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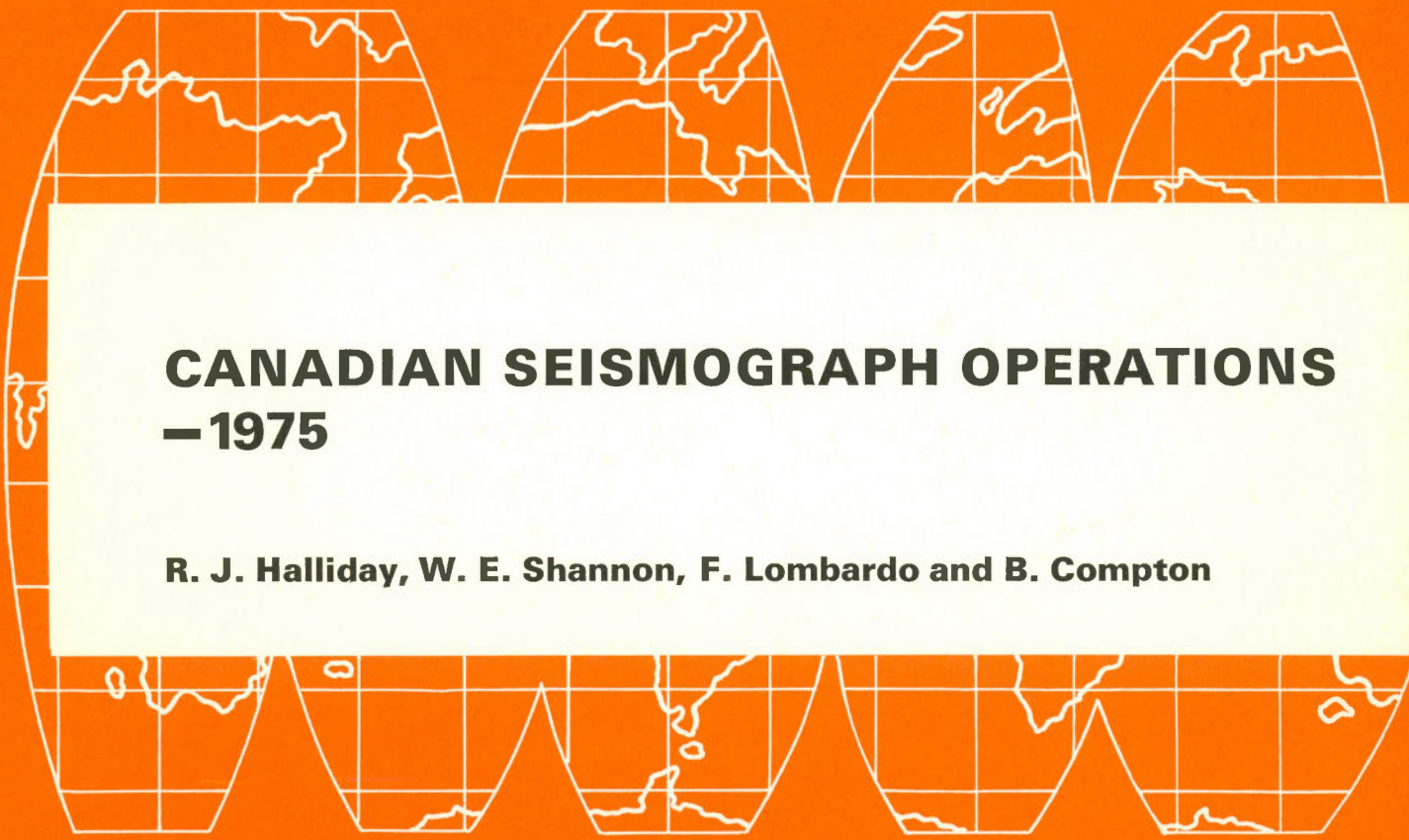
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1975

## Seismological Service of Canada



# CANADIAN SEISMOGRAPH OPERATIONS -1975

**R. J. Halliday, W. E. Shannon, F. Lombardo and B. Compton**

Seismological Series Number 75  
Ottawa, Canada 1977



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#### ABSTRACT

During 1975 the Division of Seismology and Geothermal Studies, of the Earth Physics Branch, Department of Energy, Mines and Resources operated or contracted the operation of 21 standard seismograph stations, 12 regional stations, 2 telemetered networks based at Ottawa and Victoria, a medium aperture array at Yellowknife, a strong-motion seismograph network on the West Coast and several special or temporary seismographs. This report gives the characteristics of the various systems and describes the format and availability of the recorded data.

#### RÉSUMÉ

En 1975, la Division de la séismologie et des études géothermiques de la Direction de la physique du globe, ministère de l'Énergie, des Mines et des Ressources, a exploité ou fait exploiter 21 stations séismographiques standard, 12 stations régionales, 2 réseaux de télémétrie situés à Ottawa et à Victoria, un réseau à ouverture moyenne à Yellowknife, un réseau d'accélérographes sur la côte du Pacifique ainsi que plusieurs installations séismographiques spéciales ou temporaires. Ce rapport présente les caractéristiques des divers systèmes, décrit le format des données et indique comment se les procurer.



CONTENTS

	<i>Page</i>
1. Introduction . . . . .	1
2. Canadian Seismograph Network	
2.1 General . . . . .	1
2.2 Standard Stations . . . . .	1
2.3 Regional Stations . . . . .	1
2.4 Eastern Canada Telemetered Network (ECTN) . . . . .	6
2.5 Western Canada Telemetered Network (WCTN) . . . . .	6
2.6 Long-Period Digital Tape System . . . . .	6
2.7 Special or Temporary Stations . . . . .	9
2.8 Yellowknife Array . . . . .	10
2.9 Strong-Motion Seismograph Network . . . . .	11
3. Canadian Seismological Data	
3.1 Rapid Telex Data. . . . .	16
3.2 Microfilm . . . . .	16
3.3 Original Seismograms. . . . .	16
3.4 Special Data. . . . .	16
3.5 Canadian Earthquakes. . . . .	16
4. Station Procedures . . . . .	17
5. Standard and Regional Seismograph Station Instrumentation	
5.1 Instrument Changes During 1975. . . . .	17
5.2 Calibration Curves. . . . .	19
6. Personnel. . . . .	19
References . . . . .	19

List of Figures

Figure 1. Canadian Standard and Regional Seismograph Stations . . . . .	2
Figure 2. Eastern Canada Telemetered Network and other Stations . . . . .	7
Figure 3. Western Canada Telemetered Network and Long Period Digital Tape Recording Stations. . . . .	8
Figure 4. Yellowknife Seismograph Array . . . . .	10
Figure 5. Pulse Calibration Example . . . . .	17

CONTENTS

	<i>Page</i>
<b>List of Tables</b>	
Table 1. Standard and Regional Seismograph Stations . . . . .	3
Table 2. Standard and Regional Seismograph Station Operators. . . . .	4-6
Table 3. Eastern Canada Telemetered Network Stations. . . . .	7
Table 4. Western Canada Telemetered Network Stations. . . . .	8
Table 5. Long-Period Digital Tape Recording Stations. . . . .	9
Table 6. Special or Temporary Stations. . . . .	9
Table 7. Accelerograph Sites in Canada. . . . .	11-15



# CANADIAN SEISMOGRAPH OPERATIONS —1975

R. J. Halliday, W. E. Shannon, F. Lombardo and B. Compton

## 1. INTRODUCTION

This report, formerly called the Seismological Bulletin, is published annually as part of the Seismological Series of the Earth Physics Branch. It contains summary information on the seismograph installations operated by or for the Division of Seismology and Geothermal Studies, Earth Physics Branch, Department of Energy, Mines and Resources. This information includes a brief description of the various types of seismograph installations, the data produced, the data processing procedures and the availability of station data and records. Summary information on instrumental changes in the Network and calibration curves for the standard and regional seismograph stations are included in the later pages of the report.

## 2. CANADIAN SEISMOGRAPH NETWORK

### 2.1 *General*

The Canadian Seismograph Network (CSN) is composed of various types of seismograph installations which are briefly described in the following section. In 1975, these installations included 21 standard stations (minimum of six daily records), 12 regional stations (minimum of one daily record) a four-station, short period, vertical network telemetered into Ottawa, a similar four-station, short period, vertical network telemetered into Victoria, a short and long period vertical seismograph array situated in Yellowknife, 3 long period, 3-component, automatic digital stations located in British Columbia, a strong-motion seismograph network and several special and temporary installations.

### 2.2 *Standard Stations*

A standard station consists of three orthogonal short period seismographs and three long period seismographs, each producing a photographic record. Tables 1 and 2 list stations, codes, location and operators (see also Figure 1). The short period seis-

ometers used in most standard stations are Willmores with a nominal period of one second. The seismometer signal, after passing through the attenuator which has resistors arranged in a TEE pad formation, is fed into a Tinsley galvanometer having a nominal period of one-quarter second. A Sprengnether, 3-component photographic recorder is used for both short and long period seismographs. The Victoria and Montreal stations have a standard short period Benioff system.

The short period recorder drum rotation rate is set to 60 mm per minute, and the long period rate at 15 mm per minute. The three long period Columbia seismometers used in all standard stations have their free period nominally set to 15 seconds, with the exception of those at Yellowknife, which are set to 25 seconds. The same type attenuator TEE pad formation used in the short-period seismographs is also used in the long period. The long period Lehner Griffith galvanometers have a nominal period of 90 seconds.

Calibration curves for all standard stations and any instrumental changes made during the year are included in a later section of this report.

### 2.3 *Regional Stations*

Regional seismograph stations consist of a short period vertical seismograph using a Willmore MKII or Geotech S13 seismometer with a nominal one second period. Tables 1 and 2 list the station codes, location and operators (see also Figure 1). These stations are used in seismically active areas of Canada to supplement the standard station network or for special studies. Most regional stations have electronic amplification using a Geotech preamplifier and a Geotech helicorder producing a visual record. At two regional stations, Poste-de-la-Baleine and Whitehorse, short period, north-south and east-west records are also produced. Regional station calibration curves and any instrumental changes made during the year are also included in this report.

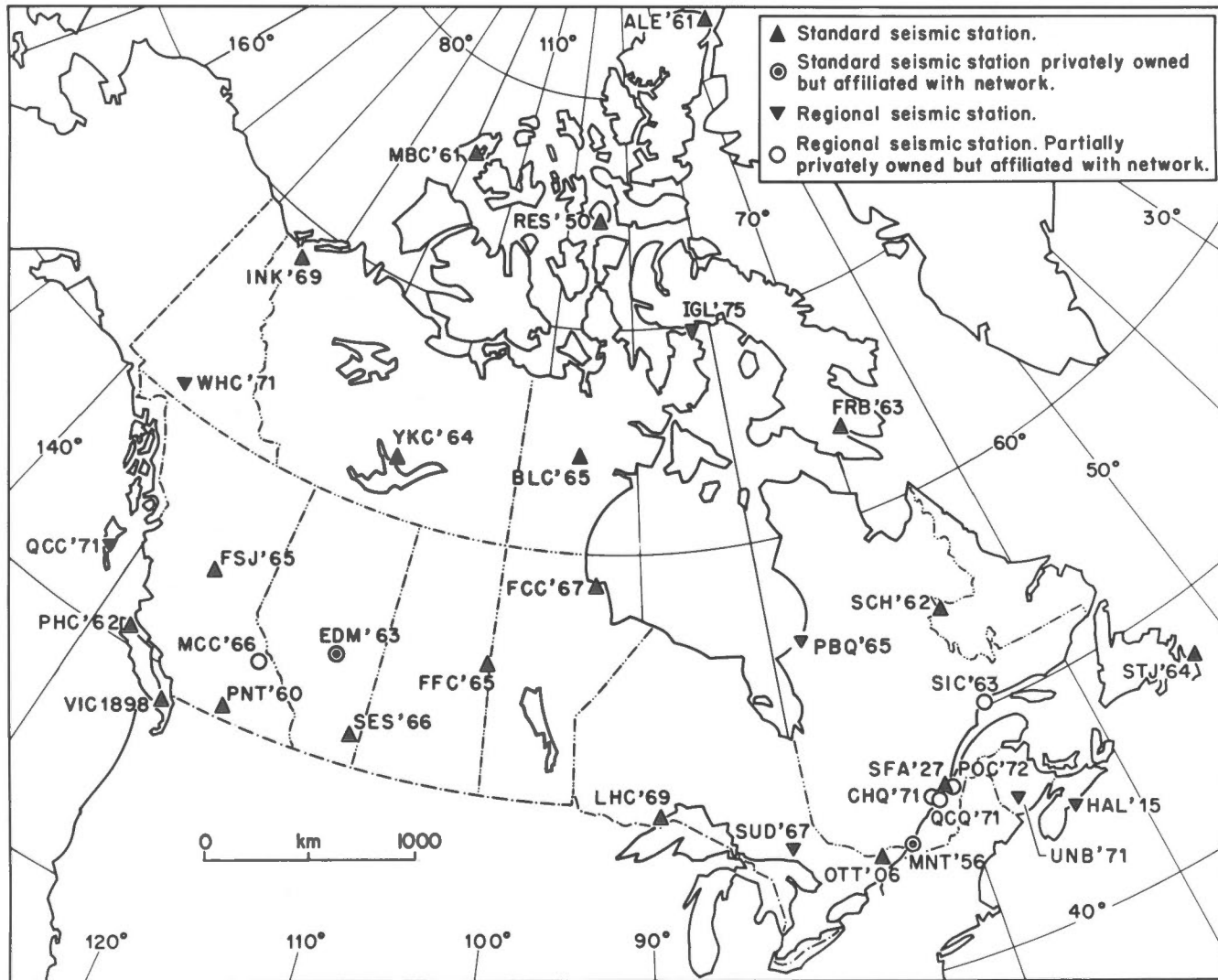


Figure 1. Canadian Standard and Regional Seismograph Stations 1975

TABLE 1  
STANDARD AND REGIONAL SEISMOGRAPH STATIONS 1975

STATION CODE	STATION	LATITUDE AND LONGITUDE		ELEVATION (meters)
ALE	Alert, N.W.T.	82.48N	62.40W	65
BLC	Baker Lake, N.W.T.	64.32N	96.02W	16
*CHQ	Charlesbourg, Qué.	46.89N	71.30W	145
EDM	Edmonton, Alta.	53.22N	113.35W	730
FCC	Fort Churchill, Man.	58.76N	94.09W	39
FFC	Flin Flon, Man.	54.73N	101.98W	338
FRB	Frobisher, N.W.T.	63.75N	68.55W	18
FSJ	Fort St. James, B.C.	54.43N	124.25W	772
*HAL	Halifax, N.S.	44.63N	63.60W	56
*IGL	Igloolik, N.W.T.	69.38N	81.81W	38
INK	Inuvik, N.W.T.	68.29N	133.50W	40
LHC	Thunder Bay, Ont.	48.42N	89.27W	196
MBC	Mould Bay, N.W.T.	76.24N	119.36W	15
*MCC	Mica Creek, B.C.	52.05N	118.59W	578
MNT	Montréal, Qué.	45.50N	73.62W	112
OTT	Ottawa, Ont.	45.39N	75.72W	83
*PBQ	Poste-de-la-Baleine, Qué.	55.28N	77.74W	20
PHC	Port Hardy, B.C.	50.71N	127.43W	33
PNT	Penticton, B.C.	49.32N	119.62W	550
*POC	La Pocatière, Qué.	47.36N	70.04W	61
*QCC	Queen Charlotte, B.C.	53.26N	132.09W	3
*QCQ	Québec, Qué.	46.78N	71.28W	91
RES	Resolute, N.W.T.	74.69N	94.90W	15
SCH	Schefferville, Qué.	54.82N	66.78W	540
SES	Suffield, Alta.	50.40N	111.04W	770
SFA	St. Féréol (Seven Falls), Qué.	47.12N	70.83W	232
*SIC	Sept-Iles, Qué.	50.19N	66.74W	283
STJ	St. John's, Nfld.	47.57N	52.73W	62
*SUD	Sudbury, Ont.	46.47N	80.97W	267
*UNB	Fredericton, N.B.	45.95N	66.63W	56
VIC	Victoria, B.C.	48.52N	123.42W	197
*WHC	Whitehorse, Yukon	60.74N	135.10W	732
YKC	Yellowknife, N.W.T.	62.48N	114.47W	198

\*Regional Stations



TABLE 2

## STANDARD AND REGIONAL SEISMOGRAPH STATION OPERATORS

Standard Seismograph Stations:

## Alert, N.W.T. (ALE)

Owned and operated by the Earth Physics Branch. Station seismologist in 1975 was M.J. Daniels.

## Baker Lake, N.W.T. (BLC)

Owned and operated by the Earth Physics Branch. Station seismologist in 1975 was O.J. Jensen.

## Edmonton, Alberta (EDM)

Instrumented by the Earth Physics Branch. Owned and operated by the Department of Physics, University of Alberta, with contract support from the Earth Physics Branch.

## Flin Flon, Manitoba (FFC)

Owned and operated by the Earth Physics Branch. Station seismologist in 1975 was L. Marsh.

## Fort Churchill, Manitoba (FCC)

Owned by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the Radiosonde Division, Atmospheric Environment Service, Department of Environment.

## Fort St. James, British Columbia (FSJ)

Owned and operated by the Earth Physics Branch. Station seismologist during 1975 was T.S. Browne.

## Frobisher, N.W.T. (FRB)

Owned by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the Radiosonde Division, Atmospheric Environment Service, Department of Environment.

## Inuvik, N.W.T. (INK)

Owned by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the Radiosonde Division, Atmospheric Environment Service, Department of Environment.

## Montréal, Québec (MNT)

Owned and operated by Jean-de-Brébeuf College with partial instrumental support and contract support from the Earth Physics Branch.

## Mould Bay, N.W.T. (MBC)

Owned and operated by the Earth Physics Branch. Station seismologist during 1975 was J.R. Alexander.

## Ottawa, Ontario (OTT)

Owned and operated by the Earth Physics Branch.

## Penticton, British Columbia (PNT)

Owned and operated by the Earth Physics Branch. Station seismologist during 1975 was M. Wilde.

## Port Hardy, British Columbia (PHC)

Owned by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the Radiosonde Division, Atmospheric Environment Service, Department of Environment.

TABLE 2 (Continued)

- Resolute, N.W.T. (RES)  
Owned and operated by the Earth Physics Branch. Station seismologist during 1975 was R.V. Green, succeeded by J.R. Stilborn on August 1.
- St. John's, Newfoundland (STJ)  
Owned by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the Department of Physics, Memorial University.
- Schefferville, Québec (SCH)  
Owned by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by McGill University Sub-Arctic Research Laboratory.
- Seven Falls, Québec (SFA)  
Owned and operated by the Earth Physics Branch. Station seismologist during 1975 was J.B. Racine. Station was closed July 31, 1975.
- Suffield, Alberta (SES)  
Owned by the Earth Physics Branch. Operated for the Earth Physics Branch by the Department of National Defence.
- Thunder Bay, Ontario (LHC)  
Owned by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the Department of Geology, Lakehead University.
- Victoria, British Columbia (VIC)  
Owned and operated by the Earth Physics Branch. The seismograph observatory is part of the Victoria Geophysical Observatory, Department of Energy, Mines and Resources, 5071 West Saanich Road, R.R. #7, Victoria, B.C., V8X 3X3. This unit constitutes the West Coast office of the Earth Physics Branch.
- Yellowknife, N.W.T. (YKC)  
Owned and operated by the Earth Physics Branch. Station seismologists during 1975 were D. Monsees, O.I.C., L. Mahaney and J. Carter.
- Regional Seismograph Stations:
- Charlesbourg, Québec (CHQ)  
Instrumented by the Department of Geology, Laval University, and operated with contract support from the Earth Physics Branch.
- Fredericton, New Brunswick (UNB)  
Instrumented by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the Physics Department, University of New Brunswick.
- Halifax, Nova Scotia (HAL)  
Owned by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by Dalhousie University.
- Igloolik, Northwest Territories (IGL)  
Instrumented by the Earth Physics Branch. Operated for the Earth Physics Branch by the Department of Indian and Northern Affairs.
- La Pocatière, Québec (POC)  
Instrumented by the Department of Geology, Laval University, and operated with contract support from the Earth Physics Branch.
- Mica Creek, British Columbia (MCC)  
Vault owned and operated by B.C. Hydro and Power Authority, but instrumented by the Earth Physics Branch.

TABLE 2 (Concluded)

Poste-de-la-Baleine, Québec (PBQ)

Instrumented by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by Laval University.

Québec, Québec (QCQ)

Owned and operated by the Department of Geology, Laval University, with contract support from the Earth Physics Branch.

Queen Charlotte, British Columbia (QCC)

Instrumented by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the B.C. Forest Service.

Sept-Iles, Québec (SIC)

Owned and operated by the Iron Ore Company of Canada, Sept-Iles, Québec, with support from the Earth Physics Branch.

Sudbury, Ontario (SUD)

Instrumented by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the Department of Geology, Laurentian University.

Whitehorse, Yukon Territory (WHC)

Instrumented by the Earth Physics Branch. Operated under contract for the Earth Physics Branch by the Radiosonde Division, Atmospheric Environment Service, Department of Environment.

2.4 *Eastern Canada Telemetered Network (ECTN)*

On February 24, 1974, a network of short-period vertical stations linked to Ottawa by telephone lines commenced recording. Figure 2 shows, and Table 3 gives a list of the stations and their location. The broadband seismic signals are transmitted in digital mode over dedicated telephone lines to Ottawa where a PDP-11 minicomputer produces monitor records on four separate helicorders. In 1975 an automatic triggering system and digital storing of data was incorporated into the computer processing program. A digital magnetic tape library is maintained of all events of interest recorded on the Network.

2.5 *Western Canada Telemetered Network (WCTN)*

On September 1, 1975, a network of short period vertical stations, similar to the ECTN but linked to Victoria by telephone lines commenced continuous operation. Figure 3 shows and Table 4 gives a list of the stations, their location and operating dates.

The computer system, data recording and storing is similar to that of the ECTN.

2.6 *Long-period Digital Tape Stations*

In July 1972, three-component, completely automatic, long period, digital tape stations were commissioned in British Columbia. Figure 3 shows the station locations and Table 5 gives the coordinates and operating dates for the various sites. The stations were completely decommissioned by October 28, 1975.

The stations' 7-track magnetic tapes were changed every three weeks and sent to Ottawa for editing. A master composite tape was then compiled of all significant recorded events. This tape which contains data from 1973 to October 27, 1975, also contains all available information on instrument characteristics, calibrations and epicentre parameters. For some events, the British Columbia standard station long period records have also been digitized and included on the master tape.

TABLE 3

EASTERN CANADA TELEMETERED NETWORK STATIONS

STATION	LAT.	LONG.	ELEVATION (Meters)	OPERATING DATES
Ottawa, Ont. (OTT)	45.39N	75.72W	83	Feb. 24/74 to date
Montréal, Qué. (MNT)	45.50N	73.62W	112	Feb. 24/74 to date
Maniwaki, Qué. (MIQ)	46.37N	75.97W	199	Feb. 27/74 to date
Manicouagan, Qué. (MNQ)	50.53N	68.78W	610	Nov. 27/74 to date

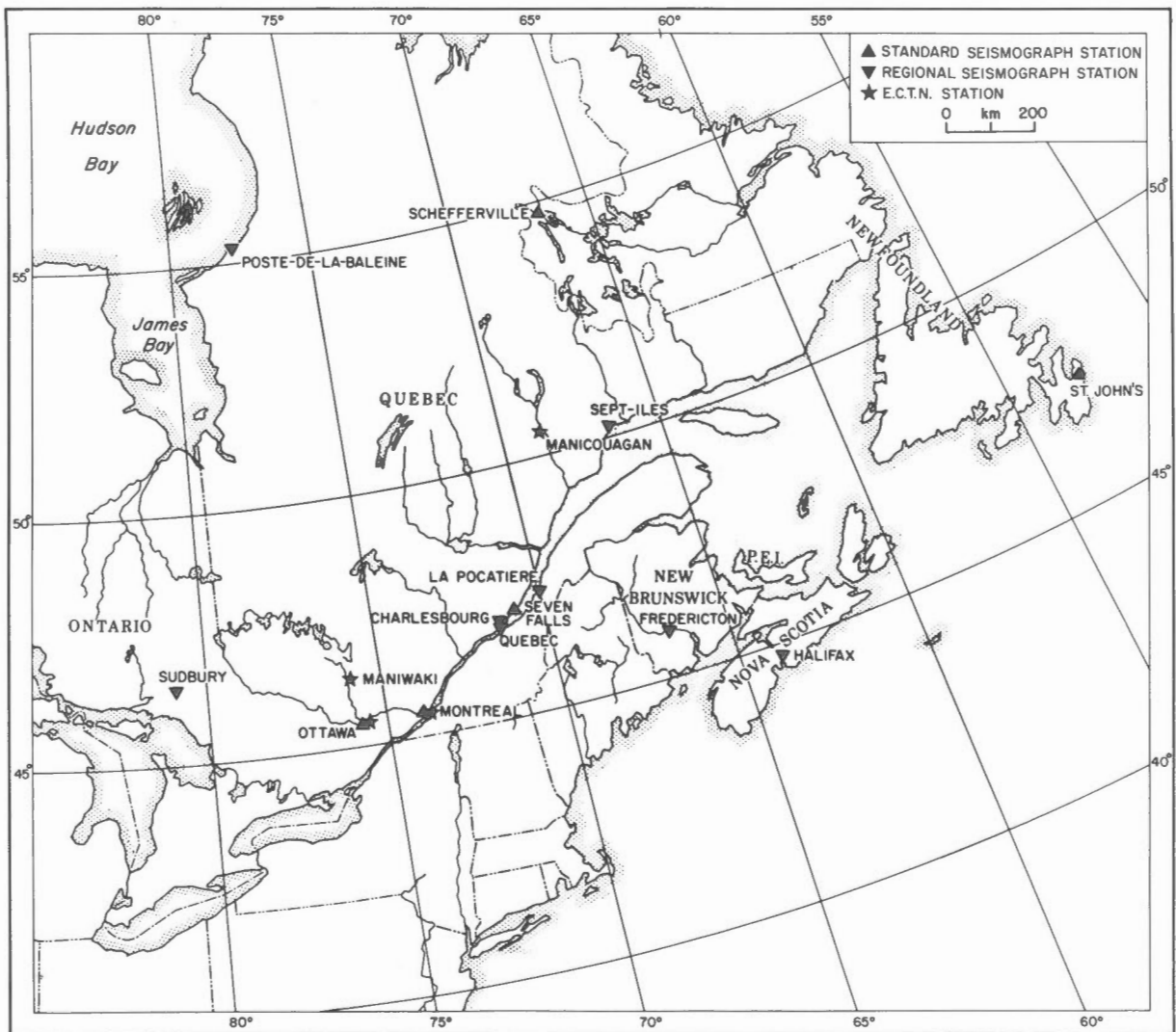


Figure 2. Eastern Canada Telemetered Network and other Stations.

TABLE 4

WESTERN CANADA TELEMETERED NETWORK STATIONS

STATION	LAT.	LONG.	ELEVATION (Meters)	OPERATING DATES
Victoria, B.C. (VIC)	48.52N	123.42W	197	Sept. 1/75 - to date
Port Alberni, B.C. (ALB)	49.27N	124.82W	25	Sept. 1/75 - to date
Haney, B.C. (HYC)	49.26N	122.57W	150	Sept. 1/75 - to date
Pender Island, B.C. (PIB)	48.82N	123.32W	40	Nov. 1/75 - to date

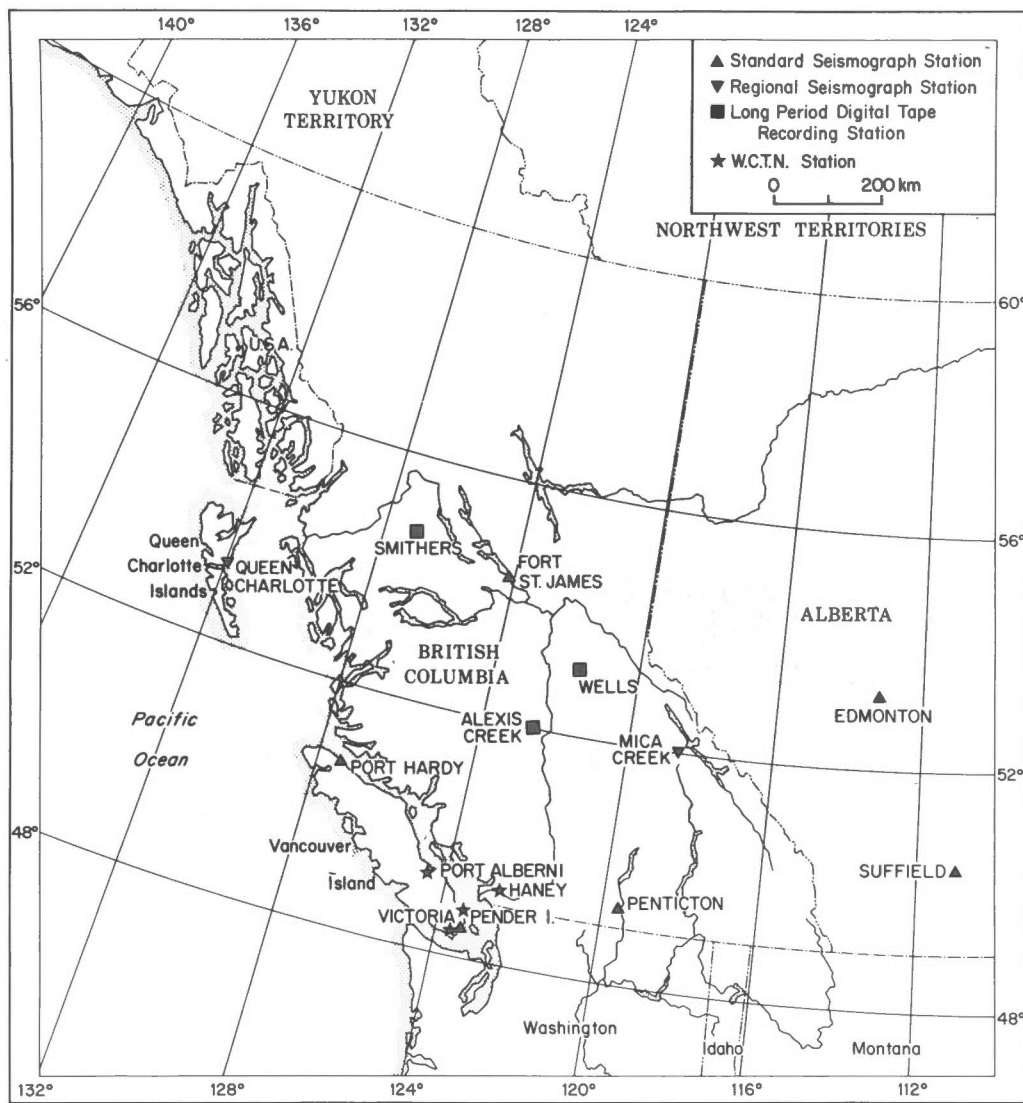


Figure 3. Western Canada Telemetered Network and Long Period Digital Tape Recording Stations.

TABLE 5

## LONG-PERIOD DIGITAL TAPE RECORDING STATIONS

STATION	LAT.	LONG.	ELEVATION (Meters)	OPERATING DATES
Wells, B.C.	53.10N	121.58W	1234	Aug. 6/72 - Oct. 28/75
Alexis Creek, B.C.	52.09 N	123.27W	838	Aug. 7/72 - Aug. 6/75
Smithers, B.C.	54.77N	127.10W	579	Jul. 15/74 - Sept. 18/75

2.7 *Special or Temporary Stations*

To supplement the existing permanent seismograph networks of the Earth Physics Branch, special or temporary installations

are commissioned at different sites for varying lengths of time. Table 6 gives the locations and operating dates for these stations plus a brief description of the type of installation.

TABLE 6

## SPECIAL OR TEMPORARY STATIONS

Station Location	Coord.	Elev. Meters	Operating dates	Description
Alert, N.W.T.	82.48 <sup>o</sup> N 62.40 <sup>o</sup> N	65	Dec. 11/73 - to date	Extra long-period vertical experimental helicorder system
La Salle, Ont.	42.19 <sup>o</sup> N 83.09 <sup>o</sup> W	177	May 16 - Aug. 14/75	Sprengnether MEQ 800 short-period vertical with ink recording
Somerset Island, N.W.T.	73.62 <sup>o</sup> N 94.83 <sup>o</sup> W	10	June 24 - Aug. 25/75	Sprengnether MEQ 800 short-period vertical with ink recording
Gold Bridge, B.C.	50.83 <sup>o</sup> N 122.87 <sup>o</sup> W	730	June 27 - Sept. 23/75	Short-period vertical regional station package
Pemberton, B.C.	50.32 <sup>o</sup> N 122.80 <sup>o</sup> W	240	Months of July, Aug. and Sept./75	Sprengnether MEQ 800 short-period vertical with ink recording
Meager Creek, B.C.	50.57 <sup>o</sup> N 122.50	790	Months of July, Aug. and Sept./75	Sprengnether MEQ 800 short-period vertical with ink recording



## 2.8 The Yellowknife Array

The Division of Seismology and Geothermal Studies has operated and maintained a medium aperture array at Yellowknife, N.W.T. since 1962. The array configuration is shown in Figure 4. The 19 Willmore Mark II short period vertical seismometers are arranged in two orthogonal lines with a 2.5 km spacing. The long period tripartite array consists of Geotech SL210 long period vertical seismometers placed at sites G1, G2 and G3, and additional Geotech SL220 long period horizontal seismometers at site G1. The G1 site is the vault of the standard station, YKC. Data are radio-telemetered to the Control Centre where they are processed on-line by computer and, as backup, are recorded on FM tape.

The on-line digital processing sys-

tem, built around a PDP11-45 computer was installed in early 1974. The processing system, called the Canadian Seismic Array Monitor (CANSAM), remotely monitors and calibrates the various seismic sensors, digitizes the short period signals and processes the data with a detection algorithm. A hard-copy event detection bulletin is printed on a teletypewriter and punched in parallel on paper tape. A copy of the bulletin information and the raw digital data for each detected event is stored on 9-track digital tape. Additional processing of the Yellowknife array data is done off-line in Ottawa from the analogue and digital tapes.

Additional information on the Yellowknife array history, developments and current configuration can be found in reports by Manchee and Hayman (1972) and Weichert (1975).

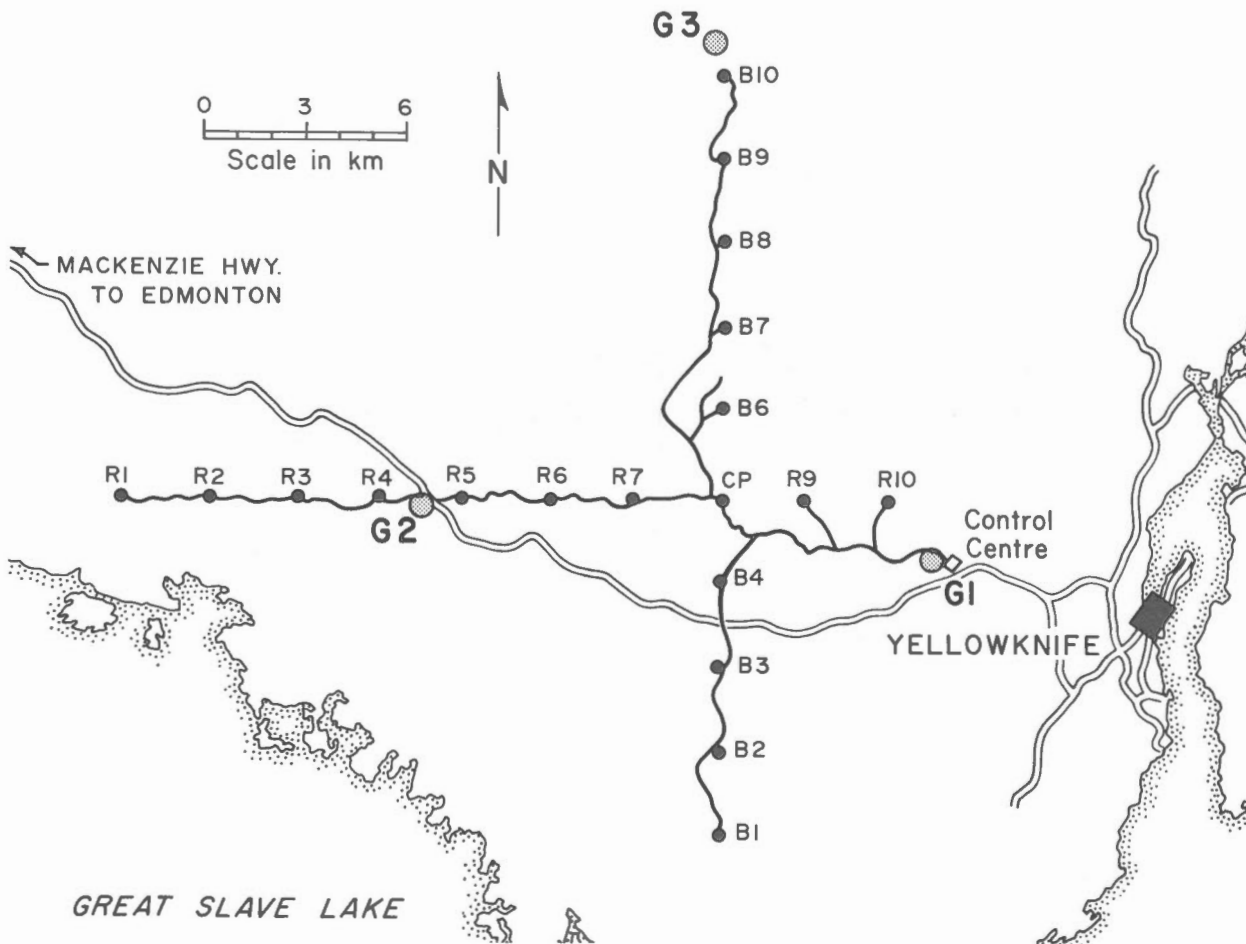


Figure 4. Yellowknife Seismograph Array

## 2.9 Strong-Motion Seismograph Networks

Strong-motion instruments in Canada are organized into two networks, one in western Canada maintained by the Earth Physics Branch and one in eastern Canada maintained by the National Research Council of Canada, Division of Building Research, Noise and Vibration Section. At the end of 1975 there were 47 accelerographs and 73 seismoscopes deployed in the two networks. The accelerograph sites are described in the accompanying Table 7. Most of the seismoscopes are associated with the accelerograph networks; 41 are located in Vancouver and the lower Fraser River valley, 20 in Victoria and on Vancouver Island, 2 in eastern British Columbia and 10 in the St. Lawrence region. For a complete description of the Strong

Motion program see Rogers (1976). For any additional information on the strong motion networks write to:

Victoria Geophysical Observatory,  
Division of Seismology and Geothermal  
Studies,  
Earth Physics Branch,  
Department of Energy, Mines &  
Resources,  
Victoria, B.C. V8X 3X3

or

Noise and Vibration Section,  
Division of Building Research,  
National Research Council,  
Ottawa, Ontario. K1A 0R6

TABLE 7

### ACCELEROGRAPH SITES IN CANADA

#### Table Explanation

<u>LOCATION</u>	City and site name.
<u>DATE</u>	Installation date of first instrument at site.
<u>COORDINATES</u> (COORD)	Latitude and longitude are listed to the nearest 0.01 of a degree. Where they are not known that accurately they are listed to the nearest 0.1 of a degree. For Eastern Canada, coordinates supplied in degrees and minutes have been converted to the nearest 0.01 of a degree.
<u>INSTRUMENT</u> (INSTR)	United Electro Dynamics AR-240, Teledyne-Geotech RFT-250, Kinematics SMA-1.
<u>SENSITIVITY</u> (SENS)	Full scale sensitivity of the instrument expressed as multiplier of the acceleration of gravity.
<u>TRIGGER</u>	Triggering level. The AR-240 and RFT-250 have horizontal displacement triggers. The SMA-1 has a vertical trigger sensitive to acceleration in the 1 to 10 Hz bandwidth. Where the acceleration level is listed as 0.01 g the instrument has not been field calibrated and is assumed to be at the factory set level.
<u>OWNER</u>	EMR Department of Energy Mines and Resources NRC National Research Council of Canada QHEC Quebec Hydro-Electric Commission BCHPA British Columbia Hydro and Power Authority AECL Atomic Energy of Canada Limited COTC Canadian Overseas Telecommunications Corporation ALCAN Aluminum Company of Canada
<u>BUILDING</u>	A brief description of the structure housing the instrument.
<u>FOUNDATION</u>	The material underlying the structure housing the instrument.
<u>*</u>	Sites having changes in the tabulated material during the current year.

