
**Confirmed Tornado
Minto, Ontario
May 31, 1985**

Date- Local: Friday, May 31st, 1985.

UTC: Friday, May 31st, 1985.

Time-Local: 18:35

UTC: 22:35

Location: Minto

Region: Stirling –Tweed – South Frontenac

Classification: Confirmed Tornado

Category: A

Casualties: None

Track Length: 650m

Width: 15m

Motion: 293°

Damage Estimate: None Available

F-Scale Rating: F2

Code: BS

Damage Survey: yes

Spotter Reports: None

Other Documents:

Logged event citing tornado.

The May Thirty-First Tornado Outbreak in Southern Ontario report.

More information can be found in the brown 'Ontario May 1985' folder at the front of the year.

Damage survey report including eyewitness survey forms and pictures.

Map of tornado path including points of interest/photos taken.

Tornado F-Scale Assessment

Marci Vanhoucke

Tornado Data Production Assistant, Environment Canada

July 21, 2005.

Classification: Confirmed Tornado

Date: Friday, May 31st, 1985.

Location: Minto, Stirling – Tweed – South Frontenac

Assessment: F2

F-Code: BS

Explanation of Assessment: There is a Tornado Outbreak report stating that along the damage track, there were 2 barns and 2 wooded sheds destroyed. Due to the damage cited, this tornado is rated an F2.

CLASSIFICATION: Severe Thunderstorm

SOURCE/WATCHER ID:

EVENT TIME (UTC): 22-35 EVENT DAY: 31.0 MONTH: 5.0 YEAR: 1985.0 EVENT DURATION (HR): 0.0 (MIN): 0.0

DAY OF THE WEEK:

EVENT LOCALE: Minto

ASSOCTD PUBLIC RGN: Peterborough and the Kawarthas

DETAILED DESCRIPTION:

Alma family of tornadoes golf ball sized hail
--

INITIAL ASSESSMENT: YES

SPL WX STATEMENT IN EFFECT ?: UKN STATEMENT LEAD TIME (HR): (MIN):

WATCH IN EFFECT ?: UKN WATCH LEAD TIME (HR): (MIN):

WARNING IN EFFECT ?: UKN WARNING LEAD TIME (HR): (MIN):

TORNADO:

WINDSPEED: ?

RAINFALL: ? MM RAIN DURATION:

HAIL DIAMETER: 45 MM HAIL DESCRIPTION: 45

EVENT DESCRIPTION: Tornado

Mesoscale ?: Synoptic ?: Big Event ?:

Statement Est Hit/Miss:

Watch Est Hit/Miss:

Warning Est Hit/Miss:

Separate Event (30km/30min): YES

Vetted by:

Vetted date:

Rawdon May 31/85

Severe storm crossed Lots #5,6,7, Cons. # 6- Rawdon.

Injuries:

None. Very sparsely populated area of mixed farming.

Topography:

Rolling terrain.

Damage:

Limited to a very small area $1\frac{1}{2}$ KM long and 25M wide.

Observations:

Witnesses observations were close to text book-
ie. exploding well house, tree twisting by, roaring, popping ears.

Summary:



Severe storm went through area involved but path was very short and narrow with very little damage elsewhere in the vicinity.

Encl: Two pictures.

RR LaRue

Rawdon #1

APPENDIX 2

Summer Severe Storm Survey

NAME OF INVESTIGATOR R. LaRocque	INVESTIGATOR'S PHONE 705-7429737	DATE OF INVESTIGATION June 4th. 1985
INVESTIGATOR'S ADDRESS 1844 Brimwood Cres. Peterborough Ontario. K9K 1R6		

1.	NAME(S) OF PERSON(S) INTERVIEWED Brenda Perrault		R.R.#1 Sterling	
2.	ADDRESS (NOT RR#) OF THIS LOCATION 6 6 Rawdon Lot Con. Twp Co. or # street, town			
3.	PHONE NUMBER OF PERSON INTERVIEWED 613- 395 2134		Area Code	Number
4.	(a) TIME AND DATE OF THE EVENT AT THIS LOCATION May 31st. 6:30 pm. EDT.			
	(b) HOW WAS THE TIME DETERMINED (STOPPED CLOCK, POWER FAILURE, MEMORY, A TIME-FIXING EVENT ETC) Power failure			
5.	DESCRIPTION OF THE DAMAGE Well house roof lifted up the walls "exploded" outwards in front of her eyes. Roaring sound. One ^{old} Barn totalled and some trees snapped off ^{20'} 20' from ground.			
6.	VISUAL SKY COLOUR? Y or N if yes, describe Yes-sky very black - storm appeared to come from the west.			
7.	(a) HAIL? Y or N Yes: Sheets of hail			
	(b) HAIL SIZE (CIRCLE) PEA GRAPE <u>WALNUT</u> GOLF BALL TENNIS BALL OTHER UNKNOWN DIAMETER(MM)			
8.	RAIN, HOW MUCH? Heavy but short duration			
9.	(a) COMMENTS ON RELIABILITY OF WITNESS REPORTS Seemed reliable.			
	(b) DOES WITNESS KNOW OF OTHERS WHO WERE AFFECTED BY OR WITNESSED STORM? If yes:			
10.	Name	Address	Phone#	
ANY INJURIES RELATED TO STORM				

Rawdon #2

APPENDIX 2

Summer Severe Storm Survey

NAME OF INVESTIGATOR R. LaRocque	INVESTIGATOR'S PHONE 705 742-9737	DATE OF INVESTIGATION June 4, 1985
INVESTIGATOR'S ADDRESS 1844 Brimwood Cres. Peterborough Ont. K9K 1R6		

1.	NAME(S) OF PERSON(S) INTERVIEWED Doug Campbell R.R.#1 Sterling			
2.	ADDRESS (NOT RR#) OF THIS LOCATION 5 6 Rawdon Lot Con. Twp Co. or # street, town			
3.	PHONE NUMBER OF PERSON INTERVIEWED Area Code Number			
4.	(a) TIME AND DATE OF THE EVENT AT THIS LOCATION May 31 1985 6:30-7:00 PM			
	(b) HOW WAS THE TIME DETERMINED (STOPPED CLOCK, POWER FAILURE, MEMORY, A TIME-FIXING EVENT ETC)			
5.	DESCRIPTION OF THE DAMAGE Through window noticed part of tree go by towards E. Ears kept popping. Sound like a train going through living room. Destroyed shed and moved concrete footings. Damage to NE corner of house SEE CON'T			
6.	VISUAL SKY COLOUR? Y or N if yes, describe			
7.	(a) HAIL? Y or N Yes Just before winds.			
	(b) HAIL SIZE (CIRCLE) PEA GRAPE <u>WALNUT</u> GOLF BALL TENNIS BALL OTHER UNKNOWN DIAMETER(MM)			
8.	RAIN, HOW MUCH?			
9.	(a) COMMENTS ON RELIABILITY OF WITNESS REPORTS - No question of the damage. Saw and heard quite a bit for someone who was supposed to be playing Monopoly with the kids in the kitchen.			
	(b) DOES WITNESS KNOW OF OTHERS WHO WERE AFFECTED BY OR WITNESSED STORM? If yes: Barn next lot E destroyed (old though)			
10.	ANY INJURIES RELATED TO STORM Name Address Phone#			

CON'T #5

Extensive damage to garage door. Falling trees. Path of RL
damage isolated to ^{1 1/2 KM} sort of zig zag, ^{6M-25M} ~~20-30~~ wide.
A glass of milk left on the kitchen table from supper would
not pour when tipped the next morning. (June 1st)

THE MAY THIRTY-FIRST TORNADO OUTBREAK IN SOUTHERN ONTARIO

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TABLE I Time of Occurrence of Tornadoes by County

Figure 1 Hail, Damaging Wind Areas and Tornado Tracks for May 31, 1985 Tornado Outbreak

Figure 2 Tornado Paths for Barrie, Grand Valley-Tottenham, and Alma Tornadoes.

