	.218	.054
LL	82-010		715.5	751.0	35.5		19.84	46.31	31.57	22.12	5722	0.46			37.05	25.26	17.69	4578	0.37		
LL	82-011		751.0	783.5	32.5		19.12	54.95	23.23	21.82	4587	0.68			43.96	18.59	17.46	3670	0.54		
LL	82-012		783.5	814.0	30.5		17.12	50.59	26.42	22.98	5210	0.58			40.47	21.14	18.39	4168	0.46		
LL	82-013		814.0	850.0	36.0		18.60	34.89	31.13	33.98	7631	0.68			27.91	24.90	27.18	6105	0.54		
LL	82-014		850.0	869.0	19.0		20.58	51.20	24.77	24.04	4980	0.64			40.96	19.81	19.23	3984	0.51		
	82-303		869.0	924.0	55.0		10.00	99.99													
LL	82-015		924.0	951.5	27.5		18.58	54.38	25.50	20.12	4437	0.42			43.51	20.40	16.09	3550	0.33		
LL	82-016		951.5	1001.0	49.5		16.28	39.00	30.49	30.51	7004	0.57			31.20	24.40	24.41	5603	0.46		
	82-304		1001.0	1027.0	26.0		10.00	99.99													
LL	82-017		1027.0	1053.0	26.0		12.18	44.18	24.72	31.10	5605	0.71	.362	.376	35.35	19.78	24.88	4484	0.56	.290	.300
LL	82-018		1053.0	1072.5	19.5		14.36	57.89	21.05	21.05	4337	0.56			46.31	16.84	16.84	3469	0.45		
	82-305		1072.5	1084.5	12.0		10.00	99.99													
LL	82-019		1084.5	1117.0	32.5		13.98	54.15	25.96	19.89	4602	0.47			43.32	20.77	15.91	3682	0.37		
LL	82-020		1117.0	1129.0	12.0		13.68	57.37	24.97	17.67	4001	0.37			45.89	19.97	14.13	3201	0.30		

DIAMOND DRILL HOLE 75-082

LAB	DRL HOL #	I/D #	SAMPLE DATA FOOTAGE FROM	TO	LENGTH	MOISTURES % EQUIL	% AS RECVD	DRY BASIS % ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS	ESTIMATED IN-SITU MOISTURE OF 20.00% % ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS
	82-306		1129.0	1148.0	19.0		10.00	99.99													
LL	82-022		1148.0	1179.0	31.0		10.18	47.85	28.90	23.25	5963	0.73			38.28	23.12	18.60	4770	0.59		
LL	82-023		1179.0	1204.0	25.0		11.92	50.86	25.49	23.65	5454	0.73			40.69	20.39	18.92	4363	0.58		
	82-307		1204.0	1225.0	21.0		10.00	99.99													
LL	82-024		1225.0	1248.0	23.0		12.92	55.58	22.45	21.97	4740	0.41			44.46	17.96	17.57	3792	0.33		
LL	82-025		1248.0	1276.0	28.0		10.10	70.09	17.64	12.27	2222	0.46	.189	.400	56.07	14.11	9.82	1778	0.36	.151	.320
LL	82-026		1276.0	1310.0	34.0		11.02	57.14	21.69	21.17	4435	0.55			45.71	17.35	16.94	3548	0.44		
	82-308		1310.0	1329.5	19.5		10.00	99.99													
LL	82-027		1329.5	1351.0	21.5		12.84	47.58	26.51	25.91	5778	0.68			38.06	21.21	20.73	4622	0.54		
	82-309		1351.0	1360.0	9.0		10.00	99.99													
LL	82-028		1360.0	1378.0	18.0		14.96	44.39	27.28	28.33	6315	0.75			35.51	21.83	22.66	5052	0.60		
	82-310		1378.0	1389.0	11.0		10.00	99.99													
LL	82-029		1389.0	1412.0	23.0		10.30	56.37	25.93	17.70	4135	0.50			45.09	20.74	14.16	3308	0.40		
	82-311		1412.0	1421.5	9.5		10.00	99.99													
LL	82-030		1421.5	1441.0	19.5		14.34	56.63	23.23	20.14	4410	0.69			45.30	18.59	16.11	3528	0.55		
	82-312		1441.0	1727.0	286.0		10.00	99.99													

