

PACIFIC REGION TECHNICAL NOTES

80-013

April 21, 1980

Kelowna Windstorm - Monday April 14/80

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INTRODUCTION

On the afternoon of Monday April 14th, 1980, a Pacific cold front crossed the Okanagan with violent winds causing extensive minor damage and in a few cases major structural damage (See Appendix A). Fortunately, there were no known injuries. There was no mention of wind in the public forecast issued at 5 a.m. Lytton in the Thompson Forecast District reported gusts to 27 knots by 1700Z, and a mean wind of 19 knots by 1900Z. A phone call to the public forecaster by one of the Kelowna staff members at approximately 2345Z resulted in an amended FP for several interior districts, issued at 2355Z.

SEQUENCE OF EVENTS UP TO AND DURING THE WIND STORM

During the weekend a strong upper ridge over southern B.C. and the Pacific Northwest supported a broad surface high pressure area and in some areas thermal troughing. By 4 p.m. Sunday, a well defined short wave trough at 133W was approaching the Washington/Oregon coast as was a 996mb surface depression with a broad frontal wave to the east and north. The wave was tilted to the west so that southern B.C. and the Pacific Northwest were in the warm sector with the cold front approaching from the southwest. A dry airmass was becoming warmer daily over the district. By 4 a.m. Monday, the upper trough was tilted NW/SE just off of the Washington coast and touching the southern Oregon coast. The winds aloft were southerly with temperatures decreasing sharply to the west. The surface low which had turned north was centered near 46N, 130W, with the cold front along the West Coast of Vancouver Island to just east of Portland. A weak thermal trough centered in the southern Washington Interior extended north into the Okanagan and Thompson Valleys. By 10 a.m. Monday, the offshore upper trough was getting the squeeze as a following upper ridge raised heights to the west steering the upper trough to the northeast. Southerly winds and cold air advection continued aloft. The surface low was centered at 47.5 N 128 W with the cold front west of Princeton and east of Wenatchee. A surface ridge of high pressure was rapidly developing behind the cold front in the denser airmass, with an apparent thermal trough intensifying over the southern B.C. interior in the warm sector. Our first indication that there would likely be gusty winds with the frontal passage was from the 1800Z Wenatchee report (See Appendix B) which increased from 2404 at 1700Z to 2228G45 with blowing dust. Gusty southerlies began at Lytton on the 1700Z report, possibly coinciding with the FROPA, although the pressure

did not begin to rise until the 1900Z sequence. All reports immediately upstream were now being monitored for signs of a FROPA, especially increasing winds. By noon, the Penticton winds had increased to 1614 but Princeton was still light NE (0604). As our own wind was light, concern was mounting that there would be gusty winds with the FROPA estimated in the next few hours and that some mention should be made of this to alert the local populace including boaters on Okanagan Lake. A wind warning was considered, but discarded as the prospect of strong winds seemed unlikely. All radio stations in Kelowna and Vernon (5) were phoned just after 2100Z and "rapidly increasing winds" was added to the forecast. Princeton and Kamloops rewarded our vigilance at 2100Z by reporting windshifts and increased wind velocity (See figure 1). Relieved now that we had a handle on the situation, we watched our own wind increase at 2200Z from near calm to 1616G24 and Kelowna Bridge to 2115. Princeton reported continuous rain with TCU 10 and PRESRR at 2200Z, but the mean wind had diminished to 7 knots. At 2230Z Penticton began a rainshower with gusts to 40 knots. At 2245Z a thunderstorm developed at Princeton, followed by a message from Penticton that Oliver reported a Squall line with gusts to 50 knots. A mild uneasiness followed as our own 2300Z observation underway showed TCU 7 and showers south to southwest with winds continuing the same. The Penticton 2300Z report indicated FROPA with gusts to 36 knots and PRESRR along with a thunderstorm. In the next 17 minutes at Kelowna Airport, the wind speed doubled as blowing dust almost completely obscured the sky and reduced visibility to 3/4 of a mile at 2317. The peak gust of 54 knots occurred at that time (See figure 2). Moderate rainshowers began at 2328Z as the wind veered to 2235G49 with PRESRR and a thunderstorm occurring at 2342Z. The temperature dropped 11 degrees in 15 minutes and 13 degrees in an hour. The pressure leaped up over 7mb in less than an hour. From 2330Z to 0000Z winds abated gradually to 11 knots with the direction backing into the south and finally the southeast by 0100Z as the speed dropped to 7 knots.