Figure 3 Tornado Paths for Wagner Lake, Reaboro, Ida, Rice Lake and Minto Tornadoes

Figure 4 Tornado Path for Rush Cove Tornado

Figure 5 City of Barrie Tornado Path

Acknowledgements:

We wish to acknowledge the contribution of all staff from the Ontario Weather Centre, Scientific Services Division, Peterborough Weather Office and the Kingston Weather Office who conducted on site investigations or aerial surveys of the tornado paths during the week following the tornado outbreak.

THE MAY THIRTY-FIRST TORNADO OUTBREAK IN SOUTHERN ONTARIO

by

W. Lawrynuik - Chief, Forecast Operations
B. Greer - Chief Meteorologist
M. Leduc - Severe Weather Meteorologist
O. Jacobsen - Meteorologist

1. Introduction

During the afternoon of May 31, 1985 a powerful cold front moved through Southern Ontario triggering a series of very damaging tornadoes. Twelve people were killed and scores of others injured as the storms moved across the Province. Property damage is estimated well over \$100 million.

This report will outline the weather pattern of May 31 which led to the storms as well as the Ontario Weather Centre's response to the real time events of the day. The report will document through detailed maps the tracks of all the tornadoes confirmed to this date (June 10). A general description of the damage and a best estimate of the time of the tornadoes will be included. Some preliminary recommendations are put forward as a consequence of the May 31st tornado outbreak.

2. Meteorological Conditions and Severe Weather Watches

On May 30th hot, humid tropical air became established across the Central United States. The air was also very unstable meaning that with any sort of lifting mechanism very intense thunderstorms could develop. During the early afternoon of May 30th a weak disturbance moved across Lake Erie and allowed some of this tropical air to move into extreme southwestern Ontario.

Another weak disturbance during the morning hours of May 31st pushed the warm humid air northeastward producing thunderstorms across all of Southern Ontario. No damage was reported from these thunderstorms in Ontario but the arrival of the warm very unstable airmass set the stage for the very dramatic events of later that day.

While the warm humid air was becoming established across the south half of Ontario an intense spring storm was developing just west of the Great Lakes. A low pressure centre with strength more typical of a mid winter storm tracked across upper Michigan during the morning of May 31st to north of Sudbury by evening. A very sharp cold front trailed southward from this low pressure system.

The morning analysis at Environment Canada's Ontario Weather Centre indicated that the thermodynamic and dynamic features necessary for the possible development of severe thunderstorms were present. The thermodynamic instability of the airmass was confirmed from the radiosonde reports east of the cold front crossing Michigan. The air above one km was

2. Meteorological Conditions and Severe Weather Watches - Cont'd...

very dry and cool while the tropical airmass near the surface was very hot and moist. The dynamic features (triggering mechanisms) were strong, that is, a sharp cold front and a sharp upper trough crossing Michigan and a very strong westerly jet stream above 10 km with winds of approximately 400 km/h (200 knots). The cold front and upper trough were expected to cross Southern Ontario during the afternoon and early evening.

As a result, the severe weather watch originally issued at 2:40 a.m. May 31st, was updated and extended for all of Southern Ontario at 7:00 a.m., 9:20 a.m. and 1:50 p.m. advising of the potential for the development of severe thunderstorms later in the afternoon and early evening. It was anticipated that these thunderstorms would be very strong since the cold front and trough were crossing the province about the time of maximum surface heating (late afternoon), which would produce the maximum thermodynamic instability in the airmass.

By noon on May 31st the thunderstorm activity associated with the weak disturbance which had affected Southern Ontario overnight had virtually ceased. There was no evidence from radar reports of any thunderstorms along the cold front approaching the Bruce Peninsula from Lake Huron.

3. The Severe Weather Event and the Severe Weather Warnings

At 1:40 p.m. radar indicated the first thunderstorm cells developing west and north of the Bruce Peninsula. By 2:20 p.m. a line of potentially severe storms was indicated by radar from the mouth of the French River to just off the Bruce Peninsula with more cells beginning to form further south. The first severe thunderstorm warnings * were issued for Bruce County and Parry Sound District at 2:25 p.m. The line of severe storms continued to develop. Warnings were issued for Huron, Perth, Grey, Northern Wellington and northern Waterloo Counties at 3:15 p.m. The most severe storms on radar appeared to be from Meaford to Perth County. Initial on site observations of the severity of the storms were received by the Ontario Weather Centre at around 4:00 p.m. indicating that 2 cm hail and very high winds had occurred near Meaford and in the Dundalk area. However, no damage was indicated up to that time.

Around 4:00 p.m. radar revealed a line of severe thunderstorms from near Collingwood to Eastern Perth County. The line was moving east at 60 to 70 km/h. At 3:45 p.m. severe thunderstorm warnings were in effect to cover areas downstream as far east as Simcoe County and northern Peel Counties. Between 4:20 and 4:40 p.m. there were indications that the southern end of the line was intensifying and at 4:53 p.m. warnings were issued to cover the counties along the west end of Lake Ontario from Hamilton-Wentworth to

* These severe thunderstorm warnings issued by the Ontario Weather Centre contained the statement: "Remember some severe thunderstorms produce tornadoes."

3. The Severe Weather Event and the Severe Weather Warnings - Cont'd...

Durham and Victoria Counties. Following a confirmed report of a tornado at Shelburn, a tornado warning was issued at 5:00 p.m. for Southern Simcoe, Northern Peel and York Counties.

Reports of the tornadoes at Grand Valley and Barrie were received by the Ontario Weather Centre at 5:00 and 5:20 p.m. respectively. Tornado warnings were issued at 5:40 p.m. for the downstream areas of Northern Durham, Victoria and Haliburton counties. Radar reports between 5:20 and 5:40 p.m. also indicated the very rapid development of storms moving across Eastern Lake Erie to the Niagara Peninsula. As a result at 5:50 p.m. severe storm warnings were issued for the Haldimand-Norfolk and Niagara Regional municipalities.

Further details on tornadoes in Orangeville and in the Tottenham area came in to the Ontario Weather Centre between 5:30 and 6:00 p.m. Based on the continuing strength of the radar echoes, tornado warnings were extended to Southern Durham and Peterborough Counties at 6:05 p.m. and to Haliburton, Northumberland, Prince Edward and Hastings counties at 6:25 p.m. At 7:00 p.m. all watches and warning messages were cancelled for all regions except for Haliburton and Lake Ontario east of Oshawa. Between 6:40 and 7:20 p.m. reports were received of tornadoes just southwest of Peterborough and in Rawden Township of Southern Hastings county.

At 7:10 p.m. the tornado warning was extended east again to include Lennox and Addington, Renfrew and Frontenac counties which mark the eastern most areas served by the Ontario Weather Centre. At about the same time the Quebec Weather Centre in Montreal, which handles forecasts for the Ottawa - Cornwall and vicinity, was notified of the continuing presence of tornadoes in the storms headed their way.

