



INDEX MAP 521-24-1

AREA COVERED BY
LINEAMENT ANALYSIS

Scale: 1 inch to 4 miles

July 1962
PRELIMINARY REPORT

LINEAMENT ANALYSIS
PERMITS 2855 and 2856
NORTHWEST TERRITORIES
(for Richard C. Cowell)

Prepared For

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by

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INTRODUCTION

The area of study is bordered by west longitude $117^{\circ} 00'$ and $118^{\circ} 00'$ and north latitude $61^{\circ} 00'$ and $61^{\circ} 30'$ and includes Permits 2855 and 2856. The purpose of this analysis is to study the density of micro-lineaments on aerial photographs. The density pattern may be useful for a geological interpretation of subsurface anomalies. Work on this project was carried out during the summer of 1962 prior to July 13th, 1962.

EXPRESSION AND NATURE OF LINEAMENTS

Linear features on aerial photographs were observed throughout the area. They are expressed as topographic relief lineaments, vegetal lineaments and soil tonal lineaments. The studied area is generally one of very low relief and topographic lineaments are only faintly expressed. There is a great abundance of soil tonal and vegetal lineaments which apparently reflect differentiation in soil moisture and a change of either density or vegetal cover or vegetation type.

ORIGIN OF MICRO-LINEAMENTS

Micro-lineaments were elsewhere defined as individual continuous (or nearly continuous) natural lineations discernible on aerial photographs. They range in length from 0.1 miles to approximately two miles. The great majority of micro-lineaments is believed to be of structural origin. Lineation originating from a prevailing wind direction was not observed. Glacial lineation expressed as, for example, grooves and floatings was observed in some areas but is relatively insignificant. The lineaments shown in this study can therefore be considered to be micro-fractures, i.e., they have to a large extent, structural control.

Micro-fractures are believed to consist of joint concentrations and are essentially vertical.

The density of micro-fractures has been found to increase along anomalies in the subsurface, whereby anomalies refers to sudden lateral changes of the rock property, as e.g., the change from competent to incompetent material.

The density of micro-fractures may also increase in areas with increasing competency of parts of the stratigraphic column beneath the topographic surface. Buried reefs in the subsurface flanked by shales may therefore be expressed on the surface by a higher concentration of micro-fractures.

The thickness of unconsolidated material overlying the bedrock has some effect on the density of the fracture pattern. Exposed flat lying bedrock is usually characterized by an extremely high density of micro-fractures. If the bedrock is masked by unconsolidated material the density of fractures decreases to a certain extent. The

thickness of the unconsolidated cover, however, has apparently no or only minor influence upon the density of micro-fractures. Micro-fractures in the bedrock can be propagated upwards through unconsolidated material regardless of its thickness. This explains the abundant occurrence of micro-fractures in various types of surficial material as well as in varying thicknesses of the unconsolidated cover from a few feet to several hundreds of feet. The fracture pattern therefore reflects mainly subsurface anomalies. The surface conditions modify the fracture pattern to only a minor extent.

MACRO FRACTURES

Macro-fractures usually consist of a concentration of micro-fractures along a rectilinear or slightly curvilinear trend. The length of the macro-fractures generally exceeds two miles and may be up to several tens of miles. Macro-fractures are major zones of weakness in the earth's crust, and are frequently used for lateral or vertical movements caused by tectonic forces.

FRACTURE PATTERN WITHIN THE AREA OF STUDY

Micro-fractures are generally abundant throughout the analysed area. An extremely high concentration of micro-fractures is apparent in the northeastern portion of the area, most prominent south of Permit 2855. The density of this fracture pattern resembles patterns observed in areas of outcropping, flatlying bedrock though there may be a thin cover of unconsolidated material. This area may be interpreted as a possible uplift of precambrian strata or as competent paleozoic strata with only a thin cover of glacial drift.

The density of the fracture pattern in the other portions of the area can be compared with the density observed in areas with a more or less thick cover of unconsolidated material. The changes of fracture concentration are believed to reflect subsurface anomalies to some extent

whereby a high density of micro-fractures suggests an increasing thickness of competent material (e. g., reef).

Macro-fractures, though not studied in detail, are observed throughout the area and trend most prominently towards northwest and northeast. They are most distinctly expressed in the northeastern portion of the area. Structural control to the geology may be more pronounced in Permit 2855 than in Permit 2856.

A more detailed report will be given when all of the data has been posted in final form and statistical evaluations can be made. Final maps based on the statistical details will be prepared and included with the final reports.

CONCLUSIONS

This method has good application in the area studied. Final results are expected to show that a major uplift has occurred in the vicinity of the permits. Interpretation of the effect of this postulated uplift will assist the search for hydrocarbons in this area.

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