HILLSIDE ENERGY CORPORATION

A Report on the Geology and Mineralization of the Zeolite Occurrence on the STIK CLAIMS

Similkameen Mining Division
British Columbia

Owners:	Operators:
Kettle River Resources Inc. P.O. Box 130 Greenwood, B.C.	Hillside Energy Corporation #401 - 134 Abbott Street Vancouver, B.C. V6B2K4

NTS Location Map: 92H 7/E
Latitude: 49° 24' N
Longitude: 120°35' W

by
T.L. SADLIER-BROWN

dated
JANUARY 31, 1989

ARIS SUMMARY SHEET

District Geologist, Kamloops — Off Confidential: 89.12.06

ASSESSMENT REPORT 18543 — MINING DIVISION: Similkameen

PROPERTY: Stik
LOCATION: LAT 49 24 00 LONG 120 35 00
UTM 10 5474512 675339
NTS 092H07E

CAMP: 012 Nicola Belt

CLAIM(S): Stik 10,Stik 12
OPERATOR(S): Hillside Energy
AUTHOR(S): Sadlier-Brown, T.
REPORT YEAR: 1989, 27 Pages
COMMODITIES SEARCHED FOR: Zeolite
KEYWORDS: Eocene,Allenby Formation,Zeolite,Clinoptilolite,Princeton Basin Tuff
WORK DONE: Geochemical
META 11 sample(s)
SAMP 11 sample(s)
MINFILE: 092HSE166

NEVIN | SADLIER-BROWN | GOODBRAND | LTD

Suite 401-134 Abbott St., Vancouver, B.C. Canada V6B 2K4 (604) 683-8271 Telex: 04-352888

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SUMMARY

Hillside Energy Corporation holds rights to a deposit of the zeolite mineral "clinoptilolite" located in the Princeton area of southwestern British Columbia.

During the late summer and fall of 1988 the company conducted an exploration and development program incorporating a geological investigation (mapping/sampling), bulk sampling and material testing on the property.

The zeolite bearing rock unit is inferred to have sufficient magnitude to be of commercial significance if viable markets can be established for the material.

Preliminary analyses confirm that the material is clinoptilolite and that it can adsorb ammonia and possibly zinc from aqueous solution. Market research suggests that it may be useful in a variety of applications where cation adsorption is required, including municipal waste treatment (removal of ammonia), nuclear waste treatment (removal of cesium and strontium), industrial waste treatment (heavy metal and other cation adsorption) and as a component in certain fertilizers and cement aggregates.

Although complete test results have not yet been received, continued work both on the deposit itself and in research into applications is warranted and recommended.

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Terms of Reference

Zeolites are a class of alkali aluminum silicate minerals with unique physical properties which make them useful in a number of industrial applications. Their unique feature is an open crystal structure enabling them to act as molecular sieves which can selectively adsorb specific molecules from gases and liquids. They are in use world-wide in such diverse applications as fillers in paper manufacturing, adsorbents ("green sands") in chemical and radioactive waste management, light-weight aggregates and pozzolans in cement manufacture, and in the manufacture of fertilizer and soil treatment products. A deposit of the zeolite mineral clinoptilolite occurs near Princeton, B.C. and is the subject of the exploration program described here.

This report was prepared on behalf of Hillside Energy Corporation of Vancouver, B.C., to comply with the work requirements of the B.C. Mineral Tenure Act. The information contained in the report is based upon data gathered by the writer during the course of an exploration program conducted on the property between September 15 and December 3, 1988. This is augmented by an evaluation of the property by B.A. Slim, P.Eng. carried out in August 1988, and testing of material from the property conducted by several industrial mineral users, processors and suppliers.

The zeolite deposit on the STIK Claims is the first and, at present, only occurrence of this industrial mineral to be explored for commercial possibilities in Canada. Field work included geological mapping combined with conventional prospecting and bulk sampling.

Unlike metals many industrial minerals, including zeolite, which are now administered under the Mineral Tenure Act, have no ready market with internationally quoted prices. The price and therefore the viability of the deposit is entirely dependent upon the suitability of run-of-the-mine material in a variety of possible industrial uses. For this reason, the sampling program incorporated distribution of material to a number of potential markets for evaluation in their particular applications. This work represents a significant component of the total exploration and development effort conducted during the 1988 assessment year. The report summarizes these evaluations as they have economic implications with respect to the property and are analogous to assay data for a metallic mineral prospect.

1.2 Property and Ownership

The STIK property consists of eight metric claims comprising a total of 129 metric units. Hillside Energy Corporation holds the property under terms of an agreement with Blackberry Gold Resources Inc. who, in turn, have an option on a larger claim group incorporating the property under discussion, from Kettle River Resources, the recorded owners. Claim names and pertinent data are summarized on Table 1 which follows:

Table 1

CLAIM NAME	RECORD NUMBER	AREA (METRIC UNITS)
STIK 3	2322	20
4	2323	15
9	2328	20
10	2329	4
11	2330	20
12	2331	10
13	2332	20
14	2333	20

The date of record for all claims is December 13th and the property is depicted on Claim Sheet 92H/7E.

