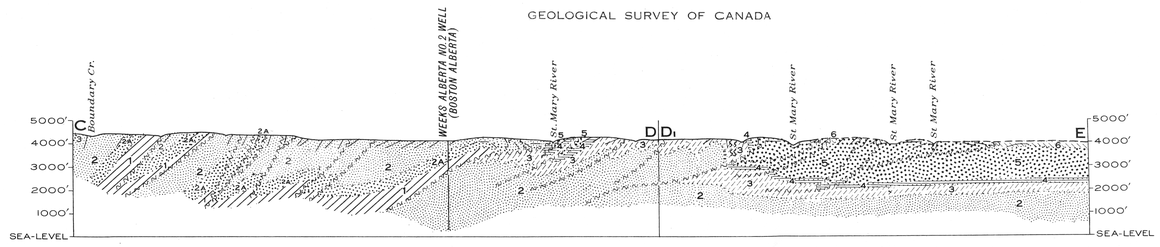
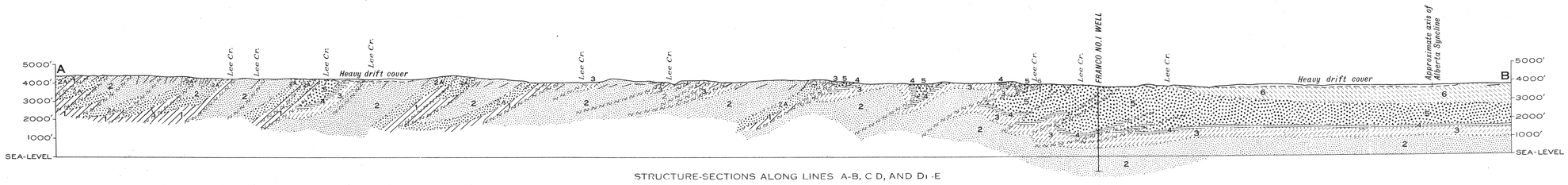
DEPARTMENT OF MINES AND RESOURCES

MINES FORESTS AND SCIENTIFIC SERVICES BRANCH

GEOLOGICAL SURVEY OF CANADA





STRUCTURE-SECTIONS ALONG LINES A-B, C D, AND D1 -E

DESCRIPTIVE NOTES

The map-area exhibits a subdued, rolling topography, modified by prominent sandstone ridges. Glacial and glacio-fluvial features are very evident. The present streams flow in incised, terraced valleys, carved into both alluvium and bedrock. Open farm and ranch land are characteristic of the area, but wooded land appears along the southwestern borders and in the stream valleys.

Since 1943, several oil companies have been actively engaged in geological and geophysical mapping of this and adjacent map-areas. Canadian Gulf Oil Company is carrying out the most active program of exploration, and the successful completion of their Gulf-Pincher Creek No. 1 well as a large wet gas producer encourages further exploration in southwestern Alberta. The well is 21 miles northwest of Cardston.

The Disturbed belt of the Alberta Foothills occupies the greater part of the map-area. Here, 4,000 feet of Upper Cretaceous beds outcrop in fault slices, repeated by movement along a series of closely spaced, west-dipping thrust faults.

The Alberta syncline, a broad structure in the comparatively flat-lying beds of the Alberta Plains, occupies the northeastern corner of the map-area. The axis of this major structural feature crosses the area near the mouth of Lee Creek.

Structural detail is shown on the accompanying structure-sections. Most of the surface anticlines are believed to be the result of drag over fault planes, and, therefore, they do not necessarily persist at depth or reflect folds in underlying fault slices. Available data do not permit predictions of the structural configurations in the deep, potential oil or gas producing formations.

Stratigraphic detail is shown with the accompanying columnar section. The succession is a conformable sequence, and the geological events indicated are those already well known for the Upper Cretaceous and (?) Paleocene formations of southwestern Alberta and adjacent Montana.

Logs of three deep wells drilled in the area furnish geological information of some value in structural interpretation.

