

GEOLOGY OF THE RAVENSCRAG FORMATION LIGNITES IN SOUTHERN SASKATCHEWAN

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Part I: Economic Geology

Coal is present in three geologic units in southern and central Saskatchewan. These three units are the Swan River (Blairmore) Group, Judith River Formation and the Ravenscrag Formation. Economically strippable coal seams are known to exist only in the Paleocene-age Ravenscrag Formation, and only the Estevan coal-field has sufficient drilling information to determine the coal reserves for some seams. The distribution of the economic lignite reserves of southern Saskatchewan is discussed in relationship to the Tertiary stratigraphy developed in the Williston Basin. An economic evaluation of the underclays associated with the Ravenscrag lignites, as well as other industrial mineral resources, is currently in progress.

Part II: Petrology

A twelve-foot thick column sample from the Utility Coal Company strip mine west of Estevan was analyzed petrographically. In addition, trace elemental analysis, X-ray diffraction, infrared spectroscopy and differential thermal analyses provided detailed information on the relationship between the petrographic macerals in the Ravenscrag lignite, as well as a new means of identifying leonarditic alterations of lignite. High concentrations of fusinite characterize the lower middle section of the seam and are indicative of forest-moor origin. This concentration in the lower and middle sections develops into higher clarite concentrations in the upper portion of the seam. The highest

inorganic concentration is in the lowest one foot of the seam. Thirty-one trace elements with concentrations greater than 10 ppm were detected in the column sample. The major detection limits are in the following minerals, identified by X-ray diffraction in the shale partings and in the ash: kaolinite, montmorillonite, illite, muscovite, pyrite, marcasite, thenardite, gypsum and calcite. Low-angle X-ray scattering of leonardite provides a new and efficient non-chemical means of determining its presence. Apparently the higher peak intensity of lignite and lower intensity of the leonardite peak is correlated with the high concentration of aromatic structures with increasing rank from leonardite to lignite.

A paleoenvironmental analysis indicates a forest-moor origin, but the autochthonous nature of the deposit is questioned. Possible marine influences at this time are discussed, particularly in reference to the Cannonball Sea intrusion into Canada during Paleocene time.

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Conference Paper · November 1971

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