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Seismic Monitoring
at the
Whiteshell Nuclear Research Establishment

by

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Seismological Service of Canada

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Division of Seismology and Geothermal Studies

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This report summarizes the progress to date of the seismic monitoring conducted by the Earth Physics Branch at the Whiteshell Nuclear Research Establishment (WNRE) near Pinawa, Manitoba. A seismograph station, PWM, was opened on the WNRE property on October 10, 1978, in order to monitor seismic activity below magnitude 3 in the area. This station has now operated continuously for about four months and has detected no earthquakes magnitude 2 or greater close to (within 60 km of) WNRE. The general assumption of a very low rate of seismic activity in southeastern Manitoba cannot be contradicted, but a four month period of observation is too short to allow a confident assessment of the rate of earthquake occurrence.

The rate is assumed to be very low in southeastern Manitoba because of the lack of any historical evidence of earthquake activity. The area is classified as the lowest risk, Zone 0, on the 1970 Seismic Zoning Map of Canada (Fig. 1). No earthquakes are known to have occurred within 300km of WNRE (Fig. 2). The closest significant earthquakes are two magnitude 5 earthquakes, one in southern Saskatchewan in 1909 and the other in western Minnesota in 1917. The 1909 tremor would have been felt mildly at WNRE, if it had existed at the time, according to the isoseismal map shown in Figure 3. It is unlikely that events of this size have occurred in

southeastern Manitoba since the mid 1800's because strong tremors that such events would produce at Winnipeg are not known to be part of the history of the city. However, some smaller tremors felt only over limited areas may have gone unrecorded.

Instrumental coverage of smaller earthquakes in southeastern Manitoba has been poor. Figure 4 shows that most seismograph stations have been located at distances greater than 500 km from WNRE. They would only provide coverage of events magnitude 4 or greater since about 1950 and 3 or greater since the mid 1960's. The present PWM station is capable of detecting any magnitude 2 events close to WNRE.

In summary, the absence of any local earthquakes during the four months of monitoring of seismic activity near the WNRE by the Earth Physics Branch has not contradicted the assumption of a very low rate of seismic activity suggested for southeastern Manitoba by the lack of historical earthquakes, but a more extensive period of monitoring is required before the presence or absence of low magnitude seismicity can be estimated with any confidence.

References

- Horner, R.B. and Hasegawa, H.S. 1978. The seismotectonics of southeastern Saskatchewan. *Canadian Journal of Earth Sciences*, 15-8, 1341-1355, 1978.

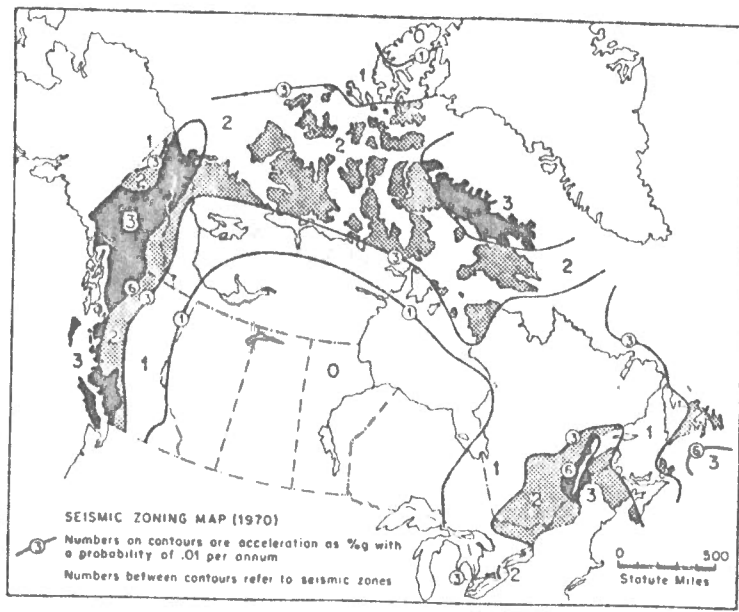


Figure 1. Seismic Zoning Map for Canada, 1970. Darker areas are higher risk zones.