Weeks Alberta (Boston Alberta) No. 2 well, in ls. 16, sec. 5, tp. 1, rge. 25, was drilled on the west flank of a surface anticline. Belly River beds were drilled to a depth of 840 feet, and Wapiabi from 840 to 1,390 feet, at which depth a fault was intersected. Below the fault, Belly River beds were again penetrated to a total depth of 3,812 feet

Franco No. 1 well, in ls. 3, sec. 5, tp. 3, rge. 25, drilled a normal sequence from the St. Mary River to Belly River formations. The tops of the Blood Reserve, Bearpaw, and Belly River formations were encountered at depths of 2,430, 2,560, and 3,360 feet respectively, and at a total depth of 4,580 feet the well was still in Belly River beds. The drilled thicknesses of the St. Mary River and Bearpaw formations are greater than the exposed thicknesses, probably due to faulting and steep dips.

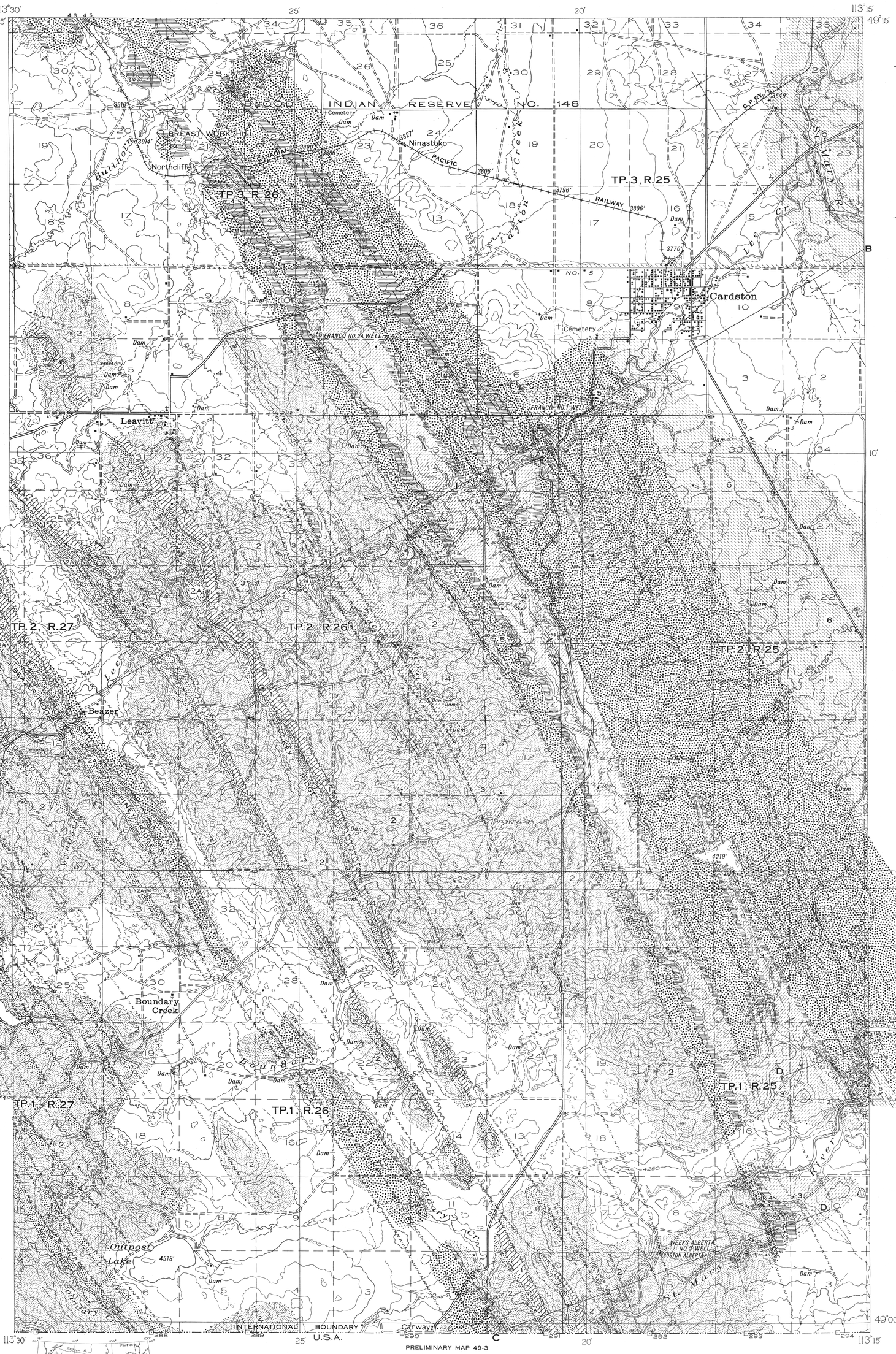
Franco No. 2A well, in ls. 1, sec. 10, tp. 3, rge. 26, was spudded in a valley flat, rimmed on the west by west-dipping and on the north by nearly flat-lying Blood Reserve sandstone. The well commenced in Bearpaw, encountered Belly River beds at 700 feet, and was abandoned at 1,467 feet in these beds.

