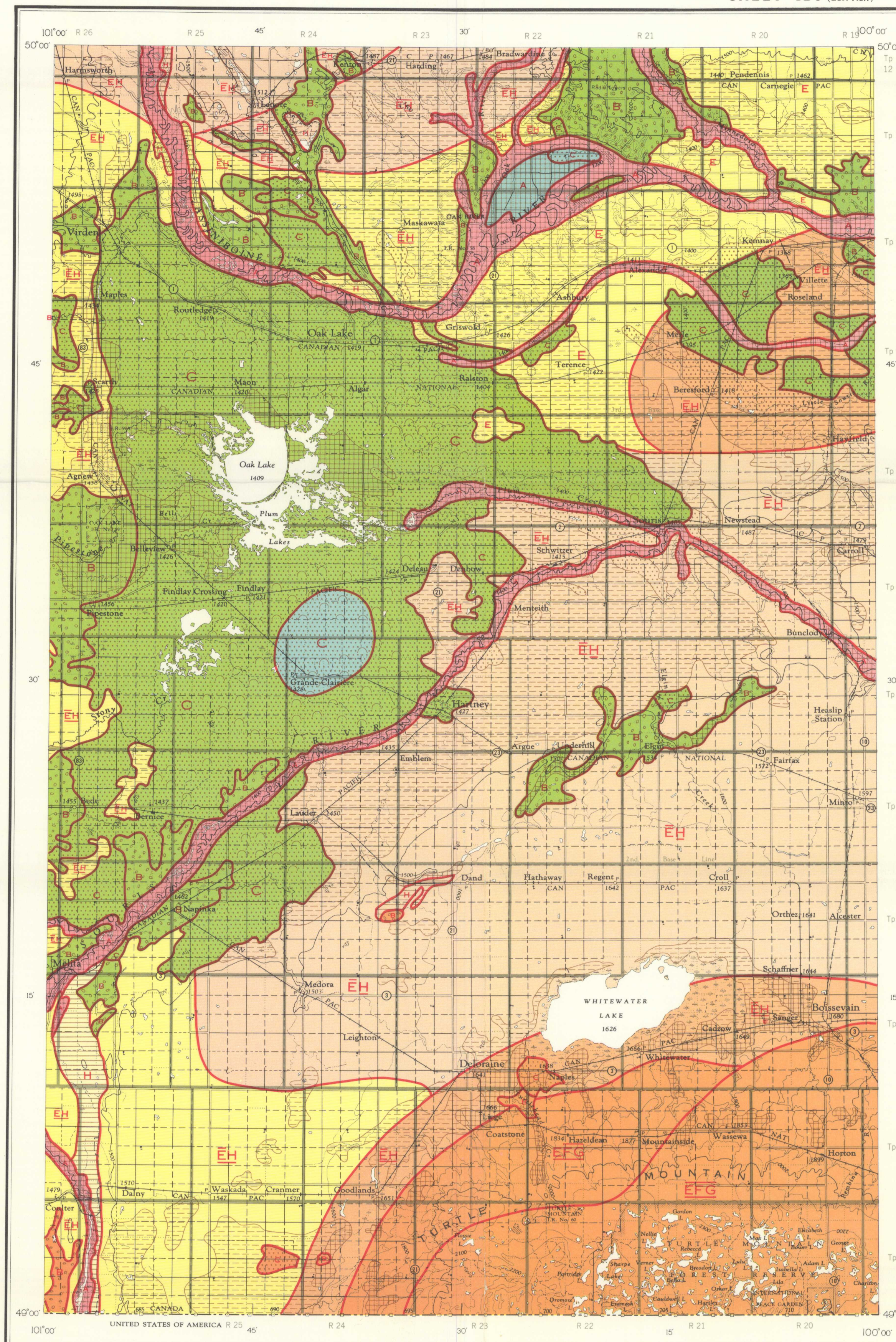


SHEET 62 F (East Half)



Section along longitude 104°

Section along longitude 100°

LEGEND

Note: For maximum benefit, the map should be carefully studied in conjunction with the legend, sections, and descriptive notes

- CENOZOIC**
- PLEISTOCENE AND RECENT**
    - A Clay, silt, sand, and gravel: alluvium on valley floors
    - B Gravel with some sand: mostly glacial-fluvial deposits
    - C Sand with some gravel: mostly glacial-lake shoreline deposits, unduned and duned
    - D Clay and silt: mostly glacial-lake deposits
    - E Silty clay till with sand and gravel lenses: glacial deposits, mostly morainal
  - TERTIARY**
    - F Sandstone, shale, with minor lignite: Turtle Mountain Formation
    - G Sandstone: Boissevain Formation
    - H Shale: Riding Mountain Formation
- MESOZOIC**
- CRETACEOUS**

