

Precise Calibration Baselines in Ontario

The Program and Its Status

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THE PROGRAM

The growing use of Electronic Distance Measuring (EDM) systems by the surveying, engineering and scientific communities necessitates the provision of precise calibration baselines against which such systems may be calibrated to ensure they are free of systematic errors, to monitor their performance and to assess their accuracy.

For some time both government and private survey organizations have recognized the need to ensure that a uniform scale is applied to all EDM measurements. In 1972, the Second National Control Survey Conference, held in Ottawa, recommended that precise calibration baselines (pcbl) be constructed across Canada. It was agreed at that conference that the provincial governments construct the baselines and the federal government measure them.

To this end the Ministry of Natural Resources (MNR) is establishing a series of such baselines throughout Ontario. The baselines installed by MNR are being measured by the Geodetic Survey of Canada (GSC) using a Kern Mekometer ME-3000 which is calibrated at regular intervals on the National EDM Precise Calibration Baseline in Ottawa.

CURRENT STATUS OF THE PROGRAM

When the pcbl program was initiated the goal was to establish a series of approximately 19 baselines throughout Ontario. To date eight pcbl's have been established and measured. These baselines are located in the following areas:

Mississauga	Belleville
Scarborough	Lindsay
Burlington	Conestogo
London	Thunder Bay

The remaining eleven general areas where additional pcbl's are proposed include:

Sudbury	North Bay
Barrie	Sault Ste. Marie
Fort Frances	Niagara Falls
Kenora	Chatham
Timmins	Windsor
New Liskeard	

OPERATION OF THE PROGRAM

The procedure to formulate a schedule for the establishment of pcbl's has been to periodically contact the Regional Groups of Ontario Land Surveyors, particularly in those regions where no pcbl currently exists, and request that they identify one or preferably more suitable locations for a baseline. The criteria for suitable baseline sites are outlined in the Ministry's publication "Precise Calibration Baselines in Ontario", 1979.

After a potential location in a given region has been chosen by the appropriate Regional Group, a representative from the Ministry visits the site to ensure it meets all the necessary qualifications. If the site is approved, clearance for its use as a pcbl site is obtained from the owner of the land on which the baseline will subsequently be constructed and if necessary, an agreement between the Ministry and the owner is prepared.

When all approvals and agreements for the use of the site are finalized the Ministry lets tender for baseline construction. The construction of the baseline is usually completed within six months to one year of the proposal by the Regional Group. Upon approval of a site the GSC in Ottawa is notified so that measurement of the baseline can be included in their measurement program for the following field season.

The process is repeated until pcbl's are established in all the general areas identified above.

STATUS OF EXISTING BASELINES

The Ministry of Natural Resources assumes the responsibility of maintaining all Ministry baselines. All the pertinent information concerning the baselines such as location, construction details, user restrictions or notices and interpillar distances are usually relayed to users through the publication "Precise Calibration Baselines in Ontario", 1979 (PCBLIO). This publication, however, is currently being rewritten to include details on newly constructed baselines and to recommend procedures for the calibration of EDM systems.

The purpose of this section is to bring the pcbl user community up-to-date on the status of each of MNR's existing baselines. Some of the information contained in the PCBLIO publication will be repeated here along with additional information on new baselines and the status of old ones.

Complete details, including currently accepted interpillar distances for all baselines can be obtained by contacting the author at:

Ministry of Natural Resources
Surveys and Mapping Branch
Room 3427, Whitney Block, Queen's Park
Toronto, Ontario M7A 1W3
(416) 965-3005

MISSISSAUGA BASELINE

Location

The Ministry of Natural Resources constructed the Mississauga Precise Calibration Baseline on Ontario Hydro lands in the City of Mississauga in the Regional Municipality of Peel, in 1977. The Mississauga baseline is readily accessible by vehicle throughout the year.

Baseline Status

The Mississauga baseline is approximately 1750 m in length. It comprises six reinforced concrete pillars which are 300 mm in diameter and stand approximately one metre above grade. They extend into the ground to a depth of two metres. Each concrete pillar is capped with a 225 mm bronze plate complete with a 15.9 mm ($\frac{5}{8}$ ") threaded stud.

