



GEOLOGICAL  
SURVEY  
OF  
CANADA

DEPARTMENT OF ENERGY,  
MINES AND RESOURCES

PAPER 69-9

STANTON MAP-AREA,  
NORTHWEST TERRITORIES (107 D)

(Report, 2 figures and P.S. Map 15-1969)

C. J. Yorath and H. R. Balkwill

This document was produced  
by scanning the original publication.

Ce document est le produit d'une  
numérisation par balayage  
de la publication originale.



**GEOLOGICAL SURVEY  
OF CANADA**

**PAPER 69-9**

**STANTON MAP-AREA,  
NORTHWEST TERRITORIES (107D)**

**C. J. Yorath and H. R. Balkwill**

**DEPARTMENT OF ENERGY, MINES AND RESOURCES**

© Crown Copyrights reserved  
Available by mail from the Queen's Printer, Ottawa

from the Geological Survey of Canada  
601 Booth St., Ottawa

and

Canadian Government bookshops in  
HALIFAX - 1735 Barrington Street  
MONTREAL - 1182 St. Catherine Street West  
OTTAWA - Corner Mackenzie and Rideau  
TORONTO - 221 Yonge Street  
WINNIPEG - 499 Portage Avenue  
VANCOUVER - 657 Granville Street  
or through your bookseller

Price: \$1.50

Catalogue No. M44-69-9

Price subject to change without notice

Queen's Printer for Canada  
Ottawa  
1970

## CONTENTS

	Page
Abstract .....	iv
Introduction .....	1
Physiography and Quaternary Geology .....	1
Stratigraphy.....	1
Devonian .....	1
Cretaceous .....	2
Table of formations .....	2
Tertiary and Quaternary .....	5
Structural Geology .....	6
References .....	7

## Illustrations

Map 15-1969 Stanton area (107D).....	in pocket
Figure 1. Disconformable contact between the Upper Cretaceous "Bituminous zone" and the Lower Cretaceous "Bentonitic zone" at section YB-21 near the mouth of Kugaluk River.....	3
Figure 2. "Pale shale zone" at section YB-23 on Anderson River.....	5

### ABSTRACT

Exposed rocks in the Stanton map-area, which lies within the Anderson Plain and Arctic Coastal Plains, belong to the Devonian and Cretaceous Systems. Devonian rocks are represented by the Imperial Formation and occur along Kugaluk River. The remainder of the region is underlain by Lower Cretaceous "Bentonitic zone" strata and Upper Cretaceous "Bituminous" and "Pale shale zone" strata; these rocks are best exposed along Anderson River. A thin gravel and sand unit of probable Tertiary - Quaternary age caps the plateau on the east side of Anderson River.

A regional unconformity separates the Devonian and Cretaceous successions and a regional disconformity occurs between the Lower and Upper Cretaceous rocks.

Strata in the map-area dip toward the northwest at low angles. There are few structural complications. A broad, linear arch of pre-Cretaceous age coincides with Kugaluk River and small, tight, disharmonic folds of non-tectonic origin occur in "Bituminous zone" rocks west of Anderson River.

## STANTON MAP-AREA, NORTHWEST TERRITORIES (107D)

### INTRODUCTION

Geological field studies of the Stanton map-area were carried out in 1968 as part of Operation Norman (Aitken et al., 1969). The area includes parts of Anderson Plain (Anderson River Morainic Plains) and Arctic Coastal Plains (see Klassen in Yorath et al., 1969).

### PHYSIOGRAPHY AND QUATERNARY GEOLOGY

The Arctic Coastal Plains is an area that is poorly drained, lake-strewn, and underlain by Quaternary stratified sediments. Peculiar features of this region are the arcuate, finger-like peninsulas that extend into the Eskimo Lakes and which range from 50 to 150 feet in elevation. Mackay (1963) has suggested that ice-thrusting has formed the peninsulas, but their origin is still uncertain. Other ice-push features involving marine Pleistocene sands, silts and clays with ground-ice segregations have been described on the west side of Nicholson Peninsula in the northeastern part of the map-area (Mackay, 1956).