## Accelerograph Sites in Eastern Canada

<u>LOCATION</u>	<u>DATE</u>	<u>COORD†</u>	<u>INSTR</u>	<u>SENS</u>	<u>TRIGGER</u>	<u>OWNER</u>	<u>BUILDING</u>	<u>FOUNDATION</u>
St. Féréol Seismograph Station	1/66	47.12N 70.82W	AR-240	1 g	0.5 mm	NRC	In underground seismic vault. Instrument on concrete pier.	bedrock
Ottawa N.R.C. Building	3/66	45.45 75.61	SMA-1	½ g	0.01 g	NRC	One-storey steel frame, masonry walls. Instrument on concrete basement floor slab.	bedrock
Montreal CIL Building	8/66	45.50 73.58	AR-240	1 g	0.5 mm	NRC	32-storey steel frame, curtain wall, four basement storeys. Instrument on bottom basement floor slab.	bedrock
Chalk River Reactor Building	4/67	46.05 77.38	AR-240	1 g	0.5 mm	AECL	Steel frame poured concrete reactor building. Instrument on concrete basement floor slab.	bedrock
Quebec Laval University	6/67	46.78 71.28	AR-240	1 g	0.5 mm	NRC	Three-storey reinforced concrete. Instrument on concrete pier on basement floor slab.	bedrock
La Malbaie Post Office	9/67	47.68 70.15	AR-240	1 g	0.5 mm	NRC	One-storey steel frame masonry walls. Instrument on concrete pier on basement floor slab.	bedrock
St. Pascal Post Office	10/69	47.52 69.80	AR-240	1 g	0.5 mm	NRC	One-storey reinforced concrete and masonry. Instrument on concrete basement floor slab.	bedrock
Mont Laurier Mercier Dam	8/72	46.67 75.98	SMA-1	½ g	0.01 g	NRC	Small shack. Instrument on concrete slab.	bedrock
Montreal Brebeuf College	12/73	45.50 73.62	SMA-1	½ g	0.01 g	NRC	Four-storey steel frame curtain wall, poured concrete. Instrument in seismic vault in basement.	bedrock
Baie Comeau Manicouagan 5 Dam	6/74	50.67 68.73	SMA-1 (6 units)	½ g	0.01 g	QHEC	Several locations in reinforced concrete dam of multiarch construction. Instruments vary from bedrock to 600 ft level in dam.	bedrock
Baie Comeau Manicouagan 3 Dam	9/74	49.77 68.62	SMA-1 (2 units)	½ g	0.01 g	QHEC	One in small hut on concrete slab. One in instrument room in rock tunnel. Instrument on concrete pier.	bedrock

†Coordinates supplied in degrees and minutes have been converted to the nearest 0.01 of a degree.

Accelerograph Sites in Western Canada

<u>LOCATION</u>	<u>DATE</u>	<u>COORD</u> <sup>†</sup>	<u>INSTR</u>	<u>SENS</u>	<u>TRIGGER</u>	<u>OWNER</u>	<u>BUILDING</u>	<u>FOUNDATION</u>
Lake Cowichan Satellite Station	3/73	48.8 124.2	SMA-1	1 g	0.010 g	COTC	One-storey structure next to earth station antenna. Instrument on concrete floor slab.	bedrock
Gold River Public Safety Building	8/73	49.78 126.04	SMA-1	1 g	0.010 g	EMR	One-storey reinforced concrete block. Instrument on concrete floor slab.	bedrock
Victoria Geophysical Observatory	5/74	48.52 123.42	SMA-1	½ g	0.008 g	EMR	Three-storey, part wood frame and part masonry. Instrument in seismic vault on main floor level.	bedrock
Vancouver Bloedel Conservatory	5/74	49.24 123.11	AR-240	1 g	0.5 mm	EMR	Triodetic dome structure 50 feet high and 140 feet in diameter. Instrument on concrete foundation.	bedrock
Richmond Brighthouse Library	5/74	49.16 123.14	AR-240	1 g	0.5 mm	EMR	One-storey reinforced masonry. Instrument on concrete basement floor slab.	alluvium
Prince Rupert Airport Terminal Bldg.	5/74	54.29 130.44	SMA-1	1 g	0.011 g	EMR	One-storey heavy wood portal frames and purlins with masonry walls. Instrument on concrete floor slab.	bedrock
Port Alberni Maquinna Elementary S.	11/74	49.23 124.79	SMA-1	1 g	0.009 g	EMR	One-storey wood frame. Instrument on concrete basement floor slab.	bedrock
Kemano Switching Station	1/75	53.56 127.93	SMA-1	1 g	0.009 g	ALCAN	One-storey masonry construction. Instrument on concrete floor slab.	gravel
Haney U.B.C. Research Forest	6/75	49.27 122.57	SMA-1	1 g	0.010 g	EMR	One-storey wood frame construction. Instrument on concrete pier.	alluvium
Richmond Highway Patrol Building	11/75	49.12 123.08	RFT-250	1 g	0.5 mm	EMR	One-storey wood frame construction. Instrument on concrete basement floor.	alluvium
Sandspit Airport Terminal Bldg.	9/67	53.25 131.81	SMA-1	1 g	0.012 g	EMR	One-storey wood frame. Instrument on concrete slab at ground level.	sandy gravel
*Duncan Cowichan Hospital	10/67	48.79 123.72	SMA-1	1 g	0.010 g	EMR	Varying from one to six storeys, reinforced concrete. Instrument on pier on concrete footing and basement level.	sand

<sup>†</sup>Coordinates supplied in degrees and minutes have been converted to the nearest 0.01 of a degree.

## Accelerograph Sites in Western Canada (cont'd)

<u>LOCATION</u>	<u>DATE</u>	<u>COORD</u> †	<u>INSTR</u>	<u>SENS</u>	<u>TRIGGER</u>	<u>OWNER</u>	<u>BUILDING</u>	<u>FOUNDATION</u>
North Vancouver Cleveland Dam	1/68	49.36 123.11	AR-240	1 g	0.5 mm	EMR	Concrete gravity dam 300 feet high. Instrument at end of gallery on concrete floor directly above bedrock.	bedrock
Delta Roberts Bank Seaport	11/69	49.02 123.16	RFT-250	1 g	0.5 mm	EMR	In small hut. Instrument on concrete slab.	silt fill
Langley Municipal Hall	3/71	49.10 122.62	RFT-250	1 g	0.5 mm	EMR	One-storey wood frame. Instrument on reinforced concrete basement floor slab.	clay
Matsqui Municipal Hall	3/71	49.05 122.32	RFT-250	1 g	0.5 mm	EMR	Two-storey reinforced concrete. Instrument on concrete floor slab.	sand and gravel
Fort McPherson R.C.M.P. Residence	6/71	67.5 134.9	SMA-1	½ g	0.009 g	EMR	One-storey wood frame. Instrument on concrete basement floor slab.	permafrost
Mica Creek Mica Creek Dam	5/72	52.0 118.5	SMA-1	1 g	0.019 g	BCHPA	Three locations in 800-foot high earth fill dam.	bedrock
Vancouver Manitoba Works Yard	12/72	49.21 123.11	RFT-250	1 g	0.5 mm	EMR	Two-storey steel frame, masonry walls. Instrument on concrete floor slab over pile foundation.	alluvium
Delta Annacis Island	12/72	49.18 122.93	RFT-250	1 g	0.5 mm	EMR	One storey. Instrument on concrete floor slab.	alluvium
*Victoria Law Courts Building	1/63	48.42 123.36	SMA-1	1 g	0.009 g	EMR	Five-storey reinforced concrete. Instrument on concrete basement floor slab.	bedrock
*Vancouver B.C. Hydro Building	7/63	49.28 123.12	AR-240	1 g	0.5 mm	EMR	Twenty-two-storey reinforced concrete. Instrument on concrete floor in lower basement.	bedrock
*Victoria University of Victoria	9/64	48.46 123.31	SMA-1	1 g	0.008 g	EMR	Three-storey reinforced concrete. Part of foundation is reinforced concrete footings and part is 'Franki' piles. Instrument on concrete pier on basement floor slab.	clay

†Coordinates supplied in degrees and minutes have been converted to the nearest 0.01 of a degree.

Accelerograph Sites in Western Canada (concl.)

<u>LOCATION</u>	<u>DATE</u>	<u>COORD</u> <sup>†</sup>	<u>INSTR</u>	<u>SENS</u>	<u>TRIGGER</u>	<u>OWNER</u>	<u>BUILDING</u>	<u>FOUNDATION</u>
Port Alberni Pulp & Paper Mill	7/65	49.24 124.81	SMA-1	1 g	0.008 g	EMR	Two-storey reinforced concrete. Instrument on concrete floor over a stiff cellular substructure built on wood piles.	sand and gravel
*Campbell River Ladore Dam	7/65	50.01 125.39	SMA-1	1 g	0.009 g	EMR	Concrete gravity dam 140 feet high. Instrument on concrete floor near base of dam.	bedrock
Vancouver University of B.C.	8/65	49.26 123.25	AR-240	1 g	0.5 mm	EMR	Two-storey building. Instrument on concrete floor slab.	sand and gravel
Comox St. Joseph's Hospital	8/67	49.67 124.94	SMA-1	1 g	0.009 g	EMR	Four-storey reinforced concrete. Instrument on concrete pier at ground level.	glacial till
Richmond Massey Tunnel	9/67	49.12 123.08	AR-240	1 g	0.5 mm	EMR	Reinforced concrete tunnel in partial trench dredged in river bottom. Instrument on concrete floor about 50 feet below ground surface.	sand and gravel

<sup>†</sup>Coordinates supplied in degrees and minutes have been converted to the nearest 0.01 of a degree.



### 3. CANADIAN SEISMOLOGICAL DATA

#### 3.1 *Rapid Telex Data*

All Canadian standard seismograph stations send telegraphic reports of P-phase arrivals to Ottawa five days a week. Additional information, such as teleseismic P-phase periods and amplitudes, P first motions and pP phase arrivals are also telegraphed when clearly recorded. The P-phase arrival time for all local earthquakes of magnitude equal to or greater than three are included in the telegraphed messages along with S-phase periods and amplitudes.

The U.S. Geological Survey, National Earthquake Information Service (NEIS) continues to make immediate use of the Canadian P-phase data in their fast hypocentre determinations. The telegraphed data from Canadian standard stations are made available with limited checking, within 48 hours to NEIS. Most Canadian P-wave data arrive at the NEIS data centre within ten days of the occurrence of each event. The P-wave data sent to NEIS are stored temporarily in the Departmental computer in Ottawa. These data are then accessed by NEIS using a teletype terminal and telephone lines. This procedure greatly decreases the delay in P-wave data reaching the NEIS data centre. Copies of the telegraphed P-arrival data are airmailed to Britain, Sweden and the U.S.S.R. for use of seismological institutions in those countries. NEIS relays Canadian data to the International Seismological Centre, Edinburgh, for inclusion in the ISC definitive calculations.

#### 3.2 *Microfilm*

Thirty-five millimeter negative microfilm rolls of Canadian seismograms are stored in Ottawa. Copies of Canadian seismogram microfilm from January 1, 1962, to the present have been deposited with the World Data Center A for Seismology, Environmental Data Service, NOAA, Boulder, Colorado, 80302, U.S.A. Microfilm of records prior to 1962 is available to cooperating institutions on request to the Head, Canadian Seismograph Network, Division of Seismology and Geothermal Studies, Earth Physics Branch, Department of Energy, Mines and Resources, Ottawa, Canada, K1A 0Y3.

#### 3.3 *Original Seismograms*

Original seismograms are normally

available only to qualified Canadian research scientists, since microfilm is available at Boulder, Colorado, to all others. On special request to the Director, Division of Seismology and Geothermal Studies, Earth Physics Branch, Department of Energy, Mines and Resources, Ottawa, Canada, K1A 0Y3, original Canadian seismograms may be loaned to qualified foreign requestors. This loan, in general, can be made only after the seismograms have been photographed; this avoids undue delay in getting complete microfilm from the Canadian Seismograph Network deposited in the World Data Center for use of all scientists.

Original Canadian seismograms dating back to and including 1965 are stored in Ottawa. Seismograms previous to this date are on permanent loan to Lamont-Doherty Geological Observatory, Palisades, N.Y., U.S.A., 10964.

#### 3.4 *Special Data*

Data and records from seismograph installations other than the standard and regional networks are available on special request to the Head, Canadian Seismograph Network, Division of Seismology and Geothermal Studies, Earth Physics Branch, Department of Energy, Mines and Resources, Ottawa, Canada, K1A 0Y3. These data include the SP and LP FM magnetic tapes from the Yellowknife arrays, the detection log and digital data of seismic signals produced by the real-time operating system, CANSAM, data from the tape of all events recorded on the long period digital tape system deployed in British Columbia, and seismograms produced by the telemetered networks and other special or temporary stations. A small charge is made for accessing and copying digital data.

#### 3.5 *Canadian Earthquakes*

All significant earthquakes occurring in or near Canada are located by the Seismicity, Seismic Hazards and Applications section of the Division of Seismology and Geothermal Studies. A bimonthly catalogue of Canadian Earthquakes is produced approximately six months in arrears and distributed to interested institutions. An annual catalogue of Canadian earthquakes is produced for each calendar year. Commencing with 1974 data, all Canadian earthquake determinations, with their associated data, will also be submitted to the ISC for inclusion in its Bulletin.



Baker Lake (BLC). From October 22 to October 24, 1975, the station was closed for calibration and maintenance. The "As found" responses of the seismographs were within 10% of the previous calibrations except for the short and long period east components. The latter two components' responses were raised 5% to match the other "As found" response levels. The short and long period east component calibrations are marked "Final"; the others, "As found and left".

Fort Churchill (FCC). From October 20 to 27, 1975, the station was visited for maintenance, calibration and inspection. "As found and left" calibrations were performed on the three short-period seismographs as their responses differed by less than 10% from the previous 1971 calibrations. "As found" calibrations on the three long-period components indicated the vertical and east long period seismometer periods were about 10% low. These periods were reset and "Final" calibrations performed.

Flin Flon (FFC). From June 17 to 23, 1975, the station was visited for maintenance and calibration. As the calibrated responses were within 5% of the previous calibrations no adjustments were made to the instruments and the calibration curves are marked "As found and left". The long-period north calibration verifies the estimated response calculated in Ottawa on August 26, 1974.

Fort St. James (FSJ). From May 6 to 10, 1975, the station was temporarily closed for calibration and maintenance. The three short period "As found" seismograph calibrations were found to be within 5% of the 1970 calibration levels. Since 1970 the short period seismographs were operating with a relatively constant magnification between 1 and 10 Hz by over damping the galvanometers, lowering the seismometers' impedance and underdamping the seismometers. As indicated on the short period "Final" calibrations, the three seismograph responses were adjusted to more closely match those of other stations in the Network. The "As found" responses of the long period components were found to be within 10% of the previous calibrated levels. The long period vertical and north components' gain were increased slightly and the "Final" calibrations performed.

Igloolik (IGL). On September 3, 1975 a short period vertical regional modular seismograph commenced operation in the Eastern Arctic Research Laboratories of the Department of Indian and Northern Affairs at Igloolik under the supervision of

Dr. A. Rode. The seismometer, located about 300 meters north of the Laboratory on a flat limestone ledge, is housed in a 1.3 meter diameter corrugated, galvanized steel culvert with a sealed bottom and removable cover. The seismograph, with a one second period seismometer, has a 1 to 10 Hz bandpass and peak velocity sensitivity of ten thousand.

Mica Creek (MCC). On May 13, 1975, the station was visited and the seismograph instrument parameters measured. The calibration curve computed in Ottawa, was calculated for the currently employed preamplifier settings for attenuation and separation of 30dB.

Ottawa (OTT). On September 19, 1975 the three short period seismographs were calibrated. Since the calibrated responses were within 10% of the 1969 levels, the instruments were not adjusted and the calibration curves are marked "As found and left".

Poste de la Baleine (PBQ). From February 13 to 16, 1975, the station was visited for reinstallation of short period north and east seismographs and for their calibration. The horizontal seismometers are located in the same culvert as the vertical seismometer. The instruments' parameters were measured and calibration curves calculated in Ottawa at the currently used preamplifier attenuation value of 30dB.

La Pocatière (POC). On September 10, 1975, the station was visited for instrument adjustment and calibration. The AS330 preamplifier bandpass was changed from 0.1-12.5Hz to 0.1-5.0Hz and the AR311 amplifier adjusted for 1 cm/V at 24dB. From the new instrument parameters a calibration curve was calculated in Ottawa.

Queen Charlotte (QCC). On March 5, 1975, the station was visited for general maintenance and calibration. From the instrument parameters measured on site a calibration curve was calculated in Ottawa.

Resolute (RES). On May 5, 1975, the long period north galvanometer was replaced due to a defective terminal post. The replacement galvanometer was calibrated on site and a calibration curve calculated in Ottawa.

Seven Falls (SFA). On July 31, 1975, the station was closed. A seismograph has operated at Seven Falls since September, 1927. Seven Falls was one of the first stations instrumented for the recording of local seismicity.

Sept-Iles (SIC). On October 31, 1975 the station was visited for calibration, maintenance and repair. The AS420 amplifier was repaired and the bandpass changed from 1-10Hz to 0.5-7.0Hz. The seismograph was then calibrated with a Pen Drive Amplifier setting of 0.5 cm/V.

Sudbury (SUD). On May 28, 1975, the station's instrument parameters were measured by the station operator. From these parameters a calibration curve was calculated in Ottawa.

Fredericton (UNB). On May 8, 1975, the station's instrument parameters were measured and a calibration curve calculated in Ottawa.

### 5.2 Calibration Curves

Calibration curves for all standard and regional stations, listed alphabetically by station code, are given on the following pages. The curves for the photographic seismographs were obtained by application of the Willmore bridge method on site (Willmore, 1959). Regional station calibration curves are computed in Ottawa from the known seismograph instrument parameters. A smooth line response curve with no plotted points signifies a calculated rather than a calibrated response. Magnification and acceleration sensitivity of any instrument is determined from the curves by multiplying the velocity sensitivity by  $2\pi/T$  and  $T/2\pi$ , respectively. The calibration sheets give the periods of the seismometers and galvanometers, and include other information such as the station coordinates, altitude, foundation material and date of calibration.

## 6. PERSONNEL

During 1975, Mr. R.J. Halliday was in charge of the Canadian Seismograph Network and was assisted in quality control and Network management by Mr. W.E. Shannon and Mr. D.R.J. Schieman. Mr. F. Lombardo continued as the Chief Technician of the Network for station maintenance, calibration and installation, assisted by Mr. B.A. Compton and Mr. P.A. Burns. Mr. R.B. Hayman was in charge of the Seismological Instrumentation Laboratory in Ottawa supporting and servicing the Network. Dr. F. Kollar gave particular attention to the Network instrumental problems and their solution.

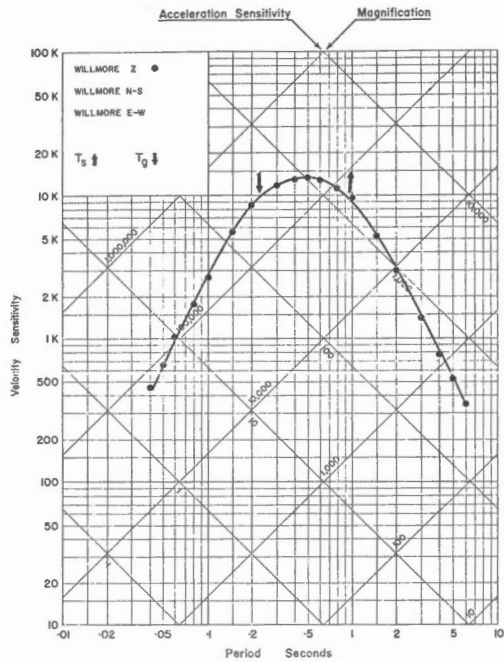
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- Willmore, P.L. The application of the Maxwell impedance bridge to the calibration of electromagnetic seismographs. *Bull. Seis. Soc. Am.*, 49, 99-114, 1959.

STATION: ALERT, N.W.T. (AS FOUND AND LEFT) (ALE)

$\phi = 82^{\circ}29' N$   $\lambda = 62^{\circ}24' W$  Altitude 65M

Foundation: Permanently frozen glacial debris overlying Palaeozoic limestone



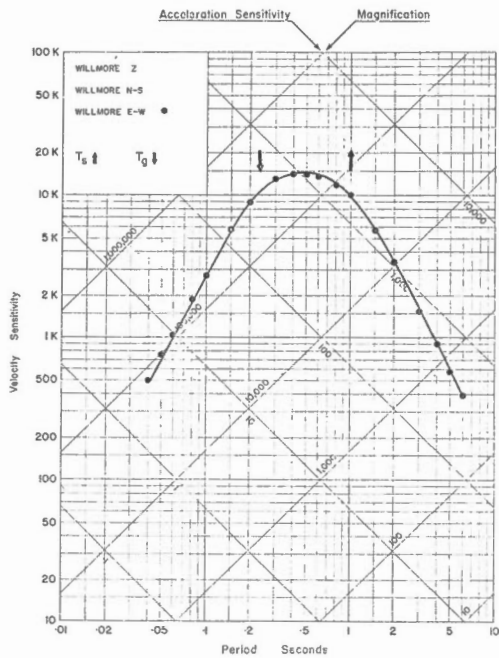
Dates of Calibration:

WILLMORE Z • April 11, 1972  
 WILLMORE N-S  
 WILLMORE E-W

STATION: ALERT, N.W.T. (AS FOUND AND LEFT) (ALE)

$\phi = 82^{\circ}29' N$   $\lambda = 62^{\circ}24' W$  Altitude 65M

Foundation: Permanently frozen glacial debris overlying Palaeozoic limestone.



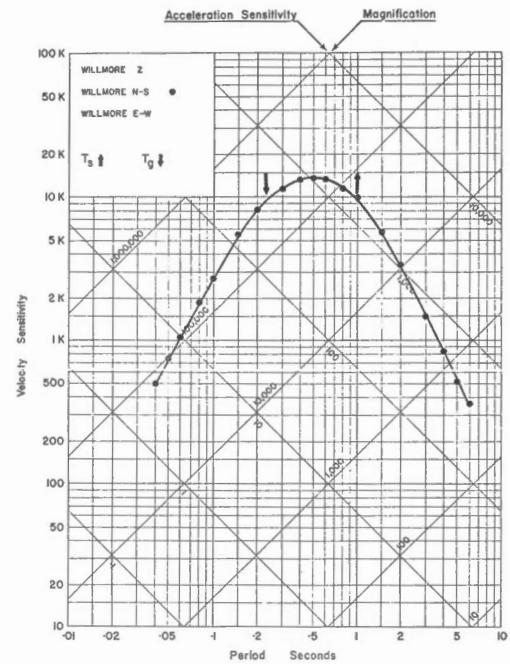
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WILLMORE Z  
 WILLMORE N-S  
 WILLMORE E-W • April 11, 1972

STATION: ALERT, N.W.T. (AS FOUND AND LEFT) (ALE)

$\phi = 82^{\circ}29' N$   $\lambda = 62^{\circ}24' W$  Altitude 65M

Foundation: Permanently frozen glacial debris overlying Palaeozoic limestone.



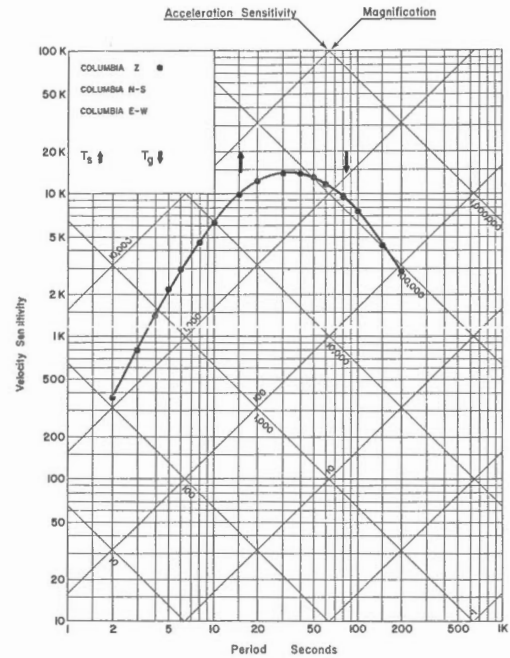
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S • April 11, 1972  
 WILLMORE E-W

STATION: ALERT, N.W.T. (FINAL) (ALE)

$\phi = 82^{\circ}29' N$   $\lambda = 62^{\circ}24' W$  Altitude 65M

Foundation: Permanently frozen glacial debris overlying Palaeozoic limestone.



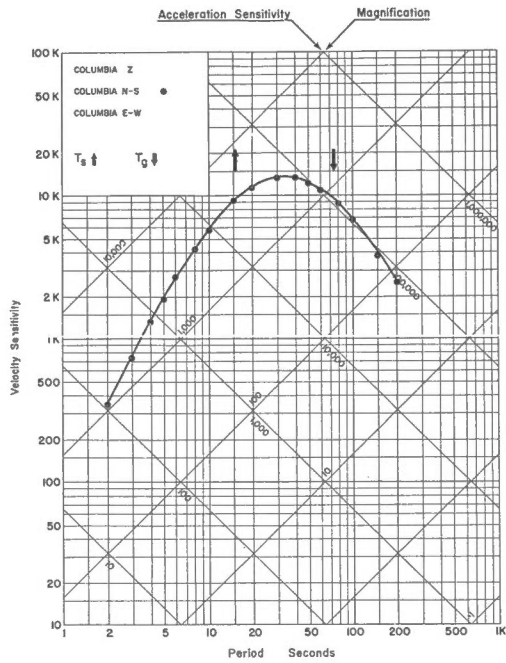
Dates of Calibration:

COLUMBIA Z • April 11, 1972  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: ALERT, N.W.T. (FINAL) (ALE)

$\phi = 82^{\circ}29' N$   $\lambda = 62^{\circ}24' W$  Altitude 65M

Foundation: Permanently frozen glacial debris overlying Palaeozoic limestone.



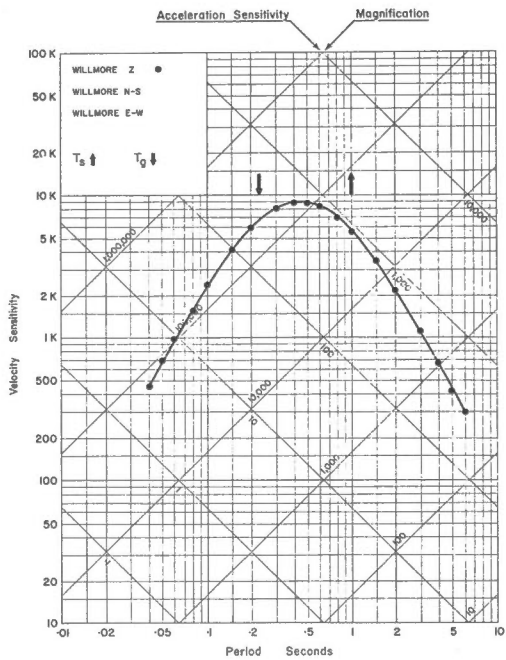
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • April 9, 1972  
COLUMBIA E-W

STATION: BAKER LAKE, N.W.T. (As found and left) (BLC)

$\phi = 64^{\circ}19' N$   $\lambda = 96^{\circ}01' W$  Altitude 16 M

Foundation: Granite Gneiss



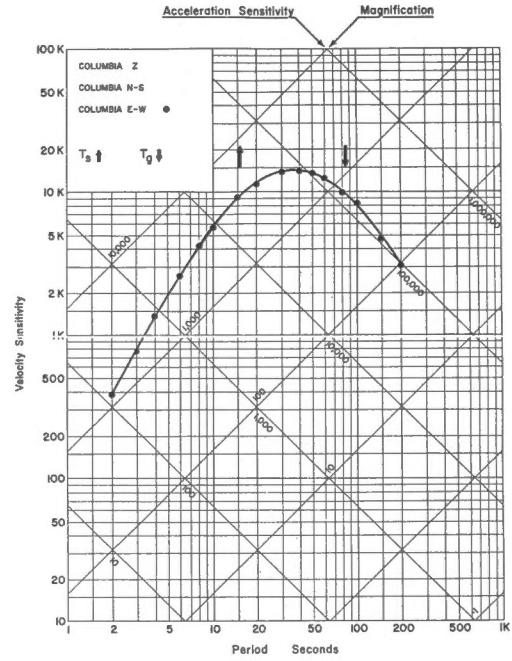
Dates of Calibration:

WILLMORE Z • June 7, 1971  
WILLMORE N-S  
WILLMORE E-W

STATION: ALERT, N.W.T. (FINAL) (ALE)

$\phi = 82^{\circ}29' N$   $\lambda = 62^{\circ}24' W$  Altitude 65M

Foundation: Permanently frozen glacial debris overlying Palaeozoic limestone.



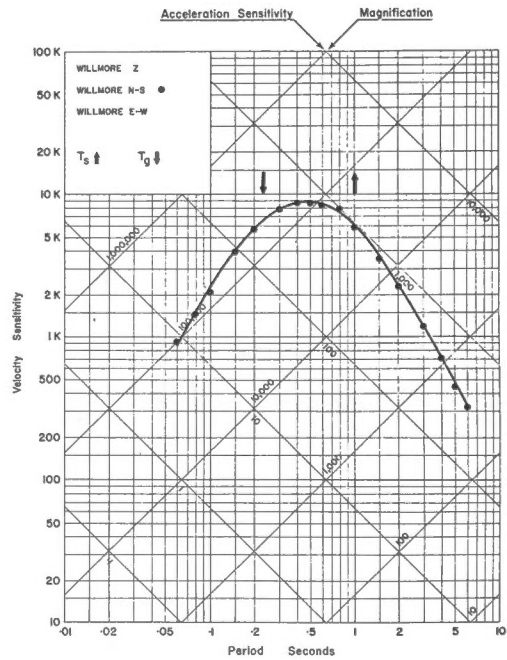
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • April 8, 1972

STATION: BAKER LAKE, N.W.T. (As found and left) (BLC)

$\phi = 64^{\circ}19' N$   $\lambda = 96^{\circ}01' W$  Altitude 16 M

Foundation: Granite Gneiss

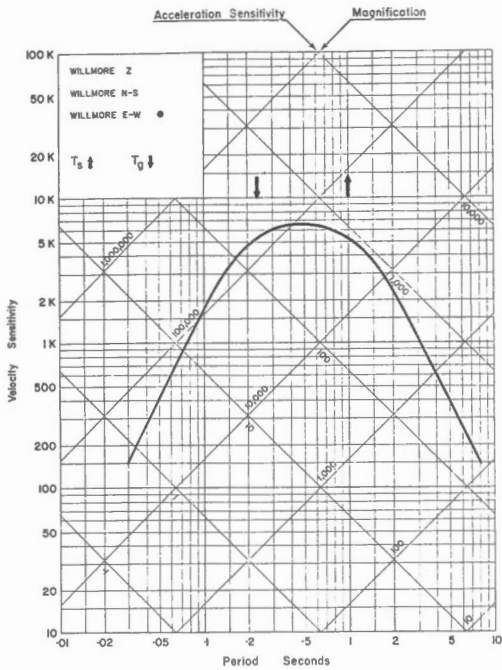


Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • June 7, 1971  
WILLMORE E-W



STATION: BAKER LAKE, N.W.T. (BLC)  
 $\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16 M  
 Foundation: Granite Gneiss



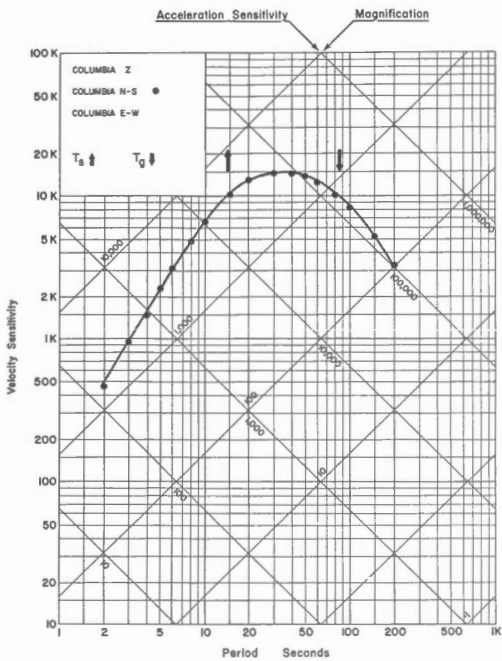
Dates of Calibration: June 11, 1974  
 (estimated in Ottawa)

WILLMORE Z  
 WILLMORE N-S  
 WILLMORE E-W

STATION: BAKER LAKE, N.W.T. (As found and left) (BLC)

$\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16 M

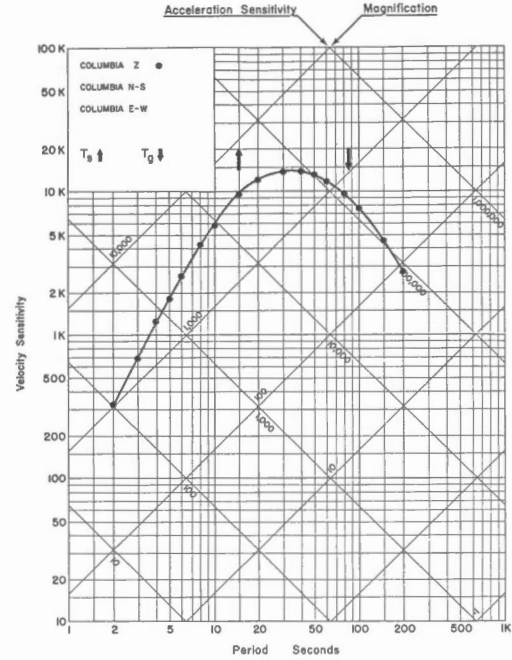
Foundation: Granite Gneiss



Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S • June 9, 1971  
 COLUMBIA E-W

STATION: BAKER LAKE, N.W.T. (As found and left) (BLC)  
 $\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16 M  
 Foundation: Granite Gneiss



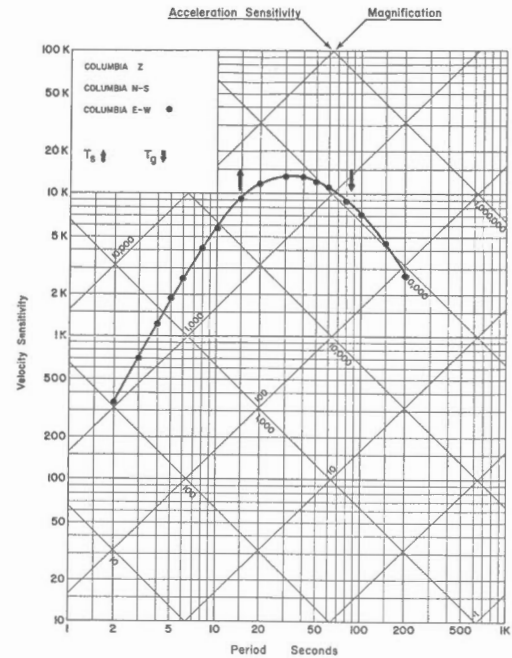
Dates of Calibration:

COLUMBIA Z • June 9, 1971  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: BAKER LAKE, N.W.T. (As found and left) (BLC)

$\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16 M

Foundation: Granite Gneiss



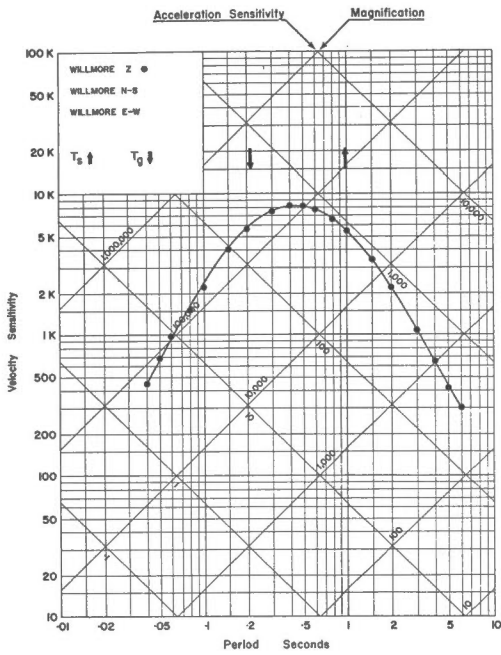
Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S  
 COLUMBIA E-W • June 9, 1971

STATION: BAKER LAKE, N.W.T. (Final) (BLC)

$\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16M

Foundation: Granite Gneiss



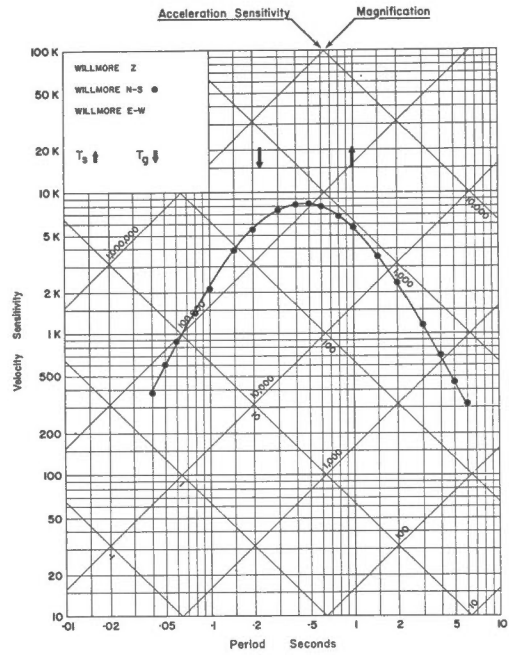
Dates of Calibration:

WILLMORE Z • Oct. 23, 1975  
 WILLMORE N-S  
 WILLMORE E-W

STATION: BAKER LAKE, N.W.T. (Final) (BLC)

$\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16M

Foundation: Granite Gneiss



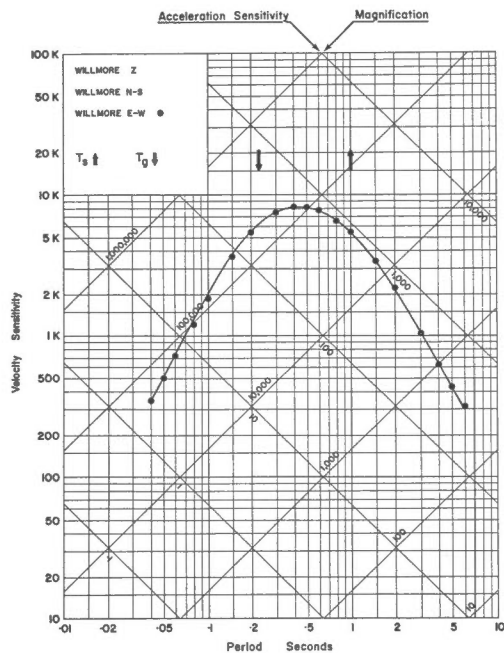
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S • Oct. 23, 1975  
 WILLMORE E-W

STATION: BAKER LAKE, N.W.T. (Final) (BLC)

$\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16M

Foundation: Granite Gneiss



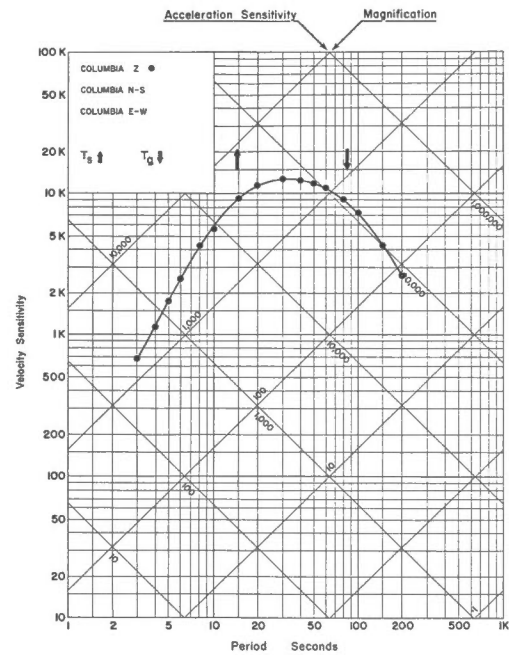
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S  
 WILLMORE E-W • October 23, 1975

STATION: BAKER LAKE, N.W.T. (Final) (BLC)

$\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16M

Foundation: Granite Gneiss



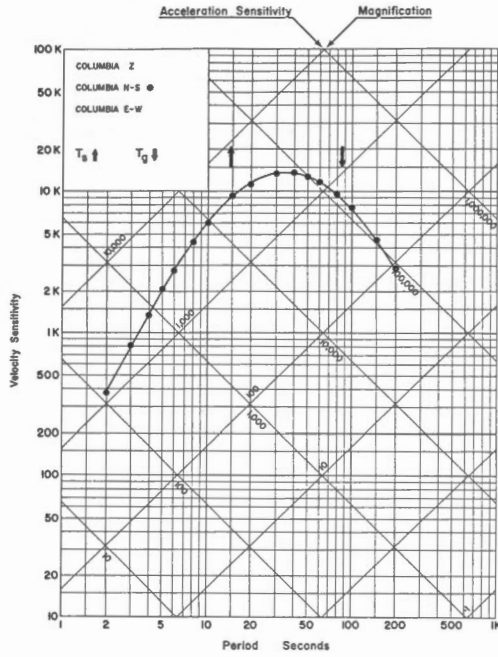
Dates of Calibration:

COLUMBIA Z • 23 Oct. 1975  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: BAKER LAKE, N.W.T. (Final) (BLC)

$\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16M

Foundation: Granite Gneiss



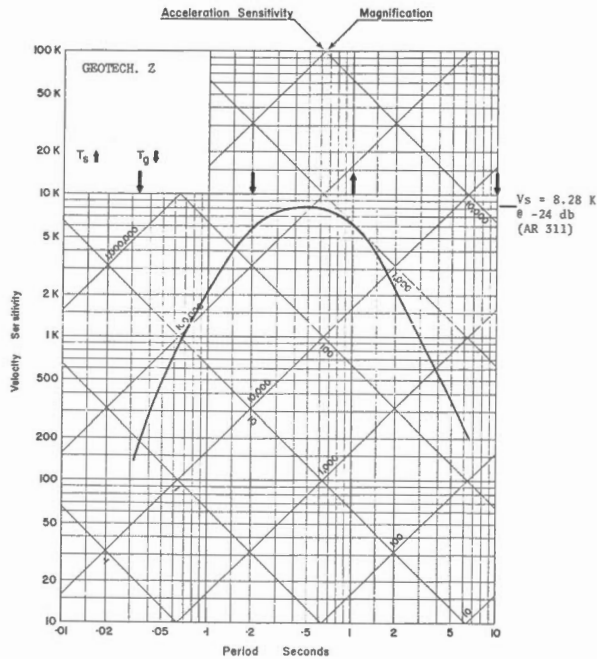
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • 23 Oct. 1975  
COLUMBIA E-W

STATION: CHARLESBOURG, QUEBEC (CHQ)

$\phi = 46^{\circ}53'23''N$   $\lambda = 71^{\circ}18'00''W$  Altitude 145 M

Foundation: Precambrian Gneiss



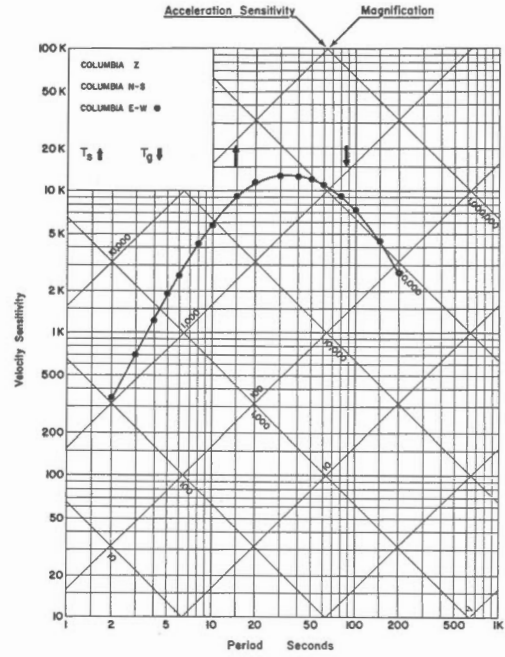
Dates of Calibration: October 1972

SEISMOMETER: Geotech. S13  $G_1 = 2.62$  V.S./C.M.  
PREAMPLIFIER: AS330 operated at 30-30 db (SEP.-ATT.)  
Filter Bandpass 0.1 - 5 Hz  
AMPLIFIER: AR 311 - 1 CM./Volt @ 24 db  
HELICORDER: RV 301 - 0-30 Hz  
Corner frequencies indicated by "K" arrows.

STATION: BAKER LAKE, N.W.T. (Final) (BLC)

$\phi = 64^{\circ}19'N$   $\lambda = 96^{\circ}01'W$  Altitude 16 M

Foundation: Granite Gneiss



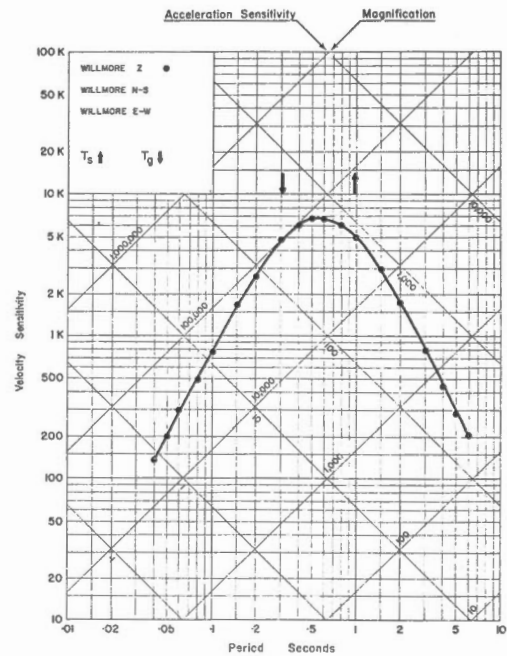
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • 23 Oct. 1975

STATION: EDMONTON, ALTA. (Final) (EDM)

$\phi = 53^{\circ}13.3'N$   $\lambda = 113^{\circ}21'W$  Altitude 730M

Foundation: Unconsolidated Shales, Edmonton Formation



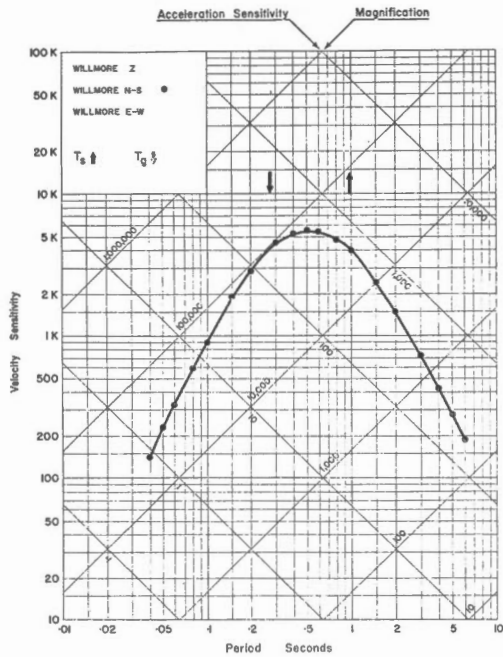
Dates of Calibration:

WILLMORE Z • November 28, 1974  
WILLMORE N-S  
WILLMORE E-W

STATION: EDMONTON, ALTA. (EDM)  
(Final)

$\phi = 53^{\circ}13.3'N$   $\lambda = 113^{\circ}21'W$  Altitude 730M

Foundation: Unconsolidated Shales, Edmonton Formation



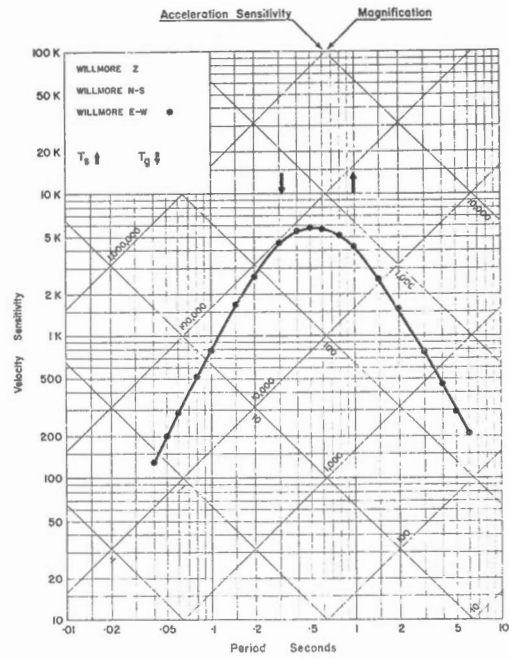
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • November 28, 1974  
WILLMORE E-W

STATION: EDMONTON, ALTA. (EDM)  
(Final)

$\phi = 53^{\circ}13.3'N$   $\lambda = 113^{\circ}21'W$  Altitude 730M

Foundation: Unconsolidated Shales, Edmonton Formation



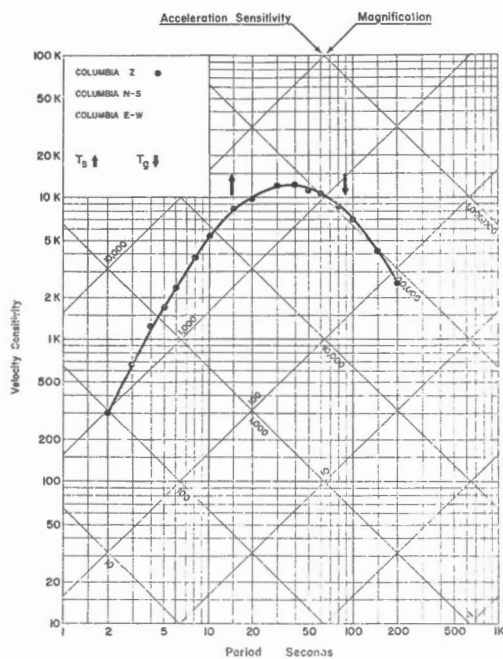
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • November 28, 1974

STATION: EDMONTON, ALTA. (EDM)  
(Final)

$\phi = 53^{\circ}13.3'N$   $\lambda = 113^{\circ}21'W$  Altitude 730M

Foundation: Unconsolidated Shales, Edmonton Formation



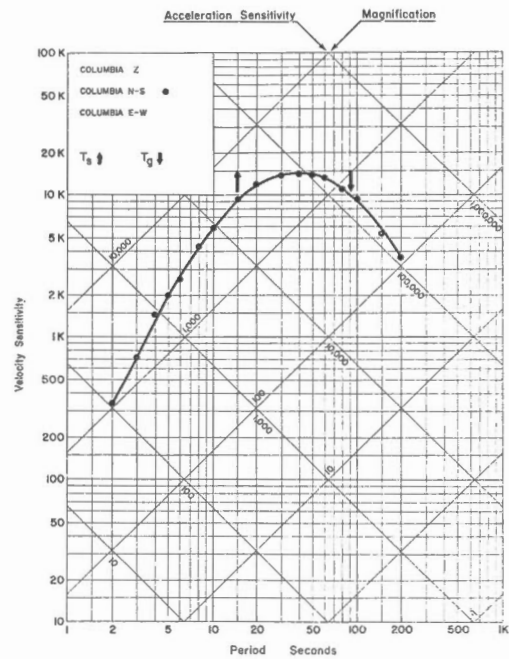
Dates of Calibration:

COLUMBIA Z • November 27, 1974  
COLUMBIA N-S  
COLUMBIA E-W

STATION: EDMONTON, ALTA. (EDM)  
(Final)

$\phi = 53^{\circ}13.3'N$   $\lambda = 113^{\circ}21'W$  Altitude 730M

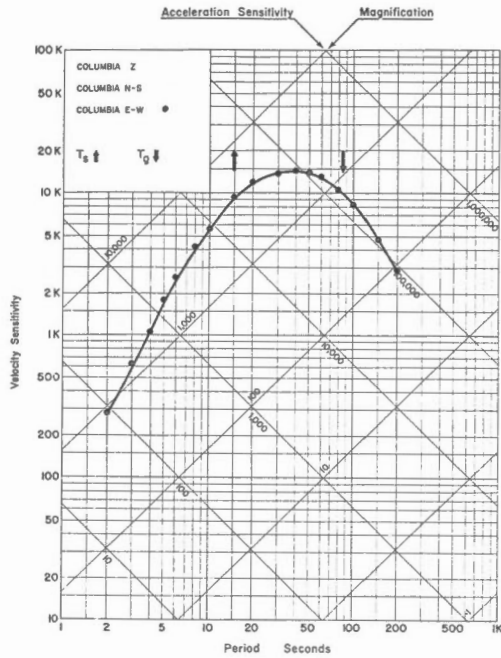
Foundation: Unconsolidated Shales, Edmonton Formation



Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • November 27, 1974  
COLUMBIA E-W

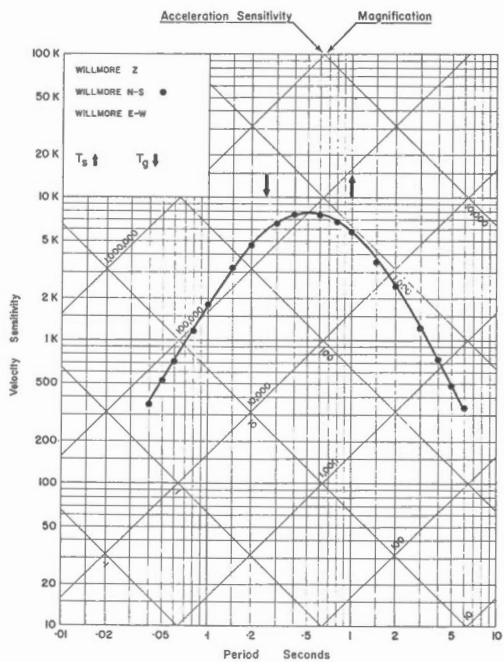
STATION: EDMONTON, ALTA. (EDM)  
 (Final)  
 $\phi = 53^{\circ}13.3'N$   $\lambda = 113^{\circ}21'W$  Altitude 730M  
 Foundation: Unconsolidated Shales, Edmonton Formation



Dates of Calibration:  
 COLUMBIA Z  
 COLUMBIA N-S  
 COLUMBIA E-W • November 28, 1974

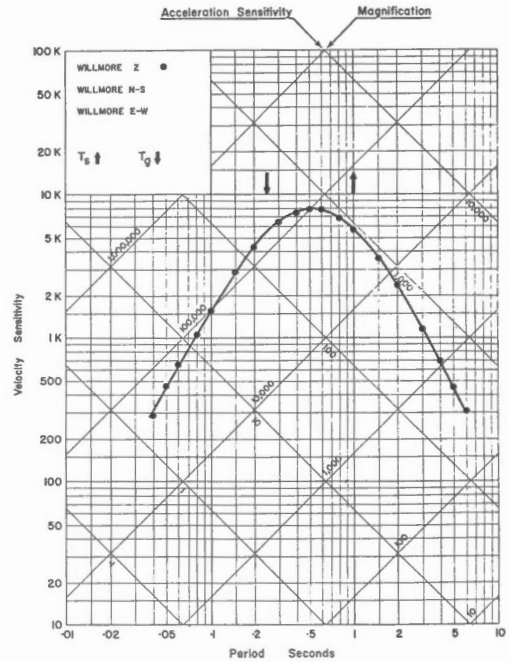
STATION: FORT CHURCHILL, MAN. (As found and left) (FCC)  
 $\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks.



Dates of Calibration:  
 WILLMORE Z  
 WILLMORE N-S • June 14, 1971  
 WILLMORE E-W

STATION: FORT CHURCHILL, MAN. (As found and left) (FCC)  
 $\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M  
 Foundation: Precambrian sediments and volcanic rocks.

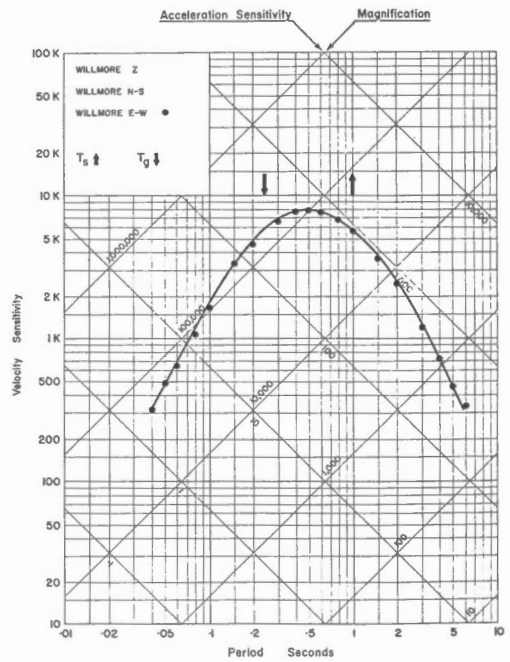


Dates of Calibration:  
 WILLMORE Z • June 14, 1971  
 WILLMORE N-S  
 WILLMORE E-W

STATION: FORT CHURCHILL, MAN. (As found and left) (FCC)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks.

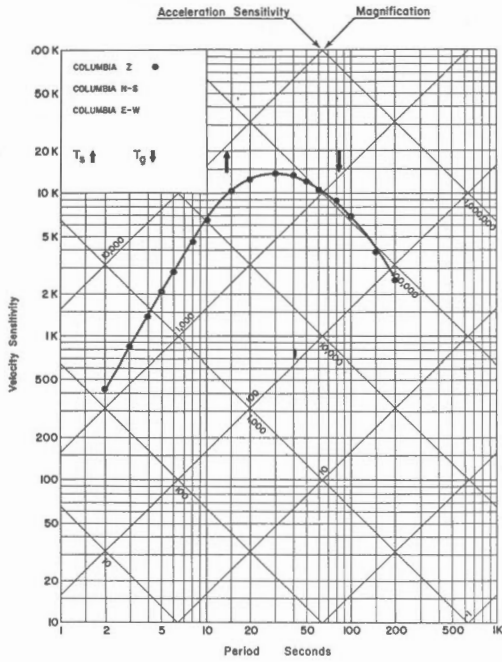


Dates of Calibration:  
 WILLMORE Z  
 WILLMORE N-S  
 WILLMORE E-W • June 14, 1971

STATION: FORT CHURCHILL, MAN. (As left) (FCC)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

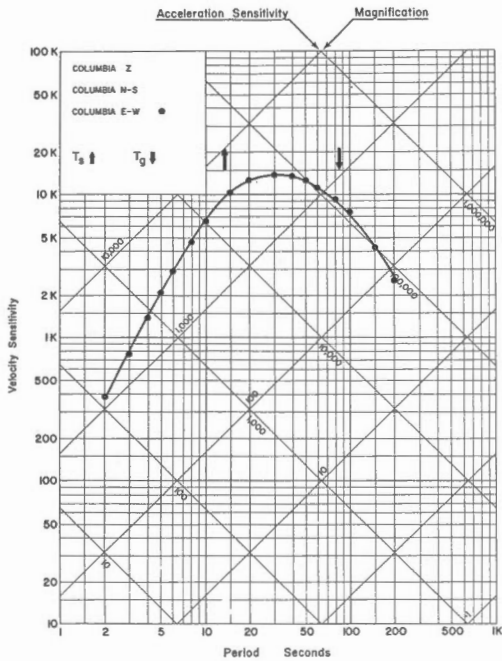
Foundation: Precambrian sediments and volcanic rocks.



STATION: FORT CHURCHILL, MAN. (As found and left) (FCC)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks.

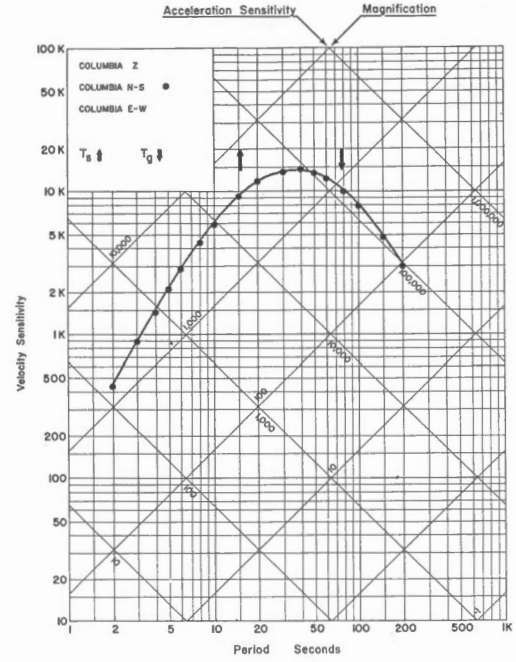


Dates of Calibration:  
COLUMBIA Z ●  
COLUMBIA N-S ●  
COLUMBIA E-W ● June 15, 1971

STATION: FORT CHURCHILL, MAN. (As found and left) (FCC)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

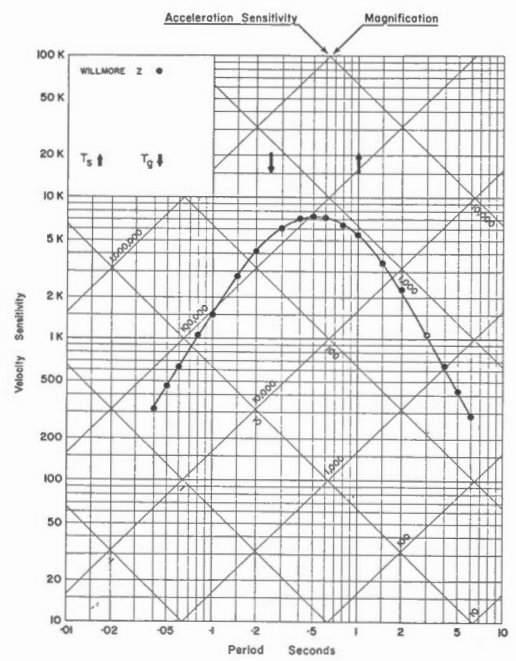
Foundation: Precambrian sediments and volcanic rocks.



STATION: FORT CHURCHILL, MAN. (As found and left) (FCC)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks.



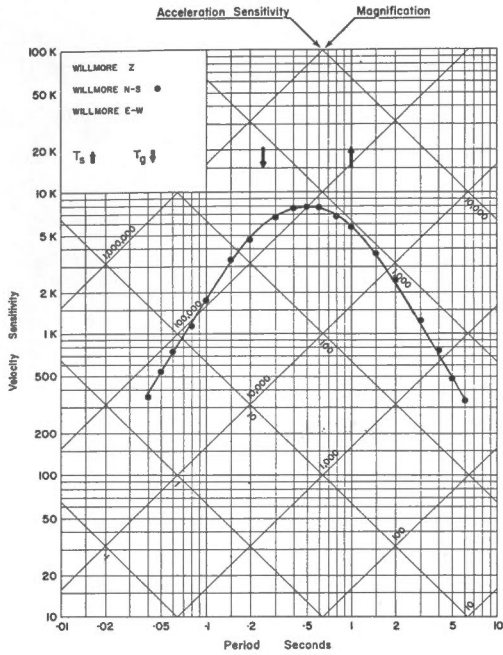
Dates of Calibration:  
WILLMORE Z ● Oct. 21, 1975



STATION: FORT CHURCHILL, MAN. (FCC)  
 (As Found and Left)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks



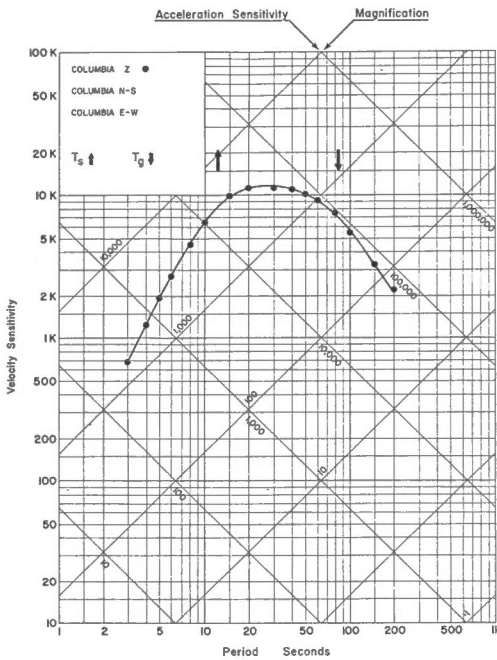
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S • Oct. 21, 1975  
 WILLMORE E-W

STATION: FORT CHURCHILL, MAN. (FCC)  
 (As found)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39M

Foundation: Precambrian sediments and volcanic rocks.



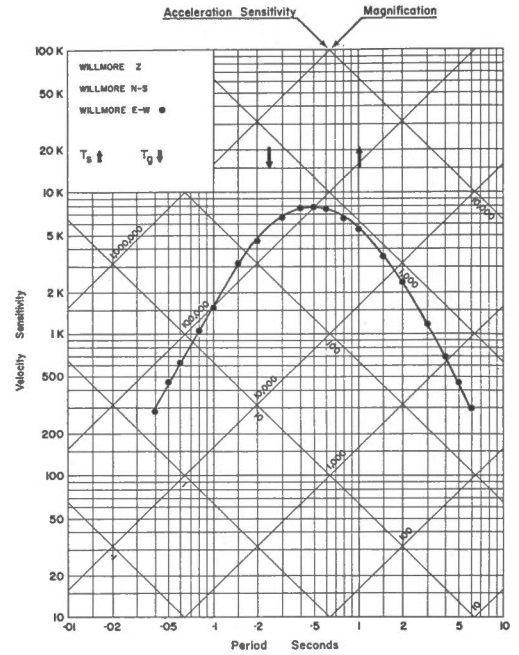
Dates of Calibration:

COLUMBIA Z • Oct. 25, 1975  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: FORT CHURCHILL, MAN. (FCC)  
 (As Found and Left)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks



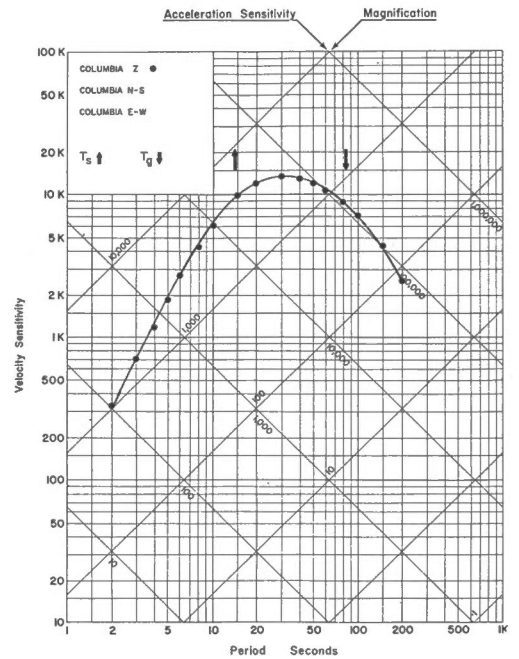
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S  
 WILLMORE E-W • Oct. 21, 1975

STATION: FORT CHURCHILL, MAN. (FCC)  
 (Final)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks



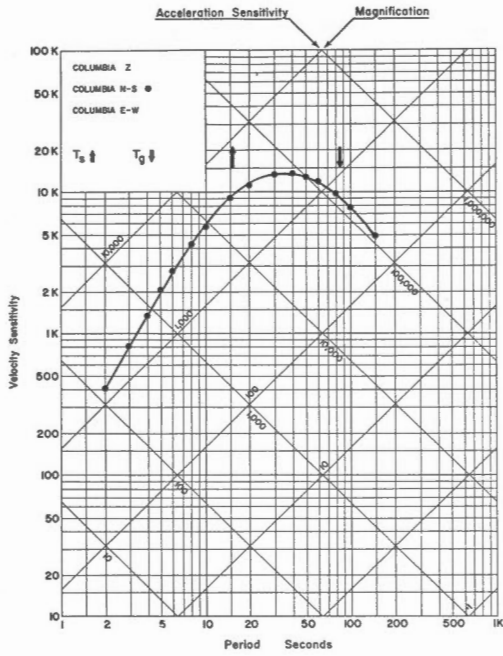
Dates of Calibration:

COLUMBIA Z • Oct. 26, 1975  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: FORT CHURCHILL, MAN. (FCC)  
(As found and left)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks



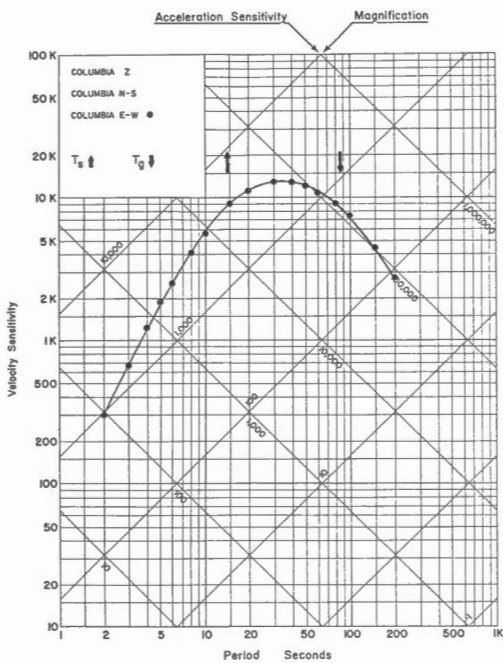
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S ● Oct. 25, 1975  
COLUMBIA E-W

STATION: FORT CHURCHILL, MAN. (FCC)  
(Final)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks



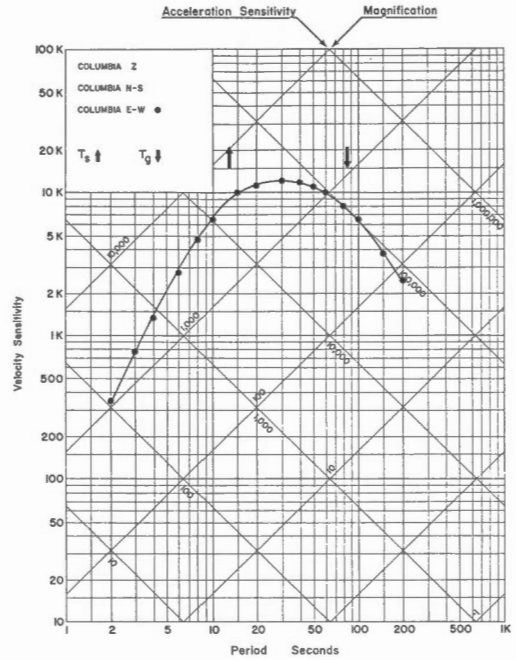
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W ● Oct. 26, 1975

STATION: FORT CHURCHILL, MAN. (FCC)  
(As found)

$\phi = 58^{\circ}45.7'N$   $\lambda = 94^{\circ}05.2'W$  Altitude 39 M

Foundation: Precambrian sediments and volcanic rocks



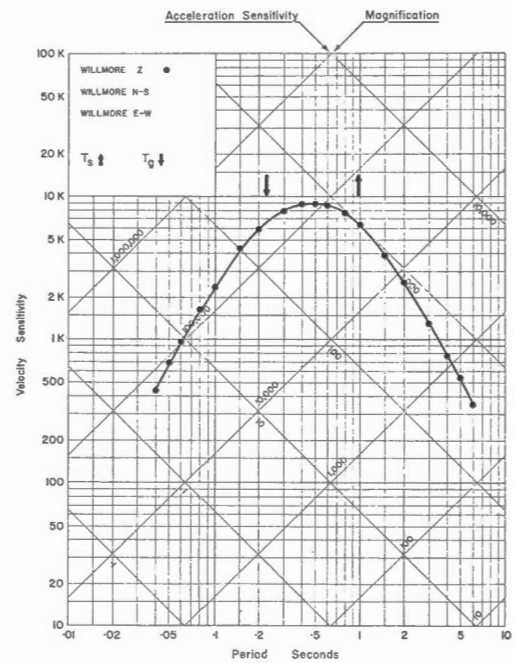
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W ● Oct. 25, 1975

STATION: FLIN FLON, MANITOBA (As found and left) (FFC)

$\phi = 54^{\circ}43'.5N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



Dates of Calibration:

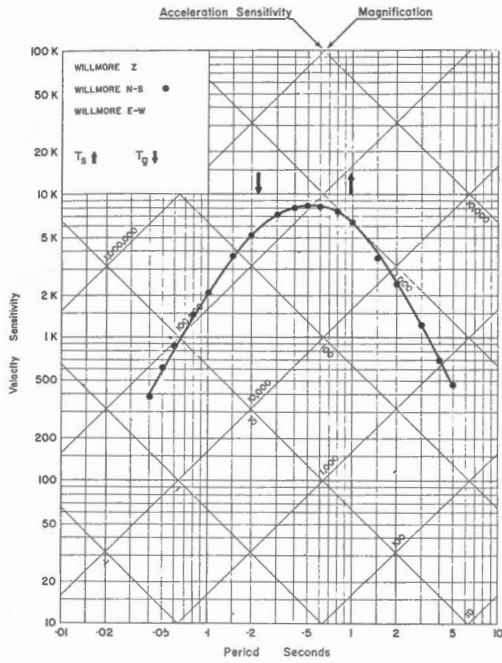
WILLMORE Z ● Oct. 22, 1971  
WILLMORE N-S  
WILLMORE E-W



STATION: FLIN FLON, MANITOBA (As found and left) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



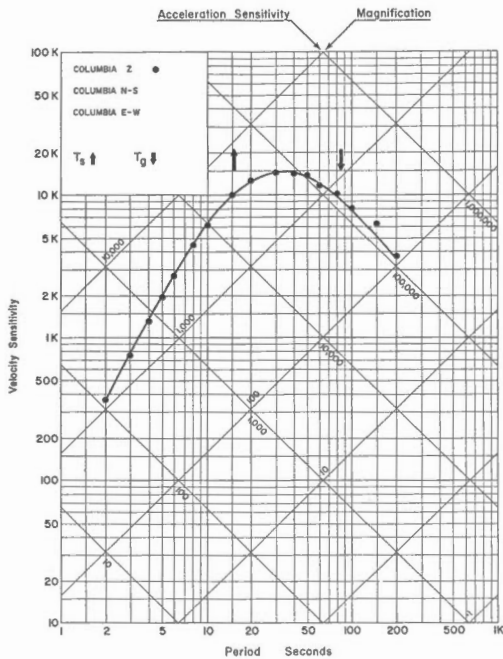
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • Oct. 22, 1971  
WILLMORE E-W

STATION: FLIN FLON, MANITOBA (As found and left) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



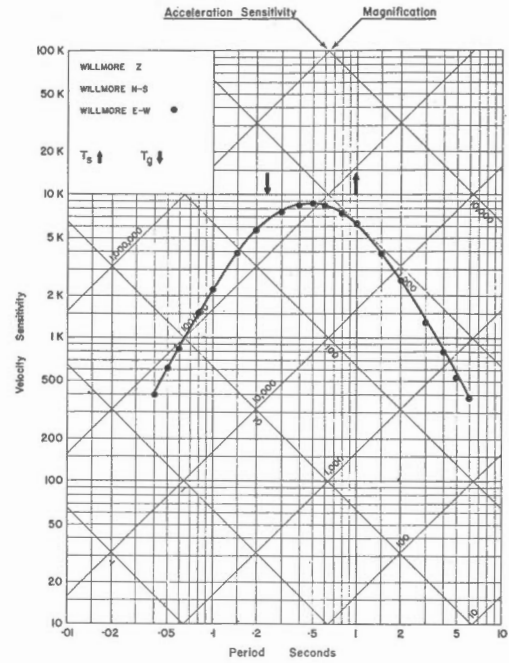
Dates of Calibration:

COLUMBIA Z • Oct. 20, 1971  
COLUMBIA N-S  
COLUMBIA E-W

STATION: FLIN FLON, MANITOBA (As found and left) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