1.3 Location, Access and Geographic Setting

The STIK property is situated in southwestern British Columbia immediately southwest of the community of Princeton and is centred at about49° 25' north latitude and 120° 33' west longitude.

The property is readily accessed by Highway #3 (the Hope-Princeton Highway) which crosses the western part of the claims. Good access throughout the claim grooup is afforded by a number of secondary roads and unimproved logging roads and/or skid trails.

Elevations on the claim group vary from approximately 800 m to over 1200 m above sea level. The terrain is hilly but with a general easterly slope to the Similkameen River which traverses the extreme southeast corner of the property. The principal drainage in the area of interest is Bromley Creek which flows from west to east across the central part of the claim group entering the Similkameen River just south of Allenby.

The most westerly and highest part of the property is mantled in mixed coniferous forest with open pine forest dominating. In the central and eastern part of the claim group this gives way to isolated stands of open pine forest and open meadow and grassland. Some of the meadowland is cultivated for hay and much of the remainder is used as cattle range.

Surface rights on the property are, for the most part, privately held by a number of owners. The principal area of interest, however, is Crown land.

1.4 Historical Background

The earliest mining activity in the general vicinity of the claim group consisted of placer mining for gold and platinum in the Similkameen and in particular in the Tulameen Rivers. With the discovery of copper at Copper Mountain, Princeton became an important centre for both mining and smelting, with the latter benefitting from the discovery of coal in the rocks of the Princeton and Tulameen basins. Coal production between 1901 and 1960, from the immediate area of the STIK claims, is reported to total approximately 1.8 million tons. The coal produced was of bituminous to sub-butuminous grade and is of particular interest because the coal measures are intimately related to the zeolite horizons.

The STIK claims were originally staked to cover suspected deposits of alluvial gold. In 1986 and 1987 an exploration program was conducted by Blackberry Gold Resources and, although precious metal values were encountered in drill holes, the values were not considered sufficient to justify development. The zeolite deposits were originally identified by the B.C. Ministry of Energy Mines and Petroleum Resources during the course of an industrial minerals study carried out in 1985 and 1986. Hillside Energy Corporation became interested in the property in 1987 and acquired rights from Blackberry Resources under terms of a letter agreement dated August 3, 1988.

2.0 GEOLOGY

2.1 General Setting

The STIK zeolite claims are underlain by a sequence of Tertiary volcanic and sedimentary rocks which form the Princeton Basin. The geology of the Basin is described in detail by Read (1987) and summarily described here.

The Princeton Basin is a northerly trending trough or graben filled in Eocene time by intermediate volcanics consisting principally of rhyolite tephra, sandstone, shale and coal measures. These rocks comprise the Allenby Formation which is to the order of 2000 m thick, thinning to the west and offset and/or terminated by left lateral strike slip faults. Its eastern limit is defined by a north/northeasterly trending normal fault or fault system which bounds the graben.

The Eocene sequence within the graben has been subjected to both folding and faulting. The principal structure in the vicinity of the STIK claims is a broad synclinal fold termed "The Tailings Syncline". This feature is truncated in the central part of the Basin by the northerly trending Asp Creek Fault.

The principal occurrences of zeolite on the STIK claims are hosted by the rocks of the Allenby formation and are situated:

a) at Bromley Vale in the "Bromley Vale Tephra", a unit within the easterly dipping rocks which comprise the west limb of the Tailings Syncline west of the Asp Creek Fault; and

b) north and west of Rt. 3 at a point 4 km southwest of Princeton. Here the zeolite occurs in the "Tailings Ash" unit east of the Asp Creek Fault.

Both the Bromley Vale Tephra and Tailings Ash units may be offset equivalents of one another on opposite sides of the fault. If so, the strata have been subjected to a right lateral displacement of approximately one kilometre.

2.2 Geology of the Zeolite Occurrence

Zeolite mineralization in the Princeton Basin forms as apparent stratigraphic horizons in a sequence of Eocene clastic sediments, tuffs and coal measures which comprise the Allenby formation. The zeolites themselves are derived from the tuff deposits where the latter have been subjected to hydrothermal alteration and re-crystallization.

Geological mapping in 1988 was confined to a strip of Crown owned land lying north and west of Watkins Lake in the general Bromley Vale area. The principal zeolite exposure in this part of the property is near the portal of the old Bromley Vale #1 mine. This was a small underground coal mine situated in the narrow steep-sided valley of Bromley Creek about 600 m upstream from its confluence with Findlay Creek. In this area, zeolitized tephra is exposed along both sides of a northerly flowing segment of Bromley Creek for a distance of approximately 80 m. The rocks strike at between 170° and 180° and they dip easterly at 30° to 35°. The lower contact of the zeolitized unit is exposed in a narrow canyon incised by an easterly flowing segment of Bromley Creek upstream from the old coal mine. In this area the zeolitized member of the Bromley Vale tephra is underlain by Eocene shales and sandstones of

the Summers Creek (sand) and/or Power Plant (shale) units. The upper contact of the zeolitized unit is not locally exposed but is assumed either to correspond with the crest of a small north/south trending ridge east of Bromley Creek or to lie on the dip slope east of this crest. Its precise location, however, is obscured by heavy Quaternary glacial overburden which mantles the bedrock throughout the area of interest. The thickness of the zeolite-rich unit in this area is uncertain but probably exceeds 20 m.