The author of this postmortem was driving enroute from the airport to the Kelowna Floating Bridge to check out the U2A recorder direction arm at the time of impact. Strengthening south to southwesterly winds were evident as was a solid dark mass of cloud moving in rapidly from the southwest and preceded by considerable blowing dust over the Lakeview/Westbank area. The peak wind followed quickly by rain, hit downtown Kelowna near 2310Z dropping visibility to one city block in blowing dust, gravel and tree limbs. Considerable difficulty was experienced climbing up the exposed staircase on the Bridge to the Lift Span Cab, but a 12 month tour of duty at Cape St. James in the late 50's provided the experience and total disregard for self preservation to make it to the top. The peak wind of 2455G75 had occurred at 2310, about 10 minutes earlier. The waves on Okanagan Lake were whitecapped and 4 to 6 feet high. An off duty Kelowna W04 staff member was driving across the Bridge at the time of the high wind, and reported that on the floating span spray from each wave pounding the south side was being carried across the traffic lanes.

In the North Okanagan, Vernon was struck by the storm less than half an hour later, with some structural damage and numerous downed trees and power lines.

In view of the overall damage reported in the papers, it was miraculous that there were no injuries or fatalities.

COMMENTS

The obvious question now is "Could we have foreseen winds of this magnitude developing locally in the Okanagan?" Using just the upstream SA's I would have to say NO. These sites indicated only a modest increase in winds with the FROPA. In past occurrences, Princeton and Kamloops have had dramatic wind shifts and have given us at least 2 hours warning. We are definitely handicapped by the loss of even the 3 hourly reports from Omak Washington as there are now no other reporting sites in northern Washington east of the Cascades. Wenatchee 140 miles south southwest of Penticton is the closest U.S. observing and reporting site. An active AES reporting site at Osoyoos would likely have provided valuable lead time to issuing a wind warning.

There were however 3 aspects during the developing period which together should have caused alarm bells to ring. FIRST, the 141200Z Quillayute raob indicated bags of cool moist air immediately behind the cold front, especially when compared to the Vernon ascent; SECONDLY, we were in the warm sector with only a variable cloud cover ahead of the front, permitting moderate to strong solar heating at the surface in an already dry airmass; THIRDLY, the Cold Front was progged to cross the southern interior in the heat of the afternoon. A quick surface analysis at 2100Z indicated a well defined north/south surface trough east of Princeton and west of the Okanagan with a much tighter pressure gradient west of the trough and cold front.

It is concluded that the sudden development of CB's by midafternoon along the cold front was the product of cool moist air advecting over the sunbaked Okanagan Valley and Highlands, with the steepest lapse rate occurring near and over Okanagan Valley where the highest surface temperatures were reached just prior to the arrival of the cold front. The strong surface heating and ultimate thermal troughing would also have caused the front to accelerate eastward after crossing the coast mountains which when combined with the explosive development of the convective cloud would provide unusually strong to severe, gusty surface winds.

Being dependant on strong solar heating at the surface, these "Super Pacific Cold Fronts" are a spring or summer phenomena occurring mainly in the afternoon or evening.