Finally at 9:20 p.m. the remaining watches were cancelled for Eastern Ontario.

4. Tornado Paths and Estimated Time of Occurrence

The tornado paths and time estimates contained in this report were determined from aerial surveys and on-site investigations of the tornado paths by Ontario Weather Centre staff, from provincial police reports, photographs, newspaper clippings, weather watcher reports, eye witness accounts, etc. Only information assembled before June 10th was available to prepare this report.

General information concerning all tornadoes and other related reports of severe weather are given in this section mostly in map form. Detailed accounts for individual tornadoes are provided in the next section.

4. Tornado Paths and Estimated Time of Occurrence - Cont'd...

Numerous reports of large hail and damaging winds were received on May 31st as the severe thunderstorms developed and moved across Southern Ontario. In particular, over the Southern Niagara Peninsula hail as large as softballs was reported. Fortunately, these storms missed the fruit belt north of the escarpment. However, in the Welland and Port Colbourne areas there was numerous reports of damage to cars and property due to the extremely large hailstones. An estimated 40 people suffered minor cuts due to flying glass. Preliminary reports are that damage in excess of \$1 million resulted from this hail storm.

The general area affected by severe thunderstorm activity as determined from reports received to date is depicted in Figure 1. This figure also shows the approximate location of all tornadoes confirmed to date.

Figures 2, 3 and 4 depict the tornado paths in different parts of Southern Ontario as determined from the investigation using all information sources. Estimated times of occurrence (Eastern Daylight Saving Time) are also shown for various points along the tornado paths. In most cases these were determined from eye witness accounts or weather watch reports. The lengths of the individual tornado paths are also shown in these figures. It should be noted that the tornado paths from Mount Forest to Barrie may have resulted from different tornadoes formed under the same severe thunderstorm complex.

Table I provides a detailed comparison of the time of occurrence of tornadoes in each county with the time of issue of severe thunderstorm warnings and tornado warnings. For counties west of Lake Simcoe severe thunderstorm warnings were issued 45 minutes to 1 hour in advance of the occurrence of the tornadoes. From Lake Simcoe eastward, once tornadoes had been reported, tornado warnings were issued 15 to 45 minutes in advance of the tornado occurrences.

5. Damage and Descriptions of Individual Tornadoes

Investigations over the past week have brought to light 9 separate damaging tornadoes across Ontario on May 31, 1985. The following is a description of each of these storms in the chronological order they first touched down. Figures 2 through 5 show the tracks of these storms.

5.1 Rush Cove Tornado - Figure 4

About 3:00 p.m. a small tornado touched down about 1.6 km southwest of the coast of Georgian Bay near Rush Cove and moved northeast out over Barrow Bay. Rush Cove is located about 25 km due north of Wiarton. One barn and three outbuildings were completely destroyed. One older house had its chimney blown off, siding torn off, and windows blown out. A 9 metre sailboat was lifted from a trailer and dropped 1200 metres away. There were no reports of any personal injuries with this storm.

5.2 Barrie Tornado - Figure 2

About 4:10 p.m. a funnel cloud dipped down from a severe thunderstorm in Egremont Township about 4 km southwest of Hopeville. For the next 50 minutes the severe thunderstorm travelled east-northeastward at 75 km/h over a distance of 85 km. It appears to have generated a series of 5 tornadoes which culminated in the devastating storm which struck southern portions of the city of Barrie. It is also conceivable that the damage paths could have resulted from one or two tornadoes touching down more than once.

a) Damage Area 1 (Hopeville)

Three concessions southwest of Hopeville to near Grey County Road 8.

Path Length: 17 km (the storm may have skipped occasionally)

Time: about 4:10 p.m.

Description of Damage: numerous barns and outbuildings were destroyed or severely damaged. Only minor damage to houses was indicated. No injuries were reported.

b) Damage Area 2 (Corbetton)

From 1 km southwest of Corbetton, a village southeast of Dundalk on Highway 10, to near Randwick at the intersection of Airport Road and the 25th Sideroad of Mulmur.

Time: struck Corbetton area at 4:17 p.m.

Path Length: 35 km

Description of Damage: the width of the damage path averaged 200 to 300 metres to just south of Honeywood where it narrowed to 50-100 metres. Through this area about 15 barns or outbuildings were destroyed and about 10 houses were heavily damaged. Cars and trucks were tossed around with some moved 60 metres. The storm continued to just south of Ruskview where it appears that a split occurred. A weakening portion appears to have lifted off the ground and moved northeast. Debris was found several km north of Ruskview. One sign which originated near Highway 24 was discovered near the hamlet of Glencairn. It had travelled about 20 km. The southern part of the storm moved from south of Ruskview to south of Randwick where it also appears to have lifted off the ground.

c) Damage Area 3 (Lisle)

Two concessions east of Randwick the tornado appears to have touched down again. Tree damage is reported as far east as Camp Borden. Two barns were destroyed near Lisle. Investigators were not allowed onto Camp Borden but reports from the Base Police and aerial surveys indicate little damage on the Base and no damage further east.

d) Damage Area 4 (Essa)

South of Essa.

A brief touchdown occurred just South of Essa. A half km long track of tree damage was evident from aircraft investigations. Apparently no buildings were damaged.

e) Damage Area 5 (Barrie) - Figure 5

The final and most dramatic touchdown began about 2 km northwest of Holly. The path of the tornado through the city of Barrie is given in Figure 5. The tornado crossed Ardagh Road about 1 km west of Crawford Road. In this area a plantation of 10 metre pine trees was totally destroyed. Aerial photographs indicate that the damage path was at least 600 metres wide in this area. Moving eastward the tornado was extremely strong with winds likely in excess of 400 km/h. Crossing Crawford Road towards Patterson the storm totally destroyed many houses. Cars were blown hundreds of metres into the bush. Further east with a width of 350 to 450 metres the storm crossed towards Highway 400. Twelve factories were destroyed just west of Highway 400 while at least 4 others near the edge of the track were heavily damaged. The storm moved just south of the Barrie racetrack with heavy damage to the horse barns and grandstand.

The tornado then moved into the Hillsdale subdivision. A townhouse complex on Adelaide was destroyed. Heavy damage occurred on Debra Crescent. Heavy damage was reported in a 300 metre swath from Marshall Street to Joanne Crescent. East of Tower Crescent the damage path narrowed abruptly to about 50 metres. Homes on Briar Road received only minor damage indicating the tornado may have lifted up somewhat. Yet at Trillium Crescent, the next street east, heavy property damage resulted. Further east the storm moved into an industrial area. Four warehouses were destroyed near Highway 11. The tornado crossed Yonge Street at Minets Point Road and headed towards the CNR tracks cutting a 100 metre wide swath through the trees. The storm hit the northwest corner of the Royal Oak Subdivision and felled many large trees. There was much less damage to houses here than in the Hillsdale Subdivision. The tornado next hit the Minet Point Marina. According to police reports thirty-five sailboats have completely disappeared. Amazingly, the heavy cement anchors embedded in the bottom of the lake holding the boats are also gone. Debris from the storm was spotted 5 km from shore on Lake Simcoe. No damage has been discovered on the opposite shore, although reports of debris from the tornado have been received from Oro township along the north shore of Lake Simcoe, Orillia and south of Bracebridge.

5.3 The Grand Valley-Tottenham Tornado - Figure 2

At 4:15 p.m., only a few minutes after the start of the storm which would hit Barrie, another tornado touched down just north of Arthur. This same tornado remained on the ground for an incredible 90 km as it tracked east-northeast at 85 km/h to the east end of the Holland Marsh. It then skipped along a further 17 km before lifting off for good near Mount Albert.