The regional topographic slope of Anderson Plain is northwestward. A prominent stream-dissected plateau region with elevations of more than 1,000 feet lies west of Anderson River. The deeply incised Anderson River, having Cretaceous rocks exposed along the meander cutbanks, provides abrupt topographic relief to the generally subdued landscape.

### STRATIGRAPHY

#### Devonian

The oldest exposed rocks of the map-area belong to the Upper Devonian Imperial Formation (Di) and crop out intermittently along lower Kugaluk River. There, the unit consists of very well-indurated, grey-green and brown-grey weathering shales and siltstones with subordinate sandstones, and is unconformably overlain by the Lower Cretaceous "Bentonitic zone" shales.

Manuscript Received October 1, 1969

Author's address: Institute of Sedimentary and Petroleum Geology  
Geological Survey of Canada, Calgary, Alberta

Cretaceous

Cretaceous strata underlie much of Anderson Plain and are assumed to occur beneath the thick Quaternary cover of the Arctic Coastal Plains. Pending establishment of formational nomenclature it was found useful to employ the unpublished informal nomenclature used by J. C. Sproule and Associates Ltd. in their report on 1960 field studies.<sup>1</sup>

The oldest Cretaceous unit exposed is the "Bentonitic zone" (Kb), which is a uniform succession of dark grey-weathering, plastic, soft shales with rusty brown- and orange-weathering, fossiliferous ironstone concretionary intervals. South and east of the map-area the unit is in conformable contact with the underlying "Silty zone",

Table of Formations

Series	Formation and Exposure Thickness in Feet	Lithology
Quaternary		Gravel, sand, silty, clay of variable thickness
Quaternary & Tertiary	Beaufort Formation 8' - 10'	Unconsolidated gravel and sand; wood fragments
UNCONFORMITY		
Upper Cretaceous	"Pale shale zone" 450'± "Bituminous zone" 100' - 450'	Pale grey shale and mudstone; low specific gravity Black, bituminous shale, jarosite, local hematite
DISCONFORMITY		
Lower Cretaceous	"Bentonitic zone" 450'± "Silty zone" 0'	Black, soft, plastic shale; fossiliferous concretions Upper: Mudstone & Siltstone Lower: Sandstone & Coal
UNCONFORMITY		
Upper Devonian	Imperial Formation 150'±	Grey-green and brown-grey siltstone, sandstone, shale

<sup>1</sup> Geological reconnaissance report, P. & N. G. Permit No. 3031, Wood Bay area, Northwest Territories.  
Prepared for Siebens Leaseholds Ltd.; November 1960, by J. C. Sproule and Associates Ltd., Calgary, Alberta. Available for inspection from the Department of Indian Affairs and Northern Development, Ottawa and Calgary.



Figure 1. Disconformable contact between the Upper Cretaceous "Bituminous zone" and the Lower Cretaceous "Bentonitic zone" at section YB-21 near the mouth of Kugaluk River. Note the truncation of "Bentonitic zone" beds at the disconformity. G.S.C. photo 201412.

the contact between the two units being marked by the base of a widespread cone-in-cone bed. The iron content of the "Bentonitic zone" beds is variable, and outcrops locally exhibit a conspicuous banding caused by the alternation of inch-thick, rust-brown beds and dark grey strata. Silt is confined to rocks near the upper and lower contacts; elsewhere in the unit it is negligible.

No complete sections of the "Bentonitic zone" were found within the map-area. Isolated exposures occur along Anderson River in the southern part of the map-area and these belong to the upper part of the unit. At section CR3-68, 250 feet of these beds were measured. In two wells drilled on Nicholson Peninsula (Texcan C&E Nicholson N-45 and G-56), the thickness of the unit is reported to be 779 feet and 757 feet respectively.

The "Bentonitic zone" is exposed also in a number of stream valleys adjacent to the broad uplands west of Anderson River and at some localities the unit is seen in disconformable contact with rocks of the "Bituminous zone".

A composite thickness of 88 feet of "Bentonitic zone" beds was measured near the mouth of Kugaluk River in the southwestern part of the map-area. There the unit rests on Upper Devonian Imperial Formation shales and siltstones, and is disconformably overlain by the "Bituminous zone" (Fig. 1).



