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CONSULTING GEOLOGICAL & MINING ENGINEERS  
1000 GUINNESS TOWER  
VANCOUVER 1, B.C.

B.C. Hydro & Power Authority

SUMMARY REPORT

1974 HAT CREEK EXPLORATION & DRILLING

- ( I) RESULTS OF STAGE I PROGRAM
- ( II) RECOMMENDED STAGE II (EXPLORATION) PROGRAM
- (III) RECOMMENDED STAGE III (OPENPIT NO. 1) PROGRAM

October 28, 1974

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SUMMARY

The Stage 1 drill exploration program of the Hat Creek coal deposit was completed under budget on October 15, 1974. Results indicate that the coal deposit is grossly displaced by regional block faults and internally dislocated by normal faulting. The stratigraphic sequence and structures of the coal measure and the surrounding strata are still imperfectly known.

The previously established coal reserve at Hat Creek occur in a length of coal measure that is terminated at the north and south ends by regional block faults and along the east edge by a steep, normal fault. This area of the western termination has not been established. Faulting has subtracted some coal from the previously estimated reserve; however, coal extensions found by Stage 1 drilling result in an appreciable net gain in the reserves.

The possible displaced southern extension of the coal measure is inferred, from magnetometer anomalies and new coal discoveries, to lie about one mile southwest of No. 1 Openpit, in an area of apparent shallow overburden. It would appear to equal No. 1 Openpit in general plan size. This area, around Finney Creek, may have the coal potential of No. 1 Openpit, in which case it would be a more favourable location for the initial mining for the power plant.

A major exploratory drill program, termed Stage 2, is recommended for the exploration of the Finney Creek area, together with other potential coal areas around No. 1 Openpit. The total cost of this stage 2 program is estimated to be \$ 914,500.00.

Additional drilling of No. 1 Openpit for definitive pit design, reserve calculations, grade determination and sampling, is recommended to be done before production is planned for that deposit. The total cost of such a program, Stage 3, is estimated to be approximately \$ 500,000.00.

It is recommended that this program be deferred until the results of Stage 2 are available, after which it might be more advisable to transfer Stage 3 to the Finney Creek pit area.

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INTRODUCTION

The Hat Creek coal deposit has been principally defined by a limited program of surface diamond drilling done in 1957 and 1959. This drilling was not sufficiently comprehensive to establish all of the limits of the coal deposit and therefore, since the entire Hat Creek valley is deeply blanketed by overburden, any feasibility study of the deposit for production to support a thermal plant requires additional data in order to determine the optimum dimensions and/or location for the coal openpit. A drill program, termed Stage I, to serve this purpose was proposed to B.C. Hydro and Power Authority in early 1974 and was begun in July, 1974. The essential elements of this program were completed on October 15 with the completion of 21,482 feet of diamond drilling in 18 holes, two of which were aborted at shallow depths.

The present report summarizes the results of the Stage I program and recommends two follow-up drill programs, one to complete the investigation of the original openpit and the other to continue exploration of the valley for additional coal deposits. Full details, including core logs, coal analyses etc., of the Stage I program will be included in a comprehensive reassessment report of the Hat Creek deposit wherein all available data is correlated and weighted.

For convenience in reporting, the coal area drilled in 1957-59 is hereafter referred to as No. 1 Openpit.

What have been, and are, referred to in reports as "drill programs" include all ancillary exploration methods or systems that have been or will be used along with the drill holes to attain the objectives of the programs. Such auxiliary features include geophysical logging of drill holes, surface geophysical surveys, mapping, trenching and any other form of investigation that can reasonably contribute to the accumulation and/or interpretation of data.

The diamond drill holes completed in Stage I are listed, with footages, in Table I.

TABLE I

HAT CREEK - EXPLORATION - STAGE I DRILLING

| <u>Hole No.</u> | <u>Overburden<br/>(ft.)</u> | <u>Total Depth<br/>(ft.)</u> |
|-----------------|-----------------------------|------------------------------|
| 74 - 23         | 231                         | 1355                         |
| 24              | 210                         | 386                          |
| 25              | 98                          | 2072                         |
| 26              | 59                          | 1522                         |
| 27              | 420                         | 1501                         |
| 28 (1)          | 330                         | 330                          |
| 28 (2)          | 380                         | 1469                         |
| 29              | 383                         | 1359                         |
| 30              | 151                         | 1099                         |
| 31              | 222                         | 664                          |
| 32              | 304                         | 1750                         |
| 33              | 227                         | 1386                         |
| 34              | 106                         | 998                          |
| 35              | 390                         | 932                          |
| 36              | 301                         | 967                          |
| 37              | 162                         | 167                          |
| 38              | 64                          | 2084                         |
| 39              | 33                          | 1441                         |
| Totals          | 4,071 ft.                   | 21,482 ft.                   |

16 completed holes

2 aborted holes - overburden only.

Total drilling - 21,482 ft.

Total overburden - 4,071 ft.

Total bedrock - 17,411 ft.

Shortest completed hole 664 ft.

Longest completed hole 2084 ft.