The damage path width varied from about 150 metres to 400 metres occasionally up to 600 metres wide. Nearly all structures within this track were damaged. Well over 100 homes were seriously damaged or destroyed with at least that many barns and outbuildings destroyed.

From Arthur to Grand Valley the damage path ranged from 150 to 400 metres wide. Estimates are that 40 buildings were seriously damaged or destroyed. In the town of Grand Valley an estimated 40 to 50 homes near the centre of the tornado track were destroyed. Winds with the tornado are estimated to have exceeded 400 km/h. Dozens of other buildings on the edge of the track suffered varying degrees of damage. One indication of the intensity of the storm was the roof of the Library being lifted and thrown 200 metres before crashing down on a house. Two people were killed in the town.

From east of Grand Valley to Orangeville the swath of damage continued 150 to 300 metres wide. The most noteworthy damage was at Mono Plaza north of Orangeville. The plaza was levelled. East of Orangeville all the way to Holland Marsh the damage swath continued with a similar degree of damage occurring. Particularly hard hit was the area just south of Tottenham where about 15 homes were extensively damaged or levelled and two deaths were reported. There was some evidence all along the track of a second weak swath of tree damage a few hundred metres south of the main track but little property damage has been noted.

The tornado moved down into the Holland Marsh just southeast of Dunkerron and followed the canal road eastward and then northeastward about 5 or 6 km. It destroyed hundreds of trees along the canal and did considerable damage to buildings along the north canal road. The tornado then headed directly eastward across the marsh hitting the village of Ansnorveldt after destroying three hydro transmission towers. East of the Holland Marsh the storm began skipping with less serious intermittent damage reported. The storm appears to have lifted off for the last time near Mount Albert.

5.4 Alma Tornado - Figure 3

Time: approximately 4:15 - 4:30 p.m.

Path Length: 33 km (continuous damage over 8 km skipping over remaining 25 km) Details of Damage: In Peel Township near Alma 4 houses were extensively damaged, 10 barns and outbuildings destroyed, some damage to 1 other house and 2 boats.

From East of Lake Belwood to just southeast of Dufferin County road 3 - a narrow path of damage - 1 house reported destroyed.

From County Road 3 to east of Hillsburgh - light damage, the tornado appeared to be aloft most of the time.

5.5 Wagner Lake Tornado - Figure 3

Time: 5:40 p.m.

Path Length: 5 km

Details of Damage: 1 barn demolished, some tree damage

5.6 Reaboro Tornado - Figure 3

Time: 6:05 p.m.

Path Length: 8 km

Details of Damage: 2 barns heavily damaged, 1 shed levelled, scattered tree damage.

5.7 Ida Tornado - Figure 3

Time: 6:20 p.m.

Path Length: 9 km

Details of Damage: Church 1 km south of Ida badly damaged. Stone home across street completely destroyed, spotty barn and tree damage further east along track.

5.8 Rice Lake Tornadoes - Figure 3

Time: 6:20 - 6:30 p.m.

Path Lengths: 7 km and 11 km

Details of Damage: 5 barns destroyed. House trailers blown over, several boats sunk, several cabins destroyed, hundreds of trees with diameters up to 1 metre downed. Estimates of damage of to \$2 million mainly in Birdsall Beach area.

5.9 Minto Tornado - Figure 3

Time: 6:35 p.m.

Path Length: 1 km

Details of Damage: very narrow path of damage 10 - 15 metres wide. Two large barns and two wooden sheds destroyed.

6. Recommendations

The following recommendations are made as a result of the preliminary investigation conducted by the Ontario Weather Centre.

- 6.1 A public education program needs to be undertaken to make people more aware of the nature of severe storms. For example there seems to be a widespread misconception that severe thunderstorms and tornadoes are independent events. Also, the public in general, and emergency officials in particular, need to understand the steps they should take when a watch is in effect; when a warning is in effect; or, when a severe storm appears imminent.
- 6.2 The methods in use for distributing warnings to the public and to emergency officials needs to be reviewed in detail.
 - a) Consultation with the media and emergency officials should be an integral part of this review.
 - b) Evaluation of the public awareness of and reaction to Environment Canada's weather watches and warnings should be undertaken.
- 6.3 The Weather Centre needs to improve its ability to detect severe thunderstorms and tornadoes:
 - a) Doppler Radar has been shown to be a fairly effective, though far from a foolproof method of detecting severe thunderstorms which may produce tornadoes. Research should be accelerated to assess the abilities of the newly acquired Doppler Radar at King City.
 - b) Additional severe weather watchers in rural areas of Ontario especially upstream of population centres need to be recruited.
 - c) The Ontario Weather Centre should undertake a development project with a view to identifying any new knowledge resulting from this survey and report the data collected on this storm that would improve future forecasts.
 - d) The Ontario Weather Centre will review its severe weather procedures in consultation with other regional units in view of the May 31st experience.