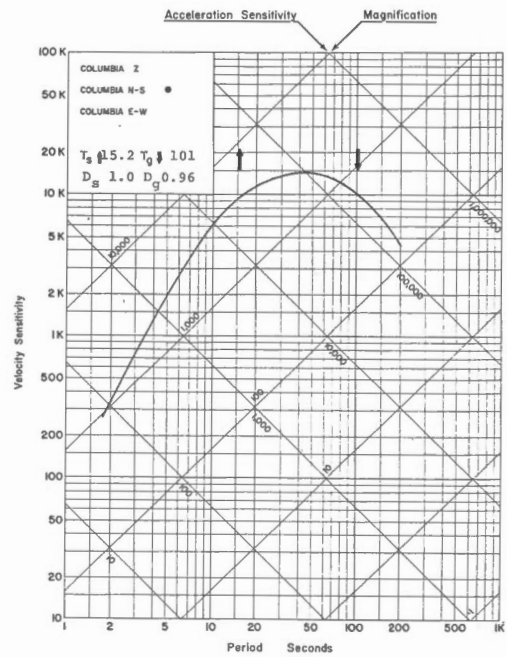
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • Oct. 22, 1971

STATION: FLIN FLON, MANITOBA (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



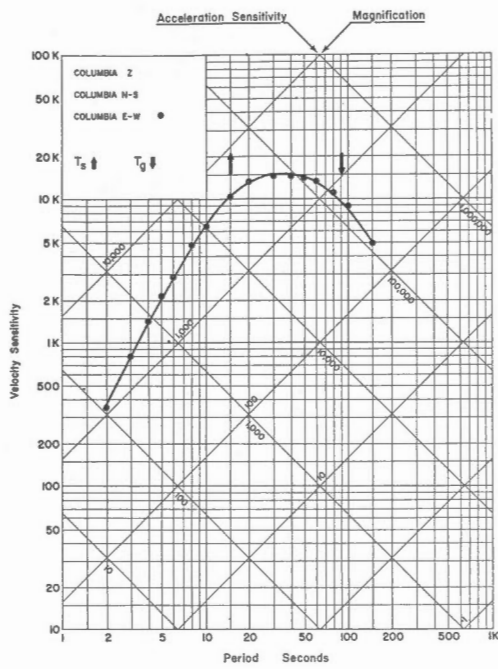
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • Aug. 26, 1974  
COLUMBIA E-W (Estimated in Ottawa)

STATION: FLIN FLON, MANITOBA (As left) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



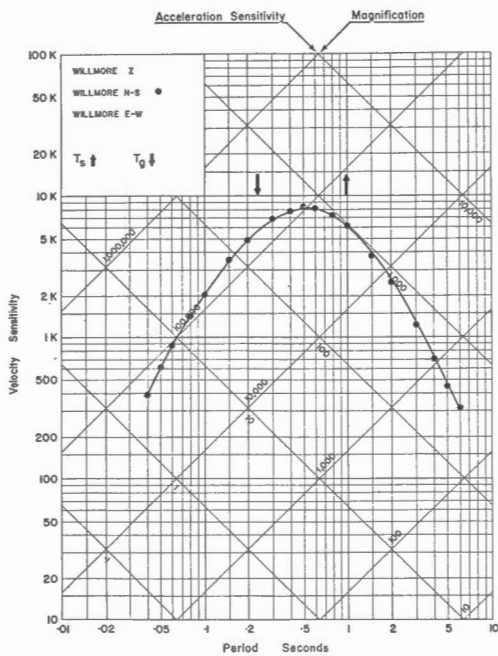
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • Oct. 25, 1971

STATION: FLIN FLON, MANITOBA (As Found & Left) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



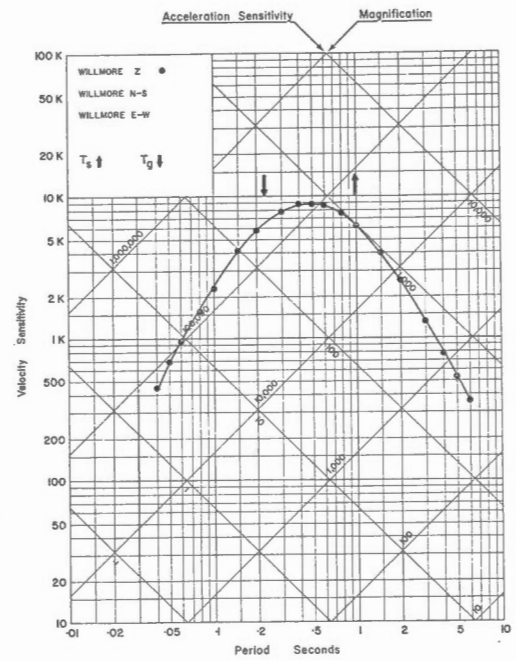
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • June 20, 1975  
WILLMORE E-W

STATION: FLIN FLON, MANITOBA (As Found & Left) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



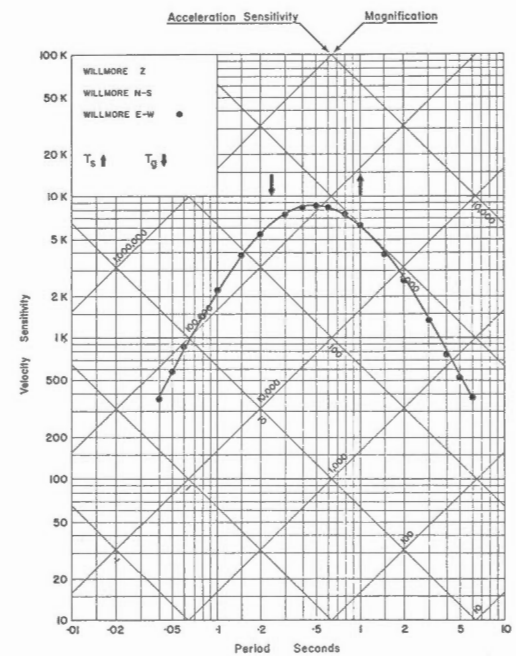
Dates of Calibration:

WILLMORE Z • June 20, 1975  
WILLMORE N-S  
WILLMORE E-W

STATION: FLIN FLON, MANITOBA (As Found & Left) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



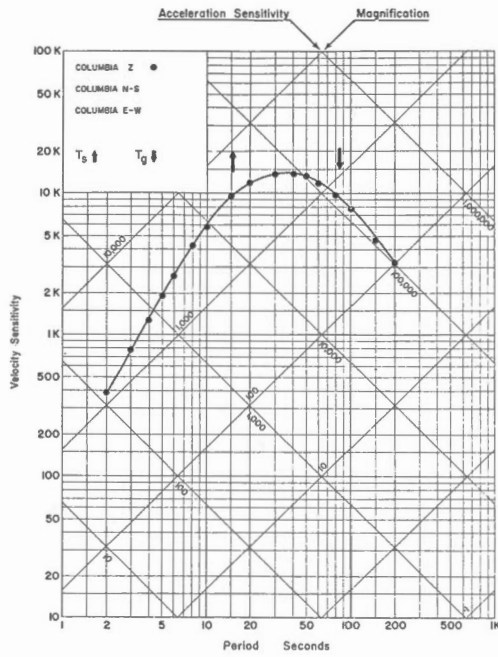
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • June 20, 1975

STATION: FLIN FLON, MANITOBA (FFC) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



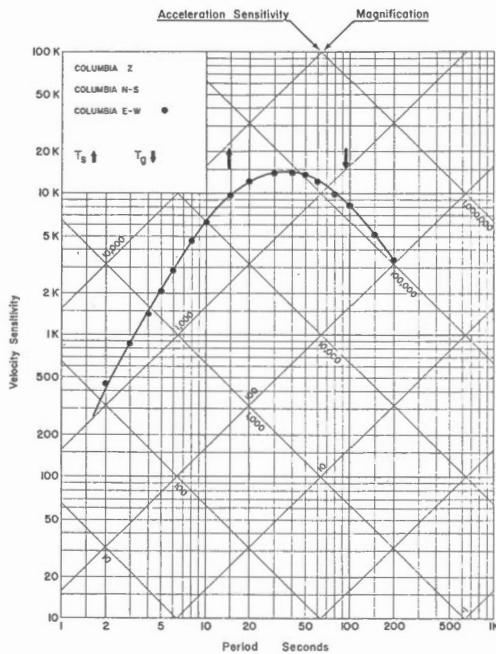
Dates of Calibration:

COLUMBIA Z • June 20, 1975  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: FLIN FLON, MANITOBA (FFC) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



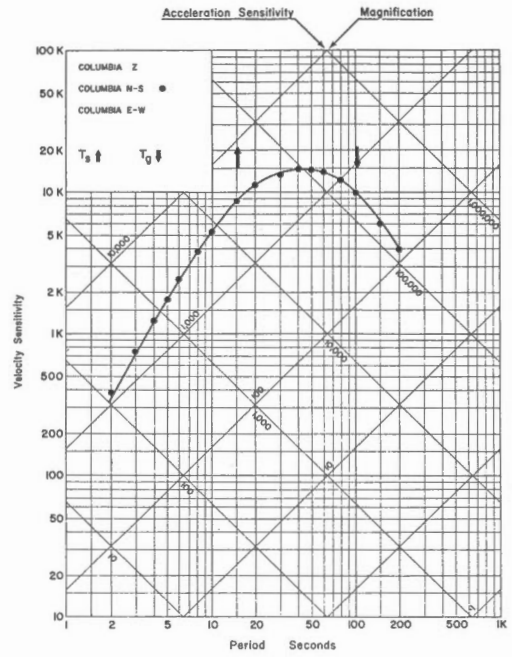
Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S  
 COLUMBIA E-W • June 19, 1975

STATION: FLIN FLON, MANITOBA (FFC) (FFC)

$\phi = 54^{\circ}43.5'N$   $\lambda = 101^{\circ}58.7'W$  Altitude 338 M

Foundation: Granite Gneiss



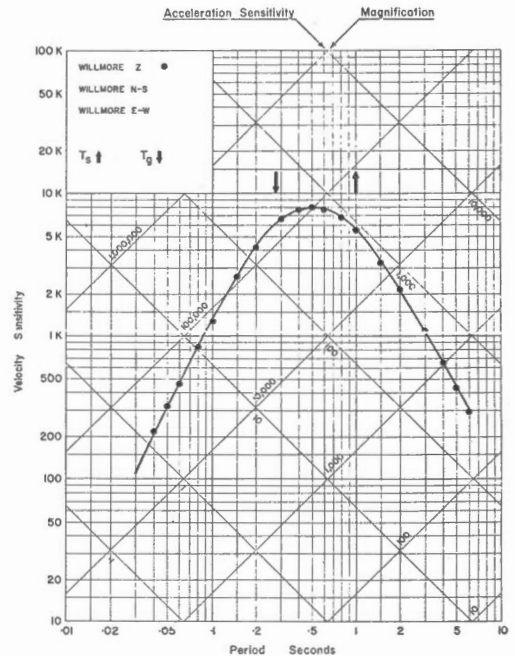
Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S • June 18, 1975  
 COLUMBIA E-W

STATION: FROBISHER, N.W.T. (PRB) (FINAL)

$\phi = 63^{\circ}44.8'N$   $\lambda = 68^{\circ}32.8'W$  Altitude 18 M

Foundation: Precambrian metamorphic rock.



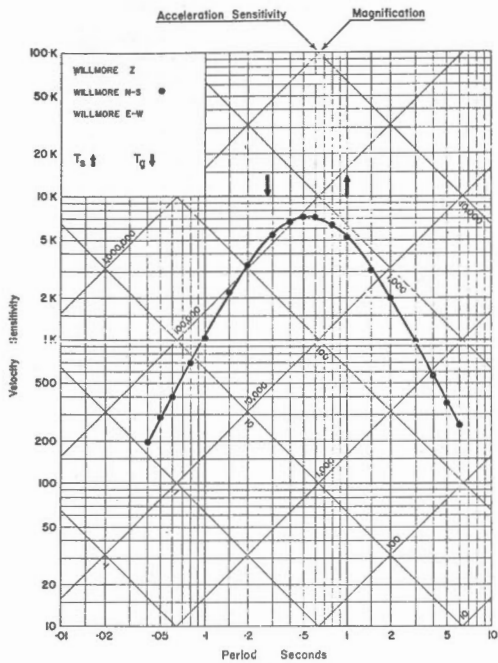
Dates of Calibration:

WILLMORE Z • Nov. 28, 1972  
 WILLMORE N-S  
 WILLMORE E-W

STATION: FROBISHER, N.W.T. (FRB) (FINAL)

$\phi = 63^{\circ}44.8'N$   $\lambda = 68^{\circ}32.8'W$  Altitude 18 M

Foundation: Precambrian metamorphic rock



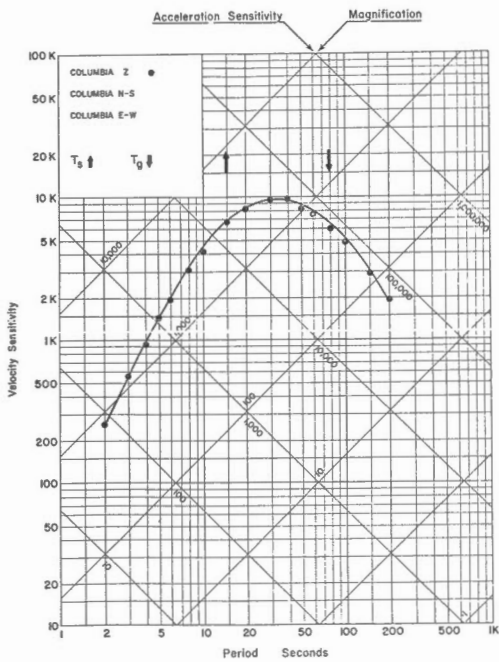
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • Nov. 28, 1972  
WILLMORE E-W

STATION: FROBISHER, N.W.T. (FRB) (FINAL)

$\phi = 63^{\circ}44.8'N$   $\lambda = 68^{\circ}32.8'W$  Altitude 18 M

Foundation: Precambrian metamorphic rock



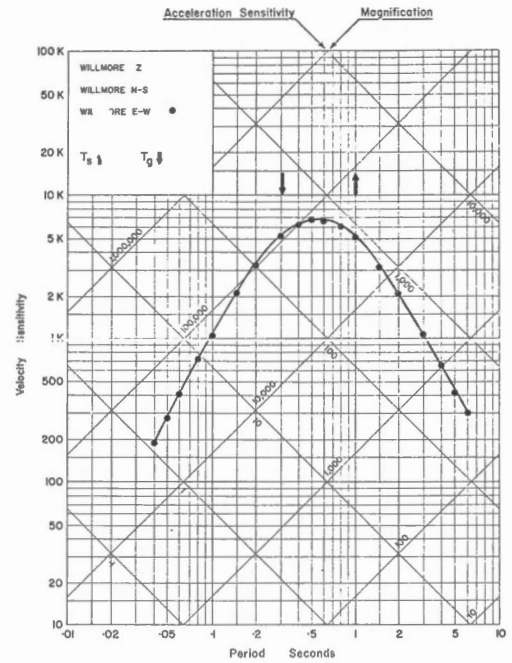
Dates of Calibration:

COLUMBIA Z • Nov. 29, 1972 (Valid from June 26, 1973 onward).  
COLUMBIA N-S  
COLUMBIA E-W

STATION: FROBISHER, N.W.T. (FRB) (FINAL)

$\phi = 63^{\circ}44.8'N$   $\lambda = 68^{\circ}32.8'W$  Altitude 18 M

Foundation: Precambrian metamorphic rock



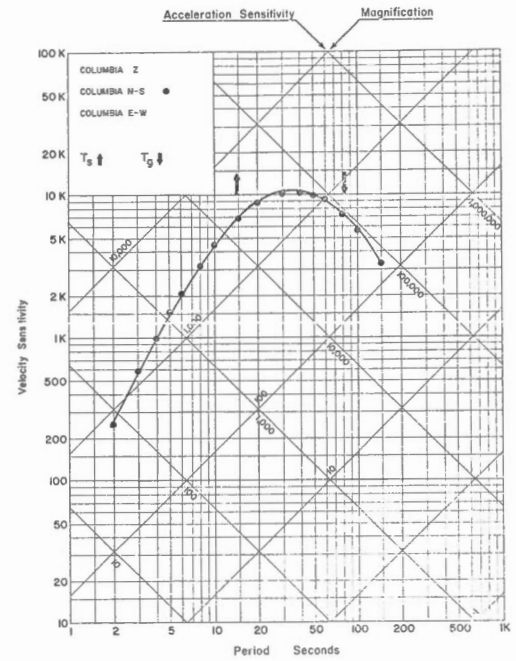
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • Nov. 28, 1972

STATION: FROBISHER, N.W.T. (FRB) (FINAL)

$\phi = 63^{\circ}44.8'N$   $\lambda = 68^{\circ}32.8'W$  Altitude 18 M

Foundation: Precambrian metamorphic rock



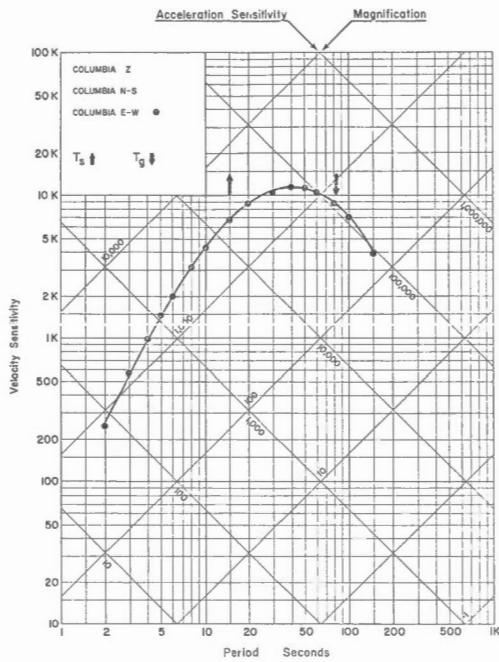
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • Nov. 29, 1972  
COLUMBIA E-W

STATION: FROBISHER, N.W.T. (FRB) (FINAL)

$\phi = 63^{\circ}44.8'N$   $\lambda = 68^{\circ}32.8'W$  Altitude 18 M

Foundation: Precambrian metamorphic rock



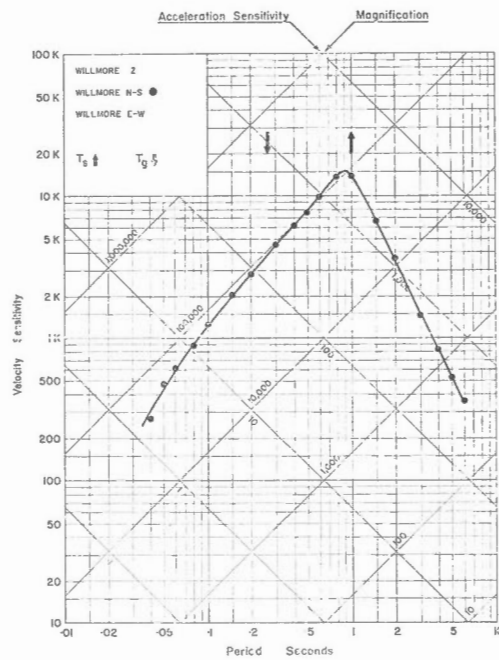
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • Nov. 30, 1972

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772

Foundation: Palaeozoic Sediments



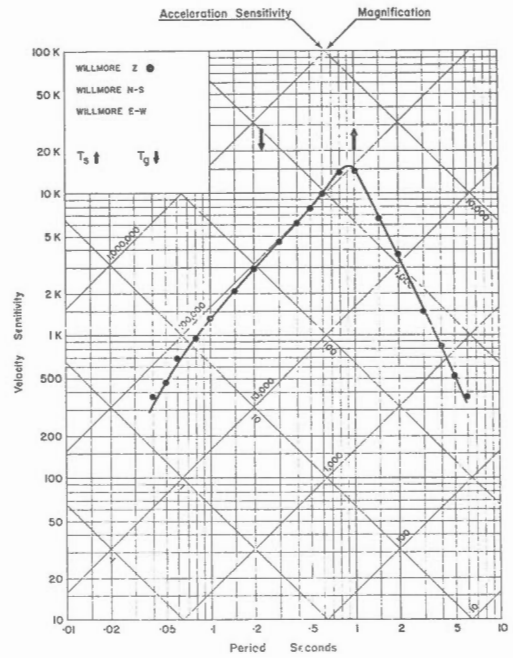
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • Oct. 29, 1970  
WILLMORE E-W

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



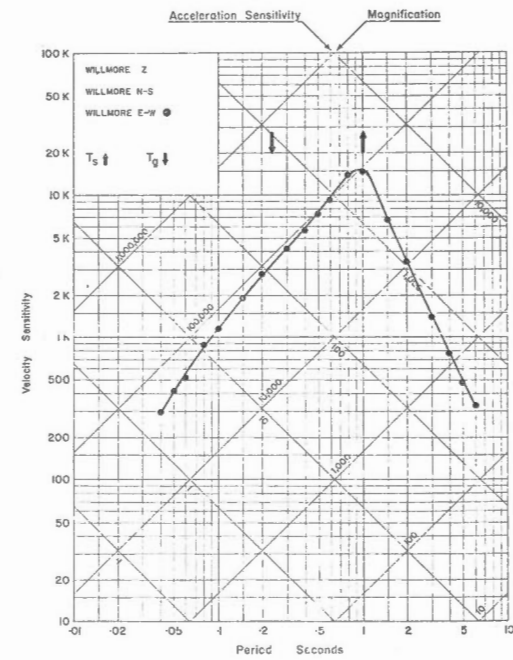
Dates of Calibration:

WILLMORE Z • Oct. 29, 1970  
WILLMORE N-S  
WILLMORE E-W

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772

Foundation: Palaeozoic Sediments



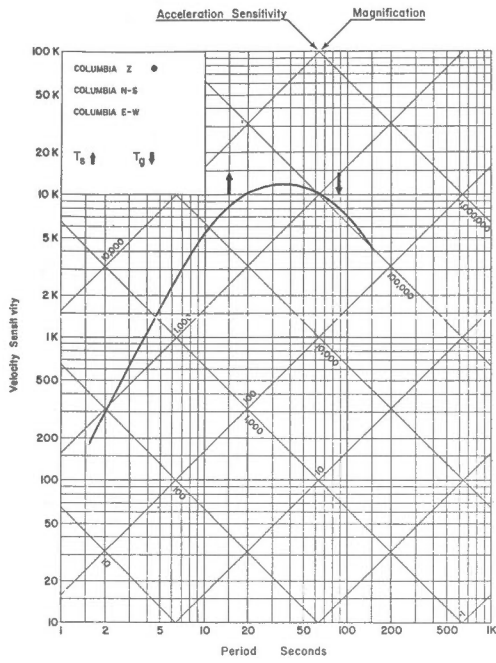
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • Oct. 29, 1970

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



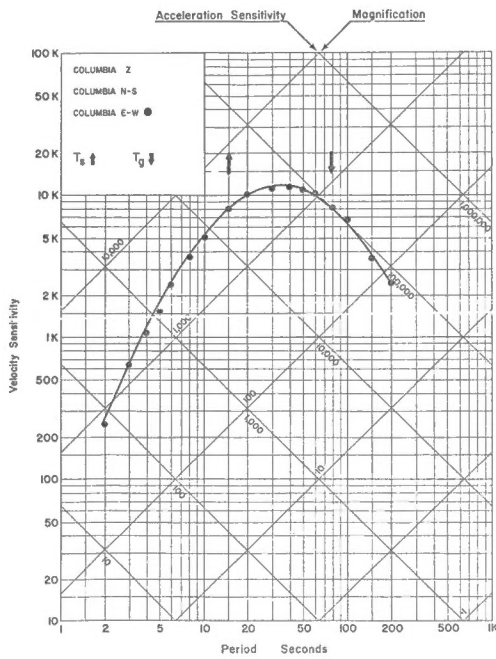
Dates of Calibration:

COLUMBIA Z • 12 Jan. 1971  
COLUMBIA N-S (Calibrated in Ottawa)  
COLUMBIA E-W

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



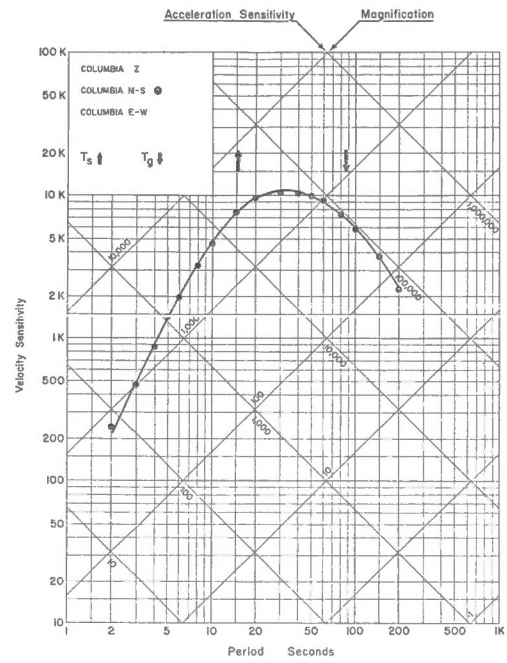
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • Oct. 28, 1970

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



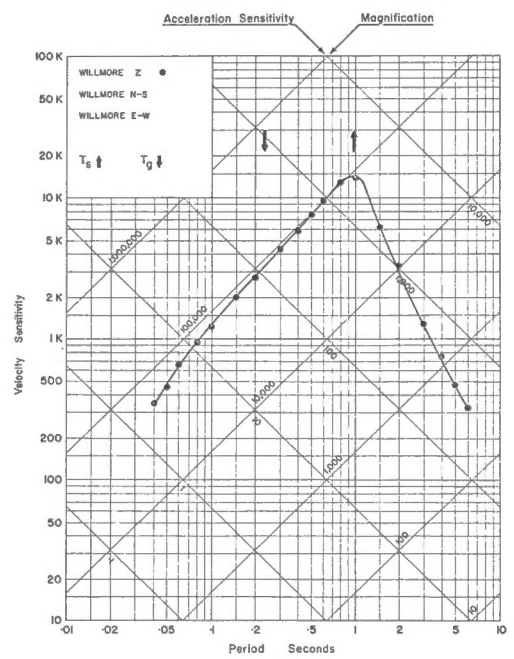
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • Oct. 27, 1970  
COLUMBIA E-W

STATION: FORT ST. JAMES, B.C. (FSJ)

(As Found)  
 $\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



Dates of Calibration:

WILLMORE Z • May 6, 1975  
WILLMORE N-S  
WILLMORE E-W

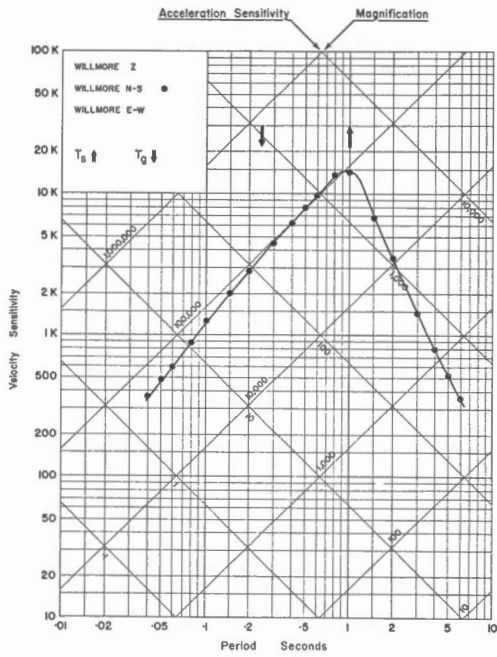


STATION: FORT ST. JAMES, B.C. (FSJ)

(As Found)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



Dates of Calibration:

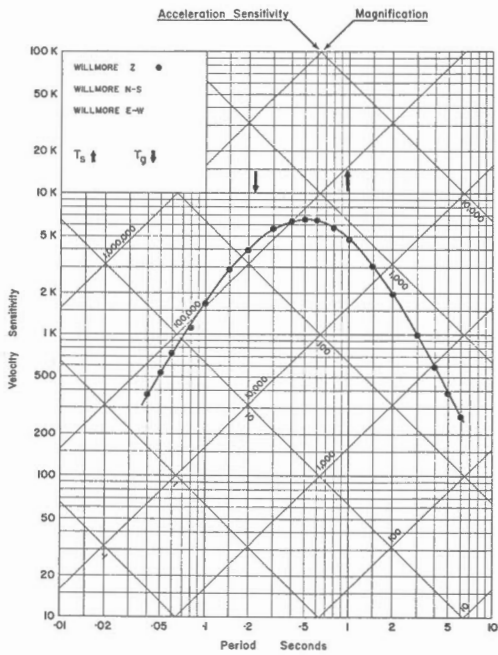
WILLMORE Z  
WILLMORE N-S • May 6, 1975  
WILLMORE E-W

STATION: FORT ST. JAMES, B.C. (FSJ)

(Final)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



Dates of Calibration:

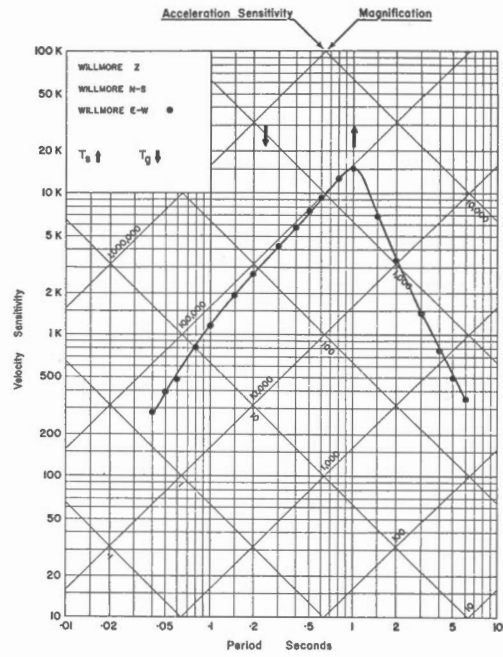
WILLMORE Z • May 8, 1975  
WILLMORE N-S  
WILLMORE E-W

STATION: FORT ST. JAMES, B.C. (FSJ)

(As Found)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



Dates of Calibration:

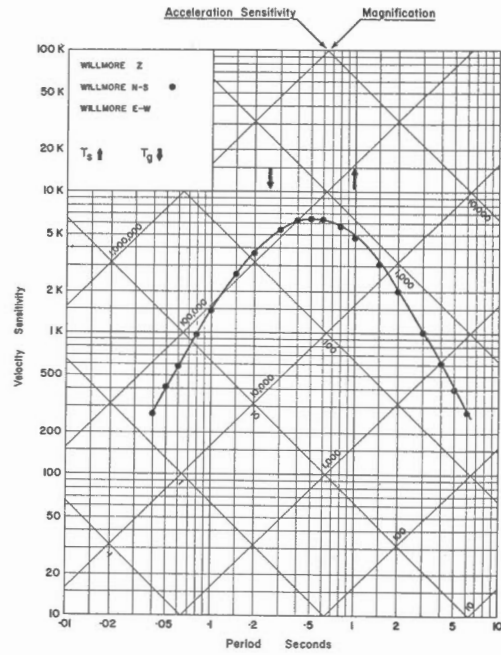
WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • May 6, 1975

STATION: FORT ST. JAMES, B.C. (FSJ)

(Final)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



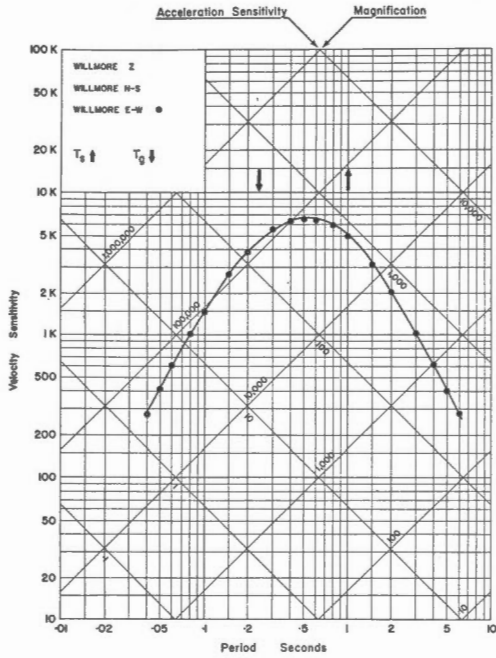
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • May 8, 1975  
WILLMORE E-W

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



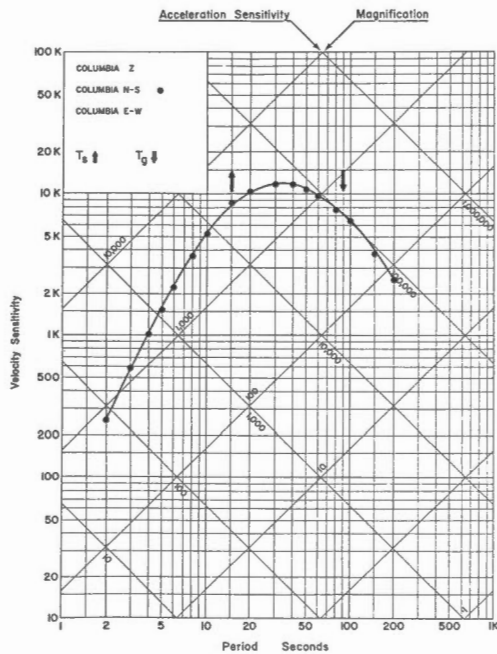
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • May 8, 1975

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



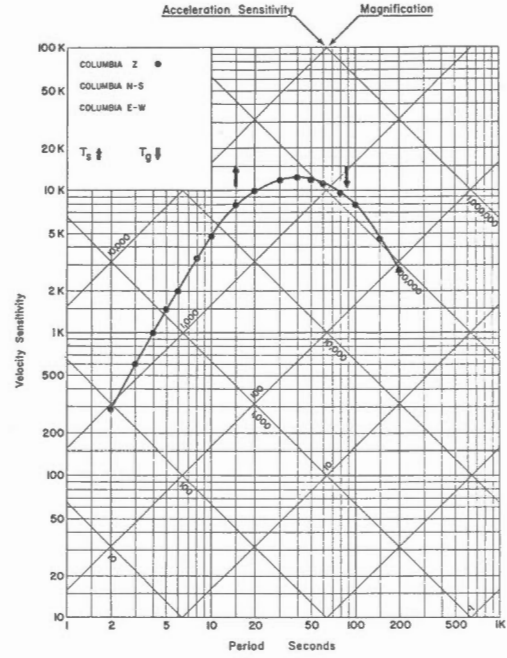
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • May 8, 1975  
COLUMBIA E-W

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



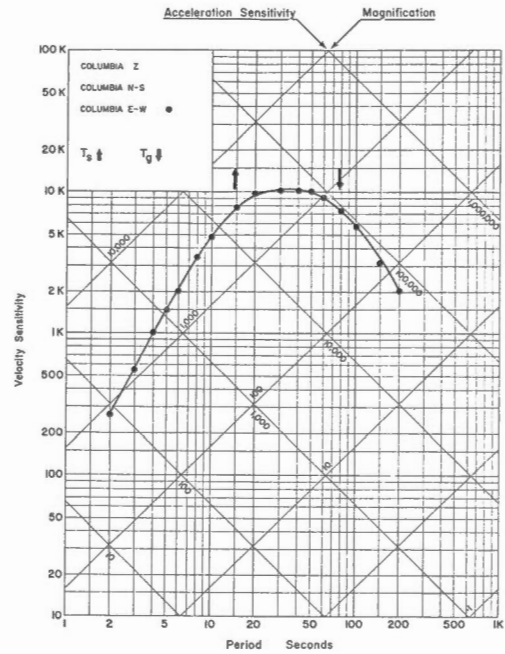
Dates of Calibration:

COLUMBIA Z • May 8, 1975  
COLUMBIA N-S  
COLUMBIA E-W

STATION: FORT ST. JAMES, B.C. (FSJ)

$\phi = 54^{\circ}26'N$   $\lambda = 124^{\circ}15'W$  Altitude 772 M

Foundation: Palaeozoic Sediments



Dates of Calibration:

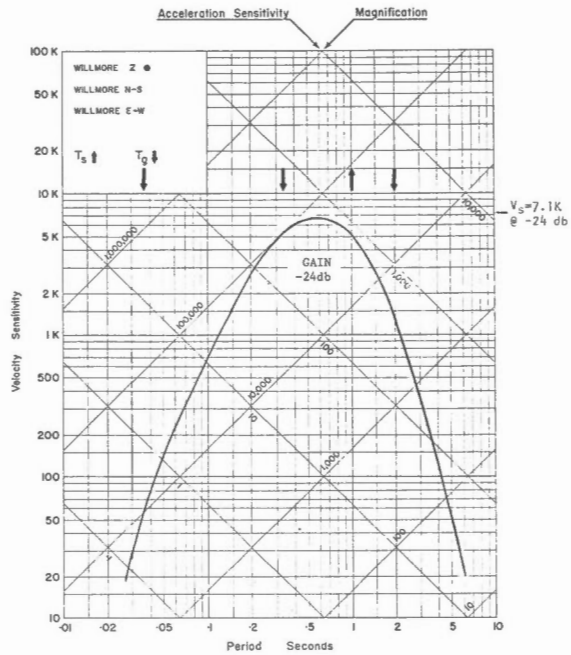
COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • May 8, 1975



STATION: HALIFAX, N.S. (HAL)

$\phi = 44^{\circ}38'N$   $\lambda = 63^{\circ}36'W$  Altitude 56M

Foundation: Carbonaceous Slate



Dates of Calibration: March 9, 1973

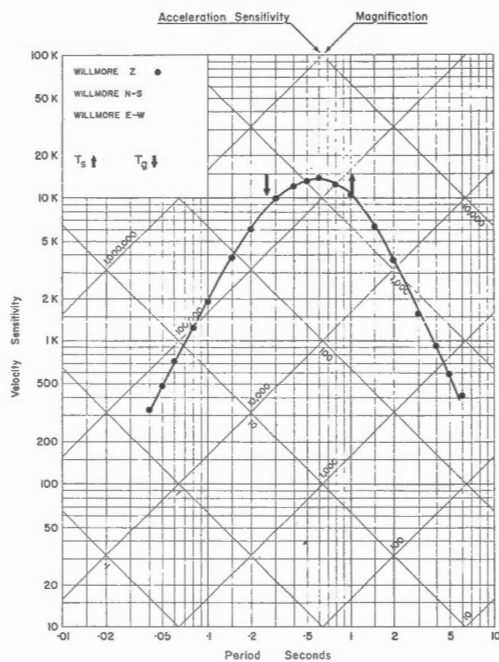
SEISMOMETER: Willmore MKII  $G_L = 1.96$  v.s/cm  
 PREAMPLIFIER: Teledyne EA310 operated @ 30 db sep. Filter Band Pass 0.5-3 Hz

HELICORDER: Model RV301 0-30 Hz  
 Corner frequencies indicated by "T<sub>g</sub>" arrows.

