# HYDROGEOLOGICAL MAP WATERWAYS–WINEFRED LAKE ALBERTA

McMURRAY N.W. 56/I12 (S.W. PART) –
LAC LABICHE-PETER POND N.W. 52/I12 (N.W. PART)

Alberta RESEARCH

## METEOROLOGY

### LEGEND

Isohyet, mean annual precipitation in inches

Mean annual precipitation:
- 15-20 inches
- 20-25 inches

Boundary of discontinuous permafrost; apices indicate direction of frost-free area

Boundary of climafrost; apices indicate direction of frost-free area

Meteorological station

Standard rain gauge only

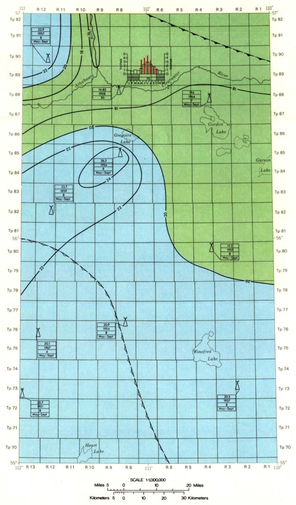
Precipitation data:
- Mean annual precipitation in inches
- Year of commencement of observations
- Number of years of record used to calculate mean annual precipitation
- Months of record

Mean monthly potential evapotranspiration*
- Mean monthly precipitation
- Period when surface is usually snow covered
- Period with mean daily temperature below freezing (0°C)
- Figure indicates percentage of mean annual precipitation falling as rain

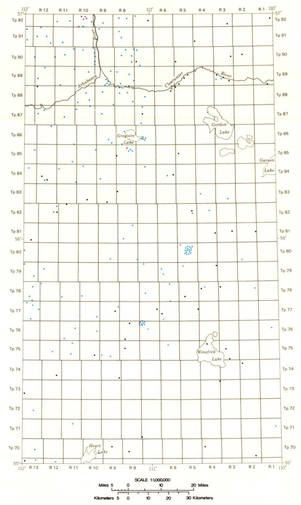
Sources of data:

Climatic Maps of Alberta (Longley, 1968); Monthly Record of Meteorological Observations (Meteorological Branch, Canada Department of Transport); and Provisional Evaporation Maps of Canada, Department of Transport Circular 4531 (Bruce and Weisman, 1967).

*Evapotranspiration estimates are based on the Provisional Evaporation Maps of Canada.




## DATA DENSITY




### LEGEND

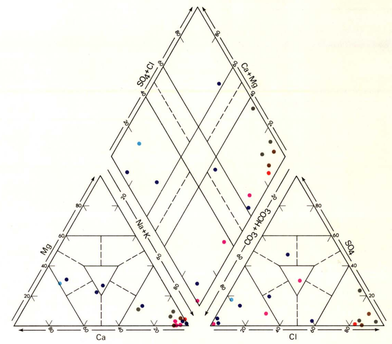
Data control point marking the location of a well with water level information only

Data control point marking the location of a well with yield information (i.e. production tests)

Data control point marking the location of a hydrogeological surface feature

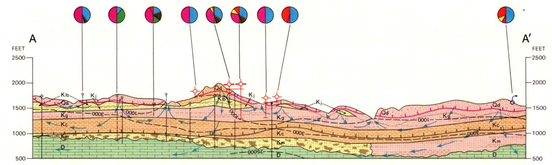
## CHARACTERISTIC WATER SAMPLES

PERCENT OF TOTAL EQUIVALENTS PER MILLION




### LEGEND

Data control point marking the location of a water sample from:
- surface water from Athabasca River
- groundwater from: Quaternary deposits
  - Grand Rapids Formation
  - Clearwater Formation
  - McMurray Formation
  - Devonian Formations




## MAIN MAP LEGEND

### Topography

Surface contours and elevation in feet (interval 250 feet):
- defined
- approximate

### Geology

Geological boundary

QUATERNARY
- Qd Unconsolidated deposits

CRETACEOUS
- Kl Labiche Formation
- Kj Joli Fou Formation
- Kg Grand Rapids Formation
- Kc Clearwater Formation
- Km McMurray Formation

DEVONIAN
- D Devonian

### Lithology

- Sand and gravel
- Sandstone and shale
- Sand and silt
- Sand, silt, and gravel
- Shale
- Limestone, dolomite, shale, evaporites
- Oil-impregnated sandstone and shale

### Hydrography

- Stream, perennial
- Stream, intermittent
- Lake or slough
- Marsh, muskeg
- Surface water divide

### Hydrogeology

- Spring, flow rate unknown
- Spring, flow rate known (imperial gallons per minute)
- Spring information, lithology of main aquifer
  - limestone ls
  - sand s
- Direction of groundwater flow

### Groundwater Probability†

Range of average expected yield of wells (in imperial gallons per minute)

Probable: estimated from quantitative information (pump tests, bail tests, etc.)