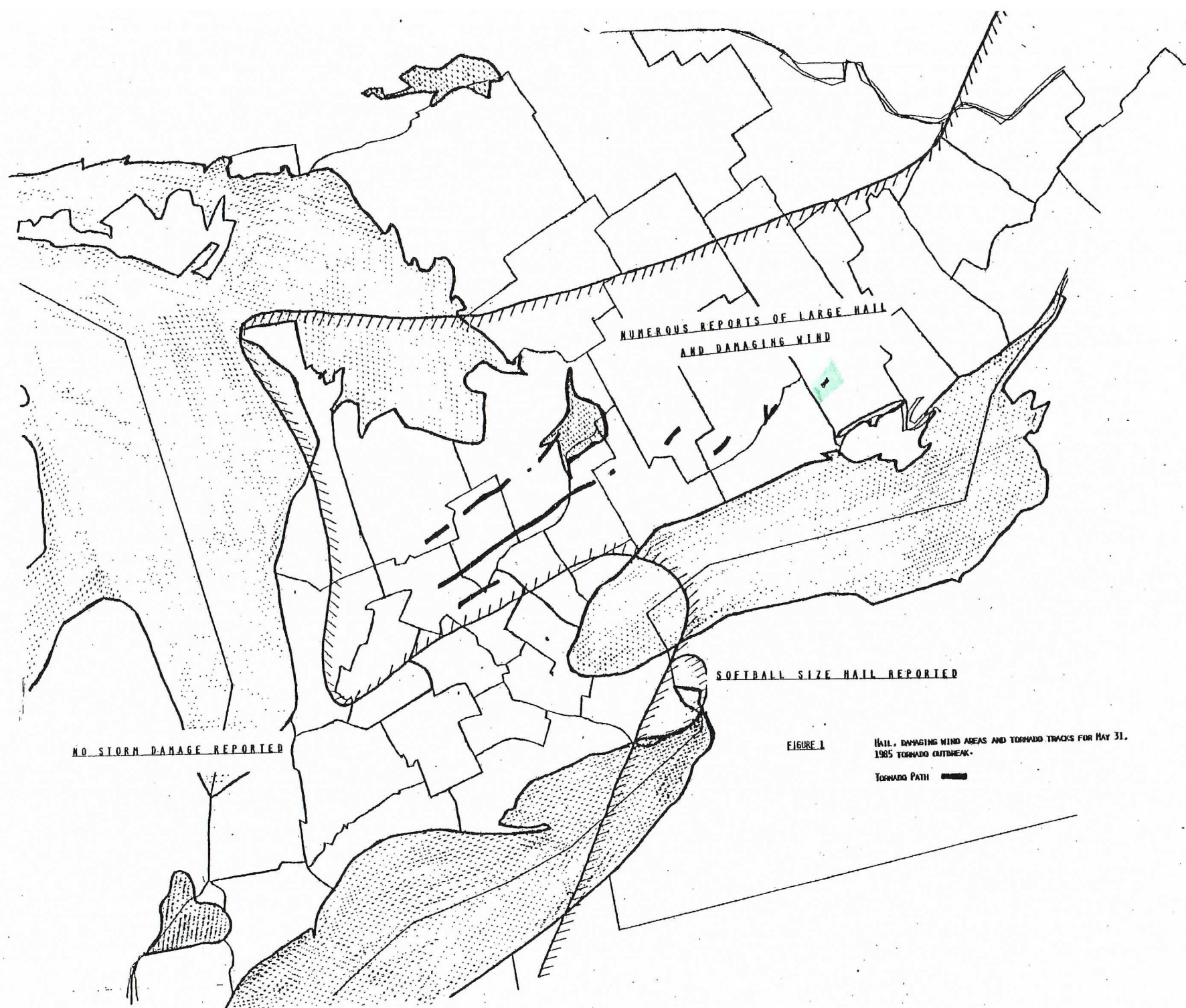
7. Conclusion

Tornadoes do occur in Southern Ontario though the majority of them are fairly weak and small scale. Storms of the power of the May 31st, 1985 event, though much less frequent, have occurred in the past and will occur again. As populations through Ontario increase, especially in more and more centres, the odds will increase of further major tornado events occurring in populated centres. Through education and further research, Environment Canada's goal should be to give the public a better understanding of the nature of these storms, and in conjunction with other federal and provincial agencies, and the media, a longer warning time in which to take action, and a knowledge of the steps to take to protect themselves in the event of severe storms.

TABLE ITime of Occurrence of Tornadoes by County

<u>Counties</u>	<u>Issue Time of * Severe Thunderstorm Warning</u>	<u>Issue Time of Tornado Warning</u>	<u>Time of Actual Storm</u>
Northern Bruce	2:25 p.m.	-	3:00 p.m. Rush Cove Tornado
Northern Wellington	3:15 p.m.	-	4:15 p.m. Tornado Touchdown near Arthur
Dufferin	3:54 p.m.	-	4:28 p.m. Grand Valley 4:45 p.m. Orange- ville
Southern Grey	3:15 p.m.	-	4:17 p.m. Tornado Touchdown near Corbetton
Southern Simcoe	3:54 p.m.	5:00 p.m.	5:18 p.m. Holland Landing.
Northern Simcoe	3:54 p.m.	-	5:00 p.m. Barrie
Northern York	4:53 p.m.	5:00 p.m.	5:25 p.m. Holt
Northern Durham	4:53 p.m.	5:20 p.m.	5:40 p.m. Wagner Lake
Southern Victoria	N/A	5:20 p.m.	6:05 p.m. Reaboro
Southern Peterborough	N/A	6:05 p.m.	6:20 p.m. Cavan 6:25 p.m. Birdsall
Southern Hastings	N/A	6:25 p.m.	6:35 p.m. <u>Minto</u>

* These severe thunderstorm warnings issued by the Ontario Weather Centre contained the statement: "Remember some severe thunderstorms produce tornadoes."