In the immediate vicinity of the Bromley Vale exposure the easterly dipping configuration of the stratigraphy and the general easterly topographic slope suggest that the zeolitized tephra unit should have a broad surface trace. The ridge lying immediately to the east of Bromley Creek canyon forms a dip slope which may be entirely underlain by the zeolitized tephra. If this is the case, there is a strong possibility for development of a substantial reserve in the immediate area of the Bromley Vale #1 mine.

Within the map area only one additional zeolite occurrence was observed. This consisted of a large angular block of float in the valley at the north end of Watkins Lake. The source of this material is uncertain but it could be glacially transported from the Bromley Vale area one kilometer to the northwest or more locally derived from the inferred southern extension of the zeolite horizon which would sub-crop on the western slope of the valley. The latter case is a good possibility but it could not be confirmed by a thorough search for outcrops. Nevertheless, signs of old coal workings strengthen the likelihood of an extension because of the close stratigraphic relationship between the tephra and coal at the Bromley Vale site. If valid, the implied strike length in the Bromley Vale area would be at least one kilometre.

3.0 MINERALOGLY AND PHYSICAL PROPERTIES OF THE ZEOLITE

3.1 Sampling and Testing

A total of 11 samples comprising some 350 kg of zeolitized material were taken from the Bromley Vale and Tailings Ash exposures. The material was sent to Bondar Clegg Laboratories Ltd. of North Vancouver, B.C. where it was crushed and screened in preparation for delivery to several private and public testing facilities. The testing was conducted for the purpose of identifying applications for the commodity in existing markets and also to evaluate the properties of the material for markets which have yet to be developed. The principal applications under consideration are:

1. As an adsorbent of cation pollutants such as ammonia and heavy metals in industrial or municipal waste.

2. As an adsorbent of soluble radioisotopes such as cesium and strontium from industrial and accidental nuclear waste.

3. As a substrate in the manufacture of ammonia/nitrogen fertilizers or as a soil conditioner.

With the exception of specialized applications in the petroleum refining industry, zeolites are not presently utilized in Canada. For this reason successful development of the STIK zeolite property will depend almost entirely upon identification of an appropriate application for the material. The testing requirements, therefore, although analogous in many respects to assays in metallic mineral exploration and development, are necessarily involved and specialized

procedures. Furthermore, the results from many of these procedures are not quantitative; instead they may simply confirm or fail to confirm that the material has properties which make it useful in the contemplated application.

For preliminary testing purposes it was determined that the preferred size fraction for the zeolite was in the range between -20 and +40 mesh. This fraction was considered to optimize permeability and particle surface area available to the fluids being tested.

Screened samples were forwarded for testing to:

Savolite Chemical Co., Delta, B.C.
UBC Mineralogy Department, Vancouver, B.C.
Freshwater Farms Ltd., Duncan, B.C.
Equity Silver Mines Ltd., Houston, B.C.
Ontario Hydro, Toronto, Ontario
Atomic Energy of Canada, Pinawa, Manitoba
Anderson Chemical Waste Disposal, Richmond, B.C.

Preliminary information on the deposit and/or analytical data was also forwarded for evaluation to a number of other organizations including:

Reef Mud, Calgary Alberta
British Nuclear Fuels, Risley, UK
Canadian Water and Wastewater Association, Ottawa Ontario
Environment Canada Wastewater Technology Centre, Burlington Ontario
Placer Dome Inc., Vancouver B.C.
Tracer Analytical Laboratories, Medicine Hat Alberta
B.C. Research, Vancouver B.C.
Western Canada Fertilizer Assoociation, Surrey B.C.
U.B.C. Soil Conservation Department, Vancouver B.C.
University of Guelph, Guelph Ontario
B.C. Ministry of Agriculture and Fisheries, Kelowna B.C.
Truckee Municipal Sewage Department, Truckee California.

3.2 Physical Properties of the Zeolite

Results have been received from four of the potential industrial users. These are Savolite Chemical Co., U.B.C., Freshwater Farms and Equity Silver. Ontario Hydro had not completed its tests by the time of writing and did not anticipate results until early- to mid-1989. Nor have results yet been received from A.E.C. Testing to date by Anderson has been minimal and results, with respect to their potential application, are not conclusive.

Savolite Chemical Company was primarily interested in the material as an absorbent of water and oil. An additional benefit might have been derived from the adsorptive properties of the material. Their tests for both water and oil show that the material does not meet the standard for an absorbent. Results are depicted in Appendix A (Savolite report).