AQUIFER DESIGNATION

The geological formation that constitutes the best aquifer qualitatively and quantitatively in any given area. (May or may not be the formation exposed at the surface) ... E

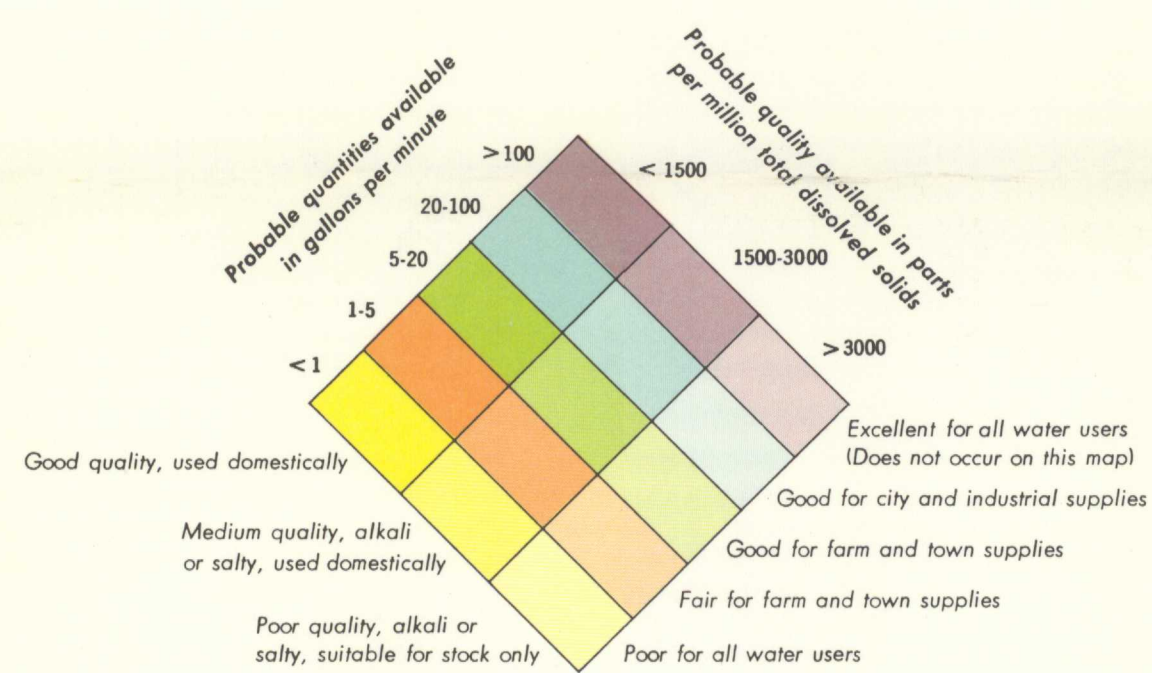
Two geological formations present, which act as aquifers. In this case E will yield the better quality water, H will yield the greater quantity. ... EH

Two geological formations present, which act as aquifers. In this case E will yield the better quality water, E and H will yield equal quantities. ... EH

Areas of groundwater probability that are similar in respect to quality, quantity, and aquifer. Changes in quality and quantity of groundwater within an aquifer are gradational. ... EH

Note: The colour and shade of colour represent the groundwater probability of the aquifer that will yield the greatest quantity of water, in cases where there are two aquifers present. If both aquifers will yield equal quantities, then the shade of colour represents the aquifer that will yield the better quality water.

GROUNDWATER PROBABILITY



Variable quantity and quality

Map and sections compiled by R. A. Freeze, and based upon the sources of information listed under the descriptive notes

Cartography by the Geological Survey of Canada, 1962

Base-map by the Surveys and Mapping Branch, 1955

Mean magnetic declination 12° 36' East, decreasing 1.5' annually. Readings vary from 11° 49' in the SE corner to 13° 20' in the NW corner of the map area

MAP 1137A  
GROUNDWATER PROBABILITY  
**VIRDEN**  
(East Half)  
WEST OF PRINCIPAL MERIDIAN  
MANITOBA

Scale: One Inch to Four Miles = 1/253,440 Miles

COPIES OF THIS MAP MAY BE OBTAINED FROM THE DIRECTOR, GEOLOGICAL SURVEY OF CANADA, OTTAWA

USE OF THE MAP

The somewhat diagrammatic sections show the successions of geological formations and their water-bearing characteristics along the four sides of the map.

1. A prospective well site can be evaluated by the following steps:
1. Plot the well site on the map.
2. Note the geological formation exposed at surface (brown pattern); note the probable underlying formations and their approximate thickness by reference to the nearest section.
3. Note the probable quantity and quality of groundwater available (coloured legend).
4. Note the aquifer designation (red letters) and check the stratigraphic position of the productive formation on the nearest section.
5. If two or more geological formations are acting as aquifers, determine their relative merits by the lines above and below the red letters.
6. Any geological formation not coloured on the sections can be considered an aquiclude (a formation that will not transmit water fast enough to furnish an appreciable supply for a well).