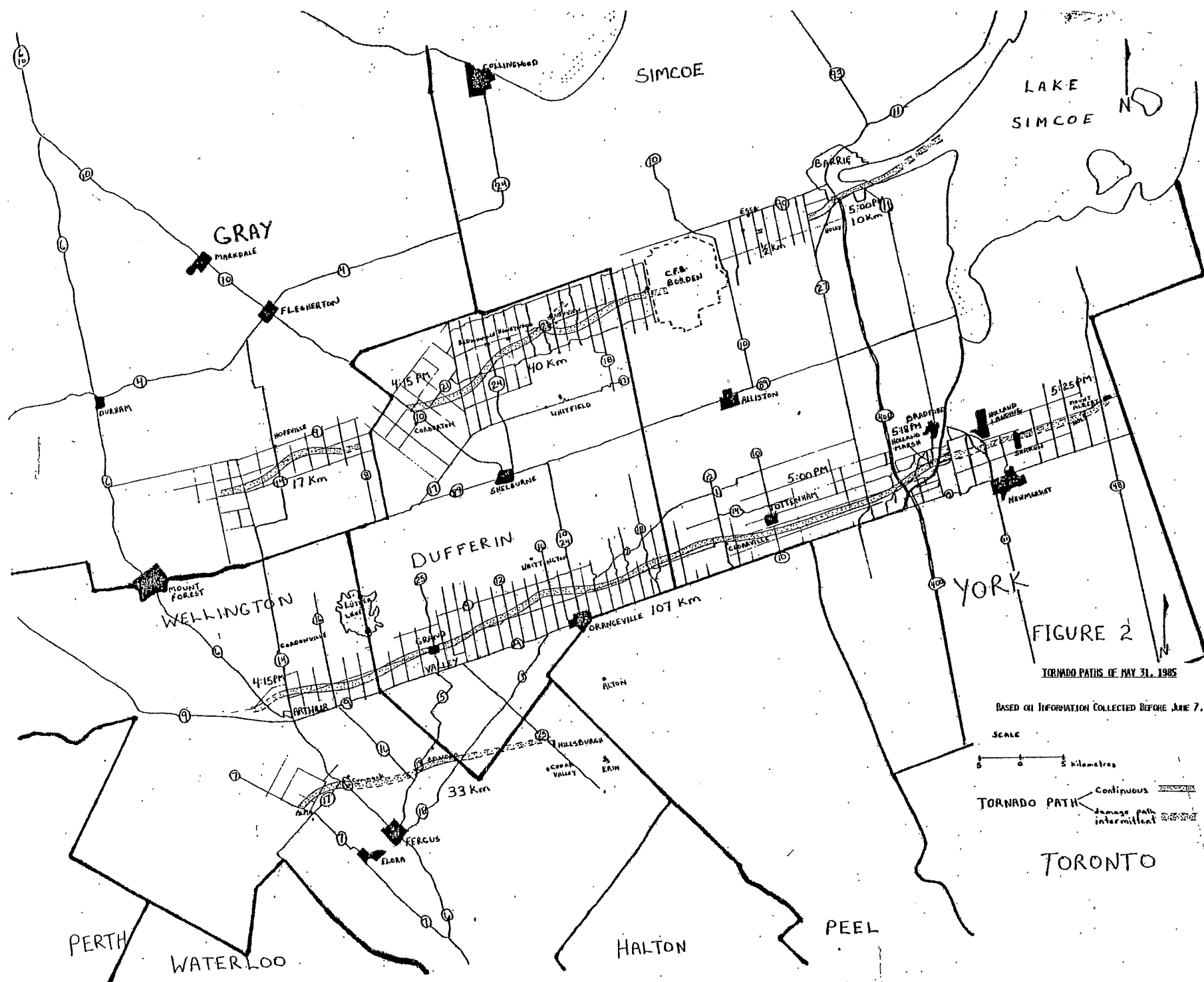



FIGURE 2

TORNADO PATHS OF MAY 31, 1985

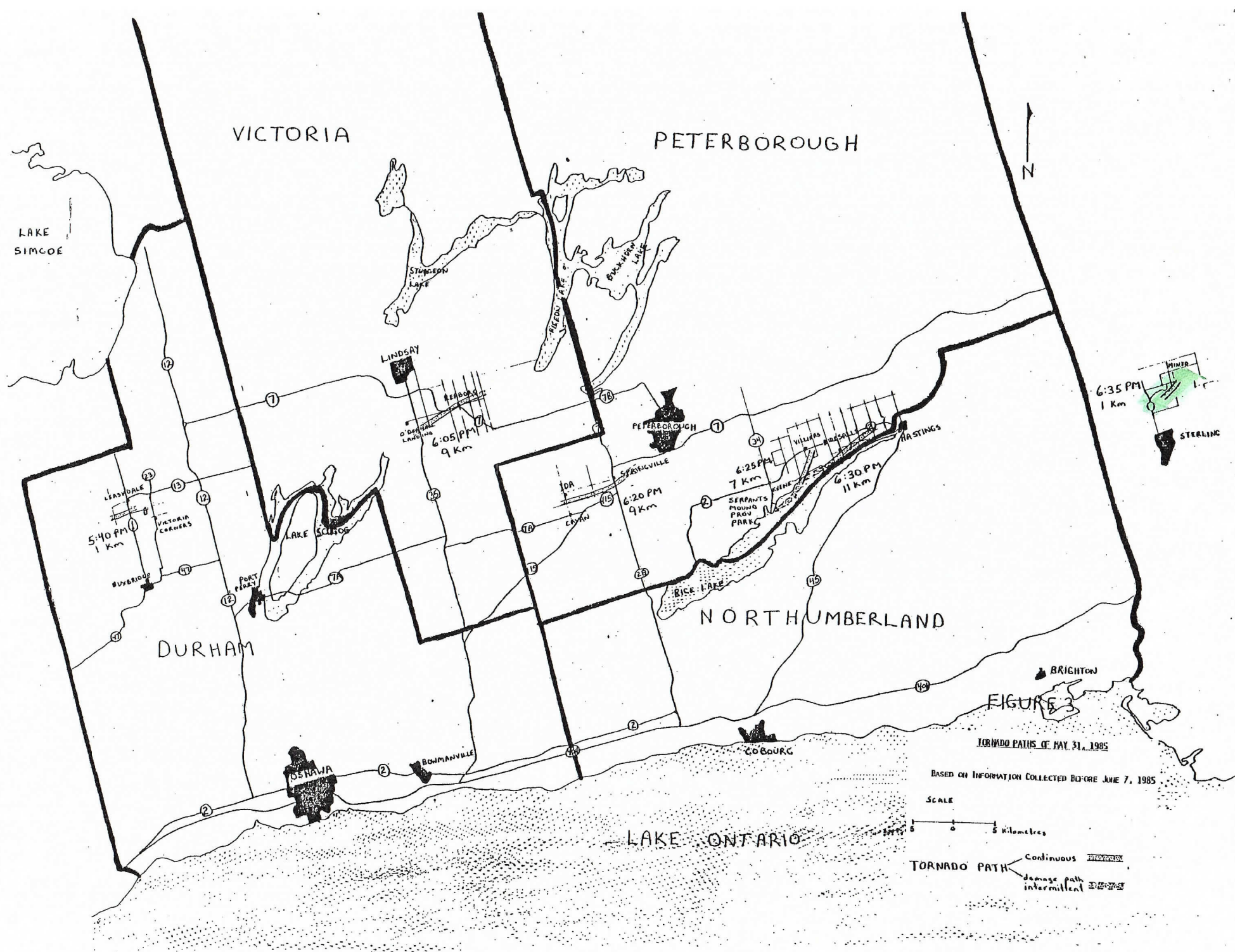
BASED ON INFORMATION COLLECTED BEFORE JUNE 7, 1985

SCALE



TORNADO PATH Continuous
damage path
intermittent

TORONTO



TORNADO PATH OF MAY 31, 1985

BASED ON INFORMATION COLLECTED BEFORE JUNE 7, 1985

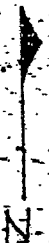
SCALE

5 0 5 Kilometres

TORNADO PATH



GEORGIAN BAY



LIONS HEAD

BARROW BAY

RUSH COVE

BARROW BAY

MELVILLE

SOOND

6

9

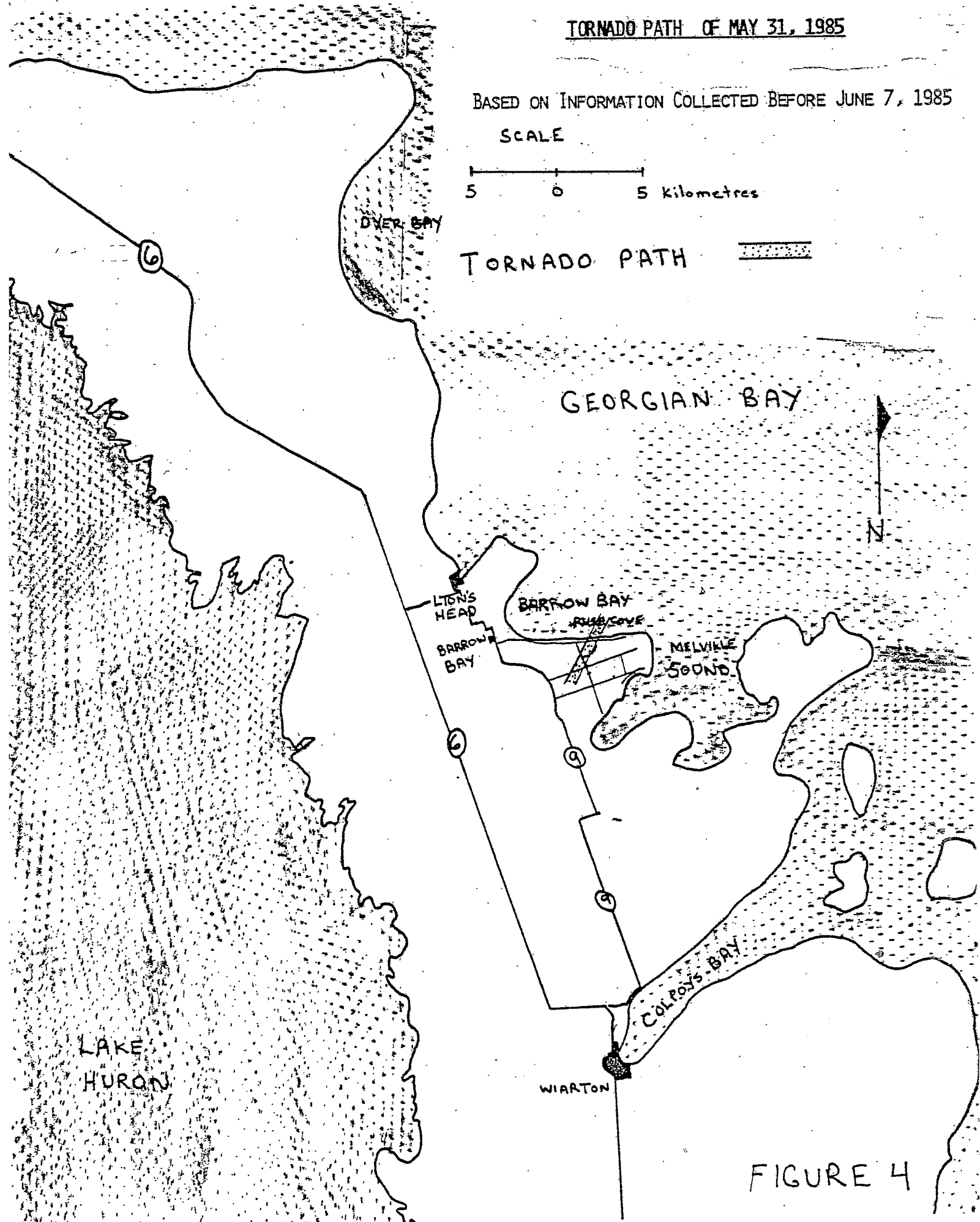
9

COLBOYS BAY

WIARTON

LAKE HURON

FIGURE 4



TORNADO PATHS OF MAY 31, 1985

BASED ON INFORMATION COLLECTED BEFORE JUNE 7, 1985



FIGURE 5

Numbers are keyed to houses.
Tour distance approximately 5 km/3 mi.