The "Bituminous zone" (Kbt) is a variable sequence of black, bituminous shale, bedded yellow jarosite, and locally, dark maroon beds of earthy hematite. In the uplands west of Anderson River and in the Smoking Hills - Horton River region to the east of the Stanton map-area (97C), the base of the unit is marked by an ironstone-pebble and shale-chip conglomerate of variable thickness, and locally overlies an irregular erosion surface on "Bentonitic zone" shales.

Exposures of the unit along Anderson River, and over much of the region to the west of the river, show brilliant weathering colours of yellow and red. The yellow colouring is owing to the presence of jarosite, a hydrous potassium-iron sulphate, whereas the red colours are caused by earthy hematite which is believed to be a product of oxidation of the jarosite. The unit is actively burning at a number of localities in the Smoking Hills - Horton River area. The shales of these localities have a dark scoriaceous appearance, and large selenite crystals are scattered about the exposures.

The "Bituminous zone" has a variable thickness apparently owing to irregular relief on the underlying erosion surface. In two sections on Anderson River (YB-18 and CR4-68), measured thicknesses were 100 and 167 feet respectively. Similar variations in thickness were observed to the east in the Franklin Bay area (97C). In the uplands west of Anderson River, contact elevations provide a thickness of 450 feet for this unit. At Nicholson Peninsula the two Texcan C&E wells penetrated 123 and 135 feet of "Bituminous zone" beds.

The "Pale shale zone" (Kps) conformably overlies the "Bituminous zone". Generally the "Pale shale zone" consists of a lower member of pale grey-weathering, recessive shale with minor amounts of mudstone, and rusty, dark maroon ironstone concretionary beds; a middle member of medium to dark grey shales with some gypsum; and an upper member of dark grey-brown, ferruginous shale that grades upward to grey sandy shale. The shales have a characteristically low specific gravity. Preliminary laboratory studies (X-ray diffraction, differential thermal analysis and thin section examination) indicate that the shales are composed of amorphous quartz, illite, kaolinite and traces of montmorillonite. The amorphous quartz appears to be derived from abundant radiolarian debris in the form of spicules and porous tests.

Incomplete sections of the "Pale shale zone" are exposed at sections YB-23 and CR4-68 on Anderson River and at Krekovick Landing at the mouth of the river. At the former locality 260 feet of the lower part of the unit are in conformable and gradational contact with the "Bituminous zone" (Figure 2.); at the latter locality, 150 feet of the upper part of the unit are exposed. Elevations of mapped contacts with the underlying "Bituminous zone" and overlying gravel and sand unit along Anderson River provide an estimated thickness of 450 feet for the "Pale shale zone".

Age assignments of the Cretaceous units are based upon micropaleontological studies by T. P. Chamney, and upon comparison with formations of similar lithology on Banks Island. The upper member of the Christopher Formation on Banks Island is lithologically similar to the shales of the "Bentonitic zone", and has been dated as Middle to late Middle Albian in age (Thorsteinsson and Tozer, 1962). Chamney (personal communication) has identified Middle Albian glomospirellid foraminifers from



Figure 2. "Pale shale zone" at section YB-23 on Anderson River, G.S.C. photo 201411.

the upper beds of the "Bentonitic zone". A few immature and fragmental ammonites were collected from the "Bentonitic zone" on Horton River east of the map-area. Jeletzky (GSC Paleontology Report No. Km-3-1969) tentatively assigned those to the late Late or early Middle Albian Arctopholites or Beudanticeras affine zone, but was unable to provide positive identifications because of the paucity, immaturity and fragmental nature of the specimens collected.

A late Cretaceous age (Late Coniacian to Early Santonian) has been assigned to the lower beds of the "Bituminous zone" by Chamney (1969) on the basis of the occurrence of Hedbergella cf. H. delrioensis (Carsey). The uppermost beds contain vertebrate remains including Hesperornis regalis Marsh which indicate an early Campanian age for these beds (Russell, 1967).

The "Pale shale zone" is tentatively considered to be Late Campanian in age on the basis of the occurrence of the index species Trochammina whittingtoni Tappan (Chamney, pers. comm.).