X-ray defraction analysis done by the U.B.C. Mineralogy laboratory (Horsky 1986) confirm that the mineral present is clinoptilolite, a member of the zeolite class of minerals described by Breck (1974) as follows:

Structure Group:	7
Typical Unit Cell Contents:	$Na_6[(AlO_2)_6(SiO_2)_{30}] \cdot 24\ H_2O$
Variations:	Na, K ≫ Ca, Mg; Si/Al = 4.25-5.25; in sedimentary type $Si/(Al + Fe^{3+})$ = 4.1-5.6
Occurrence:	Wyoming; extensive sedimentary occurrences in western U. S.
System:	Monoclinic, a = 7.41 b = 17.89 c = 15.85 $\beta = 91°29'$
Habit:	Tabular, platy
Cleavage:	[010]
Density:	2.16
Optical Properties:	Biaxial (-), $\alpha = 1.476, \beta = 1.479, \gamma = 1.479$
Reference:	6, 38, 49-53

X-Ray Powder Data (52)

hkl	d(A)	I	hkl	d(A)	I	hkl	d(A)	I
020	8.92	100	004	3.964	55	222	3.168	14
002	7.97	3	042	3.897	57	222	3.119	15
$10\bar{1}$	6.78	2	$14\bar{1}$	3.74	7	231	3.07	8
031	5.61	2	$21\bar{1}$	3.55	6	044	2.974	80
112	5.15	7	051,	3.48	3	035	2.793	15
130	4.65	14	$11\bar{4}$			$12\bar{5}$	2.793	15
$10\bar{3}$	4.35	2	220	2.419	16	$16\bar{1}$	2.728	33
132	3.964	55	202	3.324	4			

Preliminary work done on samples from Bromley Vale and Tailings Ash indicate that the ion exchange characteristics of the clinoptilolite from these sites is in the range which could make the material useful in a number of commercial applications. This property, termed the Cation Exchange Coefficient (CEC) is expressed in milli-equivalents per gram (mequiv/gm) and, in the case of the material under discussion, has been found to vary from 0.792 to 1.204 (Read 1987). Breck (1974) discusses the ion exchange properties of a number of zeolites, including clinoptilolite, which:

> ... displays an ion sieve effect for large organic cations (36). (See Table 7.9) In a series of substituted alkylammonium ions, the degree of exchange, x_{max}, decreases with increasing size of the cation. Tetramethylammonium and tertiary butylammonium ions were completely excluded. Exchange isotherms are shown in Fig. 7.13a and the selectivity coefficient function in Fig. 7.13b. The number of water molecules displaced by the larger organic cations varies linearly with (1) the degree of exchange and (2) the volume of the organic ion. The ion sieve effect was interpreted on the assumption that the alumino-silicate framework structure of clinoptilolite is isostructural with that of heulandite. (This may not be correct.) Clinoptilolite is quite selective for ammonium ions as compared to other zeolites. Good agreement with the "triangle rule" was observed; i.e., in terms of K, the rule states:
>
> $$K^A_B \times K^B_C = K^A_C \text{ for ions A, B, and C.}$$

Effluent from fish rearing and holding tanks at a salmon hatchery operated by Freshwater Farms Ltd. at Duncan, B.C., was used in a test to evaluate the ability of the Bromley Vale clinoptilolite to adsorb ammonia under operating conditions.

A 1.6 m column constructed of PVC pipe of approximately 10 cm inside diameter was filled with crushed clinoptilolite screened to +20, -8 mesh. A 20L rinse of dilute solium chloride brine was passed through the column. This was followed by addition of 40L of tank effluent. Filtered material was retrieved from a valve at the bottom of the column.

Sample #FF2 was taken from the outlet immediately after a one minute(6L) free flow through the zeolite column. Sample #FF3 was taken after a residence time of 5 minutes in the column. Sample #FF4 was taken after a residence time of 30 minutes in the column. Sample #FF1 consisted of untreated effluent. Results are depicted in Table 2.

TABLE 2

	SAMPLE			
Parameter Descriptions	**#FF1**	**#FF2**	**#FF3**	**#FF4**
Ammonia (mg/L N)	0.12	0.01	<0.01	<0.01
Nitrogen Kjeldahl (PPM N)	2.80	1.80	0.90	1.50
Nitrates (mg/L N)	0.15	0.31	0.43	0.41
Nitrites (mg/L N)	0.01	0.02	0.02	0.02

Analytical results show that the untreated effluent was not highly enriched in ammonia. Nevertheless treatment resulted in a reduction in the ammonia content from 0.12 mg/L of ammonia nitrogen to <0.01 mg/L ammonia nitrogen. Nitrogen Kjeldahl values showed similar striking reductions from the untreated material, although Sample #FF4 was inexplicably elevated compared to Sample #FF3. Nitrate and nitrite contents appeared to increase with time but overall nitrogen content was seen to be reduced from approximately 3.08 PPM to <1.36 PPM.

A 100 kg. sample of crushed, screened zeolite was forwarded to Equity Silver Mines Ltd., Houston, B.C. for testing as a possible adsorbent of heavy metals from mine waste water. Comprehensive quantitative results are not yet available but preliminary information indicates that the clinoptilolite can selectively adsorb zinc from the effluent.

