

LEGEND

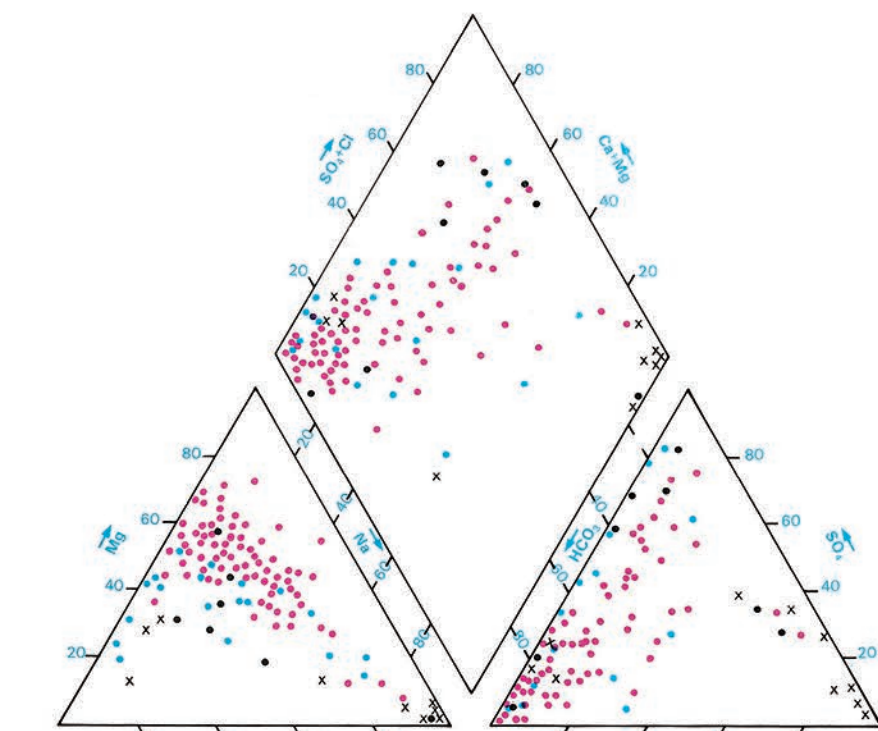
- WATER SAMPLE FROM PRECAMBRIAN ROCK
- WATER SAMPLE FROM WINNIPEG FORMATION
- WATER SAMPLE FROM CARBONATE ROCK
- WATER SAMPLE FROM SURFICIAL MATERIALS
- WATER SAMPLE FROM SPRING

TOTAL DISSOLVED SOLIDS AND CHLORIDE CONCENTRATIONS (mg/L)

ISOCON, TOTAL DISSOLVED SOLIDS IN WINNIPEG FORMATION

ISOCON, TOTAL DISSOLVED SOLIDS IN UPPER CARBONATE ROCK AQUIFER

CHEMICAL COMPOSITION OF GROUNDWATER (percent equivalents per million)



CARBONATE ROCK AQUIFER

WINNIPEG FORMATION AQUIFER

PRECAMBRIAN ROCK AQUIFER

OVERBURDEN AQUIFER

GROUNDWATER GEOCHEMISTRY

PRECAMBRIAN ROCK AQUIFER

Groundwater quality in the Precambrian bedrock aquifer shows considerable variability. Total dissolved solids concentration ranges from 331 mg/L to 4450 mg/L. Groundwater geochemical types range from calcium-magnesium-bicarbonate through mixed calcium-magnesium-sodium-bicarbonate-sulfate to sodium-chloride-sulfate. This indicates a complex and varied geochemical development, probably influenced considerably by groundwater geochemical development in surficial materials overlying the bedrock. The occurrence of significant chloride ion concentration in samples from some wells along the Winnipeg River may indicate discharge of saline groundwaters. High naturally occurring uranium concentrations have been found in water samples from some Precambrian bedrock wells in and near the Selkirk map sheet.

WINNIPEG FORMATION AQUIFER

Groundwater quality in the Winnipeg Formation is transitional from a saline brine with total dissolved solids greater than 100,000 mg/L in the southwestern part of the map sheet to fresh water with total dissolved solids less than 500 mg/L in the northern and central parts of the map sheet. Isoclines of total dissolved solids have been drawn indicating this transition which is controlled by complex groundwater flow dynamics. Where Winnipeg Formation aquifer groundwater is fresh, water quality varies from a calcium-magnesium bicarbonate type found in recharge areas east of Lake Winnipeg to sodium-chloride-sulfate, sodium-bicarbonate-chloride or sodium-sulfate-bicarbonate type groundwaters west of Lake Winnipeg.

Analyses of stable isotopes of oxygen and hydrogen in Winnipeg Formation groundwaters indicate that the fresh water found in this aquifer west of Lake Winnipeg was recharged to the aquifer during a cold climate period, probably during the last ice age.