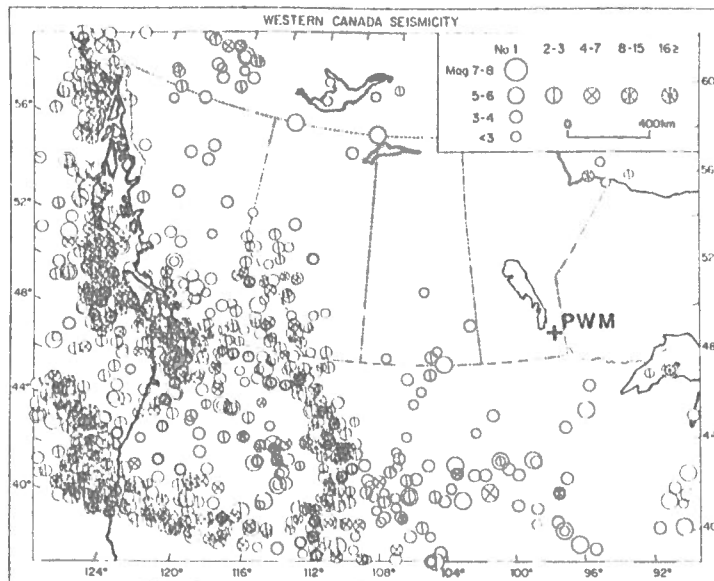


Figure 2. Known seismicity in western Canada and the United States to 1975 (1976 in Saskatchewan and the U.S.). Location of PWM is marked by the cross.

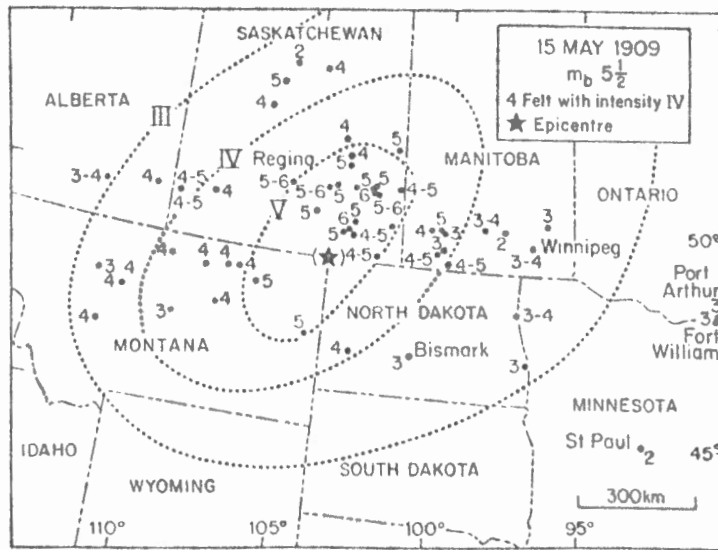


Figure 3. Isoseismal map of the 1909 earthquake compiled by O. Nuttli, St. Louis University, and amended by Horner and Hasegawa (1978). No information for the Pinawa area is published but southeastern Manitoba generally experienced mild shaking, intensities III to IV, from this tremor.

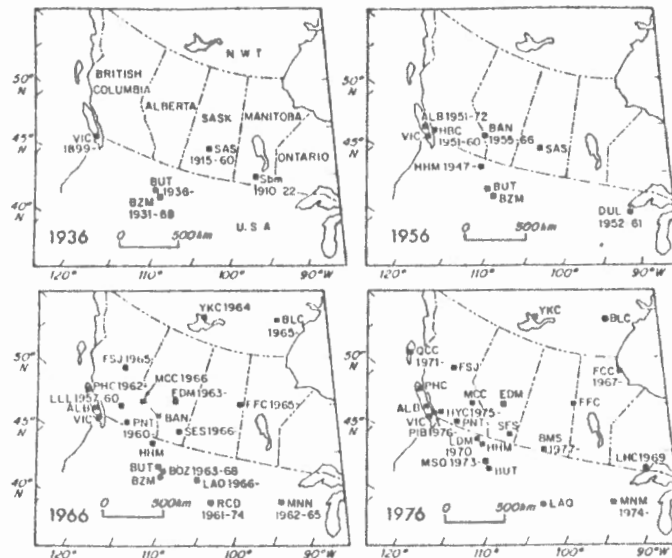


Figure 4. Spatial and temporal distribution of seismograph stations in western Canada and north-central United States from Horner and Hasegawa (1978). Many of the earlier stations, such as Sbm, were low gain intermediate period instruments not capable of recording nearby smaller earthquakes.