4.0 CONCLUSION

4.1 Discussion

Much of the area on the STIK Claims which is geologically permissible for deposition of zeolite is overburden covered; however, inferrences drawn from the limited exposures and the distribution of float and inaccessible old mine workings indicate substantial reserve potential. The zeolite-bearing rock unit within the area of interest is open both to the north and south of the exposure area at Bromley Vale. The current field investigation did not provide any information on the nature or extent of the assumed northern extension of the zeolite-bearing horizon. The geological mapping conducted by Read (1987) projects conformable host rocks at least 2.5 km north/northeasterly to the Asp Creek Fault where they are truncated.

The regional map does not identify a southern extension of the horizon as the rocks in this area are entirely obscured by overburden. Angular zeolite float was, however, identified on the west bank of the creek near the north end of Watkins Lake, some 500 m south of the Bromley Vale exposures. Although the source of this material is uncertain, it is possible that it was glacially transported southerly from the known outcrop area or downslope to the east of a southern extension of the zeolite-bearing horizon. The latter is a reasonable possibility and if valid would imply a strike length of at least 600 m.

From the standpoint of initial development, a southerly extension along the ridge immediately east of the Bromley Vale mine portal would be quite favourable. The deposit would lie on a dip slope with good drill access and, unless overburden thicknesses are excessive, favourable stripping ratios. In addition, the inferred reserves here would lie on Crown owned land. Elsewhere the deposit appears to lie on a number of

parcels of private land with complex and, in some cases, uncertain ownership. Possible near surface reserves in the south extension then, could be to the order of 500,000 m^3 which, given a density of 2160 kg/m^3, equates to 1.1 million metric tonnes. Until the property is adequately drilled, however, these figures are entirely speculative.

The test work done on the samples obtained from Bromley Vale to date have not yet confirmed that the material has an assured industrial application and therefore a market. Preliminary results do indicate that:

a) it is capable of adsorbing ammonia from aqueous solutions; and

b) it may extract zinc ions from aqueous solutions.

No test results are available to confirm the ability of the Bromley Vale clinoptilolite as an adsorber of cesium and/or strontium from radioactive wastes. This property of clinoptilolite, however, has been well documented in the past and is viewed as a potentially very important market.

Cesium and strontium are water soluble radioisotopes produced by thermonuclear reactions. As such, they are the by-products of nuclear power plants and, in areas where these plants are in use, they must be contained. Although zeolite treatment cannot destroy them, it can extract them from aqueous solution and permit safe transportation and storage in perpetuity. A system employing zeolites for this purpose is presently in successful operation at the Sellafield Plant operated by British Nuclear Fuels in England.

4.2 Conclusions and Recommendations

The test results obtained to date on the Bromley Vale clinoptilolite suggests that the material is compatible with a number of different industrial applications. The leading possibilities are:

1. As a "green sand" in treatment of municipal and industrial waste waters, particularly those contaminated with ammonia and possibly heavy metals. In such an application the contaminated fluids would be passed through vats or columns filled with crushed and sized clinoptilolite.

2. As an adsorber of cesium and strontium from water contaminated by nuclear waste.

3. As a soil conditioner or as a component of nitrogen fertilizers.

4. As a pozzolan in cement manufacture.

The commercial value of the Bromley Vale material will depend upon the outcome of the current and contemplated testing. In addition, continuing market and technical research will be required to determine which, if any, of the possible applications is appropriate. Results of the information obtained to date, however, are sufficiently encouraging to justify both further research into the properties of the material and additional geological work on the property.

REFERENCES

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APPENDIX A

ANALYTICAL CERTIFICATIONS

SAVOLITE

October 19, 1988

Comparison of Floor Absorbent

Product	Date of Test	Bulk Density g/ml kg/l	Bulk Density lbs./ cu.ft	Water Absorbtion ml/g	Water Absorbtion gal/ cu.ft	Water Absorbtion Can. Gov't Spec. ml/g	Oil Absorption ml/g	Oil Absorption gal/ cu.ft	Oil Absorption Can. Gov't. Spec.
19 Products Tested	1983-1988	0.383-0.91	23.4-56.8	0.40-1.30	1.54-4.08	min. 0.90	0.50-1.00	2.01-3.67	min. 0.80
Zeolite (Sadlier-Brown)	10/19/1988	1.04	64.9	0.68	4.41		0.50	3.24	

Chemex Labs Ltd.
Analytical Chemists * Geochemists * Registered Assayers
212 BROOKSBANK AVE., NORTH VANCOUVER, BRITISH COLUMBIA, CANADA V7J-2C1
PHONE (604) 984-0221

To: NEVIN SADLIER-BROWN GOODBRAND LTD.,
401 - 134 ABBOTT ST.
VANCOUVER, B.C.
V6B 2K4
Project :
Comments: ATTN: TIM SADLIER-BROWN, PRESIDENT

**Page No. : 1
Tot. Pages: 1
Date : 30-NOV-88
Invoice # : I-8828248
P.O. # : NONE

CERTIFICATE OF ANALYSIS A8828248

PARAMETER DESCRIPTIONS	SAMPLE FF-1	SAMPLE FF-2	SAMPLE FF-3	SAMPLE FF-4						
Sample preparation code	221	221	221	221	---	---	---	---	---	---
Sample preparation code	---	---	---	---	---	---	---	---	---	---
Ammonia (mg/L N)	0.120	0.010	< 0.010	< 0.010						
Nitrogen Kjeldahl (ppm N)	2.80	1.80	0.90	1.50						
Nitrates (mg/L N)	0.15	0.31	0.43	0.41						
Nitrites (mg/L N)	0.010	0.020	0.020	0.020						