Ave. thickness of O.B. drilled 220 ft.

PART I

RESULTS OF STAGE I DRILLING

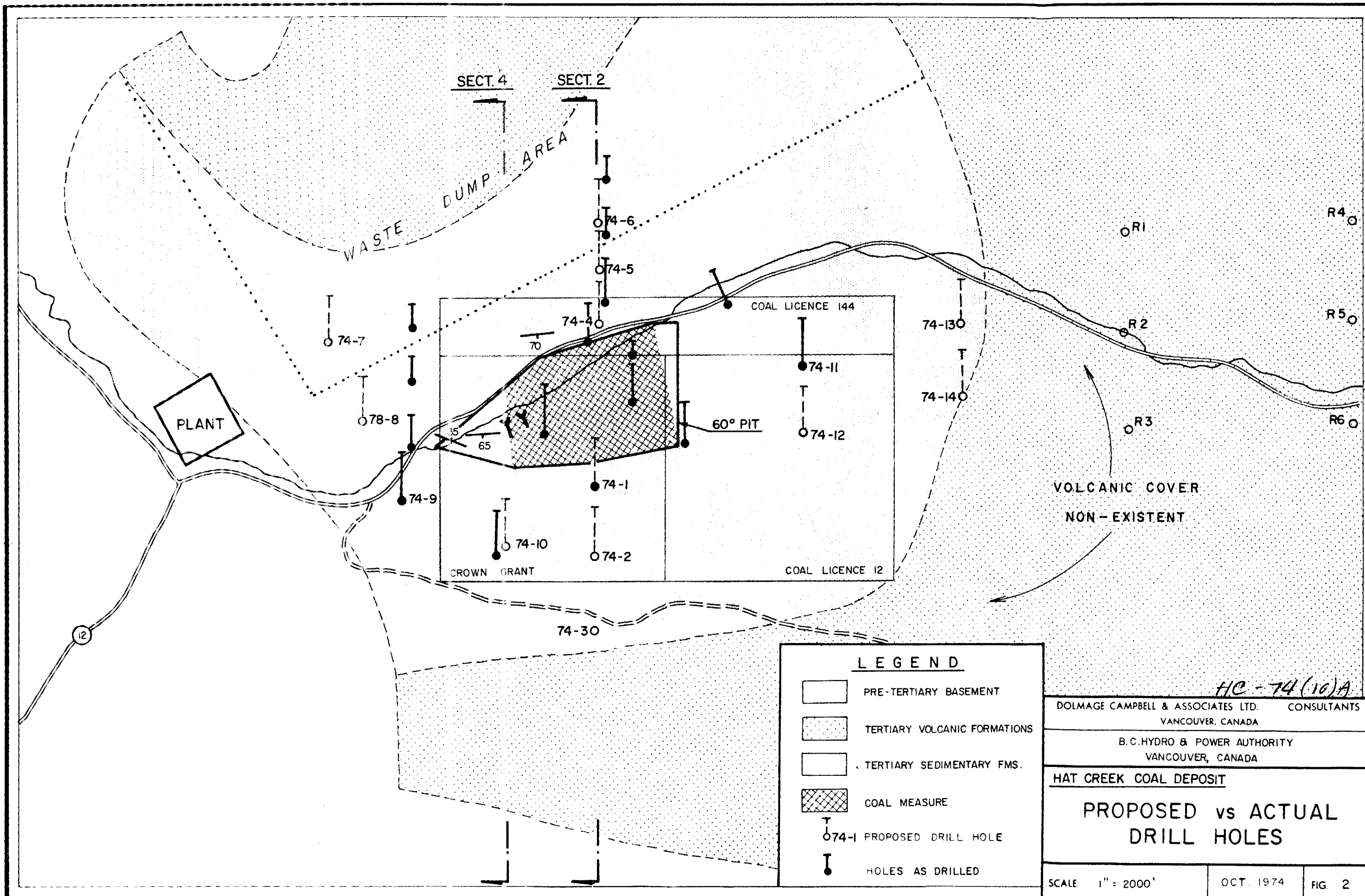
Hat Creek Coal

PART 1STAGE 1, 1974 HAT CREEK DRILL PROGRAMOBJECTIVES OF STAGE 1:

Earlier analysis of the 1957-59 Hat Creek data indicated that although the drilling had proven the existence in the deposit of a very large volume of coal, mineable by surface methods, it had not delimited the extensions of the coal deposit in any direction nor had it fully resolved the geological structures of the deposit or the enclosing formation. Because of the thick, ubiquitous overburden cover on the floor of the valley of Upper Hat Creek, such coal extensions and geological structures could only be conjectured from the data available from the very limited drilling. The purpose of the 1974 Stage 1 drill program was to establish the geological limits and extensions, if any, of the coal deposit as known from the 1957-59 drilling. The program was primarily designed to optimize openpit location and design rather than confirm the coal reserves.