CITY OF BARRIE
ENGINEERING DEPARTMENT

TORNADO PATH
Continuous
damage path
intermittent

5

6

PRELIMINARY
ESTIMATE
FOR
TORNADO
DAMAGE
PATH

MINOR
DAMAGE

WARD 4

B

C

D

E

F

WARD 5

1

2

3

4

5

6

7

8

9

10

11

12

WARD 3

WARD 2

WARD 1

KEMPENFELT BAY

LITTLE LAKE



Government
of Canada

Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

TO
A M. Leduc
Severe Weather Meteorologist
OWC

FROM
DE OIC Kingston.

SECURITY - CLASSIFICATION - DE SÉCURITÉ
OUR FILE/NOTRE RÉFÉRENCE
YOUR FILE/VOTRE RÉFÉRENCE
DATE 10 June 1985

SUBJECT
OBJET TORNADO DAMAGE - MINTO, ONTARIO.

1. On wednesday June 5th an investigation of the May 31st Tornado damage at Minto, Ontario on Lot 6 Conc. 5, Rawdon twp was carried out. It was very difficult to pin down a time of occurrence on this event, but it was generally stated that the time was between 6:00 - 6:30 p.m. one person felt that it was near 6:10 p.m. because it occurred just after the 6:00 p.m. news.

Although some evidence of tree top damage can be found 4 KM to the WNW on HWY # 14 & also on the side road immediately east, the Tornado first appeared to touchdown to the North & South of the B. Perrault residence. A rail fence just south of the house was destroyed, while the barn located ENE of the house was destroyed, there may possibly have been two funnels in that area, they appeared to join as one as they moved eastward towards the home of Mrs. Campbell (lot 6 Conc. 5 Rawdon Twp.). Mrs. Campbell saw the storm coming from the west and described it as an extremely dark cloud, inky black, she claimed she also saw the wind coming (no doubt it was the debris from the just previously demolished Perrault barn to the west north west). She indicated there was some hail just before the storm hit. When the storm hit there was a loud roaring noise, heavy rain, her ears popped, she claims that she could feel the floor of the house raise, doors slammed open and shut and the windows rattled. A large spruce tree close to the house was the first to go as the storm hit, the tree fell just catching the corner of the house as it fell. A garage next to the house was then demolished and the storm then continued eastward to the barn that is owned by Mr. Tom Woods. The barn was completely destroyed, a steel grain wagon was hurled upside down and a hay elevator was upset. Evidence of a Tornado can be seen on photo #8 - note the twisted bark on the spruce tree trunk. The Tornado then continued ESE ward across a pasture field for another 1 KM before reaching a maple bush. 3 maple trees 60 cm in diameter were uprooted before the Tornado appeared to rise off the ground and just take the tops off the trees. At this point the area of damage on the ground was 30 metres wide. Broken tree tops were evident some 2 KM further to the ESE on a side road.

Mr. Forestell, a farmer who resides just north and across the road from Mrs. Campbell recalled that he had just finished chores at his barn and was getting into his 1/2 ton truck which was parked at the barn when the storm hit. He recalls some hail fell first, the sky turned extremely dark almost dark as night, he could hardly see. Heavy rain and strong winds occurred. He did watch the well head bldg on his property in the path of the storm literally explode.

I talked to Glen Hagarman, a severe weather watcher who resides about a mile east of the Tornado path. He phoned OWC when he saw the severe weather arriving at his home. Mr. Hagarman indicated that a neighbour just west of the Campbell house saw a funnel cloud with the storm. I was unable to contact these people. At an automobile and farm equipment dealer where Mr Hagarman works in Springbrook (north on hwy #14) some automobiles were dented from large hail stones that fell on the eve of may 31st. I also talked to Lorne Hagarman who lives on E 1/2 lot 2 Conc. 6 about 5 KM ENE of the demolished barns at Minto, he stated that very large hail fell at his home, golf ball size, and the ground was white at one time, on may 31st.

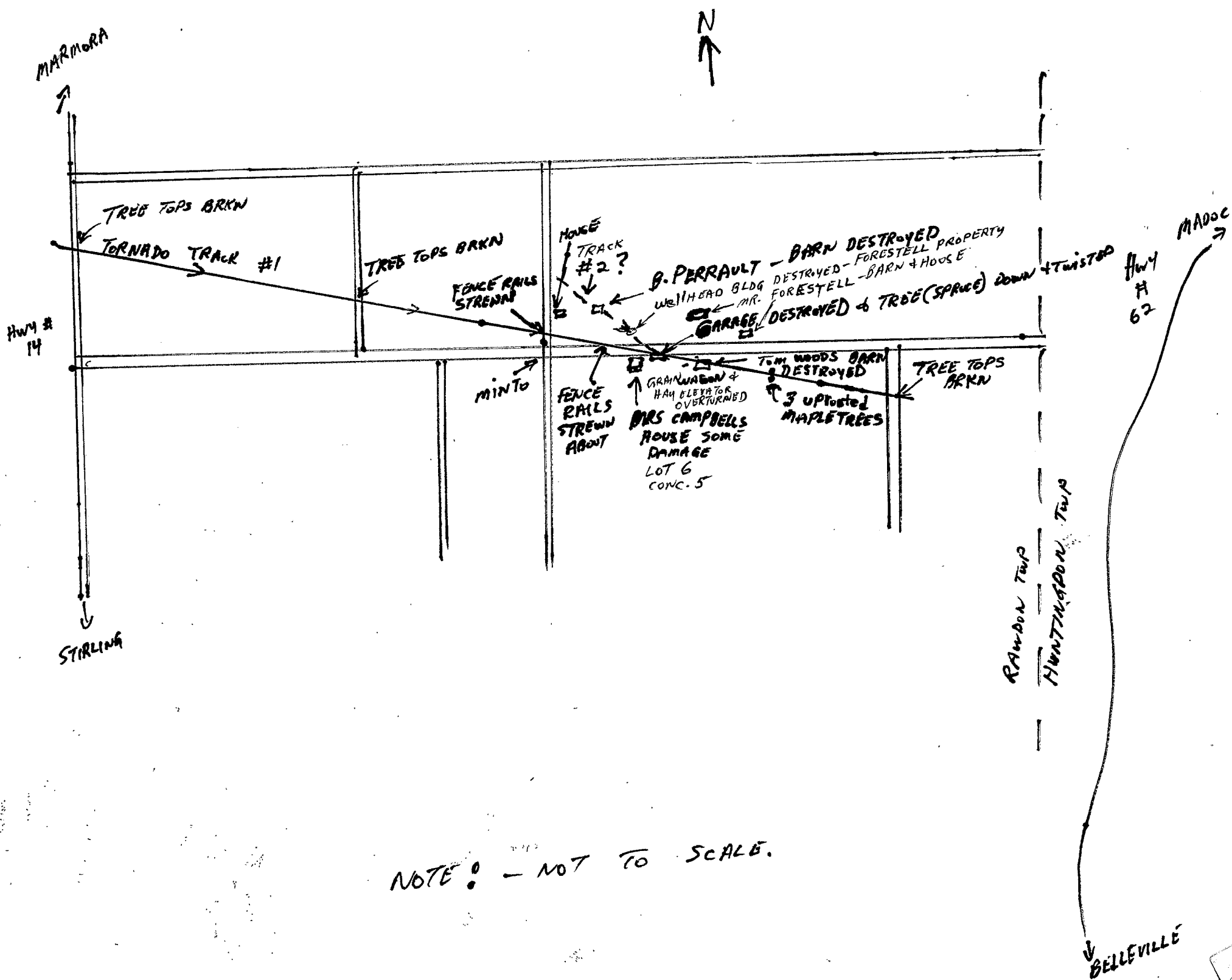
Apparently hail was widespread with this storm. I talked with a service station operator at Thomasburgh on Hwy # 37 near Tweed. He stated that large hail fell there at 7:00 p.m.. He knew it was 7:00 p.m. because it was right at closing time, hail also occurred at Tweed and eastward to Marlbank.