DIAMOND DRILL HOLE 75-082

SAMPLE TYPE	TOTAL LENGTH	COUNT	MOISTURES		DRY BASIS						ESTIMATED IN-SITU MOISTURE OF 20.00%						
			% EQUIL	% AS RECVD	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS
SERIES 1-199 :	782.5	28																
SERIES 201-299 :	0.0	0																
SERIES 301-399 :	942.5	12																
SODA & POTASH TESTS:		3																
MAXIMUM				24.32	70.09	39.30	44.94	10262	0.75	0.362	0.400	56.07	31.44	35.95	8209	0.60	0.290	0.320
MINIMUM				10.10	15.76	17.64	12.27	2222	0.37	0.189	0.067	12.61	14.11	9.82	1778	0.30	0.151	0.054
RANGE				14.22	54.33	21.66	32.67	8040	0.38	0.173	0.333	43.46	17.33	26.13	6431	0.30	0.139	0.266
WEIGHTED MEAN (EXCLUDING SERIES 301-399)		28		16.11	45.55	27.75	26.70	5919	0.60			36.44	22.20	21.36	4735	0.48		
ARITHMETIC MEAN (SERIES 1-199)		28		15.78	46.61	27.36	26.04	5757	0.60	0.275	0.281	37.28	21.88	20.82	4605	0.47	0.220	0.225
STANDARD DEVIATION				3.71	11.24	4.65	7.09	1621	0.12	0.087	0.186	8.99	3.72	5.67	1296	0.10	0.070	0.148
COEFF. OF VARIATION %				23.48	24.11	17.01	27.22	28.15	19.80			24.11	17.00	27.23	28.15	20.08		

REGRESSION EQUATIONS (DRY BASIS): Y = + 85.76 - 0.00682X WHERE Y = PERCENTAGE OF ASH,
X = +12565.20 -146.49Y X = GROSS BTU PER POUND.

LINEAR CORRELATION COEFFICIENT = -0.9847

<><> NOTE: IN DERIVING THE ABOVE REGRESSION EQUATIONS FROM THE 1-199 SERIES SAMPLES, ONLY THE 21 SAMPLES CONTAINING ASH VALUES < 55.00% HAVE BEEN USED.
(55.00% DRY ASH = 44.00% ASH AT 20.00% MOISTURE)

HAT CREEK COAL PROJECT — STATISTICAL ANALYSIS OF PROXIMATE TEST DATA

DIAMOND DRILL HOLE 75-085

CLEAN	COAL	SAMPLE DATA			MOISTURES		DRY BASIS						ESTIMATED IN-SITU MOISTURE OF 20.00%						
		FOOTAGE			%	%				GROSS						GROSS			
I/D	INCL	I/D	FROM	TO	LENGTH	COAL	AS RECVD	ASH	V.M.	F.C.	BTU /LB.	SULFR	SODA	POTAS	ASH	V.M.	F.C.	BTU /LB.	SULFR	SODA	POTAS
		85-001	2.0	214.0	212.0		16.00	99.99													
		85-002	214.0	756.0	556.0		16.00	99.99													
C		85-002	756.0	779.0	39.0		23.82	23.81	36.02	40.17	9244	0.66			19.05	28.82	32.13	7395	0.55		
C		85-002	779.0	824.0	35.0		25.34	27.80	34.62	37.58	8564	0.57			22.24	27.69	30.06	6851	0.46		
C		85-002	824.0	843.5	19.5		21.24	38.37	30.64	31.01	6986	0.48			30.70	24.49	24.81	5590	0.39		
C		85-002	836.5	864.0	27.5		24.73	22.03	36.16	41.80	9477	0.58			17.62	28.94	33.44	7581	0.47		
C		85-002	862.0	892.0	30.0		24.84	25.37	35.18	39.45	9075	0.78			20.30	28.14	31.56	7260	0.63		