Marker beds of stratigraphic significance and possible economic value occur as follows.

(1) *Coal Seams.* Seams from a few inches to 4 or 5 feet in thickness have been prospected or worked for short periods at many places in the map-area. The coal occurs in basal St. Mary River beds, associated closely with beds containing brackish-water fossils. No recent work has been done, and most of the workings have caved. The larger operations were along the east side of Piney Ridge (NE. ¼ sec. 6, tp. 2, rge. 26) and in ls. 12, sec. 26, tp. 2, rge. 26, on Lee Creek, about 5 miles southwest of Cardston.

(2) *Oyster Beds.* Prominent beds of Ostrea, generally with *Corbula* and other shells, occur commonly in the coal-bearing basal member of the St. Mary River formation, and are good stratigraphic marker beds. These beds are lenticular, varying in thickness from a few inches to several feet, and locally have either a calcite cement or a shaly matrix. Lime-cemented coquinas are of possible economic value as a source of lime or cement; a small abandoned kiln, built near St. Mary River, in sec. 9, tp. 1, rge. 25, testifies to one attempt at using these deposits. Similar coquinas are common in the northern part of the map-area (tp. 3, rge. 26,) and elsewhere in the general district. Loose-weathering shaly shell beds and the less common sandy shell beds (Ostrea for the most part), occurring as lenses in the underlying Blood Reserve formation, are perhaps too impure to be of value.

(3) *Magnetite.* In the southwestern part of the map-area, lenticular concentrations of magnetite-bearing sandstone occur in the basal member of the Belly River formation. The observed concentrations are not believed to be of present commercial value. Deposits of titaniferous magnetite, extensively prospected in the past, occur along sandstone ridges in the lower part of the Belly River formation north of Burmis, Alberta (tps. 7, and 8, rge. 3, W. 5th mer.) 50 miles northwest of Cardston.