With the above objectives in mind a total of 21,500 feet of diamond drilling in 14 holes was proposed, together with 9,000 feet of rotary drilling in six holes. The purpose of the rotary holes was to probe through the cover of volcanic rocks that is indicated on the government geological map as blanketing the valley of Upper Hat Creek everywhere beyond a mile radius of the coal deposit. The diamond drill holes were laid out in four east-west lines, one across the north end of the deposit; another across the south end; a third extending eastward from the east side of the deposit; and a fourth extending westward. This layout of holes was predicated on the relatively simple structure of the coal measure that was assumed from the 1957-59 data. These data indicate that the coal occurs in five extremely thick beds that strike slightly west of north and dip vertically at the surface and westward with depth. The bedding attitudes exposed in the drill cores are markedly regular and do not indicate the presence of disruptive folding; however, the occurrence of gouge planes in the core is not uncommon, suggesting the presence of faulting within the coal measure. Nevertheless, there is insufficient evidence available not to adopt the simplest indicated structure of the coal measure at this time. Thus, assuming that the coal measure strikes north and south and dips steeply westward, the north line of proposed drill holes would determine its extension to the north, and the south line its extension in that direction. The holes to the west would determine the dip of the measure and the possible presence of additional coal beds in the hanging wall; the holes to the east would determine the possible presence of undiscovered coal beds in the footwall. An important function of these exploratory holes was also the determination of what land around the proposed openpit would be available for plant and waste dump locations.

It was acknowledged that the proposed holes would probably be changed in depths, inclinations or locations as the program proceeded and more data on the deposit became available.





## CHANGES IN THE PROPOSED PROGRAM - (Figure 2)

A number of significant changes were made in the proposed program, all coming as a result of new discoveries regarding the geology of the valley or the deposit.

DELETIONS: The major deletion to the program was the cancellation of all of the rotary holes. This occurred just as drilling began and was the result of the reconnaissance mapping of the valley which revealed that the cover of volcanic rocks that was indicated on the government geological map as blanketing most of the valley of Upper Hat Creek does not exist. The valley is almost entirely covered deeply by sand-gravel overburden. There is no indication anywhere that the bedrock underlying this overburden is anything but the sedimentary coal-bearing strata that occur in the vicinity of the drilled coal deposit. Since the purpose of the rotary drilling was to provide a relatively rapid and low cost means of penetrating through what might have been a thick cover of barren volcanic rock, (testing for coal in the underlying rocks by means of geophysical logging of the rotary holes), the absence of such cover cancelled the need for the rotary holes. However, the possible use of geophysical logging of drill holes was retained as part of the program, to be employed if it would appear that it would materially benefit the program.

The other deletion to the original program was the cancellation of three southernmost diamond drill holes, shown as 74-12, 74-13 and 74-14 on Figure 2. This cancellation was brought about by the fact that the initial southern hole, 74-11 on Fig. 2, indicated that the coal measure did not extend that far south and was probably faulted off north of that hole.

## ADDITIONS TO THE PROGRAM:

DRILLING - - There were no drilling additions to the original program; rather, the drilling that was cancelled in the south was transferred to the 1957-59 drilled area where three holes were drilled to check the geological correlation of the known coal measure within the reserve portion of the deposit.

Many of the drill holes did not reach their planned depth, whereas a few were drilled deeper than planned. A major limitation on the depth of the drill holes became evident when it was found that holes in rocks other than coal tend to squeeze shut at depths below about 1200 feet. This tendency caused increasingly difficult and abortively slower drilling with depth, resulting in the loss of one core barrel, and tens of feet of rods in the Stage 1 holes. Several holes in Stage 1 were terminated because drilling progress became too slow and difficult to be economically sensible to continue. In contrast to this feature of holes drilled in the rock in and around the coal measure, holes drilled wholly or mostly in coal do not squeeze shut. This is a function of the apparent greater competence of the coal than of the very poorly indurated rock, much of which is poorly compacted, uncemented clay, silt or sand. (As an example; at the time of writing this report, drill hole No. 37A,

almost entirely in coal, is drilling easily at a depth of 2000 feet.) In any case, several short holes were added to the program as footage was gained from terminated holes.

GEOPHYSICAL SURVEYS - As the Stage 1 program progressed it became evident that the coal measure is dislocated by major faults. The search for the displaced portions of the coal measure, beneath deep overburden, would be inordinately costly and difficult if done solely by means of probing by diamond drill holes. For this reason it was decided to experiment with all available methods of surface indirect sensing in order to find some means that might detect coal through thick overburden. No such detection method is known in the industry; however, the unusually great mass of coal that comprises the body of the Hat Creek deposit is geologically unique. Its vast bulk, one half a square mile in area and over 1000 feet in depth, with physical and chemical characteristics that are very different from the surrounding rocks, would hopefully respond anomalously to some form of remote sensing. On this assumption, the following methods were tried at Hat Creek during Stage 1:

- (a) Airborne - Heat sensing
  - Infra-red photography
  
- (b) Ground surveys - Resistivity
  - Gravity
  - Electro-magnetic
  - Magnetic

All of the above test surveys were made across the centre of the known coal deposit where it is most thoroughly drilled, 1959 Section 2. Only two of the methods returned possibly anomalous results; the airborne heat sensing registered a slight anomaly at the west contact of the coal; however, it is difficult to resolve the anomaly with certainty and the cost of the survey is very high. The ground magnetometer survey registered a slight but distinct anomaly over the coal, at low cost, and it was therefore decided to survey the entire deposit with this method.