DIAMOND DRILL HOLE 75-085

SERIES TYPES	TOTAL (GOOD & BAD)		MOISTURES		DRY BASIS						ESTIMATED IN-SITU MOISTURE OF 20.00%						
			% COAL	% AS RECVD	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS	% ASH	% V.M.	% F.C.	GROSS BTU /LB.	% SULFR	% SODA	% POTAS
SERIES 1-199 :	142.0	5																
SERIES 201-299 :	0.0	0																
SERIES 301-399 :	748.0	2																
SODA & POTASH TESTS:		0																
MAXIMUM				24.84	36.37	36.16	41.80	9477	0.76			30.70	26.94	33.44	7561	0.63		
MINIMUM				21.22	22.03	30.62	31.01	6988	0.48			17.62	24.49	24.61	5590	0.39		
RANGE				3.62	14.34	5.54	10.79	2489	0.30			13.08	4.45	8.83	1971	0.24		
WEIGHTED MEAN (EXCLUDING SERIES 301-399)		5		23.08	26.42	35.06	38.50	8193	0.64			20.82	26.07	31.12	7114	0.51		
ARITHMETIC MEAN (SERIES 1-199)		5		23.00	27.48	34.52	38.00	8070	0.61			21.98	27.61	30.39	6935	0.49		
STANDARD DEVIATION				1.40	6.45	2.27	4.19	968	0.11			5.16	1.82	5.35	799	0.09		
COEFF. OF VARIATION %				6.20	23.47	6.58	11.03	11.51	18.24			23.47	6.58	11.03	11.51	18.31		

REGRESSION EQUATIONS (DRY BASIS): Y = + 63.40 - 0.00645X WHERE Y = PERCENTAGE OF ASH,
X = +12978.41 -155.00Y X = GROSS BTU PER POUND.

LINEAR CORRELATION COEFFICIENT = -0.9986

<><> NOTE: IN DERIVING THE ABOVE REGRESSION EQUATIONS FROM THE 1-199 SERIES SAMPLES, ONLY THE 5 SAMPLES CONTAINING ASH VALUES < 55.00% HAVE BEEN USED. (55.00% DRY ASH = 44.00% ASH AT 20.00% MOISTURE)

OUTLINE OF COAL LICENCES

RED GROUP
Ten Licences
5708 Acres
(1868 Acres 1st year)

ORANGE GROUP
Nine Licences
5418 Acres
(4138 Acres 1st year)

2757 2758 2755 2758 CG-83912E 2760 144 2754 2759 32 2761 2762 2753 3013 3012 3004 3010 3011 3003 3009 3002 3008 3001 3007 3000 2999 3006 2997 2998 3005 2996 2995 2993 2994 2992 2991

W. BOUNDARY FAULT
ALEEGE FAULT
Medicine Creek Fault
MAG FAULT
WEST BOUNDARY FAULT
E. BOUNDARY FAULT

LEGEND

Late Tertiary (Miocene)

Volcanics undifferentiated.

Early Tertiary (Eocene)

Mostly covered : Coldwater Fm. (siltstone, sandstone, coal) subcrop known in many locations by drilling; a few outcrops along creek beds etc.

Cretaceous

Spences Bridge Group : andesite, dacite, basalt.

Mount Lytton Batholith : granodiorite, diorite

PERMIAN

Cache Creek Group

Marble Canyon Fm. : limestone

Greenstone suite : (altered volcanics, chert, phyllite etc.)

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P.E. Jones

PROFESSIONAL ENGINEER

LEGEND

COMPILATION NOTE

CONTROL NOTE

75(1)E

B. C. HYDRO & POWER AUTHORITY

DOLMAGE CAMPBELL & ASSOCIATES LTD

GEOLOGICAL COMPILATION
UPPER HAT CREEK VALLEY

SCALE 1 INCH TO 400 FEET

CONTOUR INTERVAL 50 FEET

P/C

1

FIG. 3

LEGEND

LATE TERTIARY

Prob. Miocene : rhyolite, rhyolitic tuff ; andesite, dacite, basalt, in flows and breccias ; comprises at least 5 phases ; prob. equivalent of Kamloops Group.

EARLY TERTIARY

Eocene : Coldwater Formation : coal, siltstone, sandstone, conglomerate.

CRETACEOUS

Spences Bridge Group : andesite, dacite, basalt.

Mount Lytton Batholitte : granodiorite, diorite.

PERMIAN

Cache Creek Group :

Marble Canyon Formation : limestone

Greenstone suite (altered volcanics, chert, phyllite etc.)

Outcrop areas (defined, approximate)

Outcrop data supplied by Dr. N. Church, B.C. Dept. of Mines

Strike and dip of bedding (inclined, vertical)

Foliation (inclined, vertical)

Planar structure, parting etc. associated with volcanic flow structure (inclined, vertical)

Joint sets (inclined, vertical)

75-54 Diamond drill holes pertinent to assessment report

LEGEND

Spot Elevation	5275	Lake	
Main Road		Creeks	
Secondary Road		Swamp	
Track or Trail		Ditch	
Buildings		Contours	3500
Fence		Depression Contour	
Dams		Trees	

COMPILATION NOTE

This map was compiled by McELHANNEY SURVEYING & ENGINEERING LTD. from aerial photography taken May 13, 1975 at an approximate scale of 1 inch to 2000 feet.