#### Tertiary and Quaternary

Sediments of possible Tertiary and early Quaternary age (Tb) cap the plateau region between Anderson and Horton Rivers. They lie unconformably upon the "Bituminous" and "Pale shale zones" and are thought to be equivalent to part of the Beaufort Formation on Banks Island (Thorsteinsson and Tozer, *ibid*; Craig and Fyles, 1960). This unit consists of unconsolidated gravel and crossbedded sand. Pebbles

and cobbles are mainly of quartzite, dolomite and black chert. Small wood fragments and some humic material are present in the sands. The unit has a uniform thickness of from 8 to 10 feet.

## STRUCTURAL GEOLOGY

The map-area is part of Anderson structural province (Douglas et al., 1963). The strata dip at low angles towards the northwest at a few tens of feet per mile, with few structural complications. Regional epeirogenic events are marked by a wide-spread unconformity at the base of the Cretaceous sequence, and by a regional disconformity between the Lower and Upper Cretaceous successions.

The configuration of the contact between Devonian and Cretaceous rocks, and stratigraphic changes in the Cretaceous succession in the Crossley Lakes map-area (107A), (Yorath and Balkwill, in press) to the south of the Stanton map-area, suggests the presence of a northerly trending arch, the axis of which approximately coincides with the Kugaluk River in the western part of Anderson Plain. Only the northernmost part of the arch lies in the Stanton map-area. A pre-Cretaceous age for the arch is suggested by the following:

1. Near the mouth of Kugaluk River, the "Silty zone" is missing and only 88 feet of "Bentonitic zone" beds are present, resting unconformably on the Upper Devonian Imperial Formation.

2. Southwest of the map-area, at Sitidgi Lake (107B), rocks assigned to the "Silty zone" and "Bentonitic zone" are present (B. Plauchut, Elf Oil Exploration and Production Ltd. - personal communication). To the southeast, along Anderson River, rocks belonging to the upper division of the "Silty zone" rest unconformably on the Devonian Hare Indian Formation. Farther eastward, along Horton River, the two-fold division of the "Silty zone" is fully developed with the lower sandstone and coal division resting unconformably on the Devonian Bear Rock Formation.

It appears, therefore, that the "Silty zone" thickens away from the paleotopographically high "Kugaluk Arch" and is overstepped by the "Bentonitic zone".

Small, tight, randomly oriented folds occur locally in rocks assigned to the "Bituminous zone" within the uplands west of Anderson River (69° 08'N; 129° 22'W). These structures are probably non-tectonic and are disharmonic above extremely ductile "Bentonitic zone" shales.

## REFERENCES

- Aitken, J. D., et al.  
1969: Operation Norman, District of Mackenzie, Northwest Territories; in Report of Activities, May to October, 1968, R. G. Blackadar, editor; Geol. Surv. Can., Paper 69-1A.
- Chamney, T. P. (Reported in Oilweek)  
1969: Microfossil study points to prospective anomalies; Oilweek, Maclean - Hunter Ltd., vol. 20, No. 5, pp. 7-8.
- Craig, B. G. and Fyles, J. G.  
1960: Pleistocene geology of Arctic Canada. Geol. Surv. Can., Paper 60-10.
- Douglas, R. J. W., et al.  
1963: Geology and petroleum potentialities of northern Canada; Geol. Surv. Can., Paper 63-31.
- Mackay, J. Ross  
1956: Deformation by glacier-ice at Nicholson Peninsula, N. W. T., Canada; Arctic, vol. 9, No. 4, pp. 219-228.  
1963: The Mackenzie Delta, N. W. T., Geographical Branch, Memoir 8.
- Thorsteinsson, R. and Tozer, E. T.  
1962: Banks, Victoria and Stefansson Islands, Arctic Archipelago; Geol. Surv. Can., Mem. 330.
- Russell, D. A.  
1967: Cretaceous vertebrates from Anderson River N. W. T., Can. J. Earth Sci., vol. 4; pp. 21-38.
- Yorath, C. J., et al.  
1969: Preliminary account of the geology of the eastern part of the Northern Interior and Arctic Coastal Plains, Northwest Territories; Geol. Surv. Can., Paper 68-27.
- Yorath, C. J. and Balkwill, H. R.  
(in press): Crossley Lakes map-area (107A); Geol. Surv. Can., Map 8-1969.