The baseline was measured using a Kern Mikometer ME-3000 and a Tellurometer MA100 in June, 1977 and again in July, 1978. An astronomical azimuth was established on the Mississauga baseline in 1978 for the purpose of calibrating gyro theodolites. The astronomical azimuth of 39-13-08.0 was determined to an accuracy of one second of arc from the centre punch on a bronze cap set in concrete, flush with the ground, located approximately 1.25 m in front of pillar #1 to the centre of the threaded stud on pillar #4.

A check measurement of the interpillar distances of this baseline was performed using the Mekometer ME-3000 in July, 1985. Significant movement in the order of 10 to 15 mm was detected at pillar #1. Consequently, users of the Mississauga baseline should NOT include measurement involving pillar #1 in any EDM calibrations until this baseline has been remeasured and revised interpillar distances published.

The Mississauga baseline will be remeasured in the summer of 1986 and revised interpillar distances will be available soon thereafter.

SCARBOROUGH BASELINE

Location

The Ministry of Natural Resources constructed the Scarborough Precise Calibration Baseline on Ontario Hydro lands in the Borough of Scarborough in the Municipality of Metropolitan Toronto, in 1978. The Scarborough baseline is readily accessible by vehicle throughout the year.

Baseline Status

The Scarborough baseline is approximately 1092 m in length. It comprises five reinforced concrete pillars which are 460 mm in diameter and stand approximately one metre above grade. They extend into the ground to a depth of two metres. Each concrete pillar is capped with a 225 mm bronze plate complete with a 15.9 mm ($\frac{5}{8}$ ") threaded stud.

The baseline was measured using a Kern Mekometer ME-3000 in July, 1979 and again in June, 1980. Comparison of these two measurement campaigns revealed significant instabilities at pillars #2 and #4. The resulting effects on interpillar distances involving these two pillars have been confirmed on numerous occasions by various users of the Scarborough baseline. This baseline cannot be remeasured until these pillars are stabilized. The Ministry is currently examining various alternatives to resolve this problem.

Until such time as the instability at pillars #2 and #4 is remedied users are advised to use extreme caution when using the Scarborough baseline. Interpillar distances involving pillars #2 and #4 of this baseline should NOT be used in EDM calibrations.

BURLINGTON BASELINE

Location

The Ministry of Natural Resources constructed the Burlington Precise Calibration Baseline on Ontario Hydro lands in the City of Burlington in the Regional Municipality of Halton, in 1980. The Burlington baseline is readily accessible by vehicle throughout the year.

Baseline Status

The Burlington baseline is approximately 1210 m in length. It comprises six reinforced concrete pillars which are 460 mm in diameter and stand 1.2 m above grade. They extend into the ground to a depth of two metres. Each concrete pillar is capped with a 225 mm bronze plate complete with a 15.9 mm ($\frac{5}{8}$ ") threaded stud.

The Burlington baseline was measured using a Kern Mekometer ME-3000 in July, 1980, August, 1981 and May, 1982. Comparisons of these sets of data suggests a slight instability at pillar #5 and possibly at pillar #1. These instabilities are very small and may not introduce any appreciable errors into an EDM calibration. However, until such time as these instabilities are remedied or until it is determined through remeasurement that these pillars have naturally stabilized users of the Burlington baseline should exercise caution when utilizing interpillar distances involving pillars #1 and #5 for EDM calibrations.

Values published in the PCBLIO publication for the Burlington baseline are no longer valid. Updated interpillar distances are available from the Surveys and Mapping Branch.

LONDON BASELINE

Location

The Ministry of Natural Resources constructed the London Precise Calibration Baseline, south of London, on the south side of the Ministry of Transportation and Communications' right-of-way for Highway No. 401 (MacDonald-Cartier Freeway), in 1981. The London Baseline is NOT to be accessed from Highway No. 401 but is accessible by vehicle throughout the year by way of a township road parallelling the southerly limit of the right-of-way for Highway No. 401.

Baseline Status

The London baseline is approximately 1127 m in length. It comprises six reinforced concrete pillars which are approximately 460 mm in diameter and stand 1.5 m above grade. They extend into the ground to a depth of two metres. Each concrete pillar is capped with a 225 mm bronze base plate complete with a 15.9 mm ($\frac{5}{8}$ ") threaded stud.