Possible: estimated from qualitative information (flow regime, lithology, etc.)
- 25-100
- 5-25
- 1-5
- <1

Yield area boundary

†The indicated average expected yields are predictions based on the best data available at the time of map compilation; due to data shortcomings and special conditions, local discrepancies between predicted and actual yields are inevitable. Multiaquifer completion may be necessary to obtain the yield indicated.

### Wells and Other Artificial Works

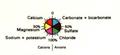
- Water well
- Water well, flowing
- Water well, shallow depth
- Water well, 20-year safe yield calculated from apparent transmissivity
- Water well, 20-year safe yield calculated from a good bail test or a short pump test
- Observation well, with automatic recorder
- Test well with more than one piezometer in a single borehole or with groundwater data collected from several depths during drilling
- Alberta Research test well — AR
- Well information, recorded around the outside of the well symbol according to the number code shown
  - 4: Aquifer material—dolomite — d
  - 5: Safe yield or estimated safe yield from a short pump test or good bail test — 15
  - 7: Total dissolved solids in parts per million — 1500

Depth scale

- Oil well*
- Abandoned well*
- Structure testhole*
- Other borehole*
- Line of hydrogeological profile — A A'

*Vertical line portion of oil, gas, or other exploratory test well symbols on hydrogeological profiles indicates well depth; dashed portion indicates surface casing interval.

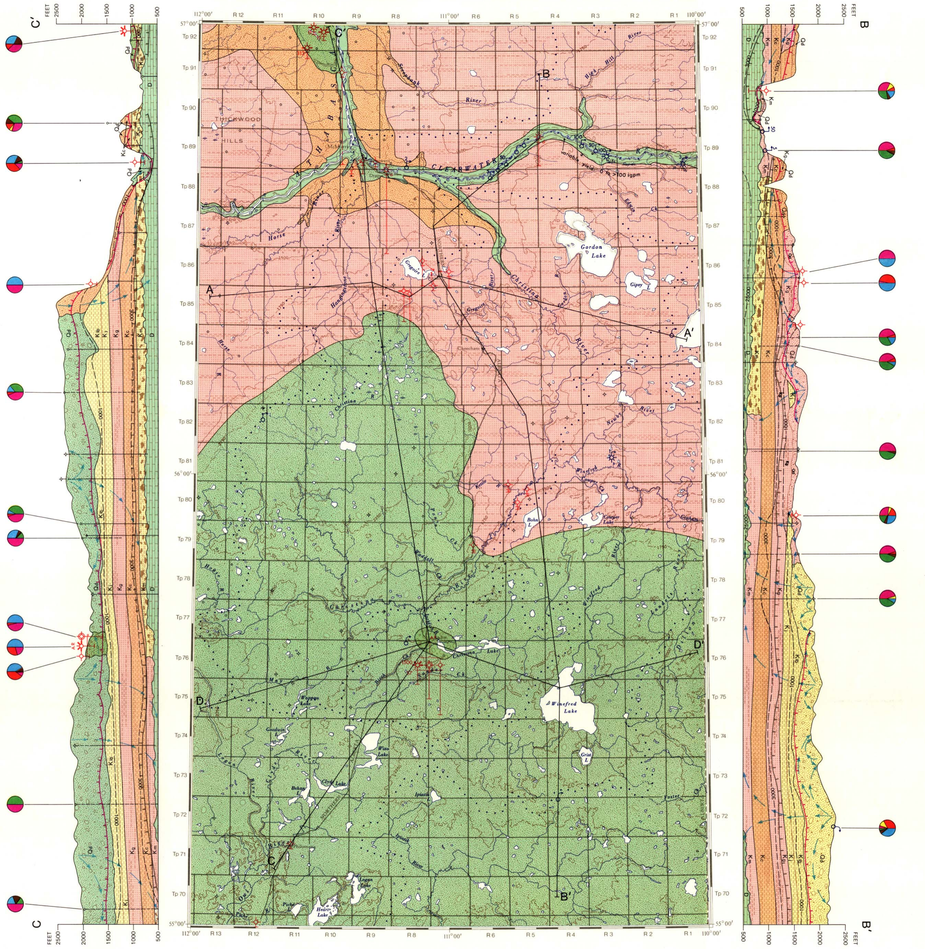
### Hydrochemistry

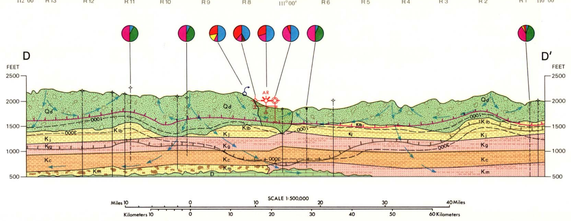



Note: When the yellow Mg pie sector is absent Ca+Mg are represented as a unit by the red pie sector.