PROPERTIES OF THE AQUIFERS

Clay, silt, sand, and gravel (A) — Most of the present and abandoned stream channels are lined with alluvial deposits, but the depth and water-bearing characteristics of the alluvium are as yet unexplored. Most of the deposits are clay and silt, but minor lenses of sand and gravel occur and are excellent aquifers. One such gravel bar occurs in the Assiniboine River valley in tp. 11, rge. 22 and sandpoints driven to depths of 20 to 30 feet yield more than 20 gallons per minute. Wide shallow flood-plain alluvial deposits, such as well as those of Oak Lake, are invariably clay and act as impermeable aquicludes.

Gravel with some sand (B) — These materials were deposited by water that flowed on, within, under, and away from the glacial ice-sheet during its waning stage. Thicknesses of up to 50 feet are common, and constitute an excellent aquifer. Recharge is by direct rainfall, consequently seasonal fluctuations in the water level may be expected. Sandpoints should be driven to a depth of 20 to 25 feet or until they are well below the water-table, in order to insure a constant supply.

Sand with some gravel (C) — Extensive deposits of fine-grained surface sands, originally deposited in glacial Lake Souris, cover the west-central part of the area. These materials are commonly associated with and reworked from materials listed under B above. In some areas the sand has been wind-blown into large dunes. The sand attains thicknesses of up to 50 feet and is an excellent aquifer. Recharge is by direct rainfall, consequently seasonal fluctuations in the water level may be expected. Sandpoints should be driven to a depth of 20 to 25 feet or until they are well below the water-table, in order to insure a constant supply.

Clay and silt (D) — Lake-bed deposits grading into and interfingering with sand (C). Clay and silt do not yield their water readily and are thus classified as impermeable. Wells should be extended through these surface deposits and developed in the underlying aquifers. The quality of the water in underlying formations is commonly poor.

Till (E) — A concrete-like mixture of clay, silt, sand, gravel, and boulders occurring as ground moraine, end moraine, and recessional moraine. In this it is covered by a few inches to a few feet of water-worked bouldery gravel. The upper 20 to 30 feet of till is greyish buff and is commonly known as 'yellow clay'. Beneath this is a more compact blue-grey till commonly known as 'blue clay'. Both contain irregularly spaced discontinuous lenses of sand and gravel. The till is relatively impermeable and wells completed in it will be poor; however, large-diameter wells bored to a depth of 50 to 90 feet and intersecting one or more sand-and-gravel lenses have provided farm supplies. The water obtained is very hard and is generally saline (rich in sodium chloride) or alkaline (rich in sodium or magnesium sulphate). The total hardness and total dissolved solids increase with the depth from which the water is taken. The thickness of the till varies considerably, but in places where it is not too great the till-bedrock contact commonly constitutes a water-bearing zone. In general the till is an unsatisfactory aquifer, but is the best available over much of the area.

Sandstone, shale, with minor lignite (F) — The youngest bedrock present is the Turtle Mountain Formation, a succession of shale and sandstone beds with some lignite-bearing bands. It outcrops on the flanks of Turtle Mountain and primarily represents the bedrock cap of the mountain. It has not been tapped extensively as an aquifer because of the thick section of till overlying it. A few wells reported to be drilled into it yield hard water, which is sometimes slightly reddish because of the high iron content. Despite this, it probably offers as good if not better groundwater possibilities than the overlying till.

Sandstone (G) — The Boissevain Formation, a 100-foot section of greenish grey sandstone, underlies the Turtle Mountain Formation. It is close enough to the surface to be considered a usable aquifer only in a band about 1 mile wide around the base of Turtle Mountain. Several wells reported to be drilled into it yield hard water, which is sometimes slightly reddish because of the high iron content. Despite this, it probably offers as good if not better groundwater possibilities than the overlying till.

Shale (H) — Shale of the Riding Mountain Formation immediately underlies the unconsolidated deposits over all of the area except Turtle Mountain. Wells drilled to the fractured upper surface of the shale generally yield soft water, which is either saline or alkaline. The total hardness and total dissolved solids of the water increase with the depth from which the water is taken.