The magnetometer survey of the known coal deposit indicated a reasonably close reflection of the shape of the deposit as a relatively uniform magnetic low over the coal. This anomaly also shows an apparent truncation to the south, where a major cross fault had been suspected from the drilling. With this encouragement, the magnetometer survey was extended one mile to the south and one half a mile to the north of the drilled deposit. No significant (low) anomaly was detected to the north; however, a major anomalous area was detected to the south, but 3000 feet west of what would be the southern extension of the coal deposit. Prospecting in this area revealed signs of coal in the overburden and a subsequent trench, 40 feet in length, has been dug a few feet to bedrock

and is entirely in coal. It now remains to test the significance of the magnetometer apparent anomaly to determine whether or not it reflects a major body of coal in this new area. The magnitude of the magnetometer anomaly over known coal is slight, only 50 to 100 gammas; however, this small increment may just represent the different heavy mineral content between the coal, which is essentially devoid of magnetite, and the enclosing sedimentary rocks.

*If the new magnetic anomalous area proves to be a valid indicator of underlying coal, then a complete magnetometer survey of the entire Upper Hat Creek valley is warranted.*

If the magnetometer apparent anomalies prove to be spurious, the airborne heat sensing data should be reconsidered, since it did suggest some positive response.

DRILL HOLE GEOPHYSICAL MONITORING: Five of the Stage I diamond drill holes have been monitored by down-the-hole geophysical instruments. This method clearly differentiates between coal and waste; however, at Hat Creek where the core recovery is close to 100 percent, this is no advantage. A study of the initial results do suggest that the geophysical logging may greatly assist in the correlation of the coal seams within the deposit by positively identifying unique electrochemical characteristics of an otherwise featureless mass of coal.

A major hindrance to the geophysical monitoring of diamond drill holes at Hat Creek is the tendency of the holes to squeeze and cave once the drill rods are pulled, especially where the holes intersect significant thicknesses of siltstone or sandstone. None of the holes monitored in Stage I could be probed to its full depth. This means that if geophysical hole logging is desired at Hat Creek it requires the stand-by attendance on a drill project of a logging truck and operator, at a cost of approximately \$13,000.00 per month. The current assessment of the logging done to date will determine the efficacy of such monitoring at Hat Creek.

GEOLOGICAL MAPPING: Geological mapping of the valley of Upper Hat Creek was begun with Stage I and is continuing. Although bedrock outcrops are sparse in the valley they are more numerous around the rim and the gross structural picture of the basin is beginning to be developed.

An enlargement of an earth satellite sub-infrared photograph of the Hat Creek area has been obtained and has proven extremely useful in detecting major faults in and around the Hat Creek basin. Two of these faults, the Medicine Creek and the West Boundary, (See Fig. 1), have been confirmed by field mapping and two, the Dry Lake and the Finney, have been inferred by drilling and the magnetometer surveys.

### RESULTS OF STAGE 1:

GEOLOGY: The core drilling, mapping and magnetometer surveying completed in Stage I have indicated the presence of major block faults around and within the coal-bearing Tertiary basin of Upper Hat Creek. The basin itself has apparently been dislocated into blocks by cross faults which may or may not terminate to the west on a fault, the West Boundary, that forms the west and north sides of the Tertiary basin and appears to be a major branch of the Fraser Fault Zone to the southwest. The known and inferred cross faults at the north end of the valley are, (See Figure 1):

- (i) Dry Lake Fault - This appears to be a branch of the West Boundary fault. Its presence is inferred from the ERTS photo and from the drill results which indicate an abrupt termination of the coal measure at 12,000 N, with entirely different strata occurring to the north.
- (ii) Finney Fault - This major cross fault is inferred from the ERTS photo, the magnetometer survey and the drill results. On section 7000 N the coal measure is more than 2500 feet in stratigraphic thickness, but at 4500 N it has disappeared (on strike).
- (iii) Medicine Creek Fault - This cross fault is about one mile south of the Finney Fault and has been mapped on the east side of the valley and is prominent on the ERTS photo.

It is also evident from the drilling and the magnetometer survey that major, steeply-dipping north to northeast-trending faults occur within the known coal deposit, No. 1 Openpit. One such fault, the Mag, has been precisely located by drilling and the magnetometer survey; it strikes northwestward and dips steeply eastward. This fault evidently cuts off the coal measure to the east in what appears to be a normal dip-slip displacement.

There is evidence that the coal measure is tightly folded at the north end of No. 1 Openpit near the junction of the Dry Lake and the Mag faults; however, there is no evidence of such folding elsewhere in the area, since bedding attitudes in all of the drill core are particularly uniform in each hole and generally uniform in all holes.

At this time it appears that deformation of the coal measure has been principally by block and normal faulting and although folding and thrust faulting may not be significant the dislocation by normal faults may be complex.

