REPORT ON A
D. C. RESISTIVITY SURVEY
IN THE
PITT RIVER AREA, B. C.

SEPTEMBER, OCTOBER, 1981

by

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Prepared for

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1.0 SUMMARY AND CONCLUSIONS

A 1.2 km wide resistivity anomaly has been observed on a single reconnaissance survey line in the Pitt River valley. The anomaly pattern is typical of a shallow-lying horizontal conductive sheet. A reasonable cause for such a conductive sheet would be an area of lateral flow of geothermal waters at or near the bedrock/overburden interface.

The existing data require a field test to establish the significance of local cultural debris prior to further consideration of the possible geothermal significance of the anomaly.

2.0 INTRODUCTION

In September and October of 1981, Premier Geophysics Inc., of Richmond, B. C. conducted a reconnaissance electrical resistivity survey in a selected area of the Pitt River valley, 12 km north of the north end of Pitt Lake, in southwestern B. C.

This survey was part of a preliminary program of geological, geochemical and geophysical investigation of the area to assess the potential for discovery of a geothermal resource.

2.1 Program Management

The survey program was operated to specifications set forth in an operating agreement between Nevin Sadlier-Brown Goodbrand Ltd., and Premier Geophysics Inc. Greg A. Shore of Premier Geophysics was responsible for the scientific conduct of the field survey, in consultation with Nevin Sadlier-Brown Goodbrand staff geologists.

Preparatory cutting and chaining of the survey line and the establishment of a field camp was undertaken by Nevin Sadlier-Brown Goodbrand Ltd., who also provided some support functions during the survey, including the co-ordination of transportation and supply acquisition.

Post-survey data reduction and analysis, and preparation of this report was done by Greg Shore and Michael Schlax of Premier Geophysics.

2.2 Objectives

The resistivity survey was conducted to provide a first evaluation of the electrical characteristics of the area geology. The survey line was situated to pass near a hot spring and to sample alluvium and bedrock over the spring and for five km to the north and south of the spring, along the valley.

The array type and dimension was selected to provide rapid coverage of a large area while retaining sensitivity to typical geothermal manifestations such as brine accumulations in alluvium, and fluid bearing fracture zones and fault structures.

3.0 SCOPE OF THIS REPORT

The recorded measurements are presented in pseudosection form along with a plan map showing the line location and area covered. The results are discussed briefly, in the context of the very general geological knowledge of the area.

No recommendations for further work were requested; none are presented here except for one exercise intended only to clarify the present results.

4.0 TECHNICAL DESCRIPTION OF THE SURVEY

4.1 Electrode Configuration

The survey consisted of a single line of dipole-dipole type resistivity measurements, using nominal dipole lengths of 300 m. Terrain and access conditions required the use of some non-uniform dipole lengths, ranging from 200 m to 500 m. Dipole separations up to 8 were read consistently, with some readings obtained at up to n=12.

Steel electrodes were used for both current and potential dipoles.

Several half-buried steel cables lie from station P to Station R. An on-site visual inspection of the line adjacent to this area was performed, and noted no cables outside the P to R section of line. Electrodes placed at P, Q, and R were located at least 20 m upslope of the cables, to minimize whatever influence the cables might have on the measurements.

4.2 Instrumentation

The transmitter used was a Huntec 7.5 kW Model M-4 Induced Polarization Transmitter, providing a polarity-reversing, effective D. C. waveform at 0.125 Hz.

The receiver was a Hewlett-Packard 7155B microvoltmeter strip chart recorder, recording the complete signal waveforms and noise for later analysis and digitization. Signal buffering and self-potential compensation were accomplished with a Premier Geophysics four-channel compensator.

4.3 Data Processing

The field records were hand digitized, in some cases with the aid of a mechanical method of filtering out telluric disturbances (Premier, 1979). Apparent resistivities are calculated exactly, using the electrode position plotted on the field map to obtain dipole length and orientation. Data is plotted in Hallof-type pseudosection form and contoured to aid interpretation.

4.4 Data Plotting

The calculated dipole-dipole data are plotted in a pseudosection convention developed by Hallof (1957) and used for most geothermal resistivity results in British Columbia and many induced polarization and resistivity survey results throughout the world. The observer is reminded that a pseudosection is an organization of data to aid in interpretation, and represents neither the true resistivity at any point relative to another, nor any absolute vertical scale.

Areas of anomalous data are identified by solid or dashed bars at the top of the pseudosection, and on the line location plan map.

An envelope encloses sections of the survey lines on the plan map (Figure 1), to indicate the scope of array sampling along the line. The distance from the line to the edge of the envelope is an estimate of the extent of effective search for the array dimensions noted. The estimate is based on the depth of investigation characteristic (D.I.C.) (Roy and Apparao, 1971) of the maximum array dimensions used, as modified for pseudosection use by Edwards (1977) who calls it effective penetration, Ze. In essence, a substantial volume of strongly anomalous materials at the edge of or within the envelope, to either side or to corresponding depth below, will be apparent as an anomaly in the pseudosection data (provided other local effects do not obscure the results). An anomaly is represented by a bar plotted along the survey line. The observer can use the envelope in conjunction with the pseudosection to identify and evaluate a range of possible geologic or topographic explanations for the anomaly, narrowing the choice by logical deduction as additional information is obtained.

The envelope plots serve as a visual catalog of approximate resistivity data coverage (providing substantially more information than plots of line location above). Where no indicators of topographic or conductive masking or distortion are present, for instance, the terrain enclosed in the envelope can be considered "explored" to the limits of the Ze definition of the envelope boundary. Where an anomaly exists, and no firm indication of anomaly source location can be determined (a shallow anomaly at distance "D" to one side may, in pseudosection data, look the same as an anomaly at depth "D" directly under the line) further survey may be necessary to resolve the anomaly. The trial plotting of the proposed detail lines and their search envelope provides an opportunity to evaluate in advance the potential effectiveness of the proposed new data in clarifying the location of the anomaly source.

5.0 OBSERVATIONS AND INTERPRETATIONS

Data from Line PIT are presented in Figure 1. Background apparent resistivity is 4000 to 7000 ohm-metres. The central part of the pseudosection is dominated by a large anomaly of symmetrical form. The pattern is characteristic of a buried conductive sheet extending at varying depth from station P to station T.

A favoured geological model proposes that this conductive body is a thin layer of highly conductive brine-saturated overburden. Such a layer might result from saline water (from a geothermal system located in the vicinity) flowing at the overburden/bedrock interface or in the upper portion of the bedrock itself. The presence of a hot spring directly downslope from the anomalous zone lends weight to this model.

The presence of partially buried steel cables lying between stations P and R can not cause the observed anomaly. Cables lying continuously between stations P and T could conceivably cause a similar response; testing to determine the effects of the cables would be in order if such cables are located.

6.0 RECOMMENDATIONS

The absence of buried cables in the area between stations R and T should be confirmed by visual observation and some pick and shovel work. If no further cables are found, the effects of the known cables can be cautiously dismissed and a geological cause for the anomaly can be sought. If cables are found to extend from station P to station T, then the effects of the cables should be measured, and laterally offset soundings employed to re-test the anomalous area away from the cables.

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