The London baseline was measured with a Kern Mekometer ME-3000 in August, 1981 and June, 1982. Pillars #1 and #6 showed a very small amount of movement upon comparison of the two sets of measurements. As a result, until this baseline is remeasured and revised interpillar distances published users of this baseline should exercise caution when utilizing interpillar distances 1-2 and 5-6 in IDM calibrations. Interpillar distances are available from the Surveys and Mapping Branch.

BELLEVILLE BASELINE

Location

The Ministry of Natural Resources constructed the Belleville Precise Calibration Baseline on the north side of Highway 401 (MacDonald-Cartier Freeway) just west of the Salmon River, between Belleville and Kingston, in 1982. The baseline is accessible during the Spring, Summer and Fall.

Baseline Status

The Belleville baseline is approximately 1308 m in length. It comprises five reinforced concrete pillars which are 460 mm in diameter and stand approximately one 1.2 m above grade. The pillars extend into the ground to bedrock which in this location is generally less than 25 cm below grade. All five pillars are fastened to the bedrock by steel reinforcing rods. Each concrete pillar is capped with a 225 mm bronze plate complete with a 15.9 mm ($\frac{5}{8}$ ") threaded stud.

The baseline was measured using a Kern Mekometer ME-3000 in May, 1983 and again in August, 1984. There is a very good agreement between the two sets of measurements. The Belleville baseline is stable and interpillar distances are available from the Surveys and Mapping Branch.

CONESTOGO BASELINE

Location

The Ministry of Natural Resources constructed the Conestogo Precise Calibration Baseline, north of Waterloo, on the north side of Regional Road 17 right-of-way, in the Township of Woolwich, in 1983. The Conestogo baseline is readily accessible by vehicle throughout the year by way of Regional Road 17.

Baseline Status

The Conestogo baseline is approximately 1120 m in length. It comprises five reinforced concrete pillars which are 460 mm in diameter and stand 1.2 m above grade. The pillars extend approximately 3 m into the ground. Each concrete pillar is capped with a 225 mm bronze

plate complete with a 15.9 mm ($\frac{5}{8}$ ") threaded stud. Each pillar is surrounded by five guard posts standing 0.9 m above grade and 1.5 m from the centre of the baseline pillar.

The baseline was measured using a Kern Mekometer ME-3000 in June, 1984, and July, 1985. Computation and analysis of the Mekometer data is not yet completed. Consequently, published values for interpillar distances for this baseline will be available in the near future.

LINDSAY BASELINE

Location

The Ministry of Natural Resources constructed the Lindsay Precise Calibration Baseline on the Frost Campus of Sir Sanford Fleming College in Lindsay, Ontario in 1983. The Lindsay baseline is accessible by vehicle throughout the year by way of Sir Sanford Fleming College, Frost Campus roads.

Baseline Status

The Lindsay baseline is approximately 1030 m in length. It comprises five reinforced concrete pillars which are approximately 460 mm in diameter and stand 1.3 m above grade. The pillars extend into the ground to bedrock which is between 6 to 8 m below grade! All five pillars are fastened to the bedrock by steel reinforcing rods. Each concrete pillar is capped with a 225 mm bronze base plate complete with a 15.9 mm ($\frac{5}{8}$ ") threaded stud.

The baseline was measured with a Kern Mekometer ME-3000 in June, 1984 and July, 1985. Computation and analysis of the Mekometer data is not yet completed. Consequently, published values for interpillar distances for this baseline will be available in the near future.

THUNDER BAY BASELINE

Location

The Ministry of Natural Resources constructed the Thunder Bay Precise Calibration Baseline on City of Thunder Bay lands in the City of Thunder Bay, in 1985. The Thunder Bay baseline is readily accessible by vehicle throughout the year.

Baseline Status

The baseline was measured using a Kern Mekometer ME-3000 in August, 1985. A second measurement will be made in the summer of 1986. Computation and analysis of the Mekometer data will be performed subsequent to this second measurement and final interpillar distances be available soon thereafter. ●

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