It is now apparent that the simple stratigraphy assumed from the 1957-59 data does not apply. Faulting has so dislocated the strata into slices and blocks that the stratigraphic sequence of the coal measure, as well as the overlying and underlying beds, cannot be determined without additional drilling. The top of the coal measure is apparently marked by a conglomerate bed that contains coal fragments. The bottom of the coal measure has not been determined.

Within the 1957-59 coal measure it appears now that Seams 2 and 3 are one massive coal bed about 1600 feet in stratigraphic thickness whose top is very dirty coal and whose bottom is very clean. This great mass of coal has been correlated visually from hole to hole and tentatively by the geophysical logging; it strikes northward and dips westward, but probably not as steeply as hitherto assumed. Seams 4 and 5 appear to be discontinuous and possibly just part of the top of the Seam 2-3 mass. Seam 1 appears east of Seam 2 and was assumed to lie stratigraphically below it; however, deep drilling in Stage 1 reveals that it does not continue down below Seam 2 to the west. The answer to this problem is not yet known but dislocation by faulting appears to be the most likely. A new bed of coal, Seam 0, was found in the Stage 1 drilling to lie east of (beneath) Seam 1; however, only one hole is in this coal and its relation to the other coal seams can only be surmised at this time.

Earlier it had been assumed that the coal seams dipped very steeply down to the west and were therefore too deep to mine in that direction. There is some evidence now that the seams may dip or be faulted back up to the surface west of No. 1 Openpit but south of Dry Lake Fault, (Fig. 1).

Additional drilling is required in the vicinity of No. 1 Openpit to determine the stratigraphy of the coal measure and the enclosing strata.

COAL RESERVES: The reserves of No. 1 Openpit are being recalculated. It is evident from the drilling that some coal will be lost from the reserve at the extreme north end of the pit area, (11,500 N), where the coal is not as deep as earlier assumed. There will also be some loss of No. 1 Seam at depth along the east side of the pit; however, this loss will probably be made up by the addition of the hitherto unknown No. 0 Seam.

A very major addition to the reserves exists to the south, between 7500 N and 6500 N (Finney Fault?), where the Stage 1 hole No. 37A has intersected over 1600 feet of coal. This additional tonnage will probably result in a net increase of the 1957-59 pit reserves by possibly as much as 20 percent.

The possibility of the faulted extension of the entire No. 1 Openpit coal deposit occurring west along Finney Creek, in the block between the Finney and the Medicine Creek faults, is important. It not only implies a new major reserve

of coal but also a deposit that would appear to be more amenable to openpit mining than No. 1 Openpit because the Finney Creek area is covered by relatively thin overburden.

The potential south of Medicine Creek will remain unknown until more is learned of the Finney Creek area. It should be appreciated that block faulting further south could conceivably have displaced the coal measure upward, and it has been eroded, or laterally, where it is beneath deep (volcanic) cover; therefore, the potential southward in the valley must be determined by progressive exploration from the north.

#### BUDGET:

Stage 1 was completed overall below budget. The funds estimated originally for the rotary drilling were allocated to the geophysical surveys and only partly consumed. Overruns in other items were small and easily made up by underruns in many items and by the contingency fund.

A good deal of the money charged to Stage 1 was actually expenditure that would better be charged to Stage 2, i.e., winter camp, extra equipment, etc.

PART II

RECOMMENDED EXPLORATION PROGRAM

STAGE II

Hat Creek Coal

PART IIRECOMMENDED EXPLORATION, STAGE 2

Stage I drill program determined the general limits of the No. 1 Openpit coal deposit; however, it did not fully explore possible fault repetitions of the coal deposit to the east and to the west, nor did it succeed in determining the stratigraphy of the coal measure. Also, the displaced portion of the coal deposit to the south has not been located. Thus, the complete assessment of the total coal resource of the north end of the valley requires continued exploration, the bulk of which must be by drilling.

A recommended next phase of exploration is designed primarily to attempt to (1) resolve the stratigraphy of the coal measure and the enclosing Tertiary strata, (2) determine the general fault pattern if possible, and (3) locate and verify the southern displaced portion of the No. 1 Openpit coal deposit. Secondary objectives will be reconnaissance exploration for coal to the north and further elaboration of the No. 1 Openpit structure. The immediate interest in possible coal to the north is diminished by the deep overburden in that area together with the restricted available space (Tertiary strata) for reserves in that area.

The principal targets for this Stage 2 exploration are described below.

POTENTIAL COAL AREAS: (Figure 1)

(1) No. 1 Openpit: The nature of the western repetition or continuation of the coal measure that forms the No. 1 Openpit deposit has not been determined. It is possible that the coal seams have been faulted back up to, or near to, the surface to the west, south of the Dry Lake Fault. Four vertical drill holes and one dipping hole, each 1500 feet in depth, are recommended to explore in this area.

The continuity of No. 1 and 0 seams at depth along the Mag Fault has not been resolved. Contingent with this is the location of a possible faulted section of the coal measure to the east of the Mag Fault. One deep hole is recommended to attempt to shed light on this problem and an additional deep hole may be useful in this area.