CONTROL NOTE

Mapping is based on ground control surveys established to 3rd order accuracy.

Coordinate origin is based on the prior D.C.A. drill hole survey with addition of 70,000 feet to Northings and 10,000 feet to Eastings.

Grid bearing is astronomic north through station 6259.

Horizontal distances are reduced to 3,000 foot elevation datum.

Elevation datum is geodetic, established from Geodetic Bench Mark 563J at Corquile.

B. C. HYDRO & POWER AUTHORITY

DOLMAGE CAMPBELL & ASSOCIATES LTD.

GEOLOGY AND DRILL HOLE LOCATIONS

(2)

SCALE : - 1 INCH TO 2000 FEET

2000 1000 0 2000 4000 6000 8000 FT.

CONTOUR INTERVAL 50 FEET
(UP TO 4500 FEET)
100 FT. INTERVAL ABOVE 4500 FT.

M.S.E.L. REF. NO. 06185-G

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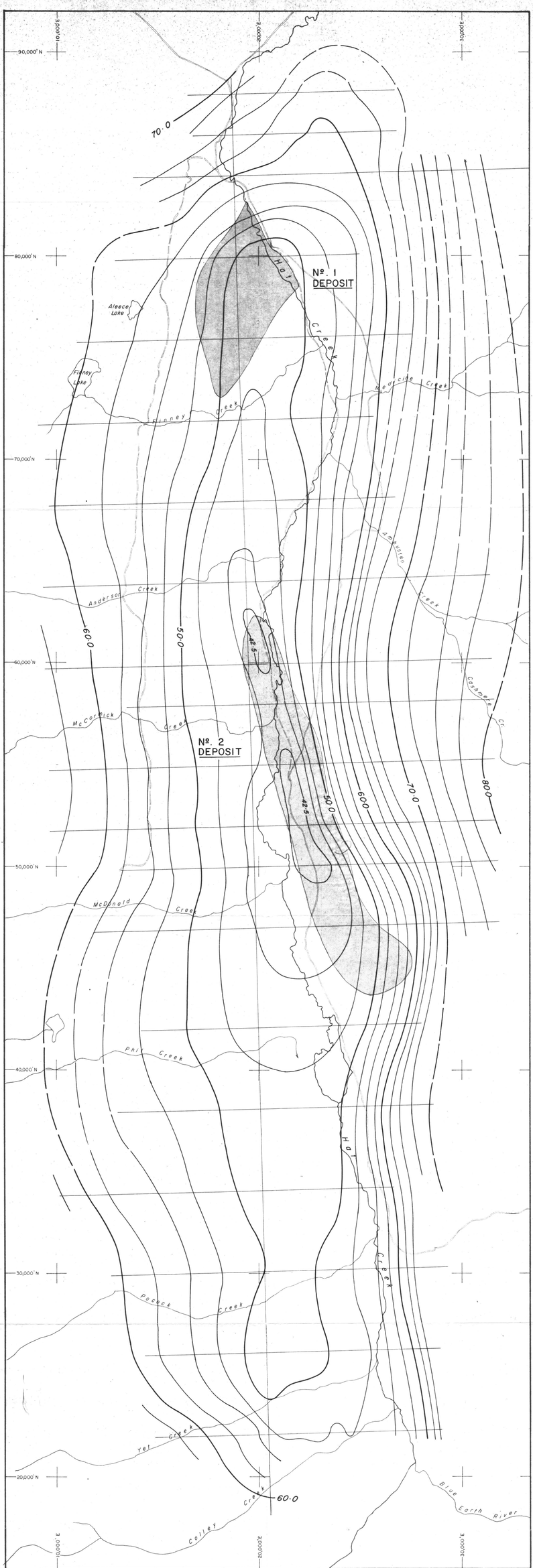
HC 75(1)E

FIG. 4



UNCORRECTED FOR TERRAIN
CONTOUR INTERVAL - 2·5 mgal.

2000 0 2000 4000 FEET

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DOLMAGE CAMPBELL & ASSOCIATES LTD. CONSULTANTS
VANCOUVER, CANADA

B.C. HYDRO & POWER AUTHORITY
VANCOUVER, CANADA

HAT CREEK COAL PROJECT (3)

GRAVITY SURVEY

SCALE : 1" = 2000' | DEC., 1975 | FIG. 5