MISCELLANEOUS NOTES

1. No regions of artesian flow are found in the map-area. The water level in existing wells varies from 5 to 20 feet below the surface in aquifers A, B, and C; and from 20 to 60 feet below the surface in aquifers E, F, G, and H.
2. The terms 'good', 'medium', and 'poor' quality are relative to this area. According to standards of the World Health Organization, 500 parts per million (ppm) total dissolved solids is permissible and 1,500 ppm is excessive. Thus the general quality of the groundwater in Virden map-area is very poor. Other WHO standards, of interest in this area, are:

Iron	permissible — 0.3 ppm
excessive — 1.0 ppm	
Alkalinity (Magnesium and sodium sulphate)	permissible — 500 ppm
excessive — 1000 ppm	
Chloride	permissible — 200 ppm
excessive — 500 ppm	

3. In regions showing the symbol 'EH' residents commonly have two wells: one tapping till and yielding small quantities of water suitable for domestic use; and another tapping shale and yielding larger quantities of poorer-quality water suitable for stock.

SOURCES OF INFORMATION

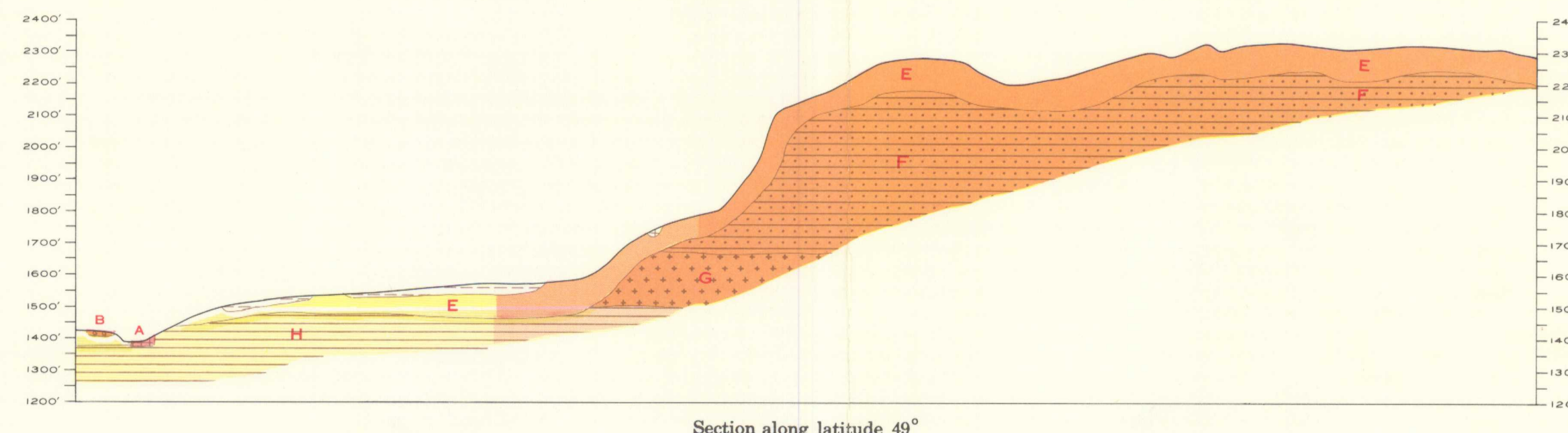
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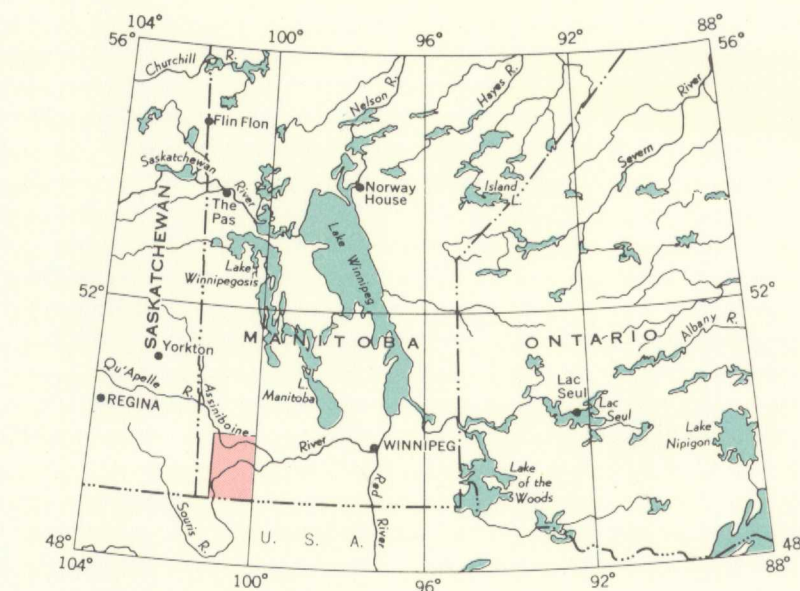
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Johnston, W. A.: Surface Deposits and Groundwater Supply of Winnipeg Map-area, Manitoba; Geol. Surv., Canada, Mem. 174 (1934).

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Section along latitude 49°



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