(2) Northern extension: There is a possible coal potential in the segment of Tertiary strata lying between the inferred West Boundary and Dry Lake faults. Stage I drilling has not enhanced this potential, therefore only two vertical holes are recommended to complete the reconnaissance exploration of this fault block.



Also, there is a suggestion of the continuation of the coal measure at the extreme north end of the valley on the east side of the Dry Lake Fault. However, the great depth of overburden, (200 - 400 feet), and the close proximity of the Indian Reservation, suggest that a coal deposit in this area would definitely be of secondary economic importance to the No. 1 Openpit deposit. One deep exploratory hole has been recommended to probe this area.

(3) Possible Finney Creek Deposit: As shown in Figure 1, the magnetometer survey suggests the possible existence about one mile southwest of No. 1 Openpit of a coal deposit as large as that at No. 1 Openpit. Additional encouragement for this possibility has been introduced by the exposure of good coal in two backhoe trenches on Finney Creek, one 40 feet in length. Certainly, the displaced portion of the No. 1 Openpit south of the inferred Finney fault should occur somewhere in the valley, provided of course that it has not been displaced upward and has thus been eroded away, (In such a case, the down-dip extension of the coal measure may still be available for mining.). This search for the displaced portion of the coal measure is encouraged by the fact that at 7000 N it is comprised of over 2000 stratigraphic feet of uninterrupted coal, dipping west and striking southward, and it is geologically unlikely that such a stratigraphic section pinches out within 2000 feet of strike length.

Accordingly, the bulk of the Stage 2 drilling has been assigned to exploring for the possible displaced coal measure south of Finney Creek Fault. Fifteen widely-spaced vertical diamond drill holes have been assigned to this task. Tentative locations for these holes are shown on Figure 1; however, it should be appreciated that these locations could be shifted extensively as data from the initial holes is obtained. Drilling has begun on hole 74-42, about 700 feet northeast of the coal exposure in Finney Creek, and has revealed the existence there of only 40 feet of overburden.

#### METHODS OF EXPLORATION; STAGE 2:

DRILLING: As described above, a total of 24 exploratory diamond drill holes have been recommended for Stage 2. All but one of the holes will be vertical and each will be approximately 1500 feet in depth (if possible). The total footage for Stage 2 is thus 36,000 feet.

GEOPHYSICAL LOGGING OF HOLES: Because of the squeezing of the holes at Hat Creek, it is necessary to have a geophysical logging unit standing by on site in order to log holes as soon as drilling ceases. This requires a stand-by (rental) charge of approximately \$13,000.00 per month, or a total charge of \$52,000.00 for four months. This amount has been included in the budget; however, it is recommended that this geophysical logging be carefully assessed during the initial phase of the program to determine its real worth for Stage 2 and that it be reduced to two months' use if its benefits prove to be limited.

It should be appreciated that because core recovery is close to 100 percent, the only use at Hat Creek for geophysical logging of the holes is for geological correlation. Because the holes squeeze shut it is not recommended that the drill exploration at this stage be that of rotary holes with geophysical logging. Under such circumstances it is quite likely that the holes would cave, with or without a geophysical probe in them, and there would be no record of the hole available. At least with core drilling the geological structures are determined and coal is obtained for analysis. The utilization of rotary holes and geophysical logging for exploration should be held in abeyance as a final resort if the magnetometer surveys, with diamond drill follow-up, fail.

GROUND GEOPHYSICAL SURVEYS: If the drilling at Finney Creek confirms the magnetometer (low) anomaly over the coal, then the use of this type of survey to explore the remainder of the Upper Hat Creek valley is warranted. Such a survey can be done in the winter and is recommended as part of Stage 2.

TRENCHING & PROSPECTING: In view of the apparent shallow overburden cover in the Finney Creek area it would be most sensible to provide additional structural data, and possible coal samples, by bulldozer trenching. With shallow overburden this would not desecrate the landscape to the major extent as it would at No. 1 Openpit. Reclamation permits will be explored for this purpose and the cost of trenching is included in the budget.

Surface mapping and coal prospecting of the valley will continue as long as weather permits.

BUDGET:

The preliminary estimate for the cost of Stage 2 is given in Table 2. Exact drilling costs cannot be listed at this time because specific bids have not yet been submitted; however, the listed cost per foot is close to what the present contractor is estimating.

It is estimated that the Stage 2 program of 36,000 feet will take approximately  $5\frac{1}{2}$  months, including the Christmas layoffs. This is estimated from the present rate of 7000 feet per month, with the possible disadvantage of winter drilling but with the definite advantage of vertical holes only.