CARBONATE ROCK AQUIFER

Groundwater quality in the carbonate rock aquifer (Red River, Stony Mountain and Stonewall Formations; Interlake Group) is relatively uniform throughout the map sheet, generally occurring as a magnesium-calcium-bicarbonate type groundwater in which sulphate and sodium locally become significant ionic constituents. Total dissolved solids typically ranges from 250 to 700 mg/L. Increased salinity in the upper part of the aquifer is found in the far southwestern corner of the map sheet, marking the northern boundary of a regional zone of sodium-chloride brine which occupies this aquifer south and west of the Selkirk map sheet. Saline groundwaters also occur in the lower part of the carbonate rock aquifer in most areas south of Township 16. These groundwaters have been intersected by deep wells near the Red River and in a number of wells farther west. North of Township 15 groundwater quality remains quite uniform throughout the full thickness of the carbonate rock aquifer except perhaps in the far western corner of the map sheet where water quality may deteriorate with depth.

OVERBURDEN AQUIFERS

Groundwater quality in overburden aquifers varies over a wide range through the map sheet. Very little information is available west of the Red River and Lake Winnipeg where the carbonate rock aquifer is used almost exclusively for groundwater supply. Analyses from two overburden aquifer wells in the southwestern corner of the map sheet show saline groundwater with total dissolved solids in excess of 1500 mg/L, reflecting upward discharge of saline bedrock groundwater in this area. Elsewhere in the western half of the map sheet it is expected that overburden aquifer groundwater quality will be comparable to that found in the carbonate rock aquifer. In the eastern half of the map sheet groundwater quality in overburden aquifers is generally excellent. Groundwater is generally of the calcium-magnesium-bicarbonate type with total dissolved solids of 200 to 700 mg/L. Some water quality deterioration occurs in the vicinity of the Brokenhead River where upward discharging saline groundwaters from the Winnipeg Formation penetrate into the overburden aquifers. In the area near the Winnipeg River groundwater quality in many overburden aquifer wells shows an increased total dissolved solids content and groundwaters tend to become mixed calcium-magnesium-bicarbonate-sulfate types. This reflects the transition from locally extensive sands and gravels found west of the Winnipeg River which receive good recharge at outcrops to local, generally more clay rich overburden aquifers which are recharged in part by water seeping through tills and fine grained lacustrine materials found in Precambrian terranes near the Winnipeg River and to the east and north of the River.

SPRINGS

Springs show a uniform water quality throughout the map sheet, occurring as magnesium-calcium-bicarbonate type groundwaters with total dissolved solids ranging from 150 to 600 mg/L.

SOURCES OF INFORMATION:

- CHARRON, J.E., 1974, A Hydrogeological Study of the Selkirk Area, Manitoba: Inland Waters Directorate, Environment Canada, Scientific Series No. 8.
- GOFF, J.K., 1971, Hydrology and Chemistry of the Shovel Lake Basin, Interlake Area, Manitoba: M.S.C. Thesis, University of Manitoba.
- MANITOBA DEPARTMENT OF NATURAL RESOURCES, 1984, Files of Chemical Analyses of Groundwater, Hydrotechnical Services, Water Resources Branch, Winnipeg.

Prepared by: R.N. Betcher, 1985

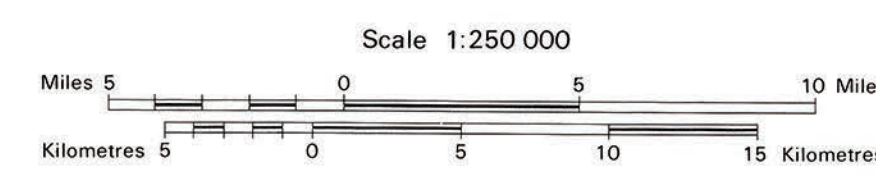
PROVINCE OF MANITOBA
DEPARTMENT OF NATURAL RESOURCES
WATER RESOURCES BRANCH

GROUNDWATER AVAILABILITY STUDY
SELKIRK AREA

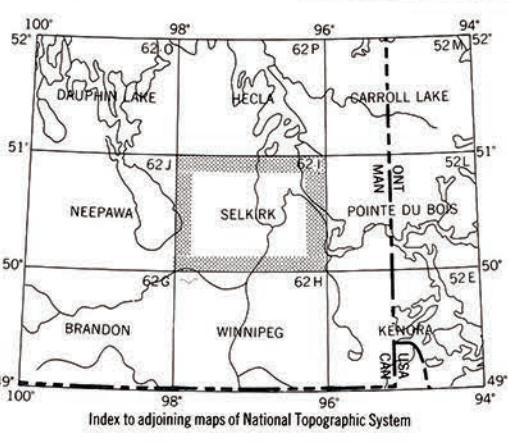
GROUNDWATER QUALITY
FIGURE 8

MAP LEGEND

- Road
- Railway
- Town
- Village or Settlement
- Intermittent Lake and Stream
- Marsh or Swamp



Cartography by: Water Resources Branch, Manitoba, 1985/86.



Magnetic declination 1976 varies from 7°38' easterly at centre of west edge to 9°44' easterly at centre of east edge. Mean annual change decreasing 4.9'.

Base Map by: Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa.

"A Canada-Manitoba Interim Subsidiary Agreement on Water Development for Regional Economic Expansion and Drought Proofing Project."