STATION: INUVIK, N.W.T. (FINAL) (INK)

$\phi = 68^{\circ}17.5'N$   $\lambda = 133^{\circ}30'W$  Altitude 40 M (approx.)

Foundation: Palaeozoic, Sediments Cambrian Limestone



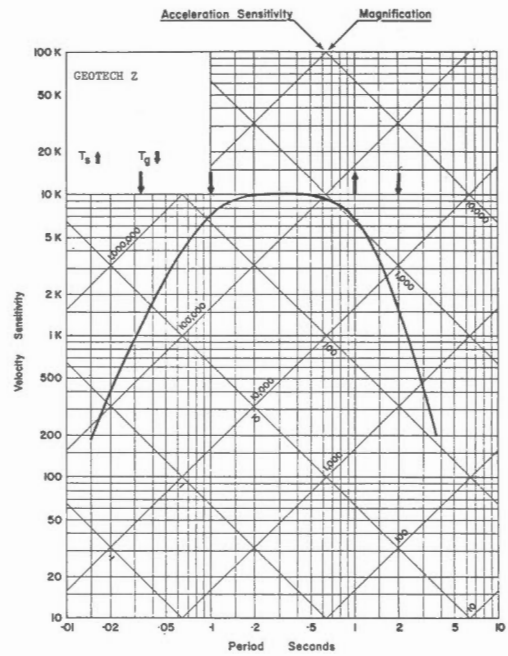
Dates of Calibration:

WILLMORE Z • June 2, 1972  
 WILLMORE N-S  
 WILLMORE E-W

STATION: IGLLOOLIK, N.W.T. (IGL)

$\phi = 69^{\circ}22.6'N$   $\lambda = 81^{\circ}48.4'W$  Altitude 38 M

Foundation: Palaeozoic, Ordovician Limestone



DATE OF CALIBRATION: Sept. 3, 1975

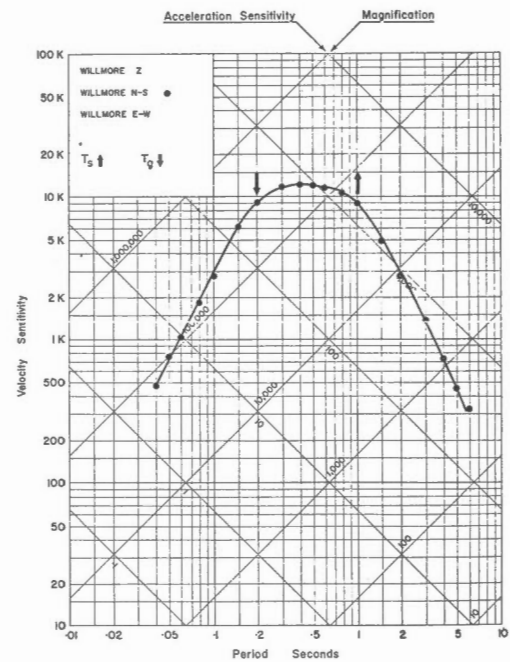
SEISMOMETER: Geotech 5-13 (vertical)  
 PREAMPLIFIER: E.P.100  
 PEN DRIVE AMP: E.P.110  
 HELICORDER: Geotech RV301

Corner frequencies indicated by T<sub>g</sub> arrows.

STATION: INUVIK, N.W.T. (FINAL) (INK)

$\phi = 68^{\circ}17.5'N$   $\lambda = 133^{\circ}30'W$  Altitude 40 M (approx.)

Foundation: Palaeozoic, Sediments Cambrian Limestone



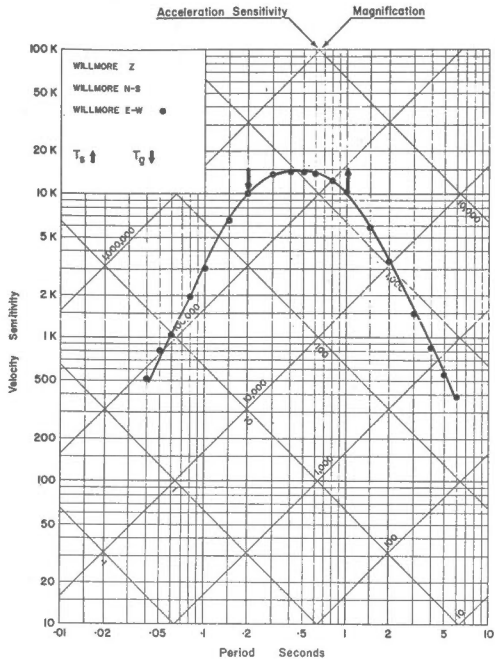
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S • June 1, 1972  
 WILLMORE E-W

STATION: INUVIK, N.W.T. (FINAL) (INK)

$\phi = 68^{\circ}17.5'N$   $\lambda = 133^{\circ}30'W$  Altitude 40 M (approx.)

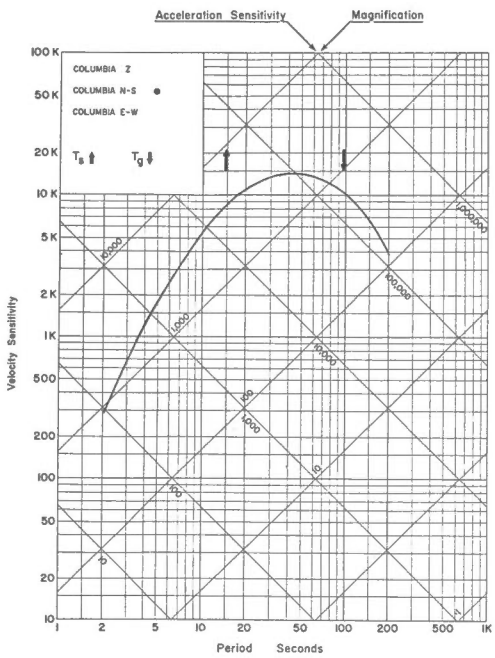
Foundation: Palaeozoic, Sediments Cambrian Limestone



STATION: INUVIK, N.W.T. (INK)

$\phi = 68^{\circ}17.5'N$   $\lambda = 133^{\circ}30'W$  Altitude 40 M (approx.)

Foundation: Palaeozoic, Sediments Cambrian Limestone



STATION: INUVIK, N.W.T. (FINAL) (INK)

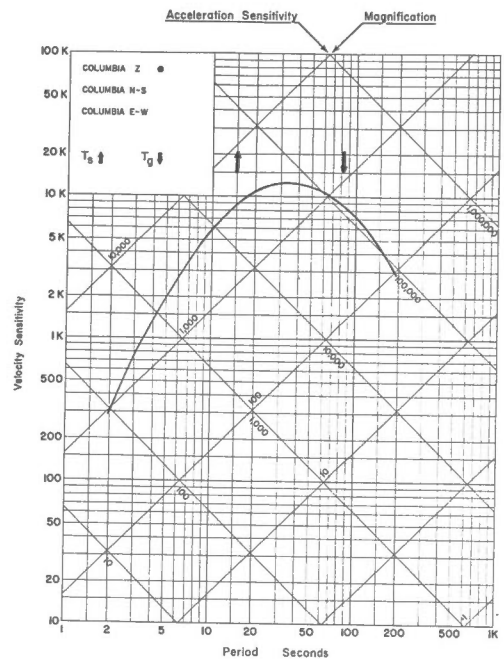
$\phi = 68^{\circ}17.5'N$   $\lambda = 133^{\circ}30'W$  Altitude 40 M (approx.)

Foundation: Palaeozoic, Sediments Cambrian Limestone

STATION: INUVIK, N.W.T. (INK)

$\phi = 68^{\circ}17.5'N$   $\lambda = 133^{\circ}30'W$  Altitude 40 M (approx.)

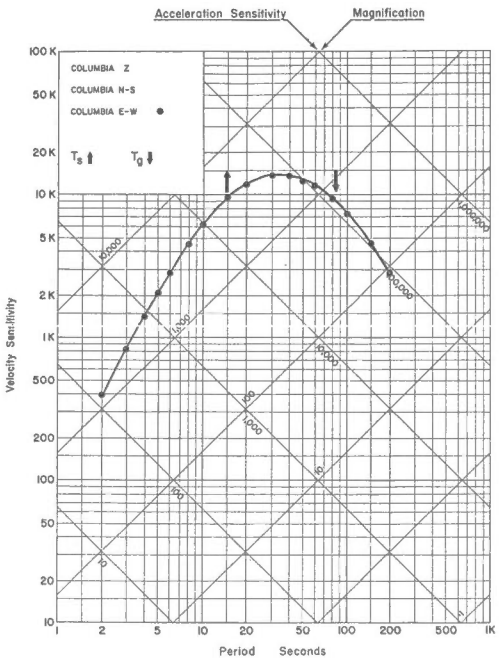
Foundation: Palaeozoic, Sediments Cambrian Limestone



STATION: INUVIK, N.W.T. (FINAL) (INK)

$\phi = 68^{\circ}17.5'N$   $\lambda = 133^{\circ}30'W$  Altitude 40 M (approx.)

Foundation: Palaeozoic, Sediments Cambrian Limestone



STATION: INUVIK, N.W.T. (FINAL) (INK)

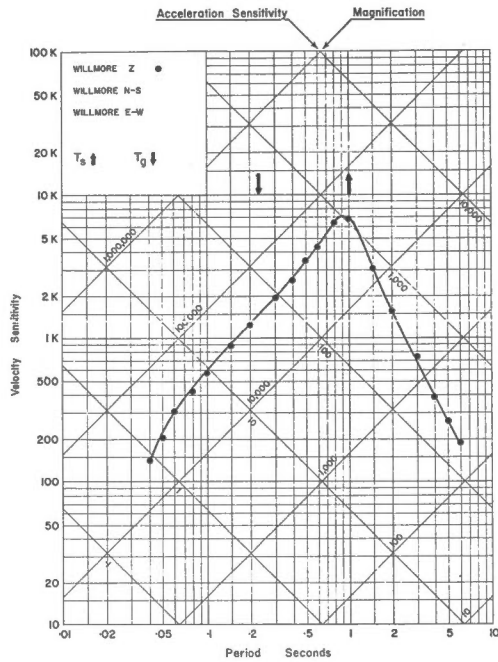
$\phi = 68^{\circ}17.5'N$   $\lambda = 133^{\circ}30'W$  Altitude 40 M (approx.)

Foundation: Palaeozoic, Sediments Cambrian Limestone

STATION: THUNDER BAY, ONT. (FINAL) (LHC)

$\phi = 48^{\circ}25'N$   $\lambda = 89^{\circ}16'W$  Altitude 196 M

Foundation: Precambrian, upper gunflint, iron formation



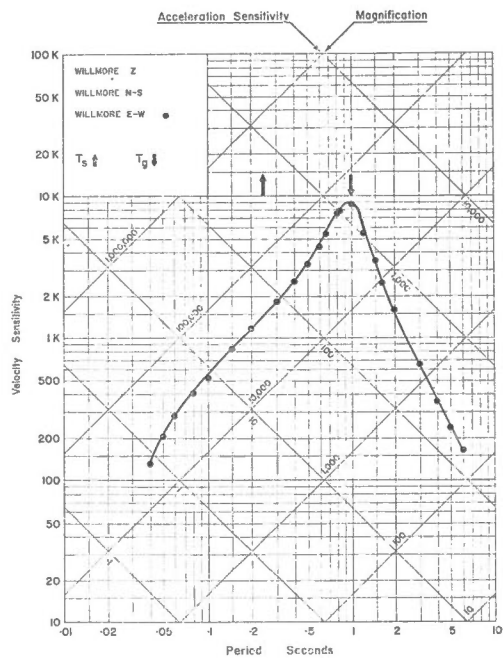
Dates of Calibration:

WILLMORE Z • Sept. 19, 1972  
WILLMORE N-S  
WILLMORE E-W

STATION: THUNDER BAY, ONT. (Final) (LHC)

$\phi = 48^{\circ}25'N$   $\lambda = 89^{\circ}16'W$  Altitude 196M

Foundation: Precambrian, upper gunflint, iron formation



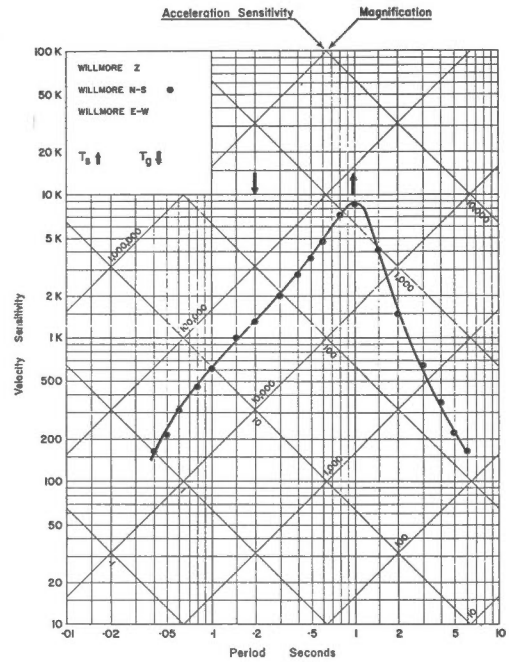
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • March 27, 1973

STATION: THUNDER BAY, ONT. (FINAL) (LHC)

$\phi = 48^{\circ}25'N$   $\lambda = 89^{\circ}16'W$  Altitude 196 M

Foundation: Precambrian, upper gunflint, iron formation



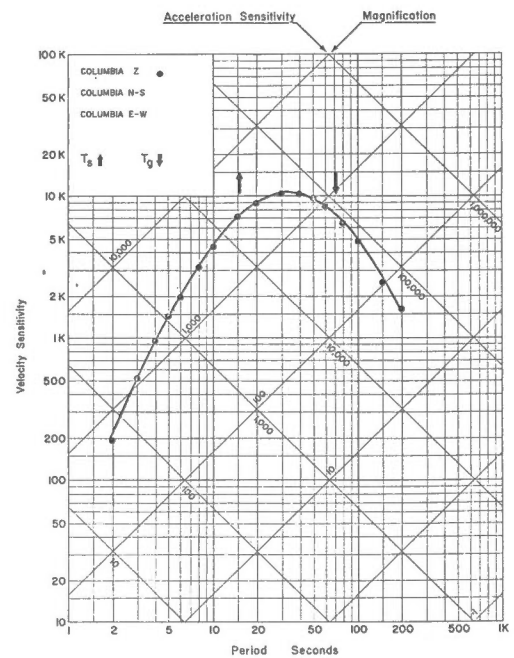
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • Sept. 20, 1972  
WILLMORE E-W

STATION: THUNDER BAY, ONT. (As found and left) (LHC)

$\phi = 48^{\circ}25'N$   $\lambda = 89^{\circ}16'W$  Altitude 196M

Foundation: Precambrian, upper gunflint, iron formation



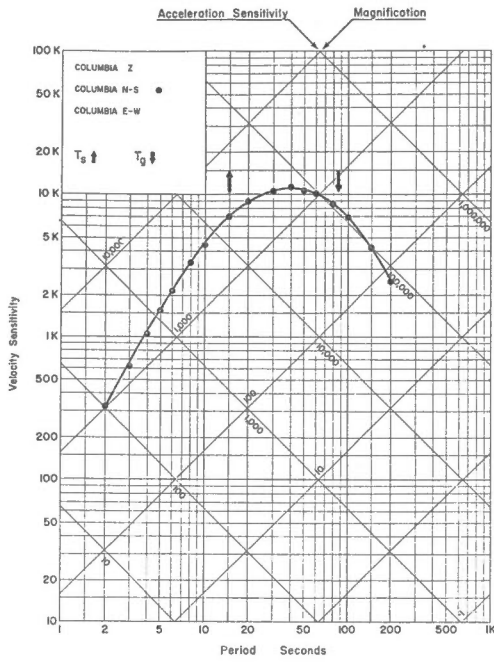
Dates of Calibration:

COLUMBIA Z • March 27, 1973  
COLUMBIA N-S  
COLUMBIA E-W

STATION: THUNDER BAY, ONT. (As found and left) (LHC)

$\phi = 48^{\circ}25'N$   $\lambda = 89^{\circ}16'W$  Altitude 196M

Foundation: Precambrian, upper gunflint, iron formation



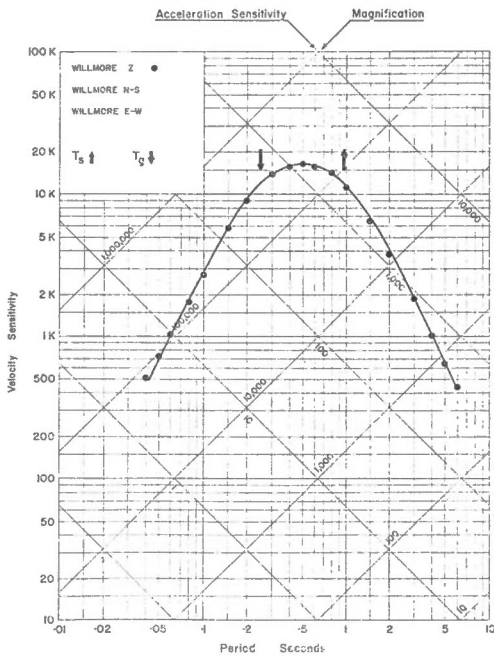
Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S • March 28, 1973  
 COLUMBIA E-W

STATION: MOULD BAY, N.W.T. (MBC)  
 (As found & left)

$\phi = 76^{\circ}14.5'N$   $\lambda = 119^{\circ}21.6'W$  Altitude 15M

Foundation: Regolith and solifluxion deposits overlying Devonian sandstone (permafrost)



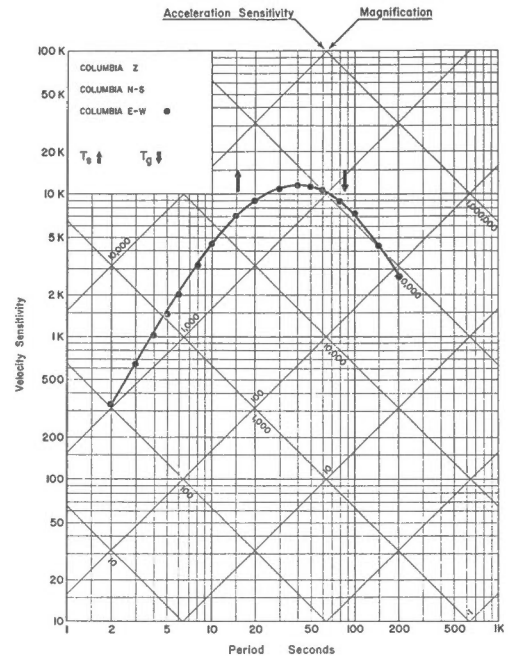
Dates of Calibration:

WILLMORE Z • May 5, 1973  
 WILLMORE N-S  
 WILLMORE E-W

STATION: THUNDER BAY, ONT. (As found and left) (LHC)

$\phi = 48^{\circ}25'N$   $\lambda = 89^{\circ}16'W$  Altitude 196M

Foundation: Precambrian, upper gunflint, iron formation



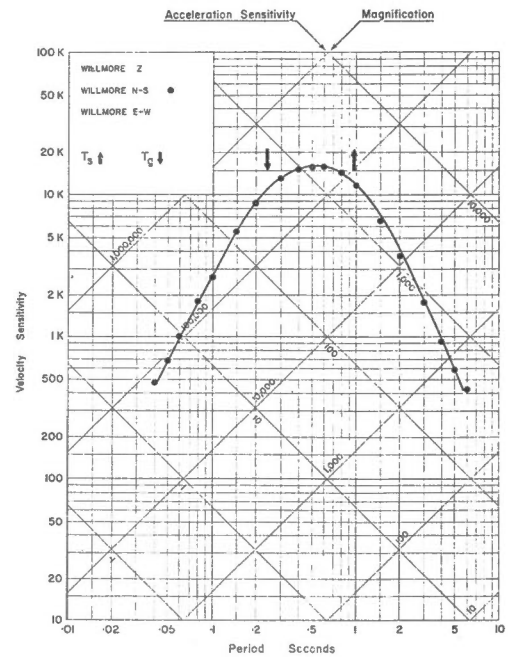
Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S • March 28, 1973  
 COLUMBIA E-W

STATION: MOULD BAY, N.W.T. (MBC)  
 (As found & left)

$\phi = 76^{\circ}14.5'N$   $\lambda = 119^{\circ}21.6'W$  Altitude 15M

Foundation: Regolith and solifluxion deposits overlying Devonian sandstone (permafrost)



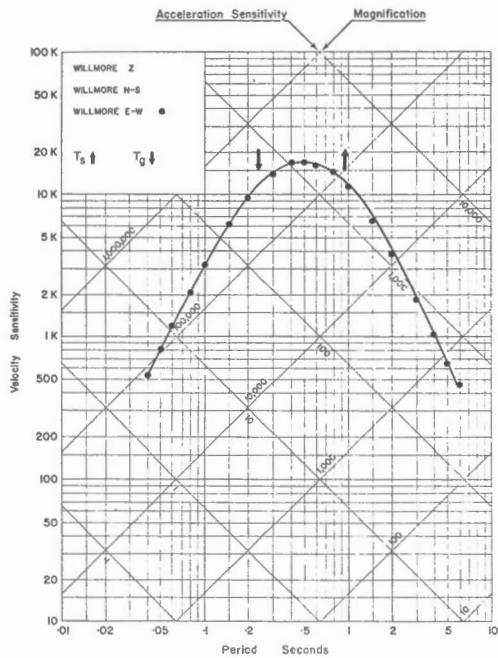
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S • May 5, 1973  
 WILLMORE E-W

STATION: MOULD BAY, N.W.T. (NBC)  
(As found & left)

$\phi = 76^{\circ}14.5'N$   $\lambda = 119^{\circ}21.6'W$  Altitude 15 M

Foundation: Regolith and solifluxion deposits overlying Devonian sandstone (permafrost)

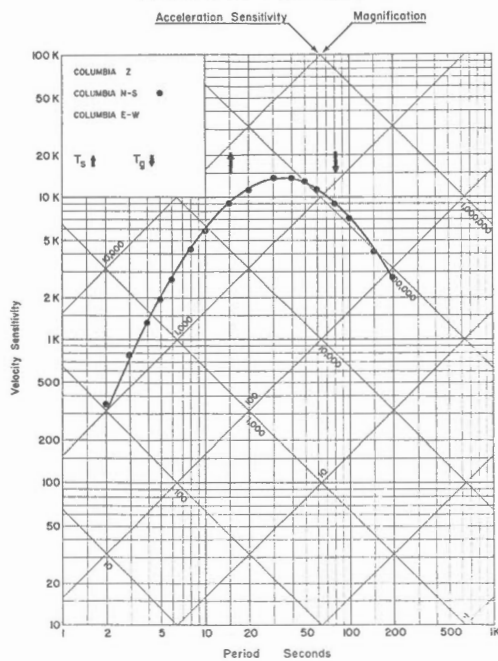


Dates of Calibration:  
WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • May 6, 1973

STATION: MOULD BAY, N.W.T. (NBC)  
(As found & left)

$\phi = 76^{\circ}14.5'N$   $\lambda = 119^{\circ}21.6'W$  Altitude 15 M

Foundation: Regolith and solifluxion deposits overlying Devonian sandstone (permafrost)

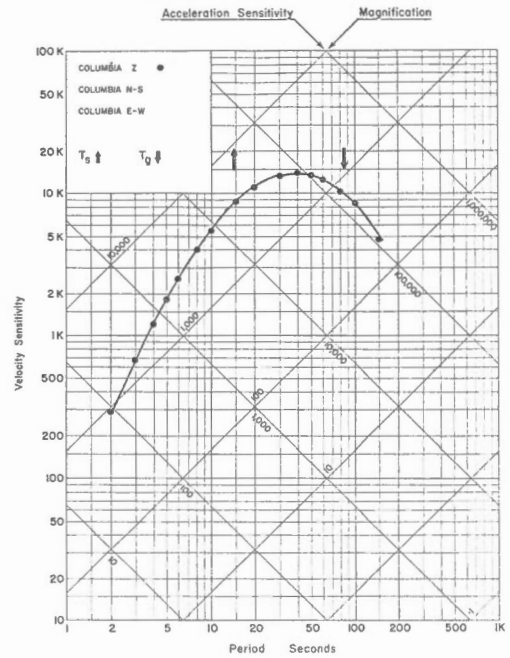


Dates of Calibration:  
COLUMBIA Z  
COLUMBIA N-S • May 5, 1973  
COLUMBIA E-W

STATION: MOULD BAY, N.W.T. (NBC)  
(As found & left)

$\phi = 76^{\circ}14.5'N$   $\lambda = 119^{\circ}21.6'W$  Altitude 15 M

Foundation: Regolith and solifluxion deposits overlying Devonian sandstone (permafrost)

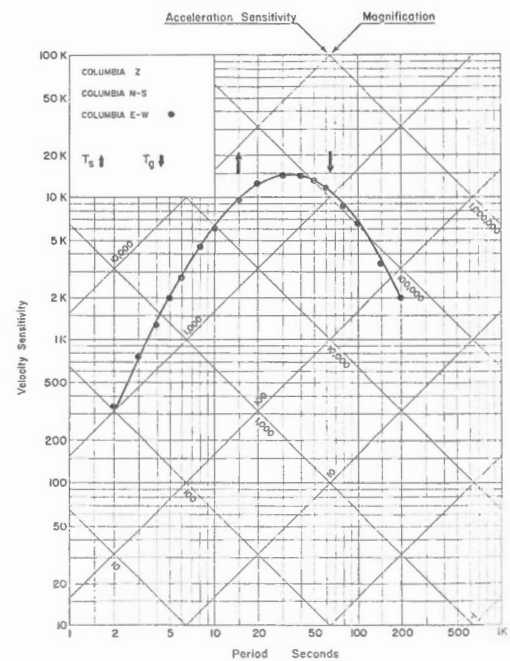


Dates of Calibration:  
WILLMORE Z • May 5, 1973  
WILLMORE N-S  
WILLMORE E-W

STATION: MOULD BAY, N.W.T. (NBC)  
(As found & left)

$\phi = 76^{\circ}14.5'N$   $\lambda = 119^{\circ}21.6'W$  Altitude 15 M

Foundation: Regolith and solifluxion deposits overlying Devonian sandstone (permafrost)

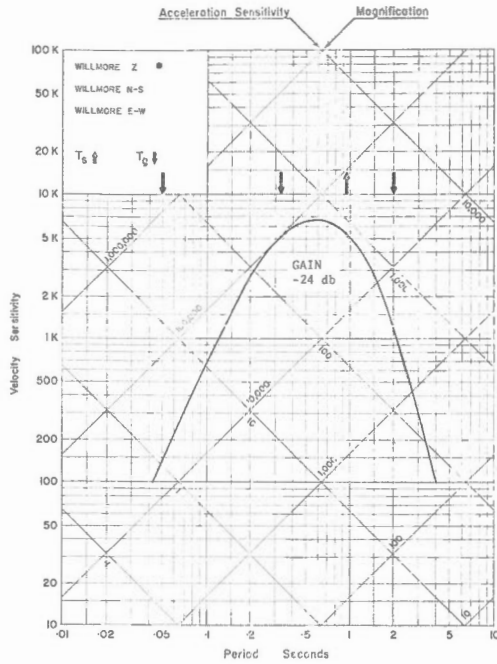


Dates of Calibration:  
COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • May 5, 1973

STATION: MICA CREEK, B.C. (MCC)

$\phi = 52^{\circ}03'06''N$   $\lambda = 118^{\circ}35'07''W$  Altitude 578M

Foundation:



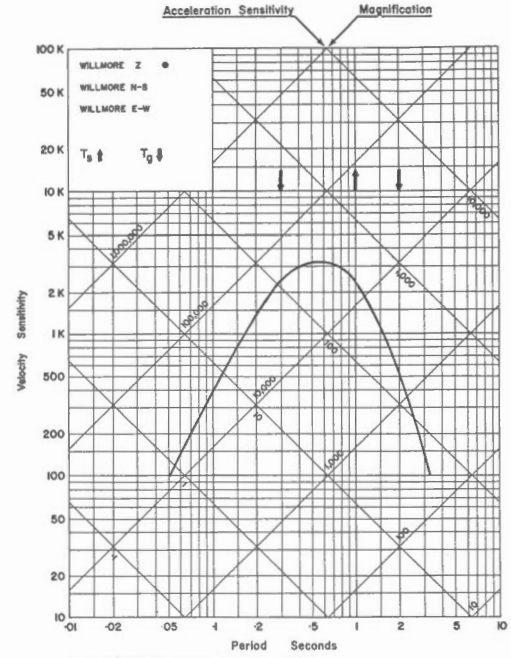
Dates of Calibration: June 18, 1971

WILLMORE Z • Operating with Telodyne EA-310 amplifier into Helicorder.  
WILLMORE N-S  
WILLMORE E-W  
Corner frequencies indicated by  $T_g$  arrows.

STATION: MICA CREEK, B.C. (MCC)

$\phi = 52^{\circ}03'06''N$   $\lambda = 118^{\circ}35'07''W$  Altitude 594 M

Foundation: Granite Gneiss



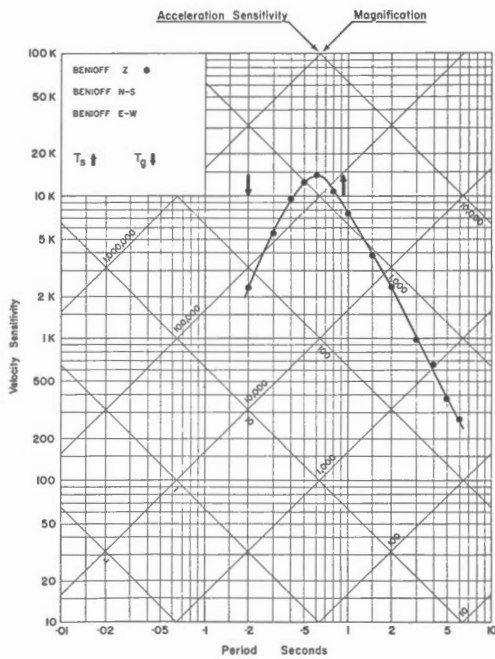
Date of Calibration: May 13, 1975

SEISMOMETER: Willmore MK11  
PREAMPLIFIER: Telodyne EA310 - ATTN: 30dB, SEP: 30 dB  
HELICORDER: Geotech. RV301  
Corner frequencies indicated by " $T_g$ " arrows.

STATION: MONTREAL, QUE. (MNT) As Found, and final.

$\phi = 45^{\circ}30'09''N$   $\lambda = 73^{\circ}37'23''W$  Altitude 112 M

Foundation: Ordovician limestone (Trenton)



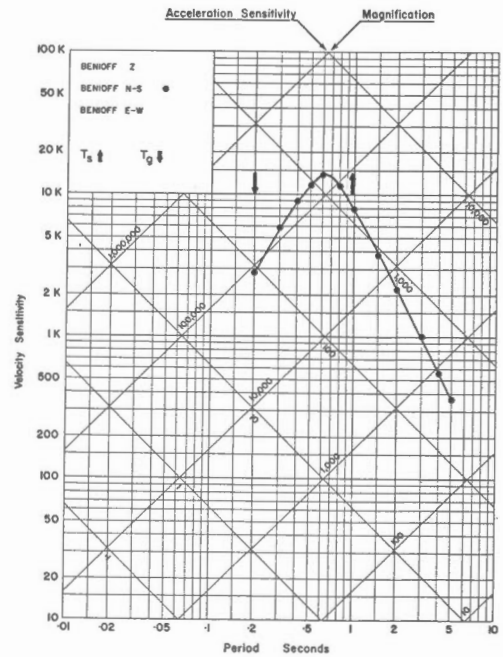
Dates of Calibration:

BENIOFF Z • Feb. 13, 1974  
BENIOFF N-S  
BENIOFF E-W

STATION: MONTREAL, QUE. (MNT) As found and final.

$\phi = 45^{\circ}30'09''N$   $\lambda = 73^{\circ}37'23''W$  Altitude 112 M

Foundation: Ordovician Limestone (Trenton)



Dates of Calibration:

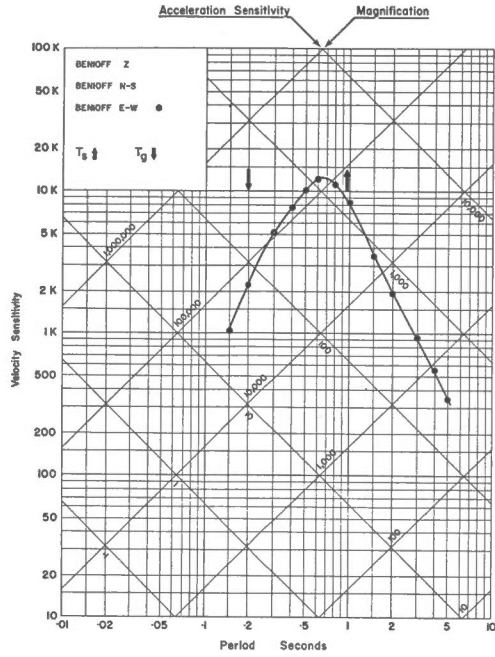
BENIOFF Z  
BENIOFF N-S • Feb. 13, 1974  
BENIOFF E-W



STATION: MONTREAL, QUE. (MNT) As found and final.

$\phi = 45^{\circ}30'09''N$   $\lambda = 73^{\circ}37'23''W$  Altitude 112 M

Foundation: Ordovician Limestone (Trenton)

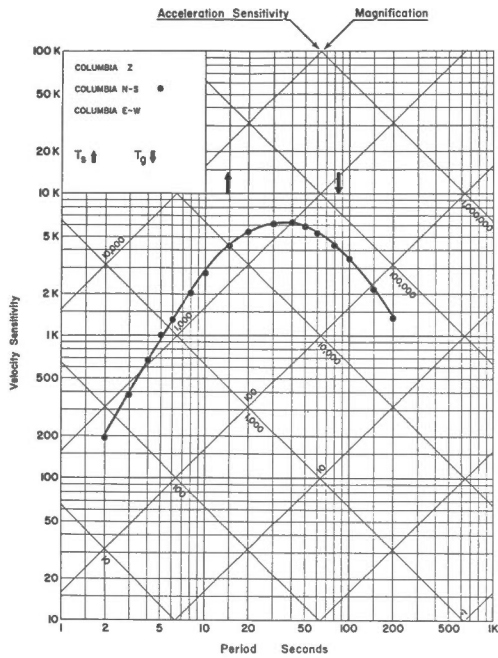


Dates of Calibration:  
 BENOFF Z  
 BENOFF N-S  
 BENOFF E-W • Feb. 13, 1974

STATION: MONTREAL, QUE. (MNT) Final.

$\phi = 45^{\circ}30'09''N$   $\lambda = 73^{\circ}37'23''W$  Altitude 112 M

Foundation: Ordovician Limestone (Trenton)

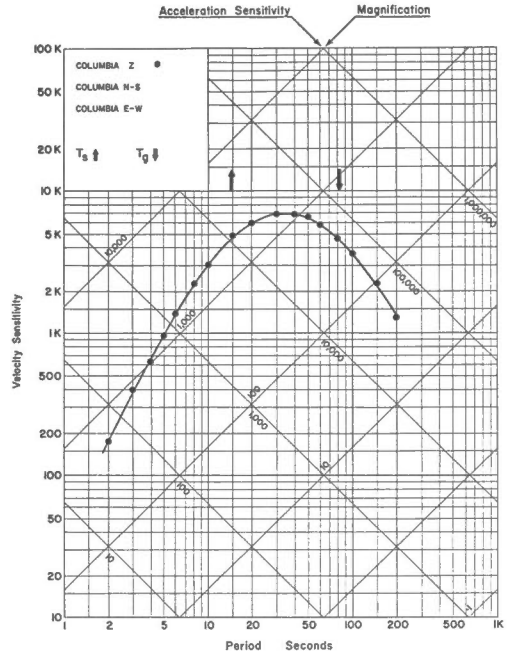


Dates of Calibration:  
 COLUMBIA Z  
 COLUMBIA N-S • Feb. 14, 1974  
 COLUMBIA E-W

STATION: MONTREAL, QUE. (MNT) Final.

$\phi = 45^{\circ}30'09''N$   $\lambda = 73^{\circ}37'23''W$  Altitude 112 M

Foundation: Ordovician Limestone (Trenton)

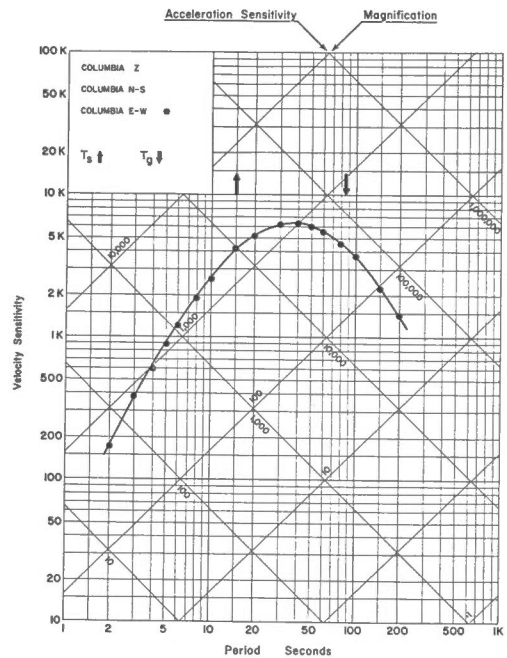


Dates of Calibration:  
 COLUMBIA Z • Feb. 14, 1974  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: MONTREAL, QUE. (MNT) Final.

