Canadian Achievements in Hydrogeology

1880 - 1980s

Searching for Groundwater (1880-1980s)

1880s: Geological Survey of Canada (GSC) began the search for groundwater in Canada.

Late 1880s: The first Canadian municipal systems supplied by groundwater were established.

1915: GSC publications began to include discussions and maps of groundwater conditions in northwest Ontario and parts of the Prairies.

Early 1930s: GSC publications with a groundwater focus first appeared.

1930-1934: GSC responded to acute shortage in rainfall and surface water supply with an extensive groundwater investigation. Results were published in Water Supply Papers aimed at farm residents, municipal bodies and well drillers to assist in finding a groundwater source.

1935-1938: Similar studies were conducted in other parts of Canada by the GSC and the National Hydraulic Research Institute focusing on processes and unique geological environments (e.g., glaciers, deltas, saltwater intrusion).

Mid-1950s to Mid-1980s: Many provincial governments established agencies for studying and managing groundwater. The first was the Ontario Water Resource Commission, under the direction of Barry and Watt. In early 1980s, Jonas was the first practicing groundwater specialist in the Groundwater Section of the Nova Scotia Department of Mines, established in 1963. In Quebec, a major expansion in mapping groundwater resources and their development, notably for municipal water supply, was led by the Ministère des Ressources naturelles and involved companies such as Foratek and Compagnie de l'Aqueduc. These studies were followed up by detailed investigations that have resulted in a much improved understanding of groundwater flow and much increased use of quantitative models.

1946: First provincial groundwater level observation network established in the province of Manitoba. Initially led by Farvolden and established an Underground Research Laboratory in Brandon.

1958-1985: Atomic Energy of Canada Ltd. (AECL) investigated the potential for deep geological disposal of high level nuclear waste in northern Ontario and established an Underground Research Laboratory in Manitoba. Initially led by Gale of the GSC and subsequently by Gristak at Environment Canada, detailed hydrogeological investigations resulted in a much improved understanding of groundwater flow systems and the hydrogeochemistry of fractured granite.

Publications

1967: The GSC published Groundwater in Canada, a milestone report that presented an authoritative scientific knowledge of Canada’s groundwater resources.

University Research (1967-Present)

Cherry became Canada’s first professor of hydrogeology in 1967. Farvolden became the second. Groundwater research programs have now expanded to more than a dozen universities across Canada.

Research Councils (1950s)

1955: Farvolden led the formation of groundwater programs at the Research Council of Alberta (RCA). Staff included Toth, Manley, Pettit, Jones, Leblanc and Lemieux. In the early 1960s this group, along with others in Canada, developed fundamental understanding of groundwater theory and processes.

Late 1960s: A groundwater group was formed at the Saskatchewan Research Council (SRC). Christiansen and Manley undertook extensive test drilling programs during the 1960s, establishing the geological framework for the major regional aquifers.

Regional Groundwater Flow (1955-1970)

Early 1960s: The Prairies were the focus of many groundwater studies by the ARC, including Meyboom’s ground-draing study of the Milk River Aquifer. Meyboom and Toth conducted a famous field trip to inspect field phenomena associated with groundwater flow. Meyboom then led the GSC’s Groundwater Section in developing a better understanding of groundwater hydrology. Staff included Brandon, Freeze, van Everdingen and Banner.

1962 & 1963: Toth published analytical solutions for steady flow through homogeneous, isotropic, media and presented concepts of local, intermediate and regional flow systems.

1965: Toth received the first Meinzer Award from the Geological Society of America for his book and presented concepts of local, intermediate and regional flow systems.

Field versus Theory (1962)

1962: Hydrogeology Symposium No. 3 held at the University of Toronto. The Proceedings included discussions and provide an excellent summary of understanding of Canadian hydrogeology at the time. Discussions on field versus theoretical approaches to groundwater flow systems by Toth and Merrygrove led to the formation of the groundwater community.

The Dawn of Numerical Modelling (late 1960s)

Late 1960s: Three Canadian hydrogeologists were simultaneously developing finite-difference models for application to groundwater flow and aquifer development issues. Freeze and Witherspoon developed numerical techniques to solve groundwater flow equations in heterogeneous and anisotropic media, while Patin and his colleagues at the Musqueabodrel Dartmoor Aquifer near Halifax, which is the most studied alluvial aquifer in North America, employed the “soil column” approach with the Nova Scotia Government. Frind worked with Farvolden on the regional dewatering project for the development of the Welland Canal.