CERTIFICATION :

APPENDIX B

SUMMARY OF EXPLORATION EXPENDITURES

Geology		
Fees re: Mapping & Sampling T.L. Sadlier-Brown (14 days @ $440/diem) S. Croft (6 days @ $330/diem)	$ 8,150.00	$ 8,000.00
Fees re: Bulk Sampling T.L. Sadlier-Brown (1.5 days @ $440/diem) D. Goodbrand (3.5 days @ $407/diem)	2,150.00	2,150.00
Testing and Analyses		
Fees re: Sample Management/Testing T.L. Sadlier-Brown (92.5hrs @ $55/hr)	5,085.00	5,085.00
Processing	1,351.35	1,351.35
Engineering Study		
B. Slim (Fees) (10 days @ $400/day)	4,000.00	2,000.00
Disbursements (Pro Rated to Geology, Testing & Engineering Study)		
Meals & Accommodation - Field (11 man days @ $48/man day)	528.30	528.30
Reproduction	84.93	84.93
Transportation/Communications (11 days @ $61/diem)		
- vehicle (4x4)	672.37	672.37
- gasoline	226.09	226.09
- telephone	440.02	440.02
Miscellaneous Field Supplies	185.73	185.73
Recording Fees	1,310.00	---
Secretarial & Office Costs	2,344.20	468.10
Report Preparation(Fees) (8.25 man days @ $440/diem)	3,628.03	468.10
TOTALS:	**$30,156.02**	**$21,660.00**

Note: Hourly and/or daily rates and times may be rounded to nearest decimal.

APPENDIX C

CERTIFICATE AND STATEMENT OF QUALIFICATIONS

I, Timothy L. Sadlier-Brown hereby certify that:

1. I am a consulting geologist and partner in the firm of Nevin Sadlier-Brown Goodbrand Ltd., with offices at #401 - 134 Abbott Street, Vancouver, B.C.

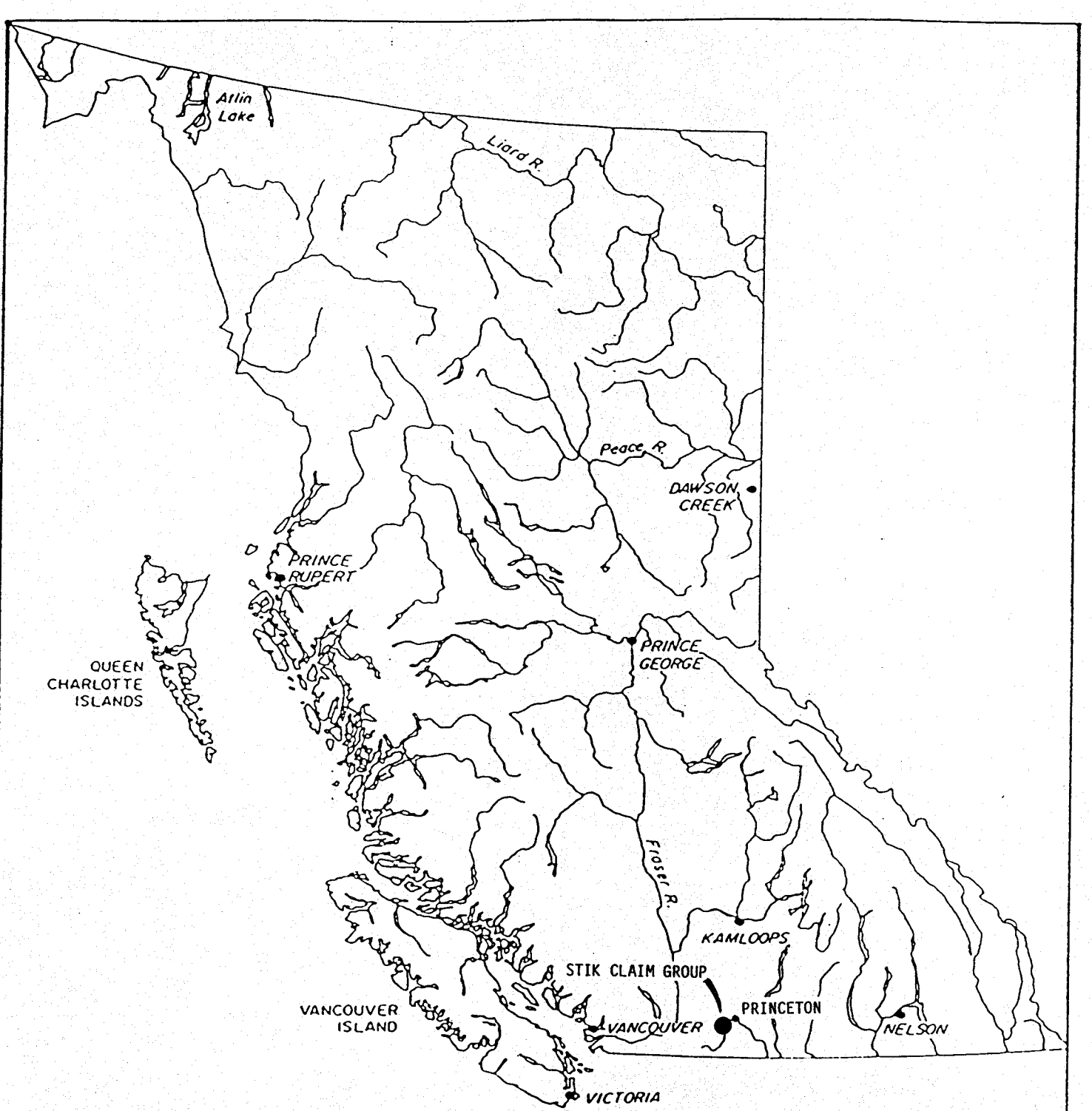
2. I was educated at Carleton University, Faculty of Geological Sciences (1964), Ottawa, Ontario, and am a Fellow of the Geological Association of Canada.