The total budget for Stage 2 is estimated to be \$914,500.00. Major primary increases in the budget from Stage 1 are in coal analyses, geophysical logging of drill holes and in drilling. The increase in drilling costs is a result of winter drilling, which requires haulage of drill water by truck, and of a recent union settlement that increased total drilling costs by approximately 8 percent. The increase in coal analyses costs is principally due to more sophisticated analyses required by design engineers. The geophysical logging could be sharply reduced with no loss to the general exploratory purpose of the program. / no

TABLE 2  
PRELIMINARY BUDGET ESTIMATE

STAGE 2

Hat Creek Coal Exploration

|                                                                                                                                                                                                       |                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| (1) DRILLING<br>36,000 ft. @ \$16.50                                                                                                                                                                  | \$594,000.00        |
| (2) SITE PREPARATION<br>(Tote roads)                                                                                                                                                                  | 5,000.00            |
| (3) COAL ANALYSES<br>Estimate 11,000 ft. of coal @ 20 ft/sample = 550 analyses<br>550 proximate analyses @ \$32 = \$17,600.00<br>100 composite analyses @ \$202 = 20,200.00<br><u>\$37,800.00</u> say | 40,000.00           |
| (4) GEOPHYSICAL LOGGING OF HOLES<br>4 months @ \$13,000.00                                                                                                                                            | 52,000.00           |
| (5) GEOPHYSICAL AND TOPO SURVEYS<br>Magnetometer etc.                                                                                                                                                 | 15,000.00           |
| (6) TRENCHING                                                                                                                                                                                         | 5,000.00            |
| (7) CAMP CONSTRUCTION & MAINTENANCE<br>Board of staff, etc.                                                                                                                                           | 8,000.00            |
| (8) FIELD OFFICE & EQUIPMENT<br>Trailer rental etc.                                                                                                                                                   | 6,000.00            |
| (9) TRANSPORTATION & FREIGHT<br>Vehicle rentals, shipment of core etc.                                                                                                                                | 5,000.00            |
| (10) TRAVEL & COMMUNICATION                                                                                                                                                                           | 2,500.00            |
| (11) SALARIES<br>Field staff (1 geologist, 1 helper)                                                                                                                                                  | 15,000.00           |
| (12) SUNDRIES                                                                                                                                                                                         | <u>1,000.00</u>     |
|                                                                                                                                                                                                       | \$748,500.00        |
| (13) MANAGEMENT & ADMINISTRATION 8% (approx.)                                                                                                                                                         | <u>60,000.00</u>    |
|                                                                                                                                                                                                       | \$808,500.00        |
| (14) CONTINGENCIES (8%) (approx.)                                                                                                                                                                     | <u>65,000.00</u>    |
|                                                                                                                                                                                                       | \$873,500.00        |
| (15) ENGINEERING & SUPERVISION                                                                                                                                                                        | 35,000.00           |
| (16) CONSULTING & REPORTS                                                                                                                                                                             | <u>6,000.00</u>     |
|                                                                                                                                                                                                       | <u>\$914,500.00</u> |

If desired, up to 6000 feet of drilling at the north end of the valley could be deferred until another program, with a consequent saving of approximately \$100,000.00.

PART III

STAGE 3

RECOMMENDED DRILLING OF NO. 1 OPENPIT

*Hat Creek Coal*

PART IIIDRILLING OF NO. 1 OPENPIT

It is evident from the Stage 1 drill results that considerable fill-in drilling is required in the No. 1 Openpit area to (1) properly define pit design, (2) correlate geological structures, (3) permit recalculation of reserves, (4) provide comprehensive coal analyses, and (5) provide test coal samples.

As described earlier in this report, the amount of coal reserve in No. 1 Openpit has been probably appreciably increased by Stage 1 drilling; however, the distribution of the reserves by "seams" or structures is not clearly understood. Thus additional drilling is required particularly at the south end of the block and along the east side.

The amount of this drilling is presently being assessed but it appears that approximately 20,000 feet of additional drilling will be required as a minimum program to serve all purposes. The total cost of such a program would be in the range of \$ 500,000.00, depending on how much geophysical logging etc. would be done.