- Total dissolved solids in parts per million, approximate — 1000
- Isogram along which sodium + potassium constitute 60 percent of total cations,* teeth indicate direction of lesser sodium + potassium content:
  - defined
  - approximate
- Isogram along which chloride constitutes 60 percent of total anions,* teeth indicate direction of lesser chloride content:
  - defined
  - approximate

*Determined on equivalents per million basis.



All elevations in feet above mean sea level.

Vertical exaggeration of the hydrogeological profiles is approximately 40X.

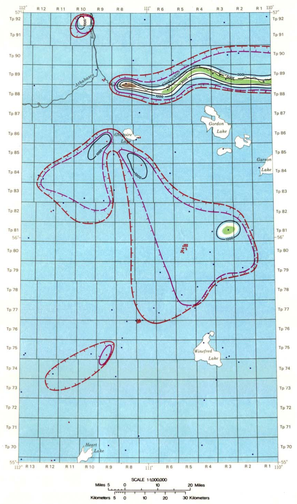
An expanded legend and explanatory notes for use with this hydrogeological map series is available from Alberta Research, Edmonton, Canada.

Map to accompany Report 74-2

Hydrogeology by G. Ozoray 1972, based on data collected in 1970 and 1971.

Cartographic editing by F. Smith and A. Gill

## HYDROCHEMISTRY: DRIFT




### LEGEND

Data control point marking the location of a water well with a chemical analysis

Data control point marking the location of a spring with a chemical analysis

Data control point marking the location of a testhole or oil well with a chemical analysis

Data control point marking the location of a hydrogeological surface feature with a chemical analysis

Total dissolved solids in parts per million:
- defined
- approximate

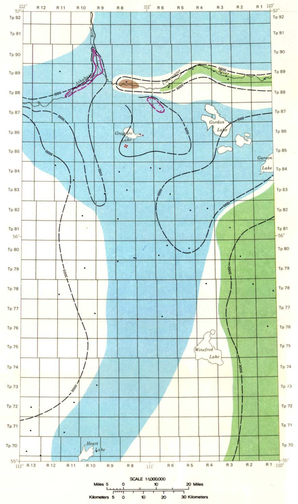
- Bicarbonate + carbonate constituting over 60 percent of total anions*
- Sulfate constituting over 60 percent of total anions*
- Chloride constituting over 60 percent of total anions*

Isogram along which calcium + magnesium constitute 60 percent of total cations*; teeth indicate direction of lesser calcium + magnesium content:
- defined
- approximate

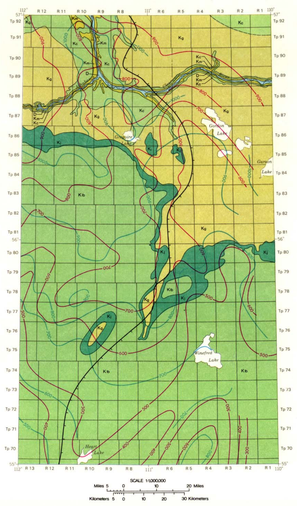
Isogram along which sodium + potassium constitute 60 percent of total cations*; teeth indicate direction of lesser sodium + potassium content:
- defined
- approximate

*Determined on equivalents per million basis.

## HYDROCHEMISTRY: BEDROCK




## GEOLOGY I




### LEGEND

- Kl Labiche Formation: *shale, silty shale, ironstone partings*
- Kj Joli Fou Formation: *shale*
- Kg Grand Rapids Formation: *sandstone, siltstone, shale, thin coal beds*
- Kc Clearwater Formation: *shale, siltstone, sandstone*
- Km McMurray Formation: *sandstone, siltstone, shale; oil-impregnated*
- D Devonian: *limestone, dolomite, shale, evaporites*

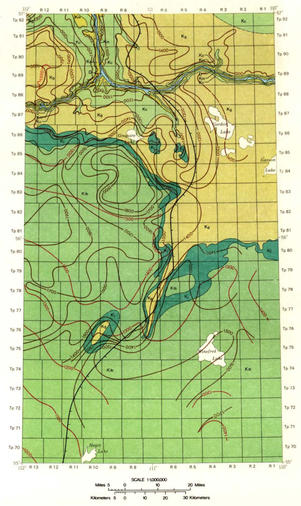
Rock unit boundary: defined / approximate

Structure contour on top of the Devonian

Structure contour on top of McMurray Formation

Structure contour on top of Grand Rapids Formation

Structure contour on bottom of Quaternary (drift)

Boundary of oil saturation in the McMurray Formation; teeth indicate direction of less saturation

## GEOLOGY II