G. Hasler

G. Hasler

Officer-in-Charge.

- Photo # 6a,b,c, - show Perrault destroyed barn
" # 7 - looking WNW, rail fence replaced by wire fence, wellhead in middle of Forestell pasture, Perrault destroyed barn is located beyond the tree line about 2 KM wnw.
8 - Twisted bark on spruce tree trunk just outside Campbell house, then destroyed garage, then eastward to barn of Tom Woods, note Steel grain wagon overturned.
#9 - Looking eastward , Mrs. Campbell's house, garage, Tom Woods barn
#10 - Eastward towards Woods barn.



NOTE: - NOT TO SCALE.

APPENDIX 2





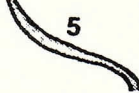
Summer Severe Storm Survey

NAME OF INVESTIGATOR GORDON HASLER	INVESTIGATOR'S PHONE 389-8349	DATE OF INVESTIGATION 5 JUNE 85
INVESTIGATOR'S ADDRESS KINGSTON CNO 4		

1.	NAME(S) OF PERSON(S) INTERVIEWED LORNE HAGARMAN, GLEN HAGARMAN, MRS CAMPBELL, MR FORESTELL (no one home at B. PERRAULT Home)											
2.	ADDRESS (NOT RR#) OF THIS LOCATION Lot 6 COW 5 RANDON TWP Lot Con. Twp Co. or # street, town											
3.	PHONE NUMBER OF PERSON INTERVIEWED Area Code Number											
4.	(a) TIME AND DATE OF THE EVENT AT THIS LOCATION MAY 31/85 6:00 P.M. - 6:30 P.M.											
	(b) HOW WAS THE TIME DETERMINED (STOPPED CLOCK, POWER FAILURE, MEMORY, A TIME-FIXING EVENT ETC)											
5.	DESCRIPTION OF THE DAMAGE 2 BARNs DEMOLISHED, HOUSE DAMAGED, GARAGE & Well Head BLDG DESTROYED.											
6.	VISUAL SKY COLOUR? Y or N if yes, describe VERY DARK ALMOST BLACK AS NIGHT											
7.	(a) HAIL? <input checked="" type="radio"/> Y or <input type="radio"/> N yes, GOLF BALL SIZE to NORTH of TORNADO TRACK											
	(b) HAIL SIZE (CIRCLE) <table border="0"> <tr> <td>PEA</td> <td>GRAPE</td> <td>WALNUT</td> <td><input checked="" type="radio"/> GOLF BALL</td> </tr> <tr> <td>TENNIS BALL</td> <td>OTHER</td> <td>UNKNOWN</td> <td>DIAMETER(MM)</td> </tr> </table>				PEA	GRAPE	WALNUT	<input checked="" type="radio"/> GOLF BALL	TENNIS BALL	OTHER	UNKNOWN	DIAMETER(MM)
PEA	GRAPE	WALNUT	<input checked="" type="radio"/> GOLF BALL									
TENNIS BALL	OTHER	UNKNOWN	DIAMETER(MM)									
8.	RAIN, HOW MUCH? —											
9.	(a) COMMENTS ON RELIABILITY OF WITNESS REPORTS I WOULD SAY RELIABLE											
	(b) DOES WITNESS KNOW OF OTHERS WHO WERE AFFECTED BY OR WITNESSED STORM? If yes: yes											
10.	<table border="0"> <tr> <td>Name</td> <td>Address</td> <td>Phone#</td> </tr> <tr> <td colspan="3">ANY INJURIES RELATED TO STORM NO</td> </tr> </table>				Name	Address	Phone#	ANY INJURIES RELATED TO STORM NO				
Name	Address	Phone#										
ANY INJURIES RELATED TO STORM NO												
11.	DOES EVIDENCE INDICATE NEED FOR DETAILED ON-SITE SURVEY? Y or N If <input checked="" type="radio"/> Y contact Severe Weather MT OWC											

APPENDIX 4

Detailed Severe Weather Survey Form

1.	(a) FUNNEL SEEN <input checked="" type="radio"/> Y or <input type="radio"/> N		by NEIGHBOUR ^{who lives} just west of Campbell-House.	
(b) FUNNEL TYPE (CIRCLE)				
<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>1 Multiple</p> </div> <div style="text-align: center;">  <p>2 Smoke-like</p> </div> <div style="text-align: center;">  <p>3 Columnar</p> </div> <div style="text-align: center;">  <p>4 Cone</p> </div> <div style="text-align: center;">  <p>5 Rope-like</p> </div> <div style="text-align: center;"> <p>6 Unknown</p> </div> <div style="text-align: center;"> <p>7 Other</p> </div> </div>				
(c) IF MULTIPLE HOW MANY			(d) FROM WHICH DIRECTION	
2.	UNUSUAL NOISE <input checked="" type="radio"/> Y or <input type="radio"/> N If yes, describe ROARING NOISE (MRS CAMPBELL)			
3.	ANY EVIDENCE OF RAPID PRESSURE DROP? (E.G. WINDOWS BLOWN OUT) <input checked="" type="radio"/> Y or <input type="radio"/> N EARS POPPING, FELT FLOOR OF BUS RAISE, DOORS SLAMMING.			
4.	EVIDENCE OF SWIRLING (CIRCULAR) MOTION IN DEBRIS. <input checked="" type="radio"/> Y or <input type="radio"/> N If yes, describe NOTE TWISTED BARK ON SPRUCE TREE (PHOTOGRAPH # 6) TREE WAS ABOUT 12 metres FROM HOUSE OF MRS. CAMPBELL.			
5.	EVIDENCE DEBRIS WAS CARRIED A LONG WAY <input type="radio"/> Y or <input type="radio"/> N If yes, describe			
6.	EVIDENCE OF NARROW DAMAGE PATH <input checked="" type="radio"/> Y or <input type="radio"/> N If yes, estimate of width less than 30 metres			