3. I have acted in the field of exploration geology in positions of responsibility since 1965 and have been a principal in the firm of Nevin Sadlier-Brown Goodbrand Ltd., Consulting Geologists, since 1972.

4. I personally conducted the geological field work and supervised the sampling and testing as described in this report.

T. L. Sadlier-Brown, F.G.A.C.

January 31, 1989



HILLSIDE ENERGY CORPORATION

LOCATION MAP

STIK Claims	Figure 1

NEVIN SADLIER-BROWN GOODBRAND LTD.

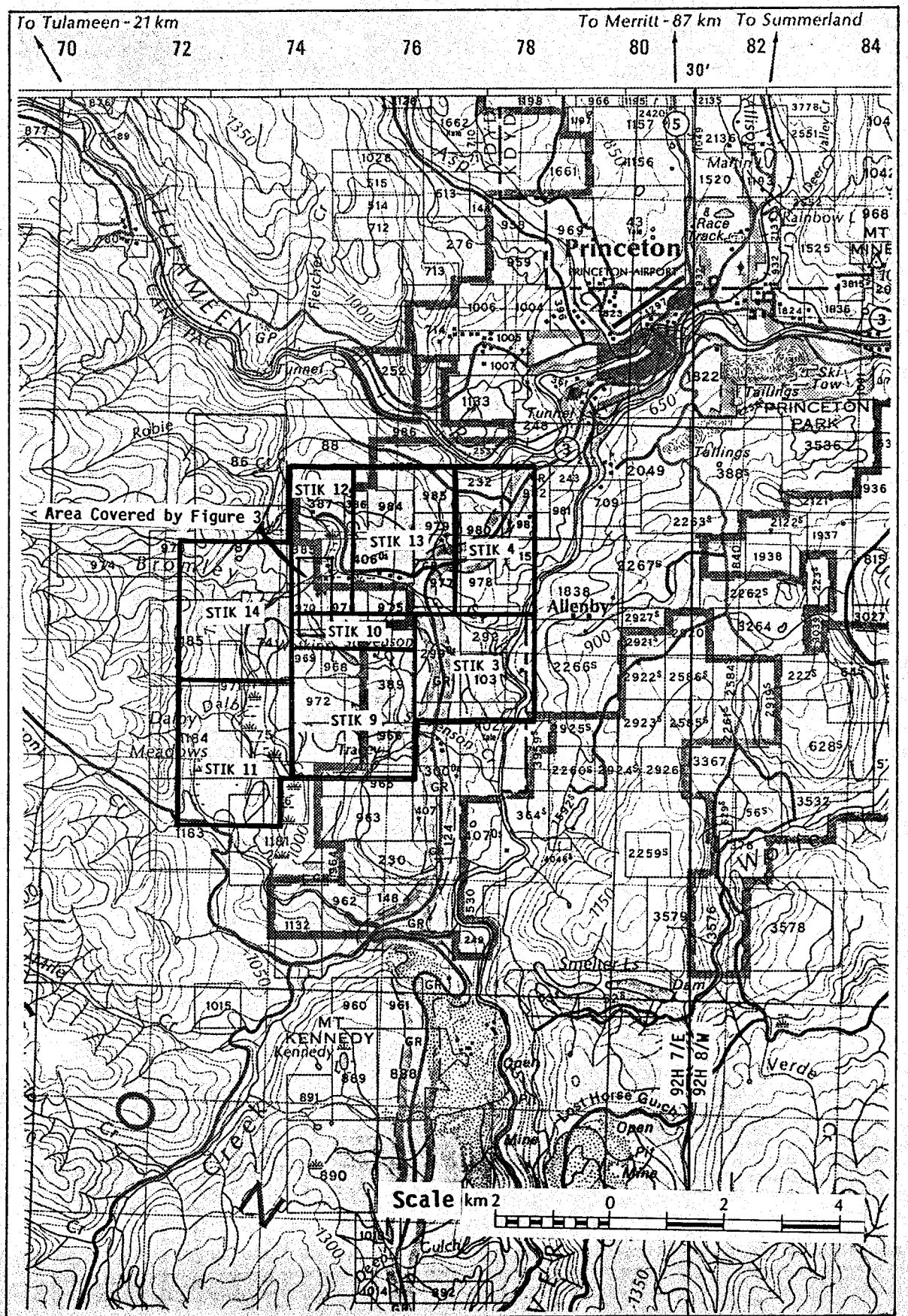


Figure 2 Property Map

