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# CHATS FALLS SEISMOGRAPH OPERATION

Quarterly Report - April 1, 1978

prepared for Geotechnical Engineering Dept. Ontario Hydro

by

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SEISMOLOGICAL SERVICE OF CANADA

INTERNAL REPORT 78-2

Division of Seismology and Geothermal Studies

Earth Physics Branch

Department of Energy, Mines and Resources

OTTAWA

April 1978

This document was produced by scanning the original publication.

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## Introduction

This is the first quarterly report on seismic activity in the vicinity of the Chats Falls station (CFO) and covers the November 1977 - March 1978 time period. Future reports will be prepared at the end of each calendar quarter. A description is given of the analysis procedure followed in studying the records. Examples of some seismic events will be presented to illustrate the station sensitivity and a brief explanation will be given about one of the predominant noise source *\$*.

### Seismic Activity Report

There were no natural seismic events detected on the CFO records up to March 31, 1978 that could have originated within 30 km of the station. However, numerous events are observed which can be attributed to explosions at different construction sites or quarries. In addition larger earthquakes located farther away from the station are clearly visible.

Starting with next report, in addition to listing events having occurred near CFO since the last report, a list will be included of earthquakes that take place farther from it but still close enough to potentially influence seismic risk calculations at Chats Falls. These latter earthquakes are located by the Seismicity, Seismic Hazards and Applications section with a six-month delay; thus the next report will list significant earthquakes that occurred in the three-month period ending 6 months before the report date.

#### Procedure

Since seismic events can be due to either blasts, natural earthquakes or noise, it was necessary to develop a procedure that would enable a distinction to be made among these various sources. It is done by correlating events detected at CFO with these on records from Ottawa (OTT), 40 km away, and from Maniwaki (MIQ), 102 km. For most tremors, this method allows an adequate sorting specially for blasts, based on epicenter locations and event signature.

## Examples of Seismic Events

To demonstrate detecting capability of CFO, three figures are included to show seismic events of particular interest. Figure 1 illustrates the record of an earthquake near Chrysler, Ontario. It occurred on February 8, 1978, at 08:05 (UT). The magnitude M<sub>L</sub> was equal to 1.8 and the epicentral distance 90 km. The seismograph was operating with the gain at 03. Figure 2 shows the trace of the February 18, 1978, earthquake that took place near St-Donat, Québec, at 09:49 (UT). Magnitude was 4.5, epicentral distance about 200 km and gain setting 03. Finally on February 22, 1978, at 05:24 (UT) an earthquake of magnitude 3.8 shook the same area. Figure 3 shows the size of the recorded event at CFO, despite its being 200 km away. These examples should provide some credibility for the estimate that any events of magnitude greater than 0.5 within a radius of 30 km from Chats Falls will be detected on the CFO records.

#### Background noise

As mentioned in the first report on station commissioning, there was one noise source still to identify. It has been established, since, that coupling between turbines or generators, when operating at full efficiency, induces an oscillatory motion into the ground. This inturn, causes long-lasting, high-frequency and high-amplitude noise to appear on the records. Figure 4 shows the trace left by that noise. On the same figure, one can see the noise burst from a generator shuting down.

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To illustrate the importance of this source of noise, following are some figures indicating the percentage of time it affected the records on a monthly basis:

October /77	0.8%
November /77	3.6
December /77	17.6
January /78	9.5
February /78	1.7
March /78	3.1

It can be concluded that this noise source will be disruptive only during cold weather peak electricity production.

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Fig. 1. : Chrysler Earthquake of February 8, 1978

Time: 08:05 U.T.

M<sub>L</sub> : 1.8 ∆ : 90 km

Gain: 03

Fig. 2.: St-Donat Earthquake on February 18, 1978 Time: 09:49 U.T.  $M_L$ : 4.5  $\Delta$ : 200 km Gain: 03 1

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Fig. 3.: St-Donat Earthquake Aftershock on February 23, 1978
Time: 05:24 U.T.
M<sub>L</sub>: 3.8
Δ : ≃200 km
Gain: 03



Fig. 4.: Noise Manifestations on CFO Records.

- A. Noise due to Vibratory Motion of Generator when operating full efficiency
- B. Noise due to the shutdown of one generator.