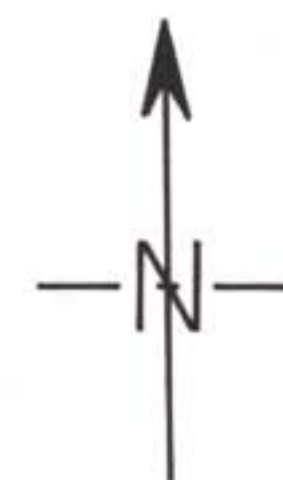
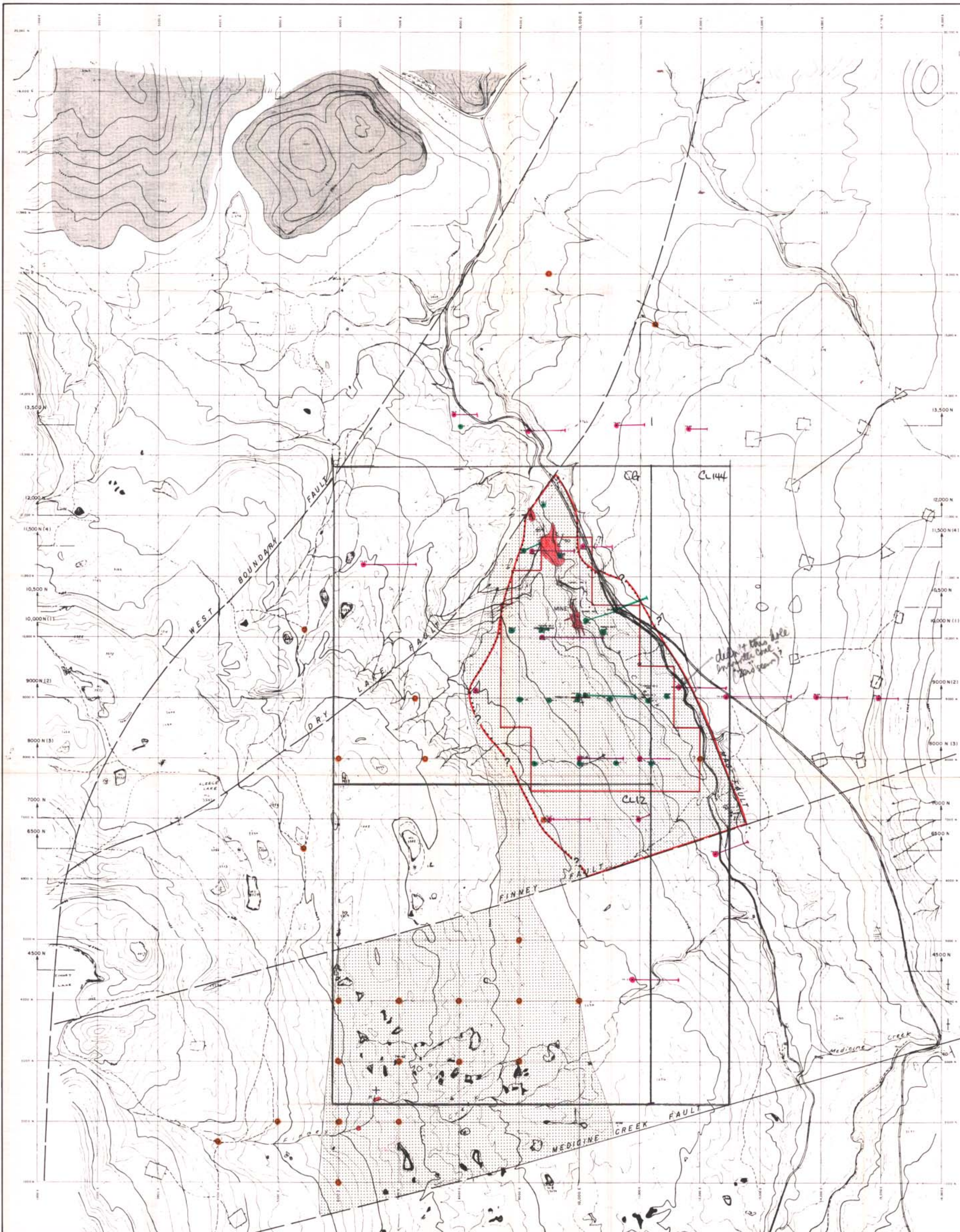
It is recommended that if possible this program be deferred until the results of Stage 2 are obtained. It is possible that the Finney Creek area may contain a more economic coal deposit than the No. 1 Openpit body, with less overburden and in a more suitable location; therefore, the Stage 3 drill program would more sensibly be done on the Finney Creek deposit, with the follow-up definitive drilling of No. 1 Openpit being deferred until such time as that coal is required.

Respectfully submitted,

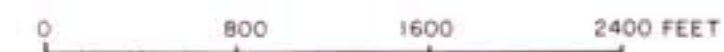
DOLMAGE CAMPBELL & ASSOCIATES LTD.



Douglas D. Campbell, P.Eng. PhD.



SCALE 1" = 800'



**LEGEND**

- OVERBURDEN
- CACHE CREEK GROUP (PRE-TERTIARY) MARBLE CANYON LIMESTONE
- TERTIARY COAL**
  - COAL OUTCROP
  - NO. 1 OPENPIT RESERVES
  - OUTLINE OF DRILLED COAL
- STRUCTURE**
  - KNOWN FAULT
  - INFERRED FAULT
  - BEDDING ATTITUDE
- DRILLING**
  - PRE-1974 DRILL HOLES
  - 1974 STAGE 1 DRILL HOLES
  - PROPOSED STAGE 2 (EXPLORATION)
  - PROPOSED STAGE 3 (OPENPIT NO. 1)
- GEOPHYSICS**
  - AREA OF MAGNETIC LOW

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|                                                                    |            |        |
|--------------------------------------------------------------------|------------|--------|
| DOLMAGE CAMPBELL & ASSOCIATES LTD CONSULTANTS<br>VANCOUVER, CANADA |            |        |
| B.C. HYDRO & POWER AUTHORITY<br>VANCOUVER, CANADA                  |            |        |
| <b>HAT CREEK PROJECT</b>                                           |            |        |
| <b>STAGE 1 RESULTS</b><br><b>1974 EXPLORATION PROGRAM</b>          |            |        |
| SCALE 1" = 800'                                                    | OCT. 10/74 | FIG. 1 |