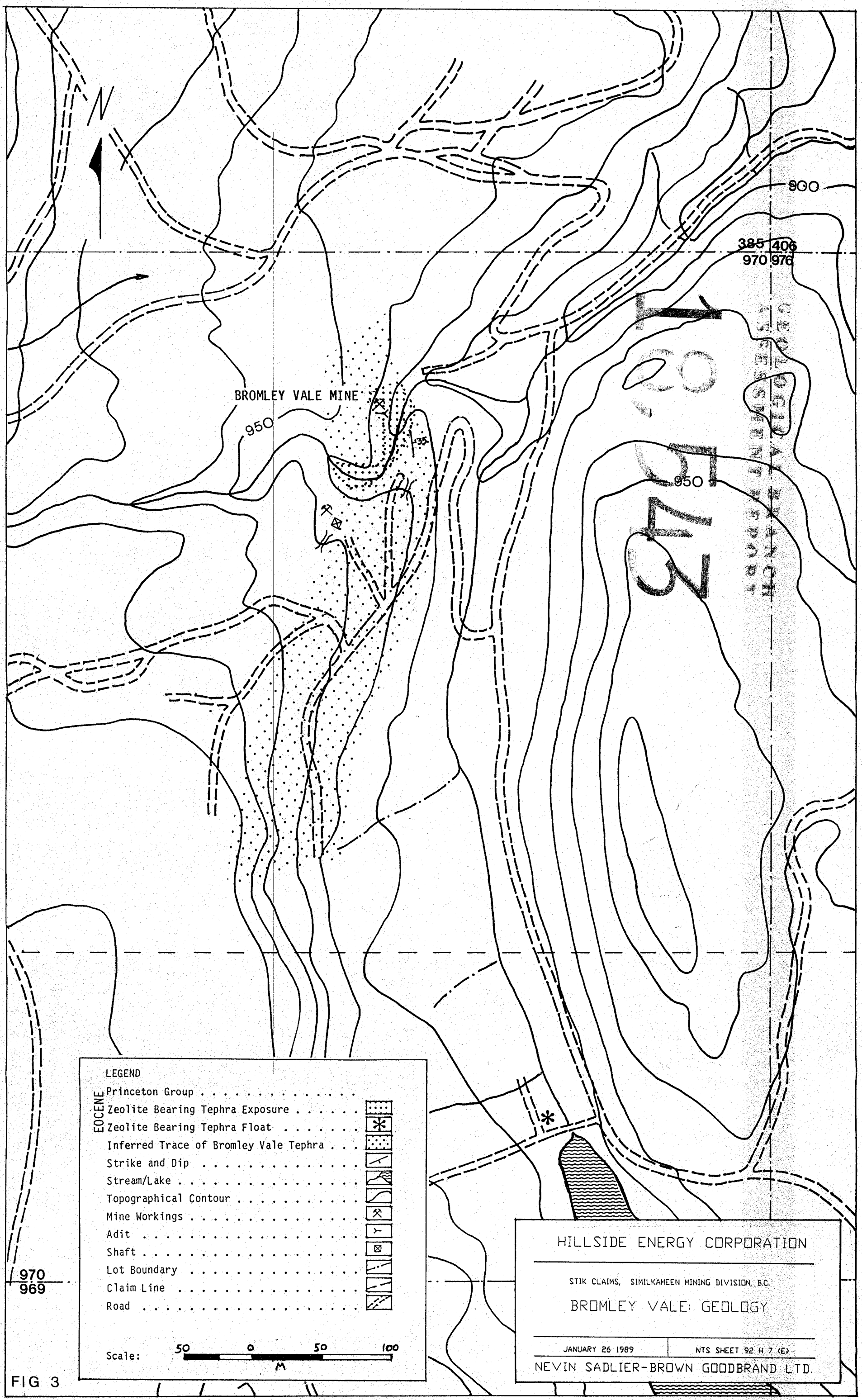

BROMLEY VALE MINE
950
900
950
385 406
970 976
970
969
LEGEND
EOCENE
Princeton Group
Zeolite Bearing Tephra Exposure
Zeolite Bearing Tephra Float
Inferred Trace of Bromley Vale Tephra
Strike and Dip
Stream/Lake
Topographical Contour
Mine Workings
Adit
Shaft
Lot Boundary
Claim Line
Road
Scale: 50 0 50 100
M
HILLSIDE ENERGY CORPORATION
STIK CLAIMS, SIMILKAMEEN MINING DIVISION, B.C.
BROMLEY VALE: GEOLOGY
JANUARY 26 1989
NTS SHEET 92 H 7 (E)
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FIG 3