FIGURE 1 POSITION OF SURFACE TROF AT 2100 GMT

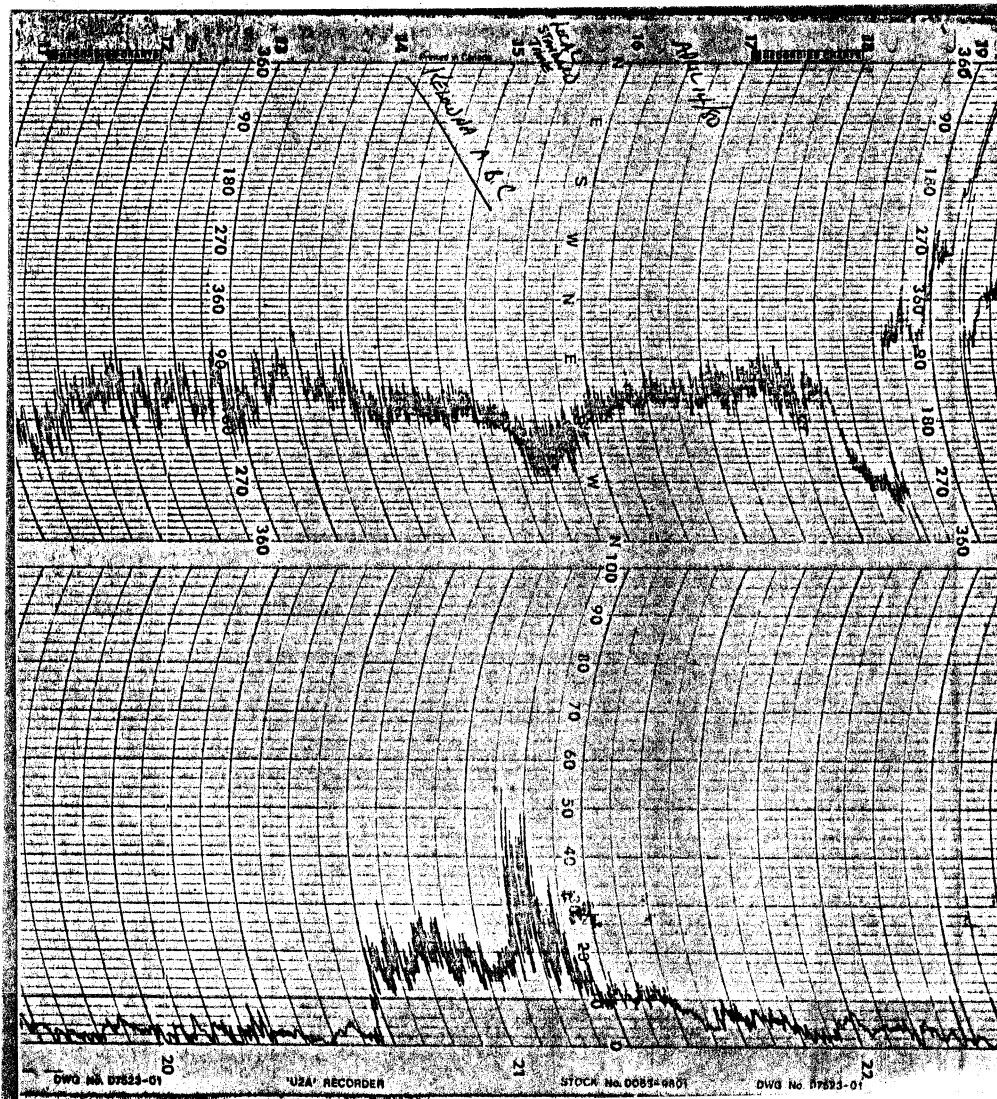
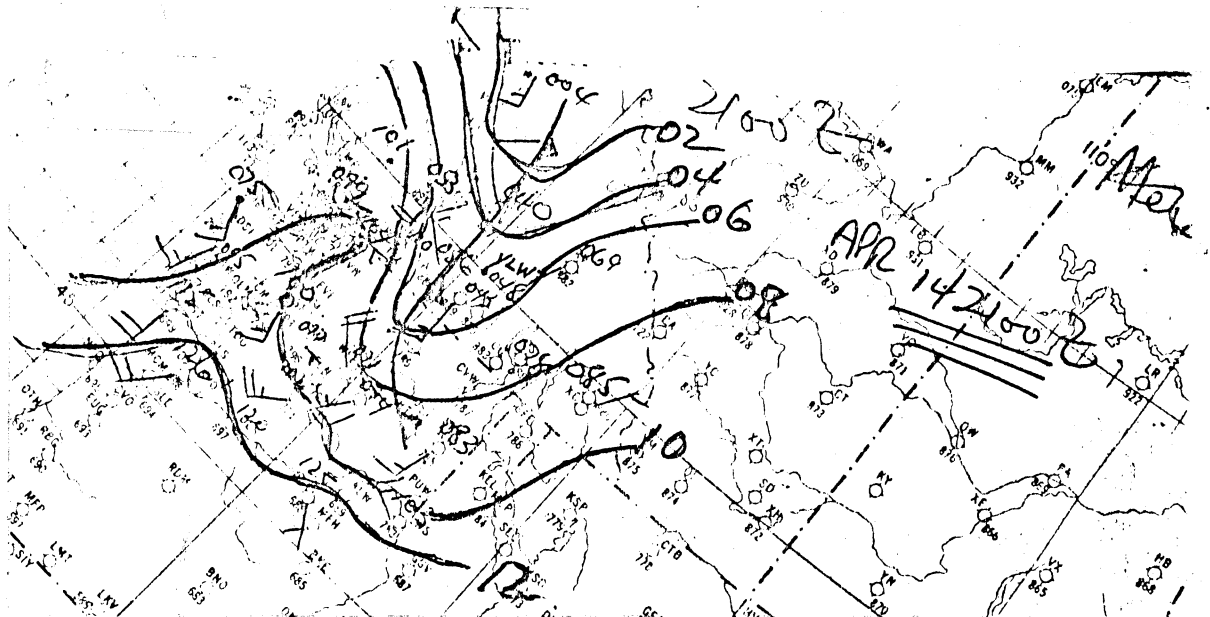


FIGURE 2

WIND RECORDER
OUTPUT FOR
KELOWNA AIRPORT

NOTE: (LOCAL STANDARD
TIME USED)