GENERALIZED COLUMNAR SECTION

Scale: 1 inch to 250 feet

Formations and thicknesses		Distinctive Features	General Character
WILLOW CREEK (non-marine) 1,000'+	6	Imparts distinct reddish colour to outcrops along river banks and to soil, where cover is thin	Soft-weathering, interbedded green, grey, and maroon shales, mottled in part; pale greenish-grey fine-grained sandstone; small whitish- weathering mottled calcareous nodules
ST. MARY RIVER (non-marine; brackish at base) 1,160'±	5	Comparatively resistant sandstones	
		Large, lenticular, channel-fill sandstone bodies with unios and bone and wood fragments; very thin beds of dark Fissile shale	Interbedded, greenish-grey and light grey soft shale and sandy shale with thin hard beds of crossbedded fine-grained sandstone and ironstone bands; minor dark carbonaceous shale, bentonite, concretions and nodules
		Coaly beds and shell beds (*Ostrea, Corbula, Corbicula, Melania*)	Soft and fissile dark brownish grey shales; fine and very fine grained rusty grey sandstone, ironstone
BLOOD RESERVE (marine shoreline) 100'-360'+	4	Resistant beds - ridge-forming or castellated outcrops (*Ostrea, Halymenites*)	Thick-bedded, massive and crossbedded light grey fine- to medium- grained sandstone, with brown weathering sandstone concretions; local brown shales, green sandstone, and fossil wood
BEARPAW (marine) 250'-400'?	3	Light-coloured bentonite streaks; small and large rusty ironstone concretions (*Baculites, Placenticeras*)	Dark brownish-grey soft laminated shale, with thin beds of light to dark grey, hard, fine- and very fine-grained sandstone
BELLY RIVER (non-marine, brackish in part at top; basal member, 2A, marine shoreline) 2,200'±	2	Fissile shale with coaly streaks (ostracods, Fish scales, bones, gastropods, and pelecypods)	
		Bentonite bed or beds	
		Reddish shale (maroon to purple)	Interbedded, rather soft-weathering light grey and greenish grey fine- and very fine-grained sandstones, shales, and sandy shales, with some hard grey sandstones and green shaly sandstones; minor, dense, grey, impure limestone beds and concretions
		10'-30' massive sandstone beds	Shale and thin sandstone beds as above; thick beds of very light grey sandstone, pale bluish green when wet; minor coaly streaks and bentonite
	2A	Resistant beds - ridge-forming or castellated outcrops; lenses of magnetite-bearing sandstone, fossiliferous lenses (*Ostrea, Cardium, Pseudobuccinum, Legumen, Preria, Panope*, sharks teeth, vertebrate bones, fossil wood)	Fine-grained, cross-bedded, light grey sandstone, with bands of hard brown weathering sandstone concretions; clayey and limy pellets in lenses of medium-grained sandstones
		Thin-bedded transition zone	
WAPIABI (marine) 300'+	1		Dark grey, laminated and platy, Firm shale and silty shale

LEGEND

NOTE. Unpatterned areas are areas of heavy drift cover

CRETACEOUS AND (OR) TERTIARY
UPPER CRETACEOUS AND (OR) PALEOCENE

- 6 — *WILLOW CREEK FORMATION:* varicoloured shale; sandstone; limy nodules

CRETACEOUS
UPPER CRETACEOUS

MESOZOIC

- 5 — *ST. MARY RIVER FORMATION:* sandy shale, sandstone, and shale; bentonite and ironstone; basal member, coal-bearing
- 4 — *BLOOD RESERVE FORMATION:* massive and crossbedded sandstone; sandstone concretions; local shale partings
- 3 — *BEARPAW FORMATION:* soft dark shale; minor sandstone, bentonite, and ironstone
- 2 2A — *BELLY RIVER FORMATION:* shale, sandy shale, and sandstone; minor carbonaceous shale, bentonite and limestone; 2A, basal member of crossbedded sandstone, with sandstone concretions; minor shale; local magnetite
- 1 — *WAPIABI FORMATION:* dark laminated shale and silty shale

Bedding (horizontal, inclined, vertical, overturned)
Bedding (direction of dip known, upper side of bed unknown)
Fault (arrow indicates direction of dip of fault plane)
Anticline (arrow indicates direction of plunge)
Syncline (arrow indicates direction of plunge)
Coal prospect or pit (abandoned)
Well drilled for oil or gas (abandoned)

Geology by E. P. Williams, 1947, 1948

PRELIMINARY MAP 49-3

CARDSTON

WEST OF FOURTH MERIDIAN

ALBERTA

Scale: 1 Inch to ½ Mile

0 — 2 Miles

Approximate magnetic declination 22° East

LEGEND

- Provincial highway
- Road and buildings
- Road not well travelled
- Road along township line, fenced
- Church
- School
- Post Office
- International boundary and monument
- Township boundary
- Indian Reserve boundary
- Section line
- Irrigation ditch
- Intermittent lake and stream
- Sand bar
- Contours, interval 50 feet — 4500
- Depression contour
- Heights in feet above mean sea-level — 4219

Base map surveyed by the Topographical Survey 1943
Cartography by the
Geological Mapping Division, 1949

This document was produced by scanning the original publication.

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