$\phi = 45^{\circ}30'09''N$   $\lambda = 73^{\circ}37'23''W$  Altitude 112 M

Foundation: Ordovician Limestone (Trenton)

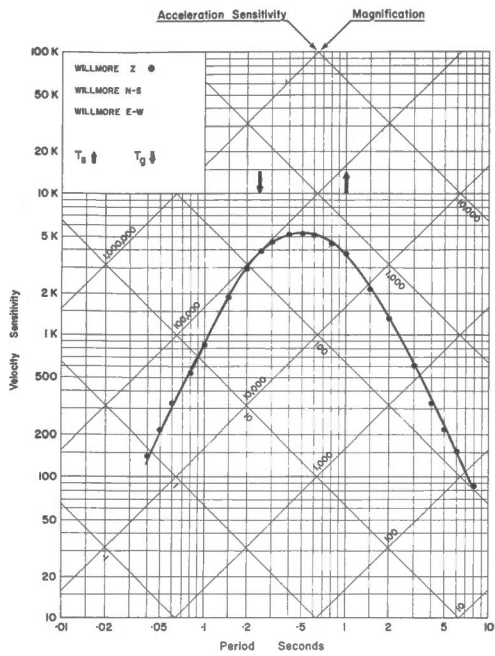


Dates of Calibration:  
 COLUMBIA Z  
 COLUMBIA N-S  
 COLUMBIA E-W • Feb. 14, 1974

STATION: OTTAWA, ONT. (OTT)

$\phi = 45^{\circ}23'38''N$   $\lambda = 75^{\circ}42'57''W$  Altitude 83M

Foundation: Boulder clay on limestone



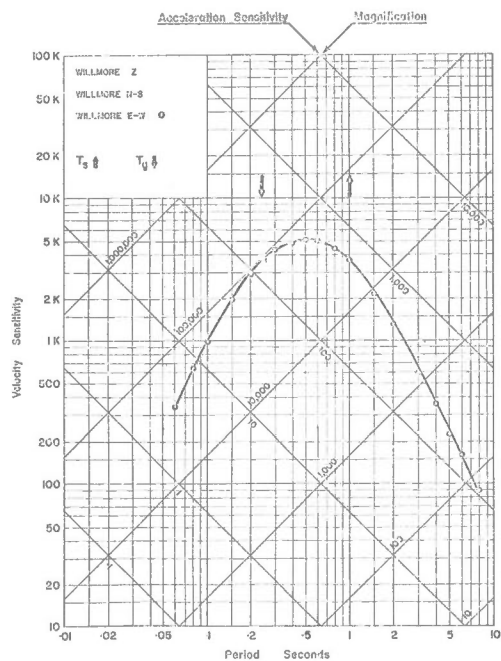
Dates of Calibration:

WILLMORE Z • March 24 - 1969  
 WILLMORE N-S  
 WILLMORE E-W

STATION: OTTAWA, ONT. (OTT)

$\phi = 45^{\circ}23'38''N$   $\lambda = 75^{\circ}42'57''W$  Altitude 83M

Foundation: Boulder clay on limestone



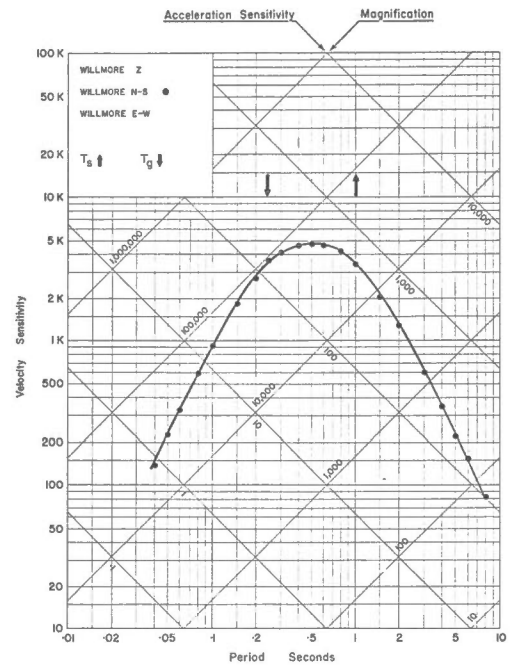
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S  
 WILLMORE E-W • March 25 - 1969

STATION: OTTAWA, ONT. (OTT)

$\phi = 45^{\circ}23'38''N$   $\lambda = 75^{\circ}42'57''W$  Altitude 83M

Foundation: Boulder clay on limestone



Dates of Calibration:

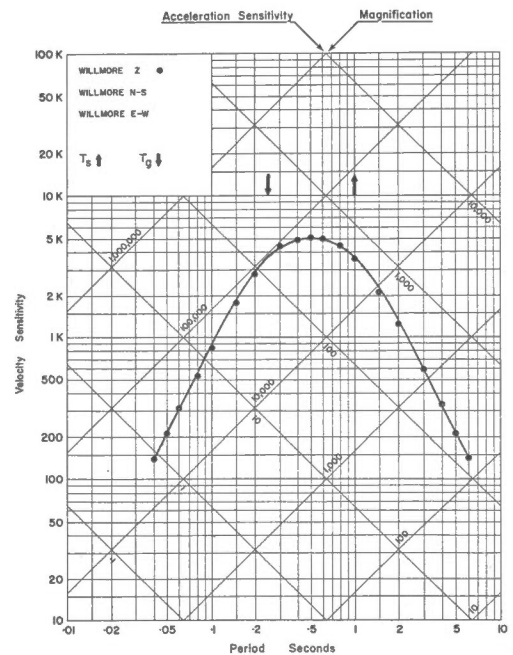
WILLMORE Z  
 WILLMORE N-S • March 25 - 1969  
 WILLMORE E-W

STATION: OTTAWA (OTT)

(As found and left)

$\phi = 45^{\circ}23'38''N$   $\lambda = 75^{\circ}42'57''W$  Altitude 83 M

Foundation: Boulder clay on limestone



Dates of Calibration:

WILLMORE Z • 19 Sept. 1975  
 WILLMORE N-S  
 WILLMORE E-W

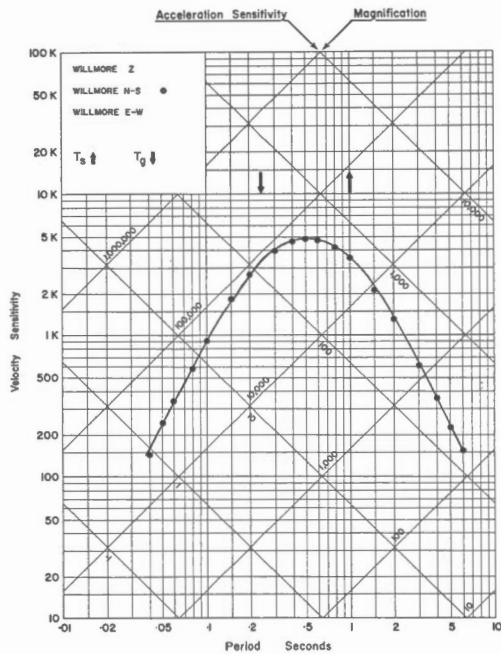


STATION: OTTAWA (OTT)

(As found and left)

$\phi = 45^{\circ}23'38''N$   $\lambda = 75^{\circ}42'57''W$  Altitude 83 M

Foundation: Boulder clay on limestone



Dates of Calibration:

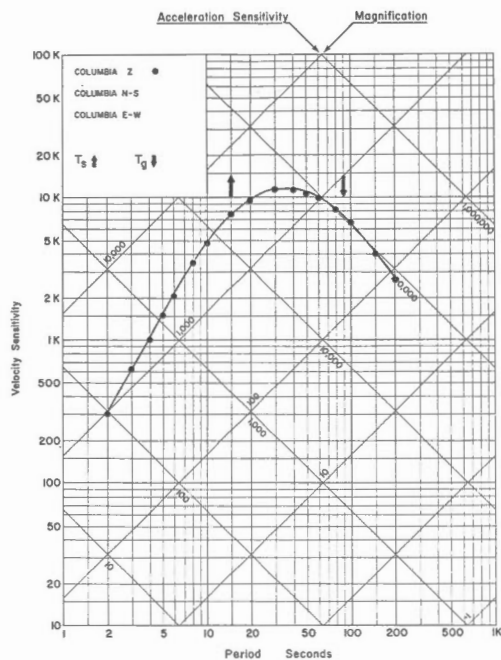
WILLMORE Z  
WILLMORE N-S • 19 Sept. 1975  
WILLMORE E-W

STATION: OTTAWA, ONT. (OTT)

(Final)

$\phi = 45^{\circ}23'38''N$   $\lambda = 75^{\circ}42'57''W$  Altitude 83 M

Foundation: Boulder Clay on Limestone



Dates of Calibration:

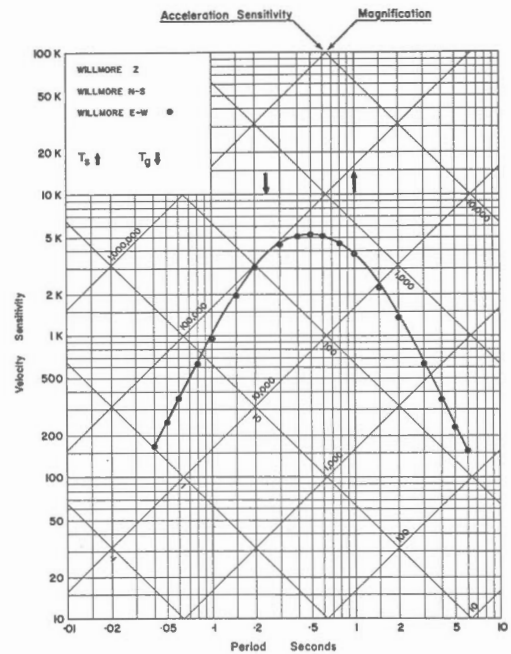
COLUMBIA Z • February 13, 1973  
COLUMBIA N-S  
COLUMBIA E-W

STATION: OTTAWA (OTT)

(As found and left)

$\phi = 45^{\circ}23'38''N$   $\lambda = 75^{\circ}42'57''W$  Altitude 83 M

Foundation: Boulder clay on limestone



Dates of Calibration:

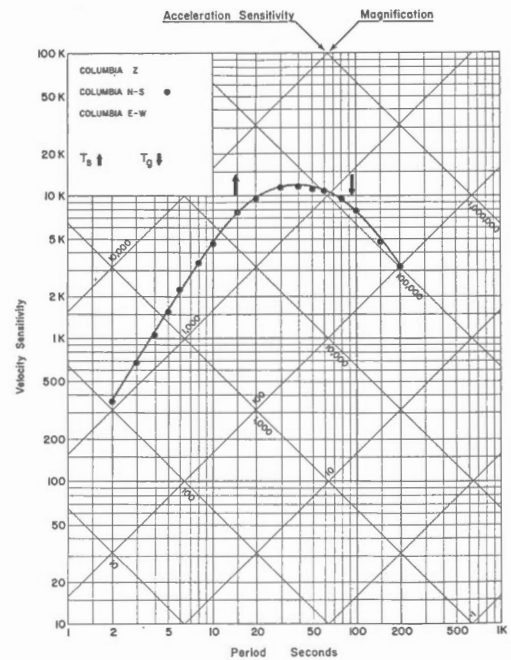
WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • 19 Sept. 1975

STATION: OTTAWA, ONT. (OTT)

(As Found & Left)

$\phi = 45^{\circ}23'38''N$   $\lambda = 75^{\circ}42'57''W$  Altitude 83 M

Foundation: Boulder Clay on Limestone



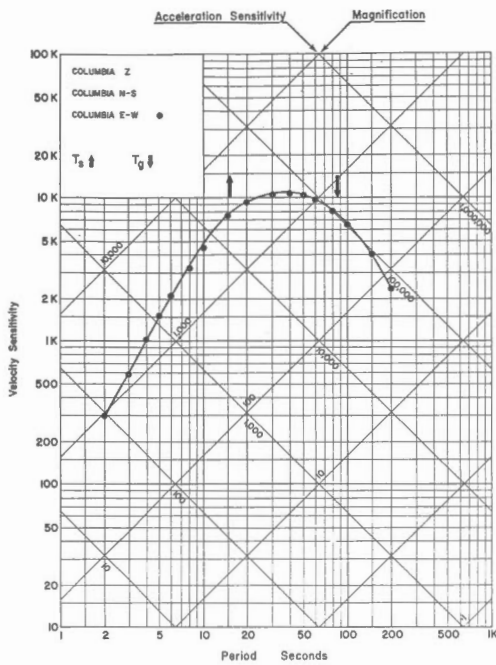
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • February 13, 1973  
COLUMBIA E-W

STATION: OTTAWA, ONT. (OTT)  
(As Found & Left)

$\phi = 45^{\circ}23'38''N$   $\lambda = 75^{\circ}42'57''W$  Altitude 83 M

Foundation: Boulder Clay on Limestone



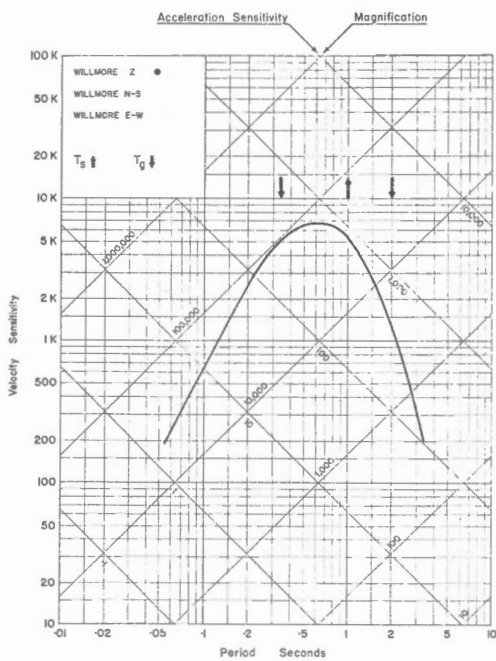
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • February 14, 1973

STATION: POSTE DE LA BALEINE, QUE. (PBQ)

$\phi = 55^{\circ}16.6'N$   $\lambda = 77^{\circ}44.6'W$  Altitude 20 M

Foundation: Granite Gneiss



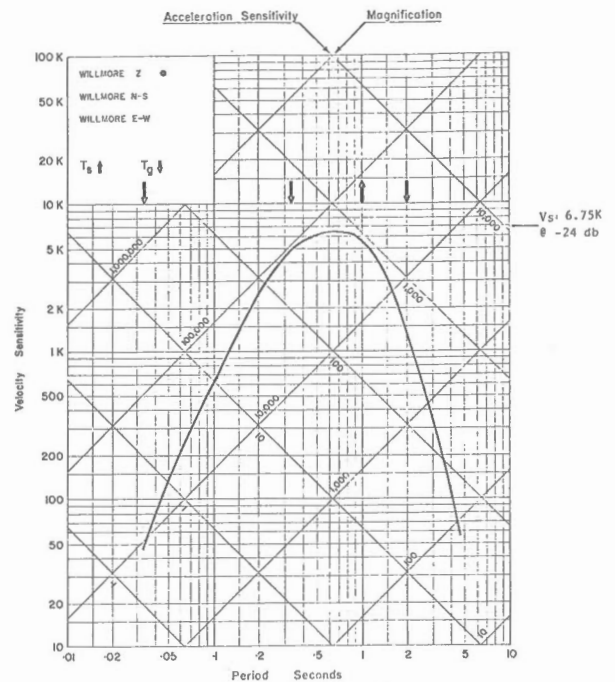
DATE OF CALIBRATION: Feb. 14, 1975

SEISMOMETER: Willmore MKII  $T_S 1.0$   $D_S 0.63$   
 $G_L = 1.13$  v.s./cm @  $R_L = 545$  ohms  
AMPLIFIER: Teledyne EA310 - Gain 7.06K @ 24 db  
HELICORDER: RV301 - 1 cm/V  
Corner frequencies indicated by "Tg" arrows.

STATION: POSTE DE LA BALEINE, P.Q. (PBQ)

$\phi = 55^{\circ}16.6'N$   $\lambda = 77^{\circ}44.6'W$  Altitude 20 M

Foundation: Granite Gneiss



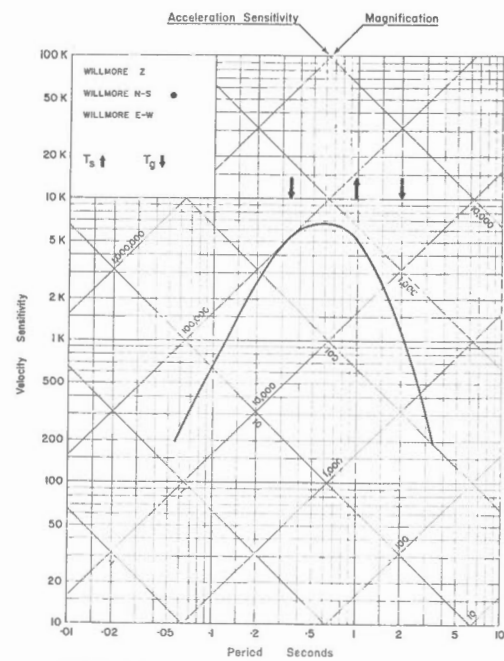
Dates of Calibration: May 24, 1974

SEISMOMETER: Willmore Short Period Vertical  
 $G_L = 1.08$  v/cm/sec  
AMPLIFIER: EA310 Filter Bandpass 0.5-3 Hz with 30 db sep. and max. gain of 100 k.  
HELICORDER: RV301 Sensit. 1 cm/v Response 0-30 Hz  
Corner frequencies indicated by "Tg" arrows.

STATION: POSTE DE LA BALEINE, QUE. (PBQ)

$\phi = 55^{\circ}16.6'N$   $\lambda = 77^{\circ}44.6'W$  Altitude 20 M

Foundation: Granite Gneiss



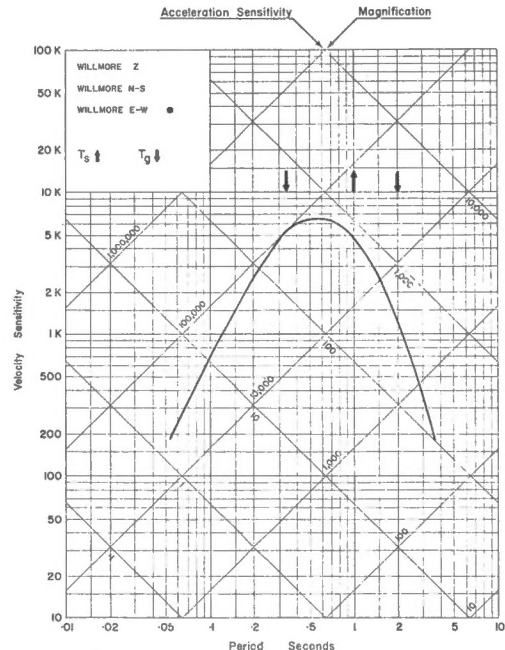
DATE OF CALIBRATION: Feb. 14, 1975

SEISMOMETER: Willmore MKII  $T_S 0.96$   $D_S 0.65$   
 $G_L = 1.17$  v.s./cm @  $R_L = 545$  ohms  
AMPLIFIER: Teledyne EA310 - Gain 7.3K @ 24 db  
HELICORDER: RV301 - 1 cm/V  
Corner frequencies indicated by "Tg" arrows.

STATION: POSTE DE LA BAILEME, QUE. (PBQ)

$\phi = 55^{\circ}16.6'N$   $\lambda = 77^{\circ}44.6'W$  Altitude 20 M

Foundation: Granite Gneiss

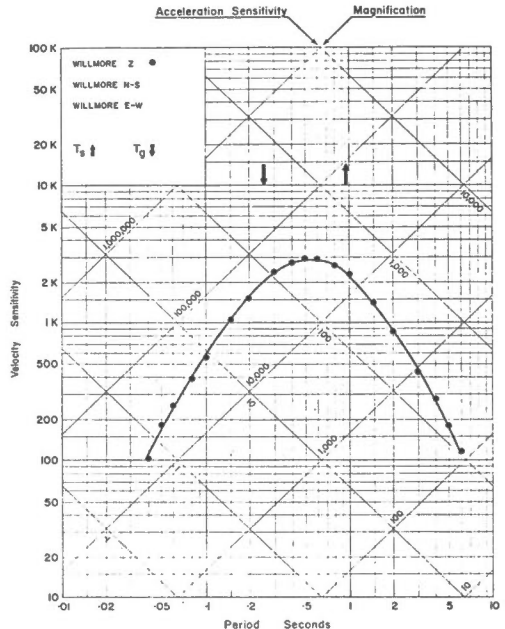


DATE OF CALIBRATION: Feb. 14, 1975  
 SEISMOMETER: Willmore MKII  $T_s$  1.0  $D_s$  0.77  
 $G_L = 1.23$  v.s./cm @  $R_L = 545$  ohms  
 AMPLIFIER: Teledyne EA310 - Gain 7.7K @ 24 dB  
 HELICORDER: RV301 - 1 cm/V  
 Corner frequencies indicated by " $T_g$ " arrows.

STATION: PORT HARDY, B.C. (PHC)

$\phi = 50^{\circ}42.4'N$   $\lambda = 127^{\circ}25.9'W$  Altitude 33 M

Foundation: Mesozoic, Triassic sedimentary and volcanic rock

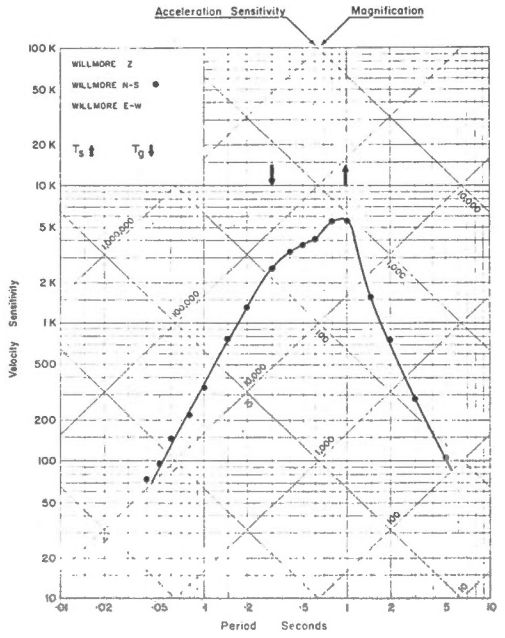


Dates of Calibration:  
 WILLMORE Z • June 27, 1974  
 WILLMORE N-S  
 WILLMORE E-W

STATION PORT HARDY, B.C. (PHC)  
 (As found and left)

$\phi = 50^{\circ}42.4'N$   $\lambda = 127^{\circ}25.9'W$  Altitude 33 M

Foundation: Mesozoic, Triassic sedimentary and volcanic rock.

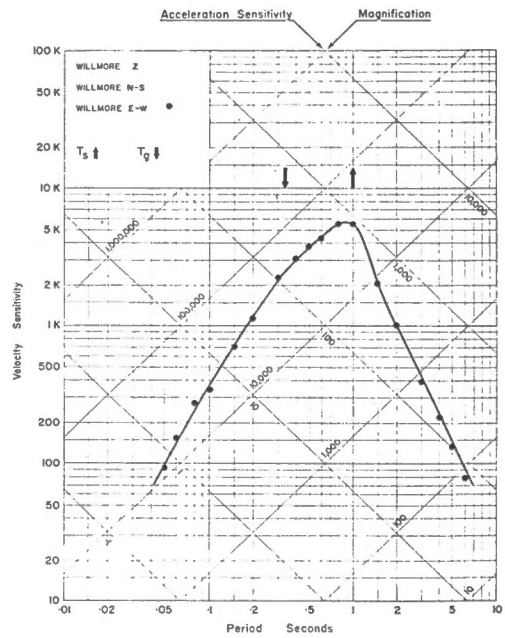


Dates of Calibration:  
 WILLMORE Z  
 WILLMORE N-S • June 27, 1974  
 WILLMORE E-W

STATION PORT HARDY, B.C. (PHC)  
 (As found and left)

$\phi = 50^{\circ}42.4'N$   $\lambda = 127^{\circ}25.9'W$  Altitude 33 M

Foundation: Mesozoic, Triassic sedimentary and volcanic rocks

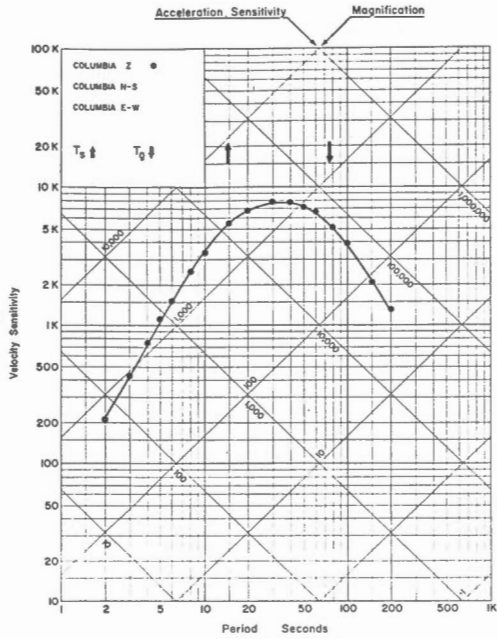


Dates of Calibration:  
 WILLMORE Z  
 WILLMORE N-S  
 WILLMORE E-W • June 27, 1974

STATION: PORT HARDY, B.C. (PHC)  
(As found and left)

$\phi = 50^{\circ}42.4'N$   $\lambda = 127^{\circ}25.9'W$  Altitude 33 M

Foundation: Mesozoic, Triassic sedimentary and volcanic rocks



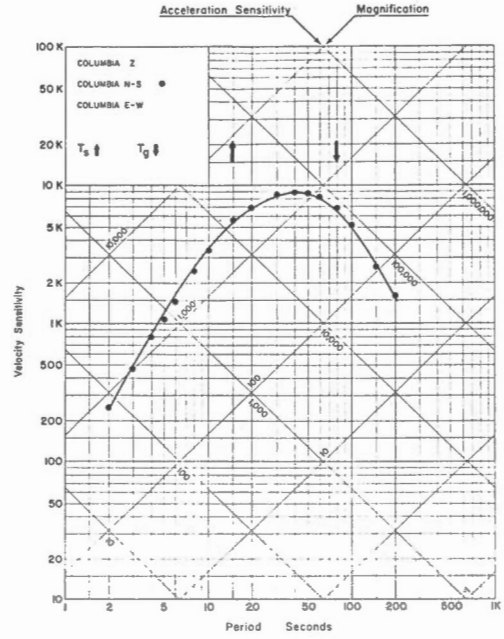
Dates of Calibration:

COLUMBIA Z • June 24, 1974  
COLUMBIA N-S  
COLUMBIA E-W

STATION: PORT HARDY, B.C. (PHC)  
(As found and left)

$\phi = 50^{\circ}42.4'N$   $\lambda = 127^{\circ}25.9'W$  Altitude 33 M

Foundation: Mesozoic, Triassic sedimentary and volcanic rocks



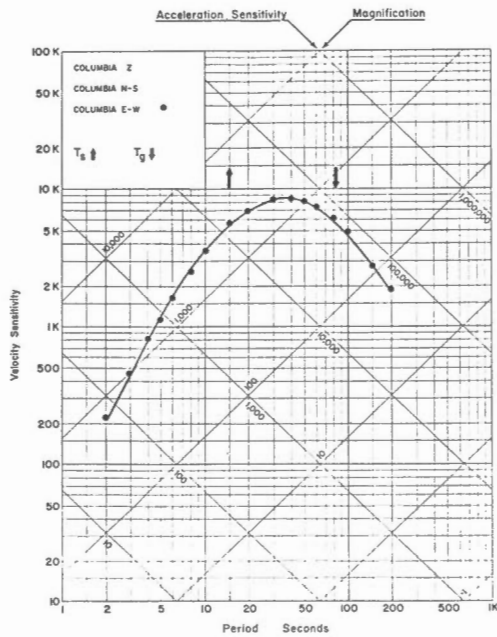
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • June 25, 1974  
COLUMBIA E-W

STATION: PORT HARDY, B.C. (PHC)  
(As found and left)

$\phi = 50^{\circ}42.4'N$   $\lambda = 127^{\circ}25.9'W$  Altitude 33 M

Foundation: Mesozoic, Triassic sedimentary and volcanic rocks



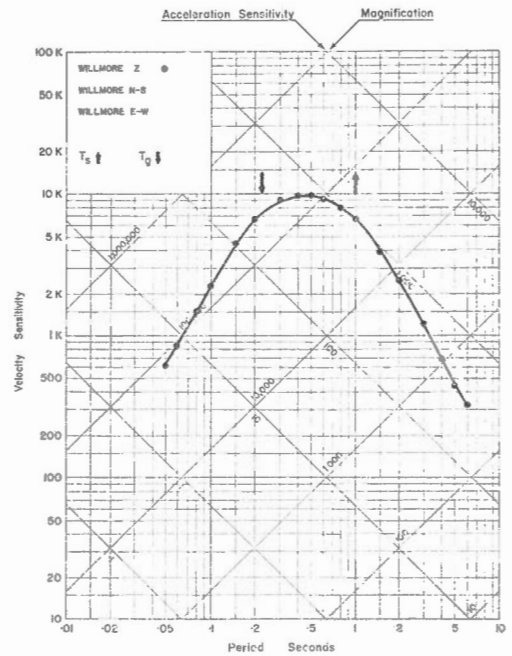
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • June 26, 1974

STATION: PENTICTON, B.C. (PNT)  
(Final)

$\phi = 49^{\circ}19'N$   $\lambda = 119^{\circ}37'W$  Altitude 550 m

Foundation: Tertiary shale



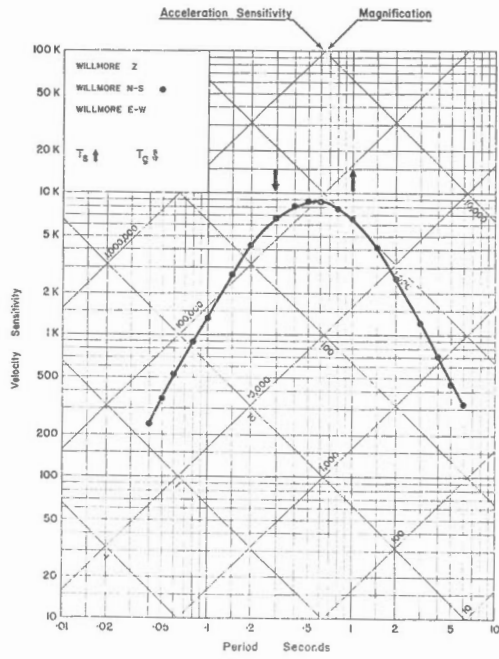
Dates of Calibration:

WILLMORE Z • December 2, 1974  
WILLMORE N-S  
WILLMORE E-W

STATION: PENTICTON, B.C. (PNT)  
(Final)

$\phi = 49^{\circ}19'N$   $\lambda = 119^{\circ}37'W$  Altitude 550 m

Foundation: Tertiary shale

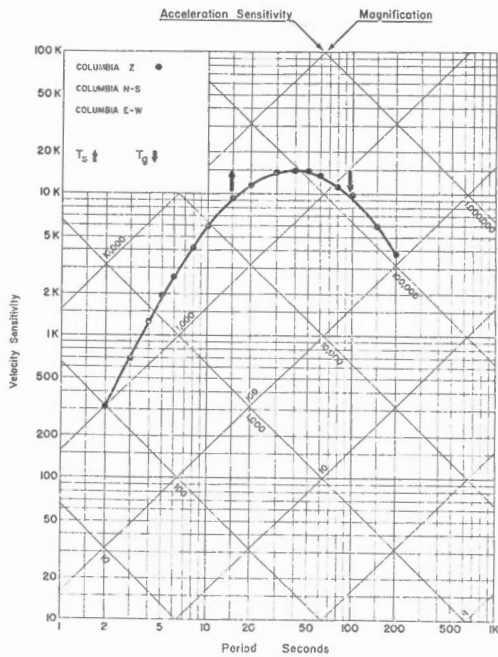


Dates of Calibration:  
WILLMORE Z  
WILLMORE N-S • December 2, 1974  
WILLMORE E-W

STATION: PENTICTON, B.C. (PNT)  
(As found and left)

$\phi = 49^{\circ}19'N$   $\lambda = 119^{\circ}37'W$  Altitude 550 m

Foundation: Tertiary shale

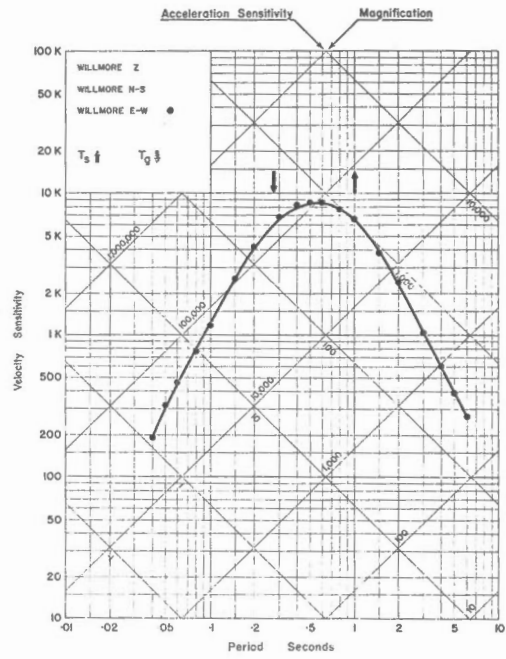


Dates of Calibration:  
COLUMBIA Z • December 3, 1974  
COLUMBIA N-S  
COLUMBIA E-W

STATION: PENTICTON, B.C. (PNT)  
(Final)

$\phi = 49^{\circ}19'N$   $\lambda = 119^{\circ}37'W$  Altitude 550 m

Foundation: Tertiary Shale

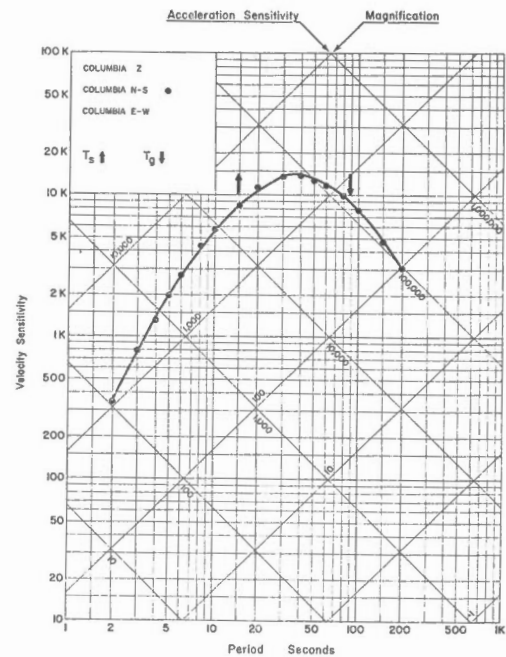


Dates of Calibration:  
WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • December 2, 1974

STATION: PENTICTON, B.C. (PNT)  
(As found and left)

$\phi = 49^{\circ}19'N$   $\lambda = 119^{\circ}37'W$  Altitude 550 m

Foundation: Tertiary shale



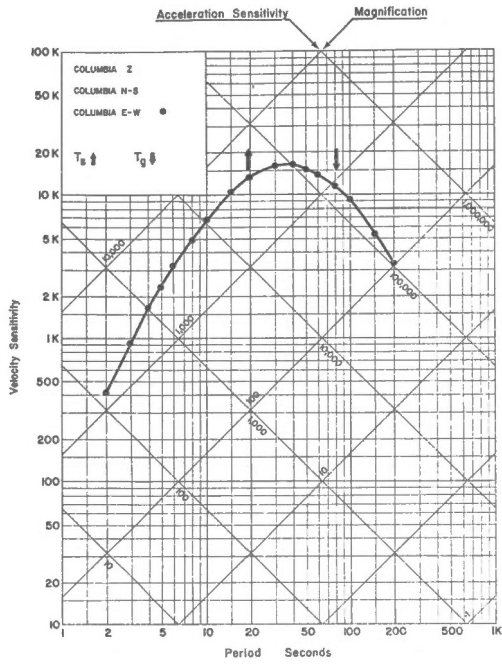
Dates of Calibration:  
COLUMBIA Z  
COLUMBIA N-S • December 4, 1974  
COLUMBIA E-W

STATION: PENTICTON, B.C. (PNT)

(As found and left)

$\phi = 49^{\circ}19'N$   $\lambda = 119^{\circ}37'W$  Altitude 550 m

Foundation: Tertiary shale



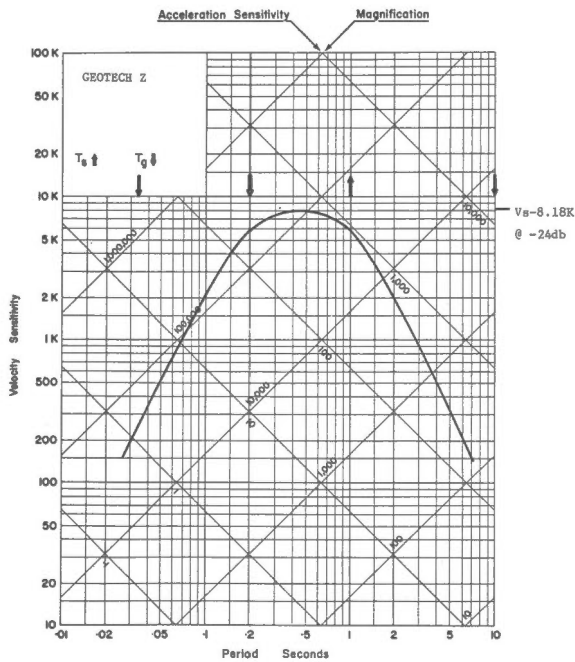
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • December 4, 1974

STATION: LA POCATIERE, QUE. (POC)

$\phi = 47^{\circ}21'52''N$   $\lambda = 70^{\circ}02'27''W$  Altitude 61 M

Foundation: Quartzite

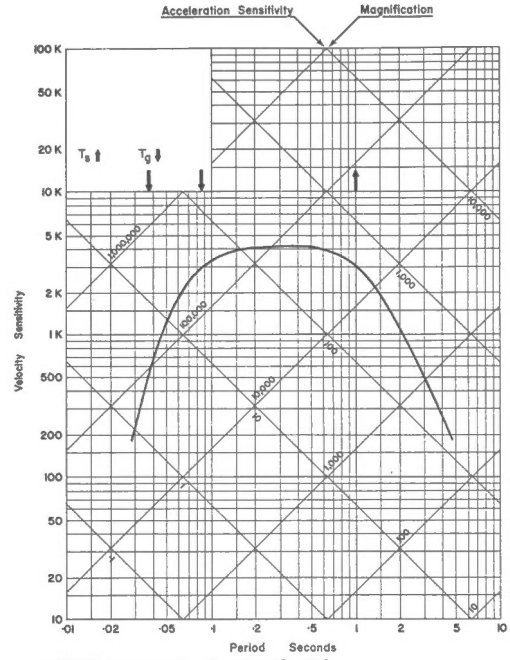


DATE OF CALIBRATION: Sept. 10, 1975  
SEISMOMETER: GEOTECH S13 (vertical)  
PREAMPLIFIER: AS330 ATTN: 30dB, SEP: 30dB  
AMPLIFIER: AR311 1 cm/V @ -24dB  
HELICORDER: RV301  
Corner frequencies indicated by  $T_g$  arrows.

STATION: LA POCATIERE, QUE (POC)

$\phi = 47^{\circ}21'52''N$   $\lambda = 70^{\circ}02'27''W$  Altitude 61 M

Foundation: Quartzite



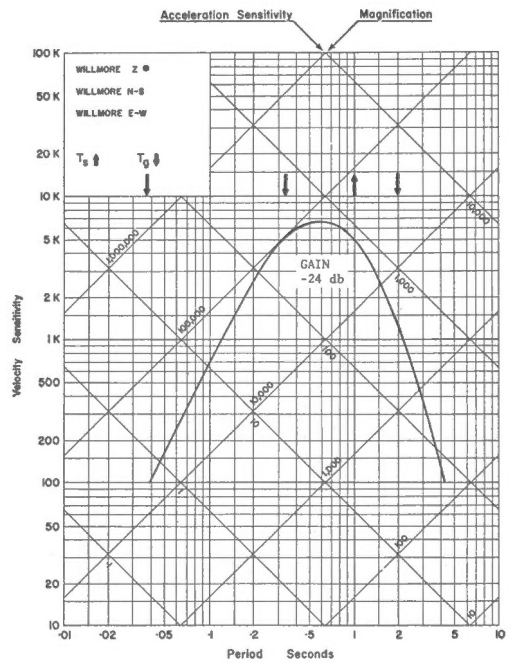
DATE OF CALIBRATION: November 18, 1974

SEISMOMETER: GEOTECH S13  
PREAMPLIFIER: AS330  
AMPLIFIER: AR311  
HELICORDER: RV301  
Corner frequencies indicated by  $T_g$  arrows.