APPENDIX A

MS

171 121

YLW WTO 1 WVR 2

CCRM TORONTO

ATTN: ANDY RADOMSKI

COPY PAEMM VANCOUVER

U R G E N T

PART I

AT 3:17 PM APRIL 14 A SUDDEN AND VIOLENT WIND AND DUST STORM BEGAN AT THE KELOWNA AIRPORT. THE INITIAL SURGE FROM THE STORM PRODUCED A PEAK GUST OF SSW 100 KM/H. THIS IS THE STRONGEST GUST EVER MEASURED AT THE KELOWNA AIRPORT SINCE RECORDS BEGAN IN JUNE OF 1972. THE PREVIOUS RECORD OF NNW 89 KM/H WAS SET ON MARCH 30, 1975. A SECONDARY GUST OF SW 91 KM/H WAS TWICE RECORDED NEAR 3:30 PM. WIND SPEEDS DROPPED TO FAIRLY LIGHT BY 4 PM. A PEAK GUST OF 139 KM/H AT 3:10 PM WAS MEASURED AT THE KELOWNA BRIDGE SITE WHICH IS JUST TO THE SOUTH OF KELOWNA CITY.

THERE WAS A BRIEF FOREWARNING OF THE STORM APPROACHING AS BOTH PENTICTON AND PRINCETON AIRPORTS WERE REPORTING THUNDERSTORMS AND GUSTY WINDS AT 3 PM. ALSO SHOWERS WERE OBSERVED FROM THE KELOWNA OFFICE TO THE SOUTH AND SOUTH-WEST AT 3 PM.

AT APPROXIMATELY 3:15 PM A WALL OF BLOWING DUST WAS OBSERVED TO THE SOUTH RAPIDLY ADVANCING TOWARDS THE AIRPORT. THE HEIGHT OF THE DUST REACHED ABOUT TWO TO THREE HUNDRED FEET ABOVE GROUND. SHORTLY AFTER THE DUST CLOUD SPREAD TO THE AIRPORT THE VISIBILITY DROPPED WITHIN SECONDS TO LESS THAN ONE MILE, SETTLING AT 3/4 OF A MILE FOR A PERIOD OF ABOUT 10 MINUTES. FOR ABOUT ONE OR TWO MINUTES IT DROPPED TO 1/2 MILE.

END PART I

MS

171 121

YLW WTO 1 WVR 2

CCRM TORONTO

ATTN: ANDY RADOMSKI

COPY PAEMM VANCOUVER

U R G E N T

PART 2 OF 2

ALTHOUGH THE SKY NEVER BECAME COMPLETELY OBSCURED I WOULD ESTIMATE SEVEN OR EIGHT TENTHS WERE COVERED DURING THE TEN MINUTE TIME SPAN. IN THE HALF HOUR FOLLOWING THE ORIGINAL WIND GUST A PRESSURE RISE OF JUST OVER SEVEN MILLIBARS WAS OBSERVED ON THE BAROGRAPH CHART. TEMPERATURE DROPPED 10 DEGREES C IN 15 MINUTES AND 11.7 DEGREES IN ONE HOUR.

DAMAGE FROM THE STORM WAS OF A RELATIVELY MINOR NATURE. HARDEST HIT WERE DOWNED POWER LINES WHICH CAUSED A POWER FAILURE OF ABOUT HALF AN HOUR IN MOST AREAS ALTHOUGH SOME LINES WERE NOT RESTORED UNTIL LATE IN THE EVENING. OTHER DAMAGE REPORTED INCLUDED FENCES BLOWN DOWN, FLYING GARBAGE CANS HITTING CARS, PARTS OF ROOFS BLOWN OFF, AND A FEW SIGNS KNOCKED DOWN. NUMEROUS TREES WERE UPROOTED BUT ONLY ONE NEAR THE HOSPITAL WAS REPORTED TO HAVE DONE ANY DAMAGE TO BUILDINGS. AT THE AIRPORT A FEW AIRPLANES WERE BLOWN AROUND BUT ONLY ONE WAS SLIGHTLY DAMAGED. NORTH OF KELOWNA A BARN WAS DEMOLISHED IN THE NE VERNON REGION. ALSO AN ESTIMATED \$100,00 - \$150,000 DAMAGE TO A FARM IN THE SWAN LAKE AREA INCLUDING A SECOND DEMOLISHED BARN AND DAMAGE TO NUMEROUS OUT BUILDINGS. A BRICK WALL COLLAPSED DESTROYING A VOLKSWAGON RABBIT. NO INJURIES WERE REPORTED AS A RESULT OF THE STORM.

END PART 2 OF 2.

WO4 KELOWNA 151900

TREND SHEET

APR 14/80	Y/LW	Y/YF	Y/KA	Y/DC	Y/LY	EAT	Y/KM	SMP	
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2125 Z									
2200 Z	039 19 087 14 039 8 085 15 054 57 102	65 10							

WEATHER RECORD FOR APRIL 14, 1980

[illegible]