STATION: QUEEN CHARLOTTE, B.C. (QCC)

$\phi = 53^{\circ}15.3'N$   $\lambda = 132^{\circ}05.3'W$  Altitude 3 M

Foundation: Sedimentary Rocks



Dates of Calibration: Sept. 30, 1971

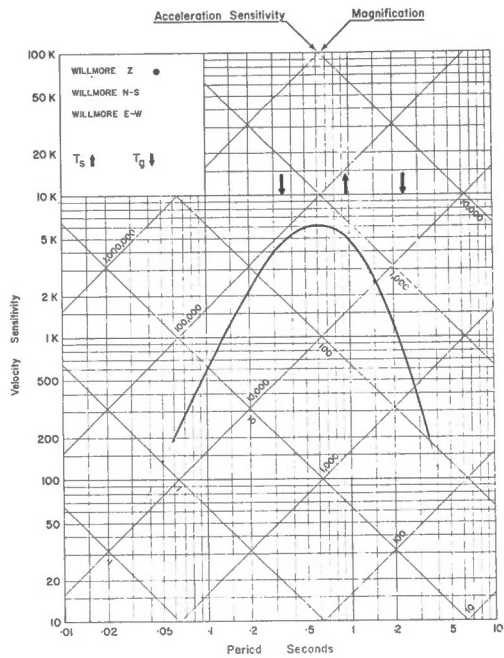
WILLMORE Z • Operating with a Teledyne EA310 amplifier into a helicorder.  
WILLMORE N-S  
WILLMORE E-W Corner frequencies indicated by " $T_g$ " arrows.



STATION: QUEEN CHARLOTTE, B.C. (QCQ)

$\phi = 53^{\circ}15.3'N$   $\lambda = 132^{\circ}05.3'W$  Altitude 3 M

Foundation: Sedimentary Rocks

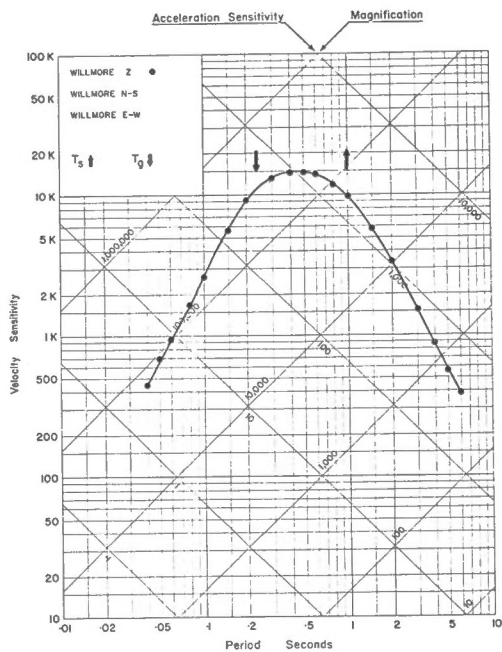


DATE OF CALIBRATION: Mar. 5, 1975  
 SEISMOMETER: Willmore MKII  $T_s = 0.97$   $D_s = 0.59$   
 $G_L = 1.08$  v.s./cm @  $R_L = 545$  ohms  
 AMPLIFIER: Teledyne EA310 - Gain 6.1K @ -24 db  
 HELICORDER: RV301 - 1 cm/V.  
 Corner frequencies indicated by "T<sub>g</sub>" arrows.

STATION: RESOLUTE, N.W.T. (RES)  
 (final)

$\phi = 74^{\circ}41.2'N$   $\lambda = 94^{\circ}54.0'W$  Altitude 15 M

Foundation: Early Palaeozoic limestone

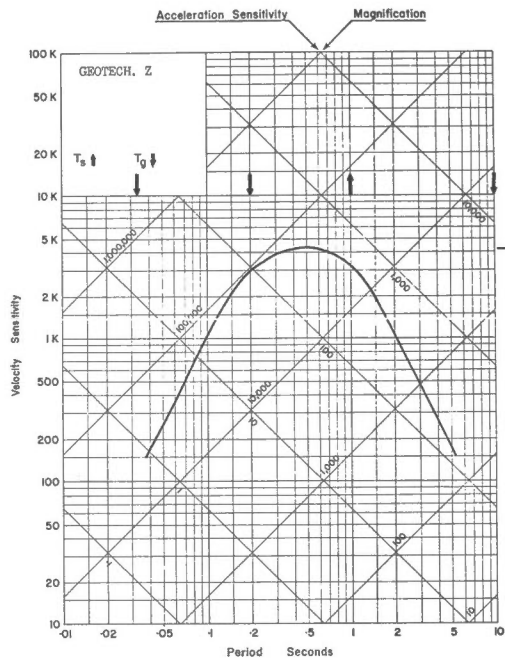


Dates of Calibration:  
 WILLMORE Z • July 18, 1974  
 WILLMORE N-S  
 WILLMORE E-W

STATION: QUEBEC, QUE. (QCQ)

$\phi = 46^{\circ}46'44''N$   $\lambda = 71^{\circ}16'33''W$  Altitude 91 M

Foundation: Schist

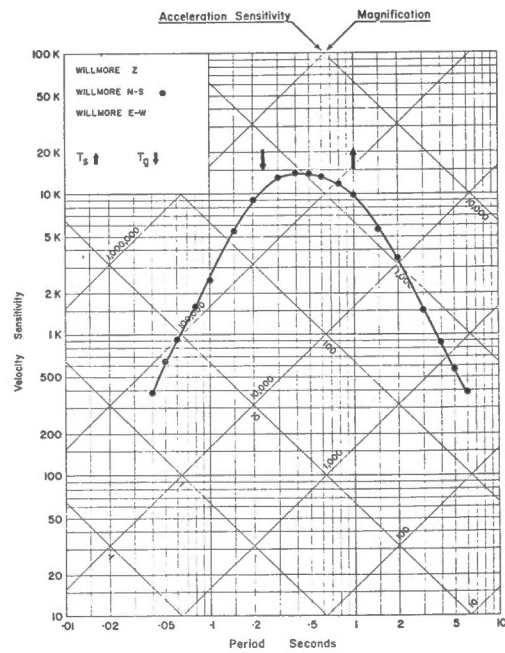


Dates of Calibration: October 1972  
 SEISMOMETER: Geotech. S13  $G_L = 2.62$  V.S./C.M.  
 PREAMPLIFIER: A5330 operated at 30-50 db (SEP.-ATT.)  
 Filter Bandpass 0.1 - 5 Hz  
 AMPLIFIER: AR 311 - 1 C.M./Volt @ 24 db  
 HELICORDER: RV 301 - 0-30 "H"  
 Corner frequencies indicated by "T<sub>g</sub>" arrows.

STATION: RESOLUTE, N.W.T. (RES)  
 (final)

$\phi = 74^{\circ}41.2'N$   $\lambda = 94^{\circ}54.0'W$  Altitude 15 M

Foundation: Early Palaeozoic limestone

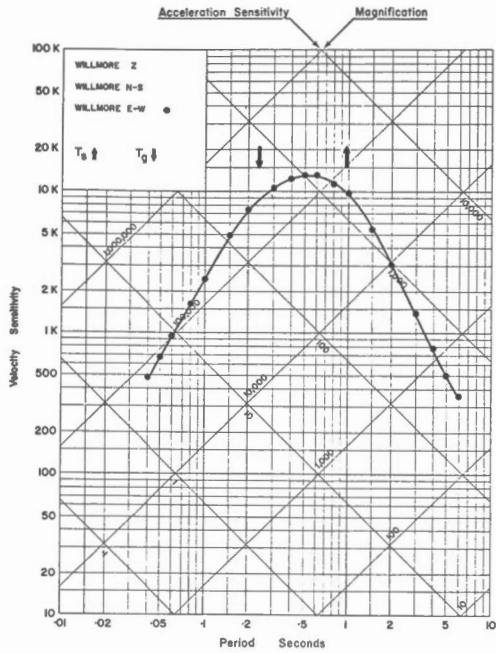


Dates of Calibration:  
 WILLMORE Z  
 WILLMORE N-S • July 19, 1974  
 WILLMORE E-W

STATION: RESOLUTE, N.W.T. (RES)  
(final)

$\phi = 74^{\circ}41.2'N$   $\lambda = 94^{\circ}54.0'W$  Altitude 15 M

Foundation: Early Palaeozoic limestone



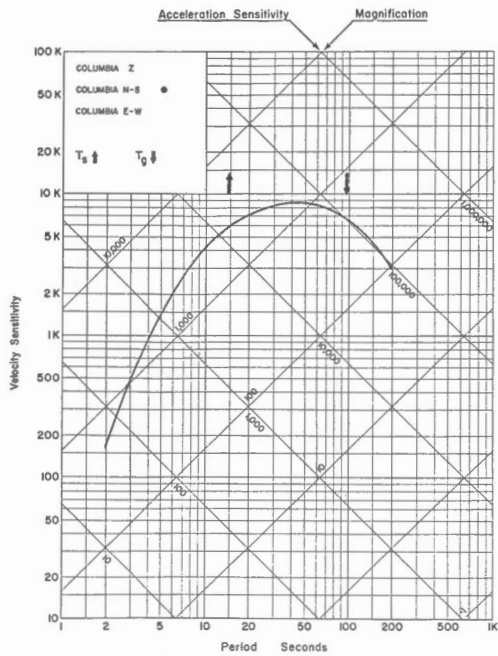
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • July 19, 1974

STATION: RESOLUTE, N.W.T. (RES)

$\phi = 74^{\circ}41.2'N$   $\lambda = 94^{\circ}54.0'W$  Altitude 15 M

Foundation: Early Palaeozoic limestone



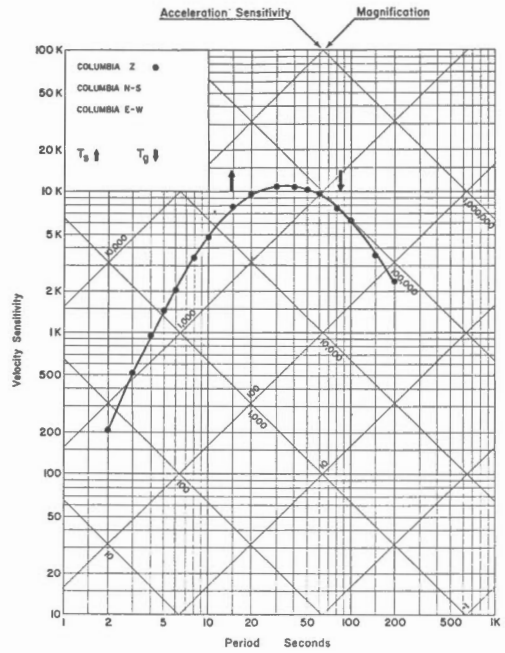
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • Sept. 25, 1974  
COLUMBIA E-W

STATION: RESOLUTE, N.W.T. (RES)  
(final)

$\phi = 74^{\circ}41.2'N$   $\lambda = 94^{\circ}54.0'W$  Altitude 15 M

Foundation: Early Palaeozoic limestone



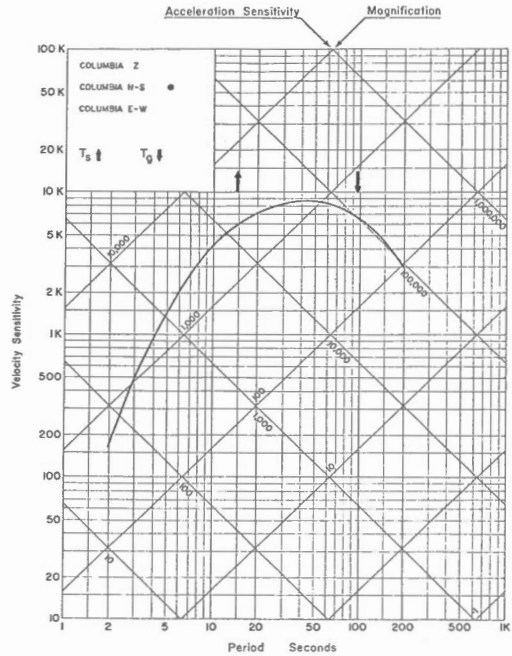
Dates of Calibration:

COLUMBIA Z • July 17, 1974  
COLUMBIA N-S  
COLUMBIA E-W

STATION: RESOLUTE, N.W.T. (RES)

$\phi = 74^{\circ}41.2'N$   $\lambda = 94^{\circ}54.0'W$  Altitude 15 M

Foundation: Early Palaeozoic limestone



Dates of Calibration:

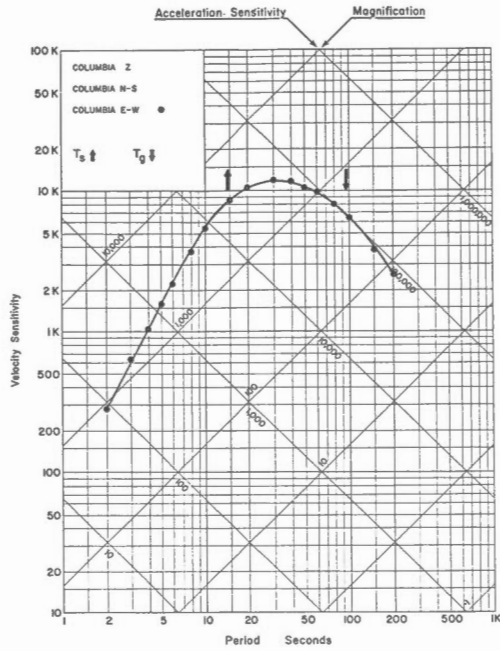
COLUMBIA Z  
COLUMBIA N-S • May 5, 1975  
COLUMBIA E-W



STATION: RESOLUTE, N.W.T. (RES)

$\phi = 74^{\circ}41.2'N$   $\lambda = 94^{\circ}54.0'W$  Altitude 15 M

Foundation: Early Palaeozoic limestone



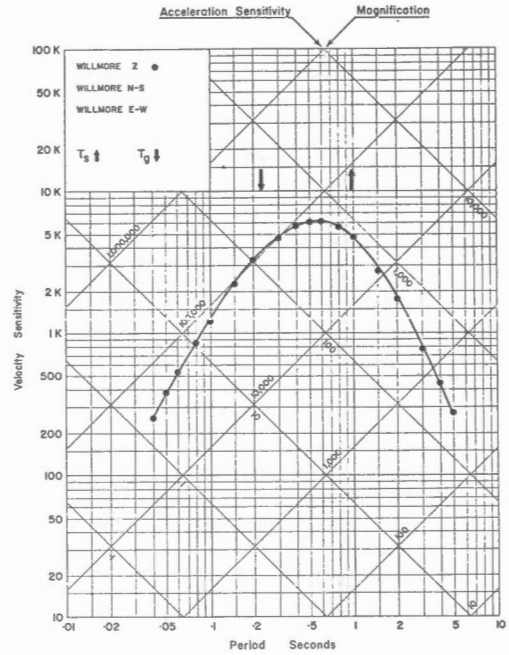
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • July 17, 1974

STATION: SCHEFFERVILLE, QUE. (AS FOUND AND LEFT) (SCH)

$\phi = 54^{\circ}49'N$   $\lambda = 66^{\circ}47'W$  Altitude 540 M

Foundation: Competent Precambrian state-shale



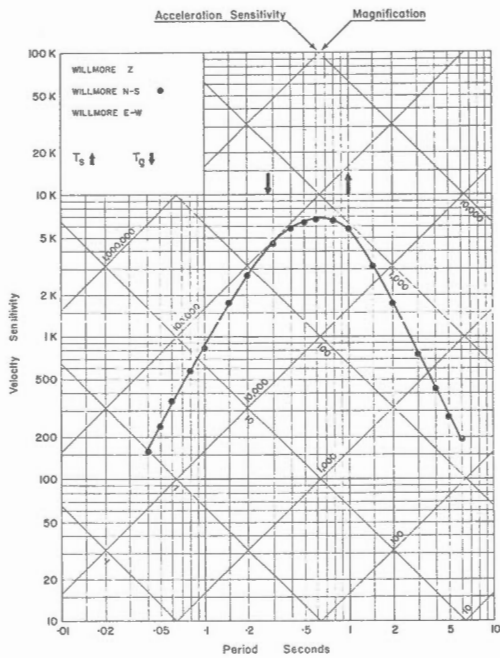
Dates of Calibration:

WILLMORE Z • 22 Feb. 1973  
WILLMORE N-S  
WILLMORE E-W

STATION: SCHEFFERVILLE, QUE. (AS FOUND AND LEFT) (SCH)

$\phi = 54^{\circ}49'N$   $\lambda = 66^{\circ}47'W$  Altitude 540 M

Foundation: Competent Precambrian slate-shale



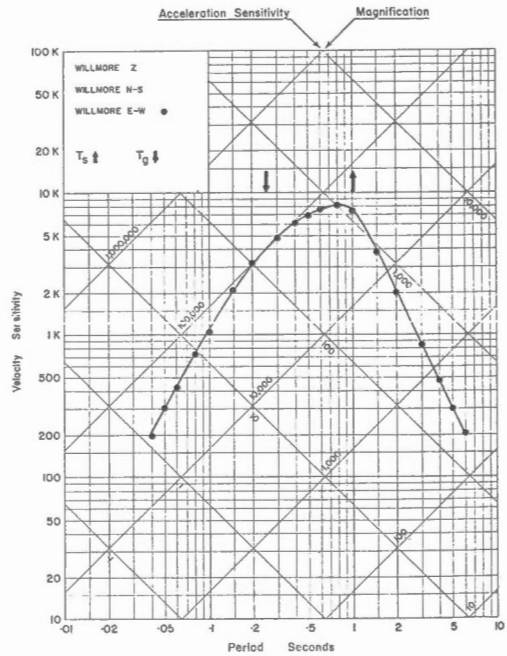
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • 22 Feb. 1973  
WILLMORE E-W

STATION: SCHEFFERVILLE, QUE. (AS FOUND AND LEFT) (SCH)

$\phi = 54^{\circ}49'N$   $\lambda = 66^{\circ}47'W$  Altitude 540 M

Foundation: Competent Precambrian state-shale



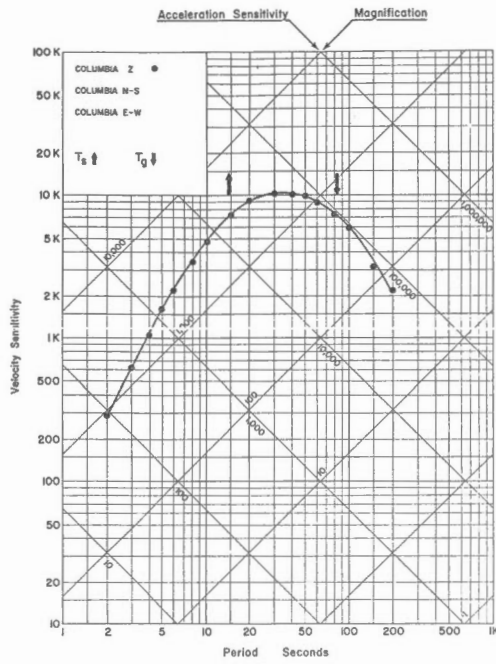
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • 22 Feb. 1973

STATION: SCHEFFERVILLE, QUE. (AS FOUND AND LEFT) (SCH)

$\phi = 54^{\circ}49'N$   $\lambda = 66^{\circ}47'W$  Altitude 540 M

Foundation: Competent Precambrian slate-shale



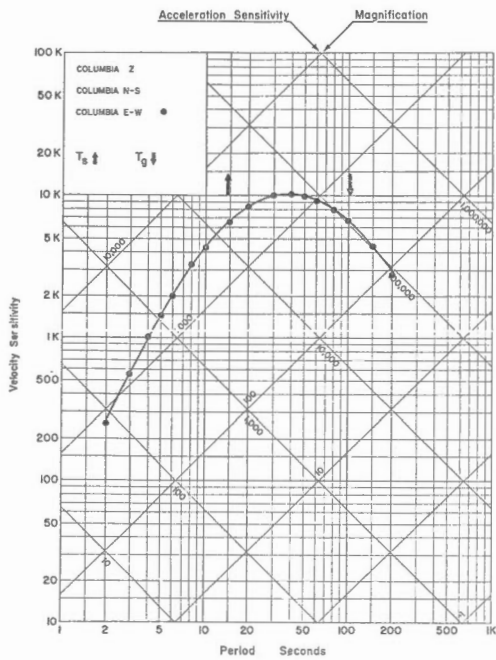
Dates of Calibration:

COLUMBIA Z • 21 Feb, 1973  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: SCHEFFERVILLE, QUE. (AS FOUND AND LEFT) (SCH)

$\phi = 54^{\circ}49'N$   $\lambda = 66^{\circ}47'W$  Altitude 540 M

Foundation: Competent Precambrian slate-shale



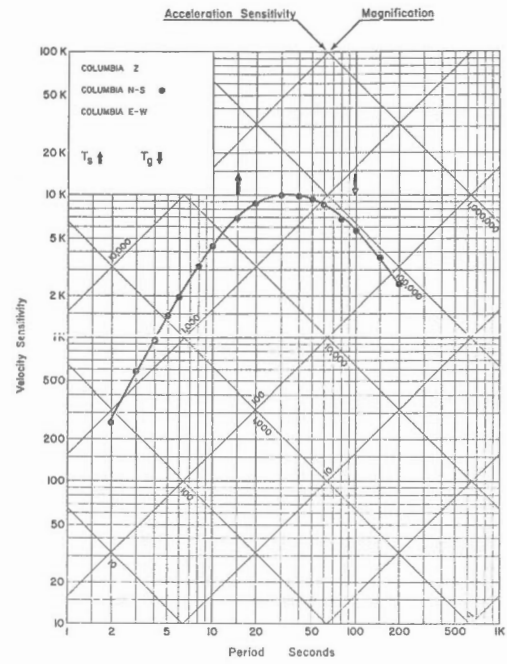
Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S  
 COLUMBIA E-W • 22 Feb, 1973

STATION: SCHEFFERVILLE, QUE. (AS FOUND AND LEFT) (SCH)

$\phi = 54^{\circ}49'N$   $\lambda = 66^{\circ}47'W$  Altitude 540 M

Foundation: Competent Precambrian slate-shale



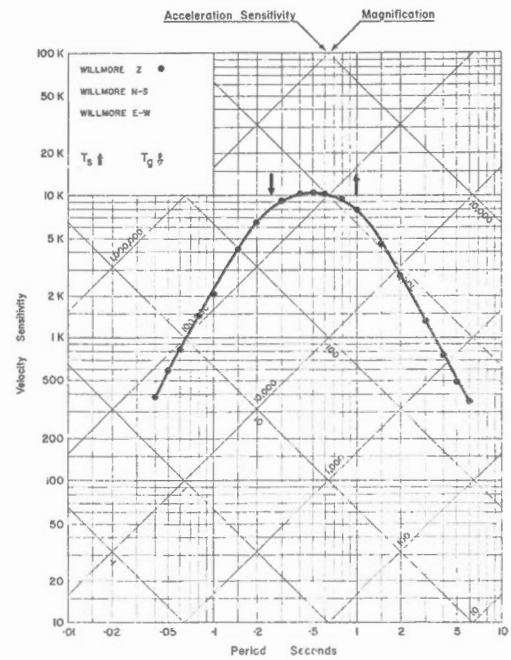
Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S • 22 Feb, 1973  
 COLUMBIA E-W

STATION: SUFFIELD, ALTA. (Final) (SES)

$\phi = 50^{\circ}23'45'N$   $\lambda = 111^{\circ}02'30'W$  Altitude 770M

Foundation: Grey Competent Sandstone

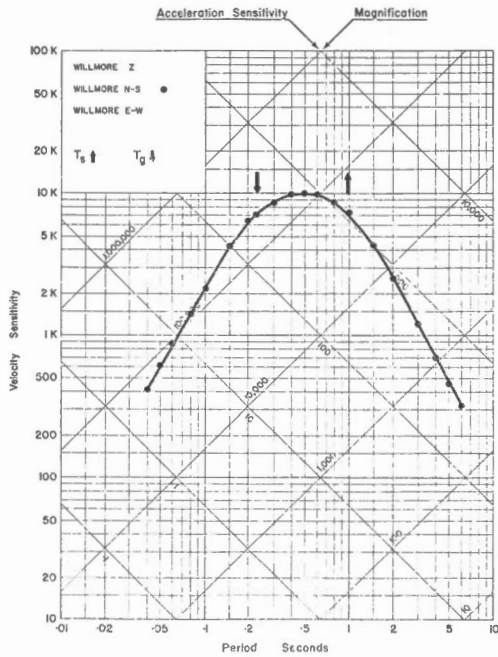


Dates of Calibration:

WILLMORE Z • December 7, 1974  
 WILLMORE N-S  
 WILLMORE E-W

STATION: SUFFIELD, ALTA. (SES)  
 (final)  
 $\phi = 50^{\circ}23'45''N$   $\lambda = 111^{\circ}02'30''W$  Altitude 770M

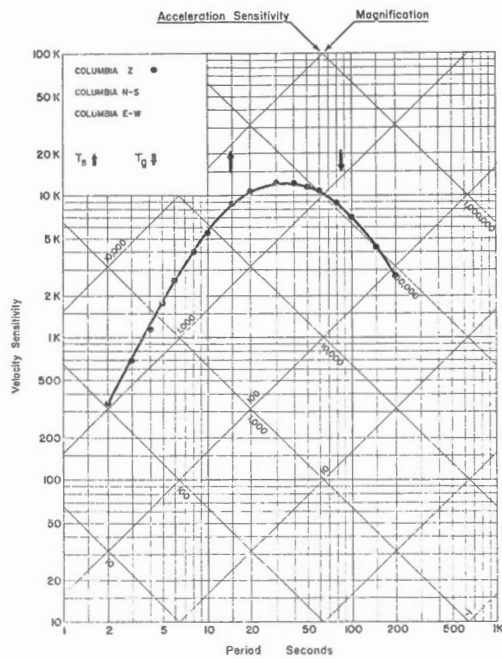
Foundation: Grey Competent Sandstone



Dates of Calibration:  
 WILLMORE Z  
 WILLMORE N-S • December 7, 1974  
 WILLMORE E-W

STATION: SUFFIELD, ALTA. (SES)  
 (As found and left)  
 $\phi = 50^{\circ}23'45''N$   $\lambda = 111^{\circ}02'30''W$  Altitude 770M

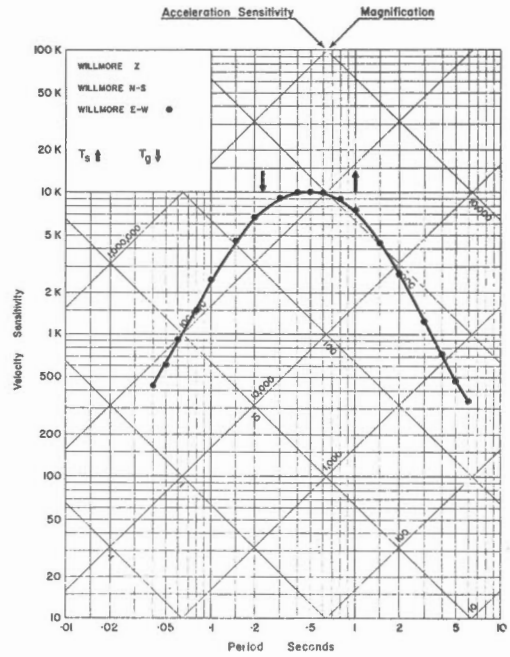
Foundation: Grey Competent Sandstone



Dates of Calibration:  
 COLUMBIA Z • December 7, 1974  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: SUFFIELD, ALTA. (SES)  
 (Final)  
 $\phi = 50^{\circ}23'45''N$   $\lambda = 111^{\circ}02'30''W$  Altitude 770M

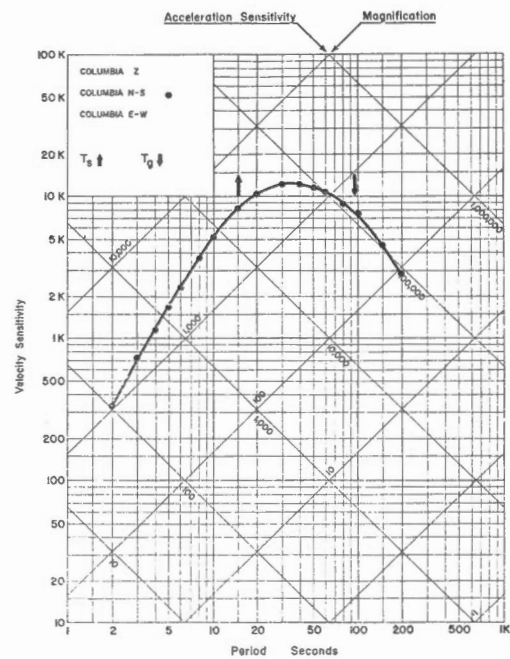
Foundation: Grey Competent Sandstone



Dates of Calibration:  
 WILLMORE Z  
 WILLMORE N-S  
 WILLMORE E-W • December 7, 1974

STATION: SUFFIELD, ALTA. (SES)  
 (as found and left)  
 $\phi = 50^{\circ}23'45''N$   $\lambda = 111^{\circ}02'30''W$  Altitude 770M

Foundation: Grey Competent Sandstone

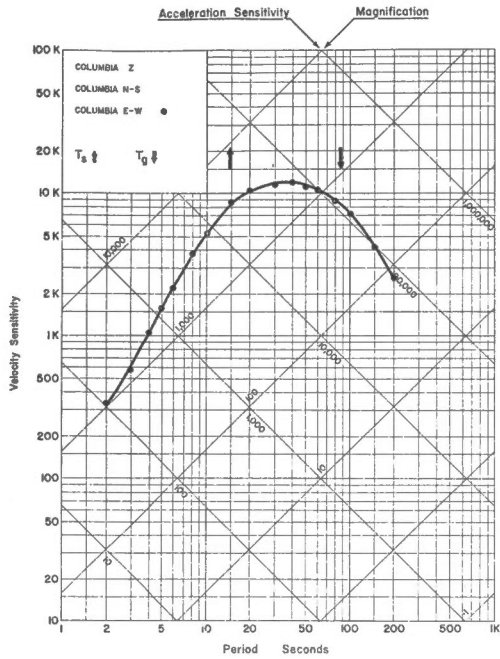


Dates of Calibration:  
 COLUMBIA Z  
 COLUMBIA N-S • December 8, 1974  
 COLUMBIA E-W

STATION: SUFFIELD, ALTA. (SBS)  
(As found and left)

$\phi = 50^{\circ}23'45''N$   $\lambda = 111^{\circ}02'30''W$  Altitude 770M

Foundation: Grey Competent Sandstone



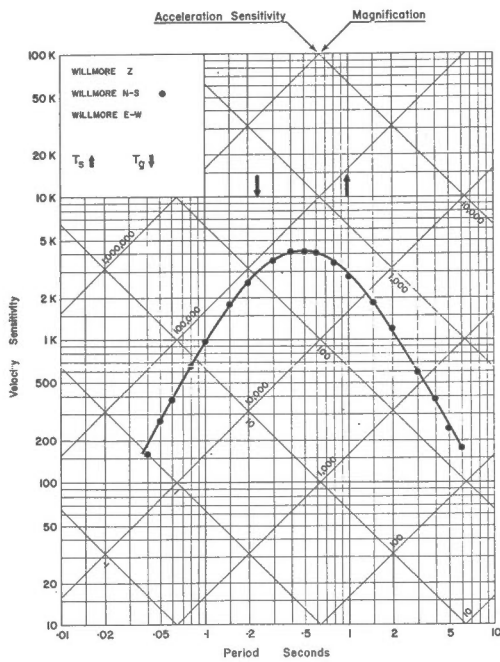
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • December 9, 1974

STATION: SEVEN FALLS, QUE. (SFA)

$\phi = 47^{\circ}07.4'N$   $\lambda = 70^{\circ}49.6'W$  Altitude 232 M

Foundation: Precambrian basement rocks



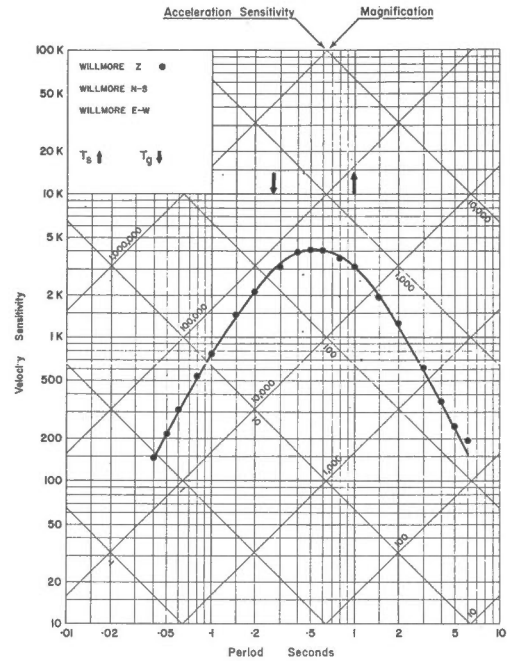
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • Feb. 9, 1972  
WILLMORE E-W

STATION: SEVEN FALLS, QUE. (SFA)

$\phi = 47^{\circ}07.4'N$   $\lambda = 70^{\circ}49.6'W$  Altitude 232 M

Foundation: Precambrian basement rocks



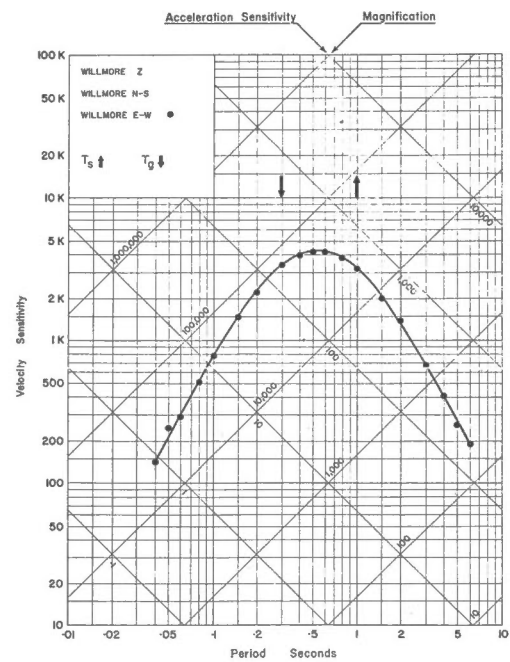
Dates of Calibration:

WILLMORE Z • Feb. 9, 1972  
WILLMORE N-S  
WILLMORE E-W

STATION: SEVEN FALLS, QUE. (SFA)

$\phi = 47^{\circ}07.4'N$   $\lambda = 70^{\circ}49.6'W$  Altitude 232 M

Foundation: Precambrian basement rocks



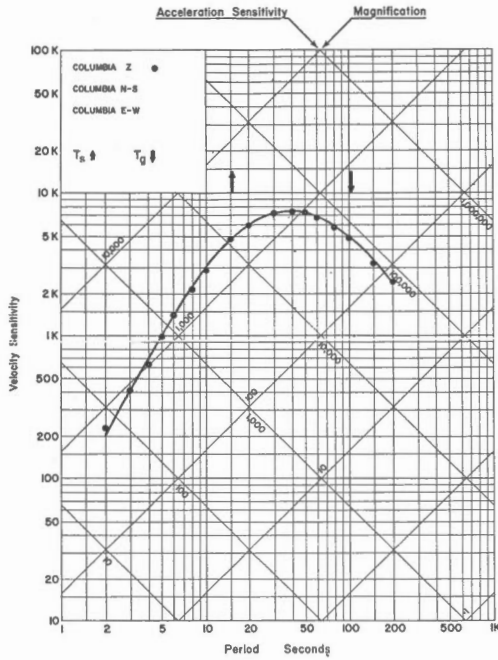
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • Feb. 11, 1972

STATION: SEVEN FALLS, QUE. (SFA)

$\phi = 47^{\circ}07.4'N$   $\lambda = 70^{\circ}49.6'W$  Altitude 232 M

Foundation: Precambrian basement rocks



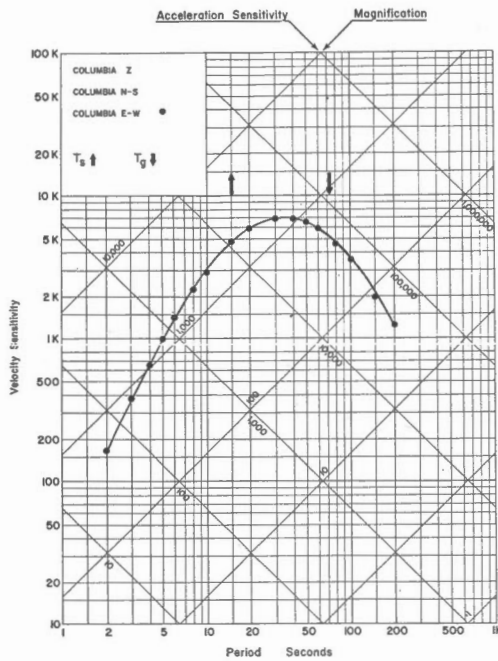
Dates of Calibration:

COLUMBIA Z • Feb. 10, 1972 ( see "Instrument Changes during 1972" - notes )  
 COLUMBIA N-S  
 COLUMBIA E-W

STATION: SEVEN FALLS, QUE. (SFA)

$\phi = 47^{\circ}07.4'N$   $\lambda = 70^{\circ}49.6'W$  Altitude 232 M

Foundation: Precambrian basement rocks



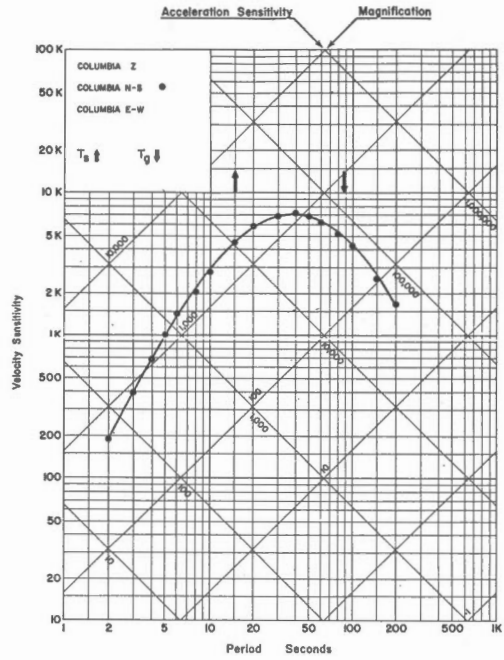
Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S  
 COLUMBIA E-W • Feb. 11, 1972

STATION: SEVEN FALLS, QUE. (SFA)

$\phi = 47^{\circ}07.4'N$   $\lambda = 70^{\circ}49.6'W$  Altitude 232 M

Foundation: Precambrian basement rocks



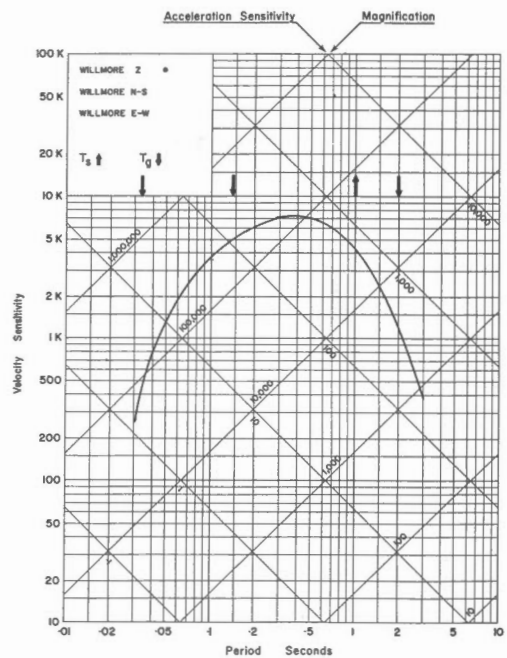
Dates of Calibration:

COLUMBIA Z  
 COLUMBIA N-S • Feb. 10, 1972  
 COLUMBIA E-W

STATION: SEPT-ILES, QUE. (SIC)

$\phi = 50^{\circ}11'20''N$   $\lambda = 66^{\circ}44'25''W$  Altitude 283 m

Foundation:



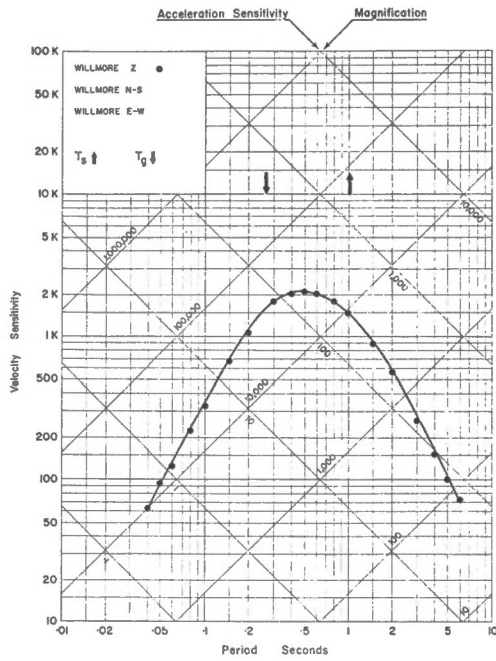
Dates of Calibration:

WILLMORE Z • Oct. 31, 1975  
 WILLMORE N-S  
 WILLMORE E-W  
 Corner frequencies indicated by "Tg" arrows.

STATION: ST. JOHN'S, NFLD. (STJ)

$\phi = 47^{\circ}34.3'N$   $\lambda = 52^{\circ}44.0'W$  Altitude 62 M

Foundation: Precambrian: Siliceous Mudstone



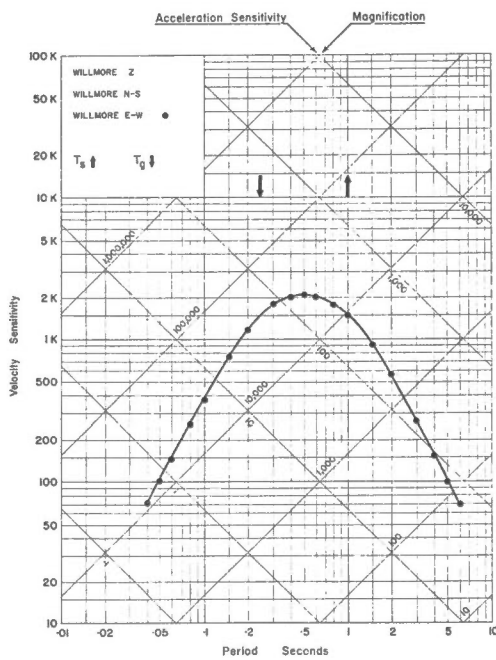
Dates of Calibration:

WILLMORE Z • Aug. 14, 1973  
 WILLMORE N-S  
 WILLMORE E-W

STATION: ST. JOHN'S, NFLD. (STJ)

$\phi = 47^{\circ}34.3'N$   $\lambda = 52^{\circ}44.0'W$  Altitude 62 M

Foundation: Precambrian: Siliceous Mudstone



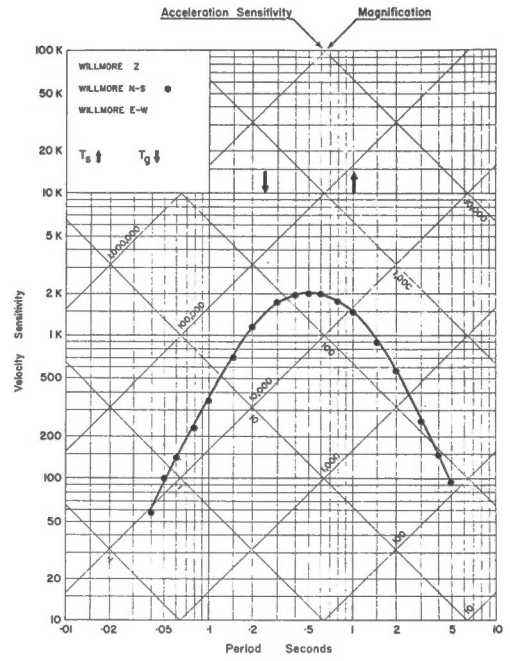
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S  
 WILLMORE E-W • Aug. 15, 1973

STATION: ST. JOHN'S, NFLD. (STJ)

$\phi = 47^{\circ}34.3'N$   $\lambda = 52^{\circ}44.0'W$  Altitude 62 M

Foundation: Precambrian: Siliceous Mudstone



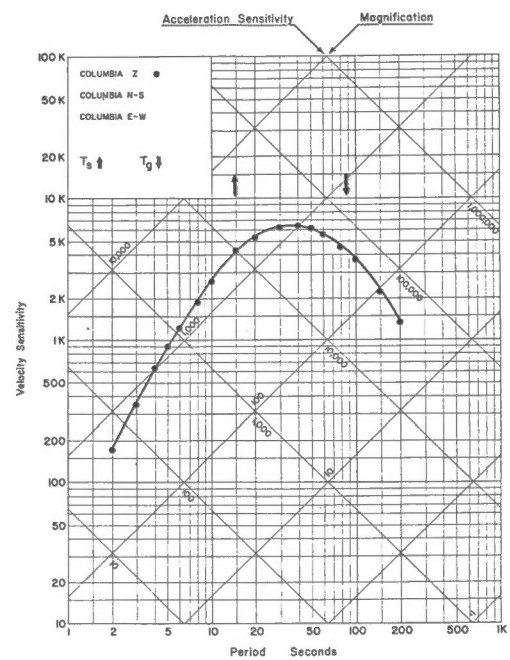
Dates of Calibration:

WILLMORE Z  
 WILLMORE N-S • Aug. 14, 1973  
 WILLMORE E-W

STATION: ST. JOHN'S, NFLD. (STJ)

$\phi = 47^{\circ}34.3'N$   $\lambda = 52^{\circ}44.0'W$  Altitude 62 M

Foundation: Precambrian: Siliceous Mudstone



Dates of Calibration:

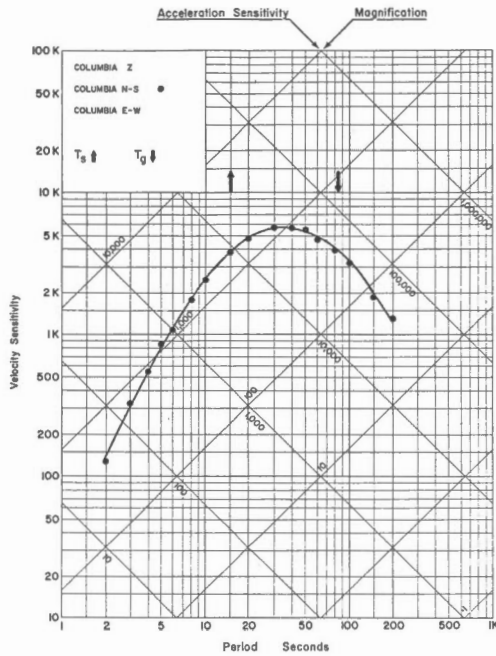
COLUMBIA Z • Aug. 17, 1973  
 COLUMBIA N-S  
 COLUMBIA E-W



STATION: ST. JOHN'S, NFLD. (STJ)

$\phi = 47^{\circ}34.3'N$   $\lambda = 52^{\circ}44.0'W$  Altitude 62 M

Foundation: Precambrian: Siliceous Mudstone



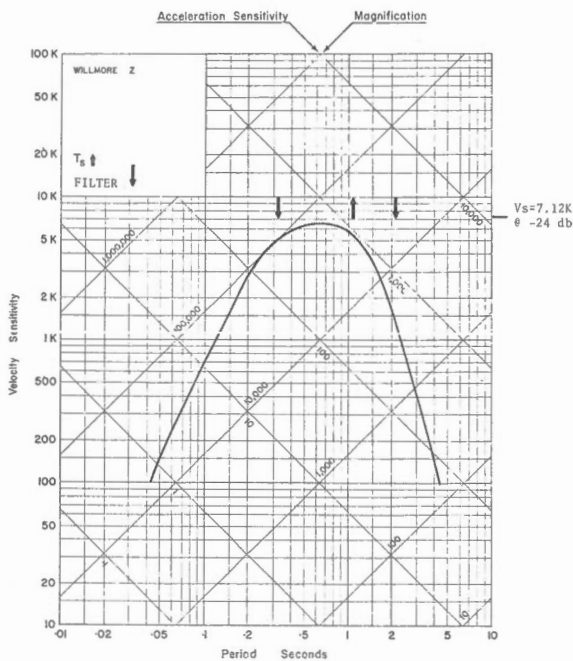
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • Aug. 17, 1972  
COLUMBIA E-W

STATION: SUDBURY, ONTARIO (SUD)

$\phi = 46^{\circ}28'N$   $\lambda = 80^{\circ}58'W$  Altitude 267 M

Foundation: Proterozoic, Huronian, Manapitae Quartzite



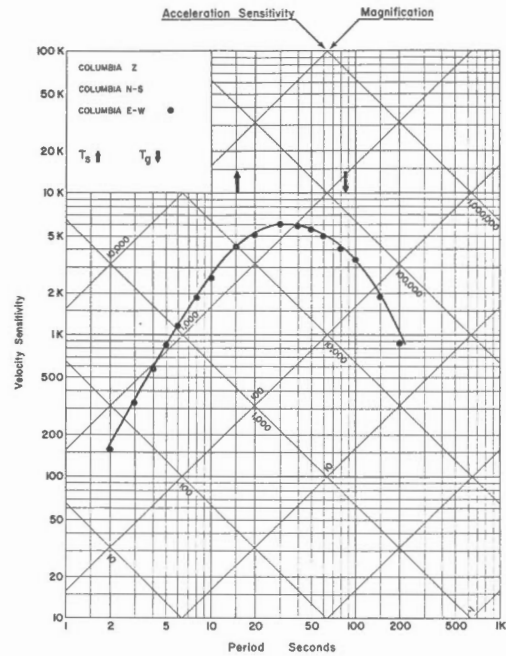
Dates of Calibration: Dec. 13, 1972

SEISMOMETER: Willmore K =  $1.90 \frac{V}{cm/sec}$   
PREAMPLIFIER: AS310 operated at 24 - 30 (ATT-SEP)  
Filter Bandpass - 0.5 - 3 Hz  
HELICORDER: RV301 - Bandpass - 0 - 30 Hz  
Sensitivity - 1 cm/Volt

STATION: ST. JOHN'S, NFLD. (STJ)

$\phi = 47^{\circ}34.3'N$   $\lambda = 52^{\circ}44.0'W$  Altitude 62 M

Foundation: Precambrian: Siliceous Mudstone



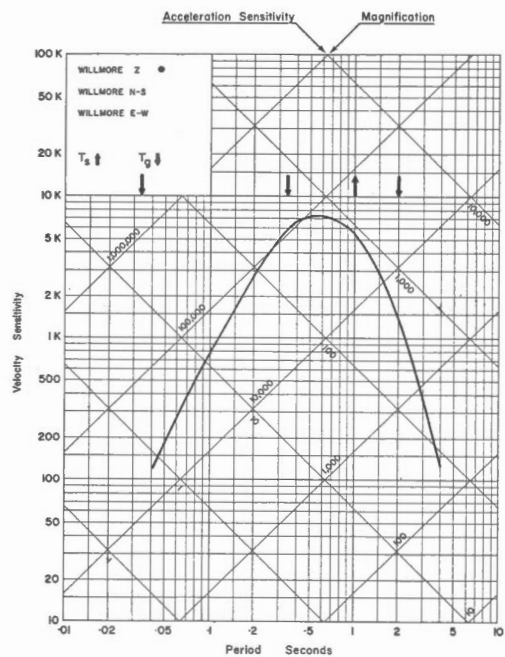
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • Aug. 18, 1973

STATION: SUDBURY, ONT. (SUD)

$\phi = 46^{\circ}28'N$   $\lambda = 80^{\circ}58'W$  Altitude 267 M

Foundation: Proterozoic, Huronian, Manapitae Quartzite

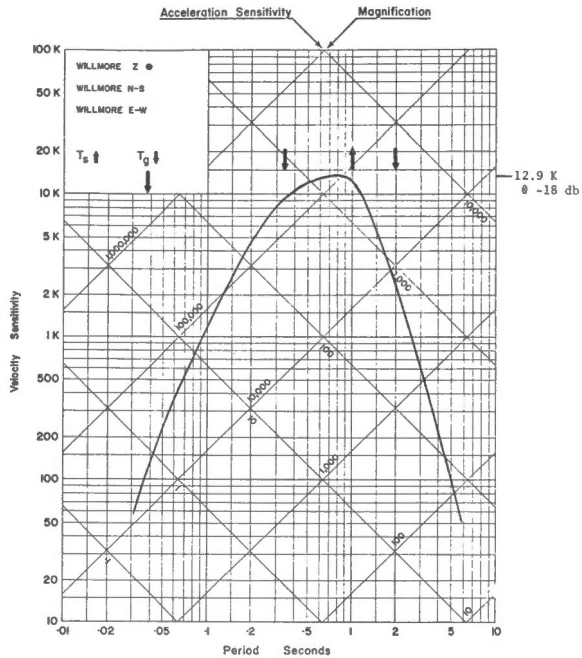


DATE OF CALIBRATION: May 28, 1975  
SEISMOMETER: WILLMORE MK11  
PREAMPLIFIER: TELEDYNE AS310 ATTN: 24dB, SEP: 30dB  
HELICORDER: GEOTECH RV301  
Corner frequencies indicated by T<sub>g</sub> arrows.



STATION: FREDERICTON, N.B. (UNB)  
 $\phi = 45^{\circ}57'N$   $\lambda = 66^{\circ}38'W$  Altitude 56 M

Foundation: Cenozoic, early post-glacial rock

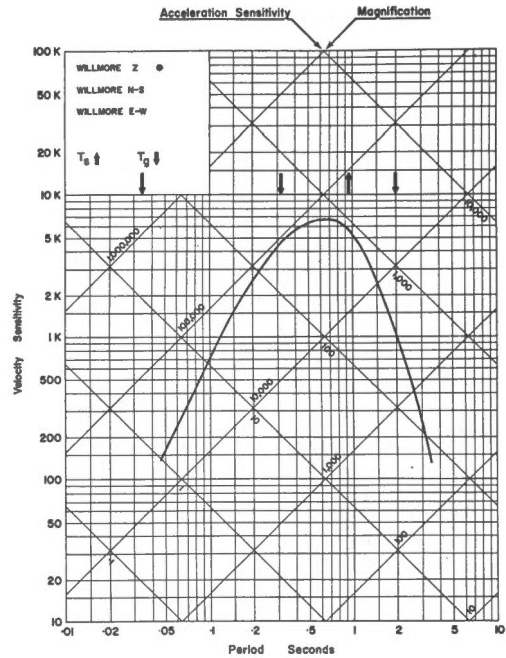


Dates of Calibration: February 7, 1973

SEISMOMETER: Willmore MK11  $G_1 = 1.75$  v.s./cm  
 PREAMPLIFIER: Teledyne EA310 operated at 30 db sep. Filter Bandpass 0.5-3 Hz  
 HELICORDER: 2484 0-25Hz  
 Corner frequencies indicated by "T<sub>g</sub>" arrows.

STATION: FREDERICTON, N.B. (UNB)  
 $\phi = 45^{\circ}57'N$   $\lambda = 66^{\circ}38'W$  Altitude 56 M

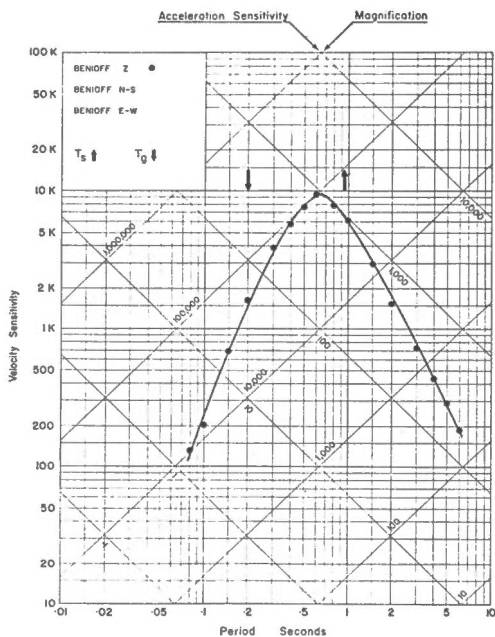
Foundation: Cenozoic, early post-glacial rock



DATE OF CALIBRATION: May 8, 1975  
 SEISMOMETER: WILLMORE MK11  
 PREAMPLIFIER: TELEDYNE EA310 ATTN: 24dB, SEP: 30dB  
 HELICORDER: GEOTECH RV301  
 Corner frequencies indicated by T<sub>g</sub> arrows.

STATION: VICTORIA, B.C. (VIC)  
 (As Found and Left)  
 $\phi = 48^{\circ}31'10"N$   $\lambda = 123^{\circ}24'55"W$  Altitude 197 M

Foundation: Quartz Diorite

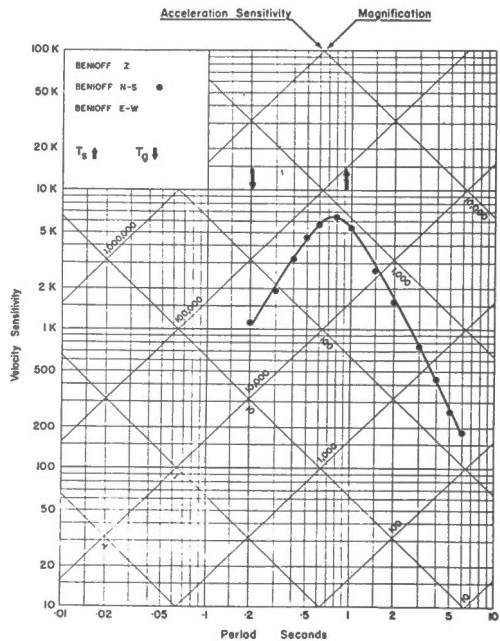


Dates of Calibration:

BENOFF Z • June 22, 1974  
 BENOFF N-S  
 BENOFF E-W

STATION: VICTORIA, B.C. (VIC)  
 $\phi = 48^{\circ}31'10"N$   $\lambda = 123^{\circ}24'55"W$  Altitude 197 M

Foundation: Quartz Diorite



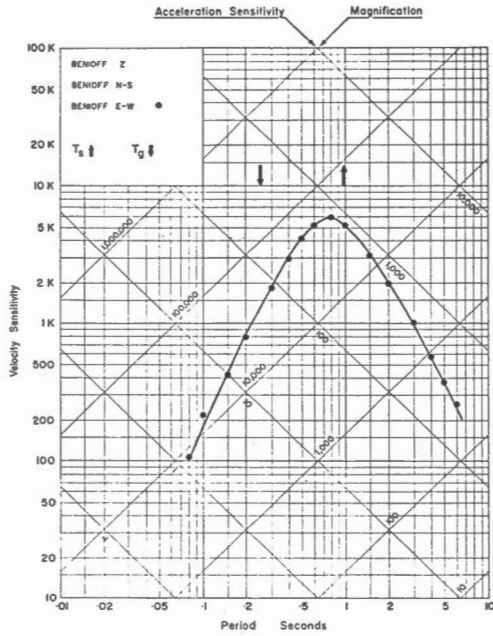
Dates of Calibration:

BENOFF Z  
 BENOFF N-S • June 22, 1974  
 BENOFF E-W

STATION: VICTORIA, B.C. (VIC)  
(As found and left)

$\phi = 48^{\circ}31'10''N$   $\lambda = 123^{\circ}24'55''W$  Altitude 197M

Foundation: Quartz Diorite



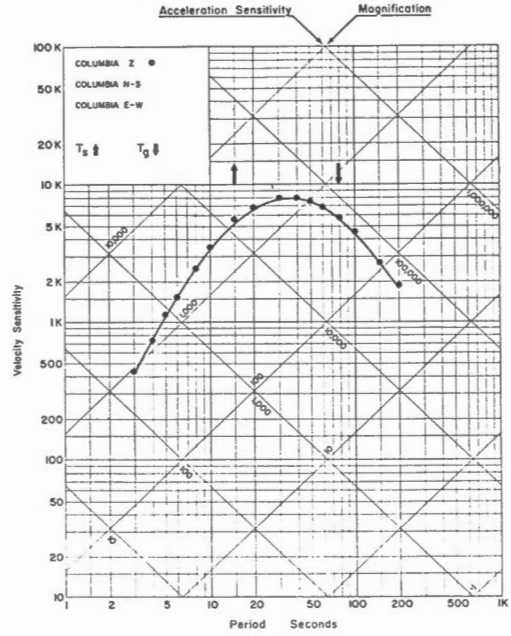
Dates of Calibration:

BENOFF Z  
BENOFF N-S  
BENOFF E-W • June 22, 1974

STATION: VICTORIA, B.C. (VIC)  
(As found and left)

$\phi = 48^{\circ}31'10''N$   $\lambda = 123^{\circ}24'55''W$  Altitude 197M

Foundation: Quartz Diorite



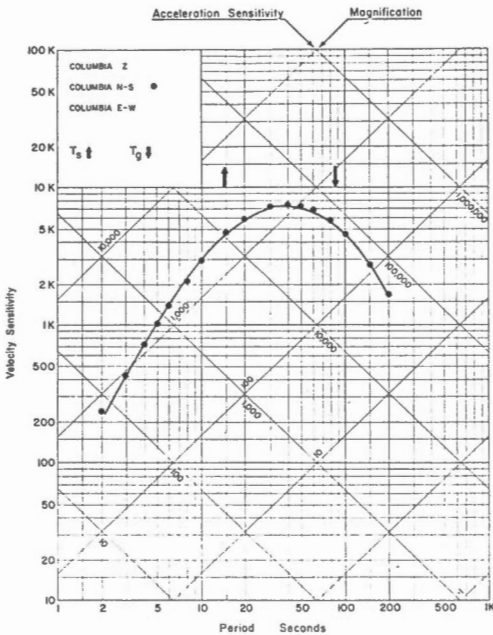
Dates of Calibration:

COLUMBIA Z • June 18, 1974  
COLUMBIA N-S  
COLUMBIA E-W

STATION: VICTORIA, B.C. (VIC) FINAL

$\phi = 48^{\circ}31'10''N$   $\lambda = 123^{\circ}24'55''W$  Altitude 197 M

Foundation: Quartz Diorite



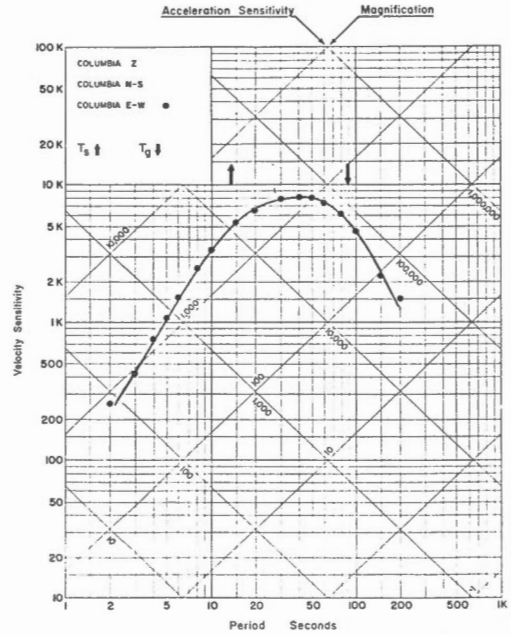
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • June 20, 1974  
COLUMBIA E-W

STATION: VICTORIA, B.C. (VIC)

$\phi = 48^{\circ}31'10''N$   $\lambda = 123^{\circ}24'55''W$  Altitude 197 M

Foundation: Quartz Diorite



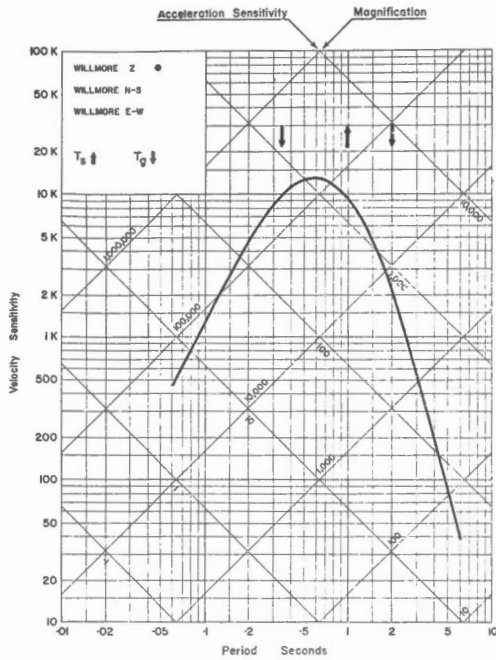
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S  
COLUMBIA E-W • June 20, 1974

STATION: WHITEHORSE, Y.T. (Final) (WHC)

$\phi = 60^{\circ}44.2'N$   $\lambda = 135^{\circ}05.9'W$  Altitude 734 M

Foundation: Grandiorite



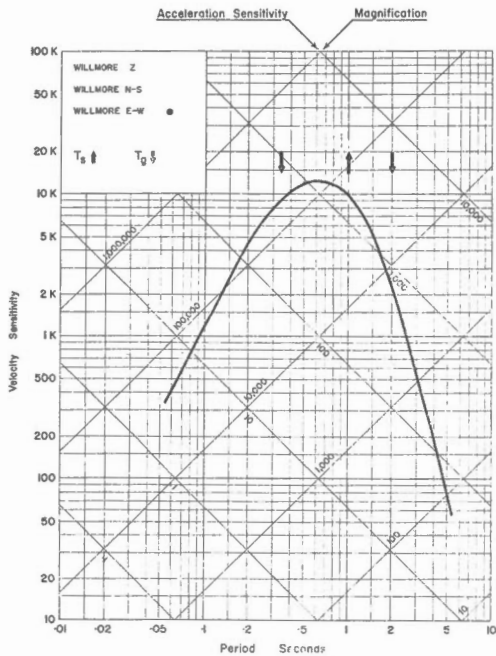
DATE OF CALIBRATION: November 28, 1974

SEISMOMETER: Willmore MK11  $T_s$  0.96  $D_s$  0.68  
 $G_L = 1.11$  v.s./cm @  $R_L = 545$  ohms  
 AMPLIFIER: Teledyne EA310 - Gain 12.5K @ -18db  
 HELICORDER: RV301 - 1 cm/v  
 Corner frequencies indicated by "Tg" arrows.

STATION: WHITEHORSE, Y.T. (WHC)

$\phi = 60^{\circ}44.2'N$   $\lambda = 135^{\circ}05.9'W$  Altitude 734 M

Foundation: Grandiorite



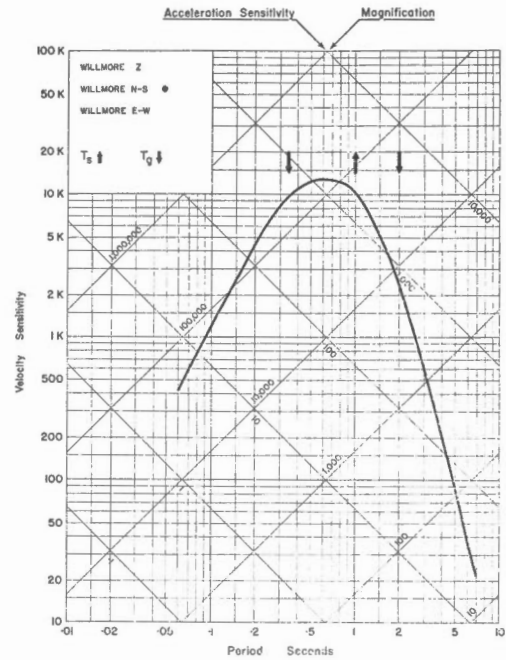
DATE OF CALIBRATION: November 28, 1974

SEISMOMETER: Willmore MK11  $T_s$  1.0  $D_s$  0.61  
 $G_L = 1.04$  v.s./cm @  $R_L = 545$  ohms  
 AMPLIFIER: Teledyne EA310 - Gain 12.5K @ -18 db  
 HELICORDER: RV301 - 1 cm/v  
 Corner frequencies indicated by "Tg" arrows.

STATION: WHITEHORSE, Y.T. (WHC)

$\phi = 60^{\circ}44.2'N$   $\lambda = 135^{\circ}05.9'W$  Altitude 734 M

Foundation: Grandiorite



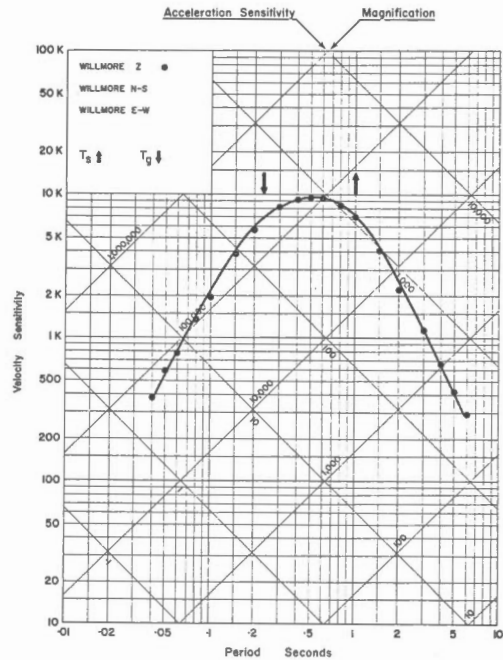
DATE OF CALIBRATION: November 28, 1974

SEISMOMETER: Willmore MK11  $T_s$  1.0  $D_s$  0.60  
 $G_L = 1.04$  v.s./cm @  $R_L = 545$  ohms  
 AMPLIFIER: Teledyne EA310 - Gain 12.5K @ -18 db  
 HELICORDER: RV301 - 1 cm/v  
 Corner frequencies indicated by "Tg" arrows.

STATION: YELLOWKNIFE, N.W.T. (YKC) Final

$\phi = 62^{\circ}28.7'N$   $\lambda = 114^{\circ}28.4'W$  Altitude 198 M

Foundation: Granite



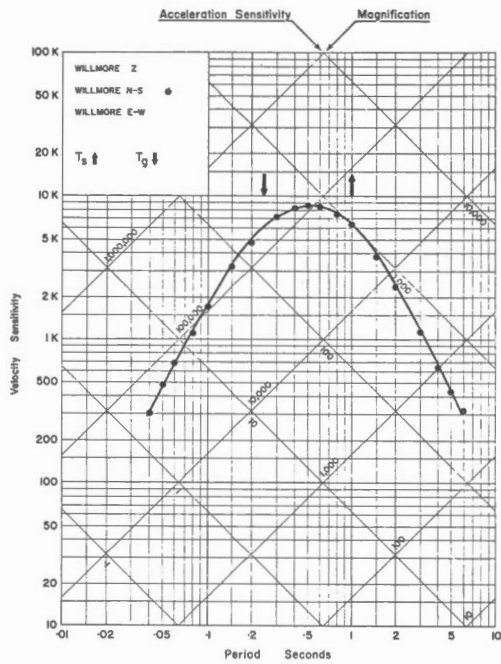
Dates of Calibration:

WILLMORE Z • March 23, 1974  
 WILLMORE N-S  
 WILLMORE E-W

STATION: YELLOWKNIFE, N.W.T. (YKC) Final

$\phi = 62^{\circ}28.7'N$   $\lambda = 114^{\circ}28.4'W$  Altitude 198 M

Foundation: Granite



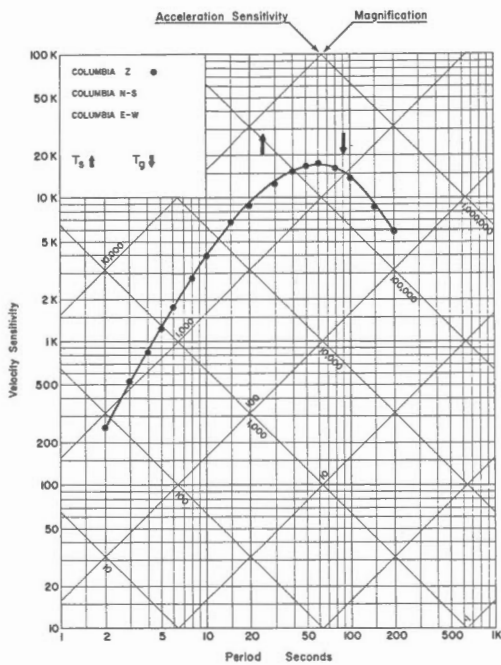
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S • March 23, 1974  
WILLMORE E-W

STATION: YELLOWKNIFE, N.W.T. (YKC) Final

$\phi = 62^{\circ}28.7'N$   $\lambda = 114^{\circ}28.4'W$  Altitude 198 M

Foundation: Granite



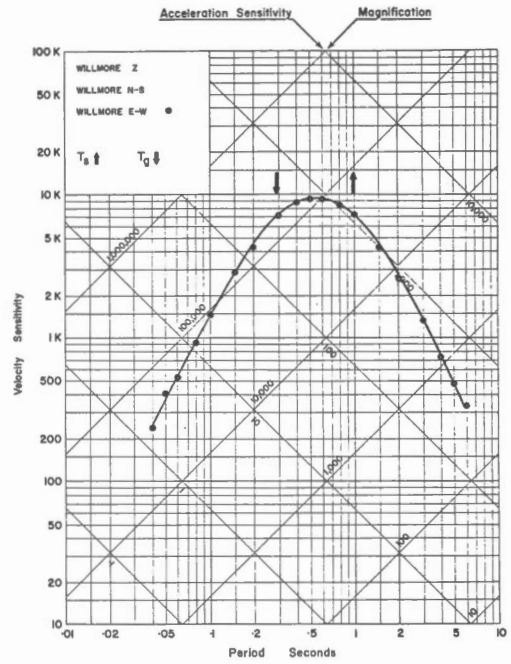
Dates of Calibration:

COLUMBIA Z • March 24, 1974  
COLUMBIA N-S  
COLUMBIA E-W

STATION: YELLOWKNIFE, N.W.T. (YKC) Final

$\phi = 62^{\circ}28.7'N$   $\lambda = 114^{\circ}28.4'W$  Altitude 198 M

Foundation: Granite



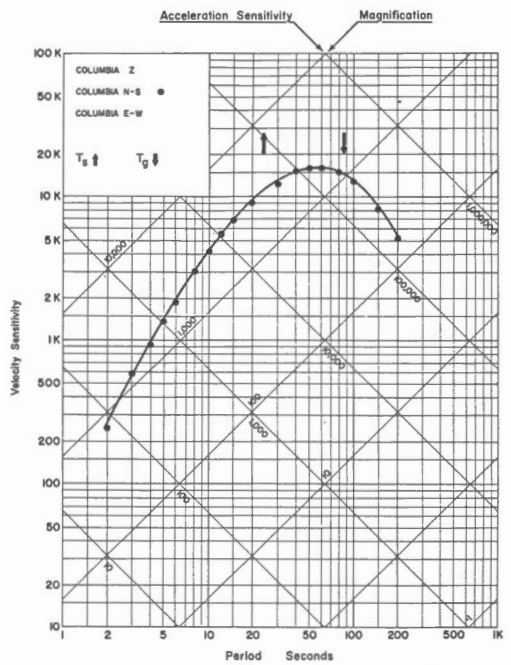
Dates of Calibration:

WILLMORE Z  
WILLMORE N-S  
WILLMORE E-W • March 23, 1974

STATION: YELLOWKNIFE, N.W.T. (YKC) Final

$\phi = 62^{\circ}28.7'N$   $\lambda = 114^{\circ}28.4'W$  Altitude 198 M

Foundation: Granite



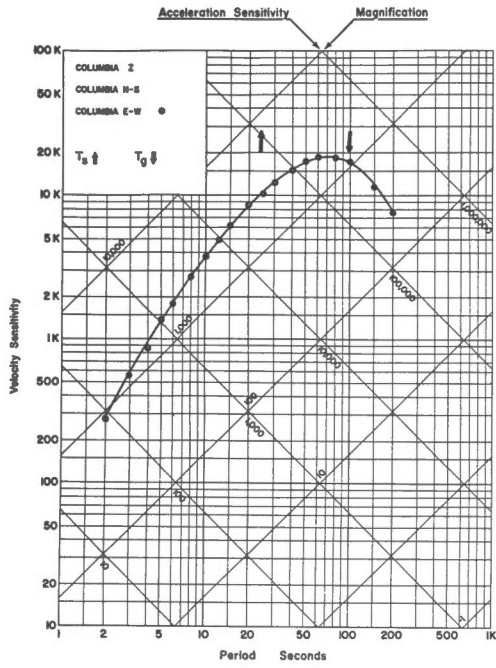
Dates of Calibration:

COLUMBIA Z  
COLUMBIA N-S • March 25, 1974  
COLUMBIA E-W

STATION: YELLOWKNIFE, N.W.T. (YKC) Final

$\phi = 62^{\circ}28.7'N$   $\lambda = 114^{\circ}28.6'W$  Altitude 198 M

Foundation: Granite



Dates of Calibration:

COLUMBIA Z

COLUMBIA N-S

COLUMBIA E-W • March 25, 1974





