Final Report

of the

Investigation on the Storm of October 11-12, 1984

on the

West Coast of Vancouver Island

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CONCLUSIONS AND GENERAL RECOMMENDATIONS

A review of the circumstances of the storm of October 11-12, 1984 and of the fisheries activities which preceded it shows unambiguously that the weather services provided by Environment Canada on that occasion were inadequate: the storm was forecast much too late to influence the movements of fishermen and wind speeds in it were seriously underestimated.

A scrutiny of the weather forecasting and reporting processes has revealed a number of weaknesses and deficiencies which may have played some role in the failure to provide a timely forecast. The main problem seems, however, to have been caused by the unusual nature of the storm itself and by its explosive transformation from the weak remains of a tropical storm into a strong mid-latitude low pressure system in the last day of its approach towards the B.C. coast.

Our recommendations fall under two headings: those specific to the storm of October 11-12, 1984, and those pertinent to the general level and quality of weather services which should be made available to mariners on the B.C. coast.

A. Recommendations Specific to the Storm of October 11-12, 1984

In order to improve the likelihood of more accurate forecasts of this particular kind of storm in the future, we recommend that:

A1. A workshop be held to explore the understanding and detection of explosive deepening from ex-tropical systems. This workshop should be international in scope, with participation of operational coastal forecasters from Canada and the U.S.

A2. Research on the physics of the rapid deepening process be encouraged, either by commissioning it independently or by collaboration with other interested parties.

A3. In order to assess the possible effect of missing data on the predictability of the storm, CMC should be requested to rerun

their numerical prognoses for the period of interest with all data which will later have become available.

B. General Recommendations on the Provision of Weather Services to Mariners on the B.C. Coast

To most Canadians, weather forecasting is a service of great convenience in planning daily activities. To some, like farmers or the construction industry, profits or bankruptcy may depend on reliable forecasting. To others, in particular mariners and aviators, good weather forecasting and information is a matter of life and death.

A comparison of the weather services provided to mariners with those available to aviators shows a striking difference in the quality of weather information dispensed to each group, the frequency at which reports and forecasts are issued and the commitment of equipment and personnel assigned to each task. The needs of aviators and mariners are of course not identical (or independent), but the history of losses of life and property at sea of Canada's fishing fleets and in particular the recent sinkings and losses of life on the B.C. coast (the Cape Blanco, April, 1984: the six vessels lost in the storm of Oct. 11-12, 1984), show that a lot more could be done to help mariners at sea. Aviators need frequent and accurate weather reports because they move quickly; mariners, and especially fishermen in their small and slow vessels need information of similar quality because they have to commit themselves to the elements for long periods of times (many hours) between safe harbours. Bad forecasts are just as deadly to mariners as they are to aviators.

The following general recommendations are inspired by what appears to us the relatively low level of weather services provided to mariners in comparison to that available to aviators. Only broad recommendations are presented here; details are given in Chapter 7 of the report.

B1. The general level of weather services provided to mariners should be enhanced towards that available to aviators by the dedication of additional personnel and resources to marine forecasting and weather reporting.

B2. Specialist marine forecasting positions should be created in coastal forecast offices.

B3. Sea state forecasting be included in the services provided to mariners.

B4. Active development of a number of marine meteorological data acquisition systems should be pursued.

B5. Consultation between the department of Fisheries & Oceans and the Atmospheric Environment Service should take place before fisheries openings.

B6. Mechanisms for closer collaboration between the Atmospheric Environment Service and mariners, and in particular fishermen, should be explored in the matter of collection and dissemination of weather information.

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1. Introduction

1.1 General Contents

In keeping with the terms of reference of this investigation (Appendix 1), this report presents a review of the nature of the storm of October 11-12, 1984, of the weather reporting and forecasting activities which preceded its arrival on the B.C. coast and of the needs expressed by fishermen and other mariners for weather information.

The process of meteorological data acquisitions, transmission, analysis and dissemination have also been scrutinized and reviewed for specific weaknesses. Recommendations for improved marine weather services and for avoidance of further surprises by storms of this particular type are presented in detail.

1.2 Methodology

The evidence and opinions on which our review and recommendations are based have been gathered from a number of sources. Reports on the meteorological aspects of the storm and on data collection, transmission, interpretation and forecasting activities were provided by various branches of the Atmospheric Environment Service (the Pacific Weather Centre; AES Headquarters, Downsview; Canadian Meteorological Centre, Dorval), and by individuals within AES who took a special interest in examining the available information. The Canadian Coast Guard provided a report of transmissions from its Tofino and Alert Bay radio stations as well as logs of communications during the period of interest.

A number of submissions (some solicited, most not) were received on various aspects of the forecasting and data collection processes from meteorologists, marine scientists and mariners.

The experiences of the fishermen which were active on the west coast of Vancouver Island before and during the storm were sampled by J. Scanlon and his Emergency Communication Research Unit of Carleton University. Scanlon and his team also examined the sources of weather information available to fishermen during that period (Appendix 16).

Finally, the investigation panel met over parts of two days (Nov. 22, 23) to review the information available, determine its sufficiency, outline recommendations and discuss the structure of the final report (Appendix 2). The final preparation and wording of this report were entirely the responsibility of the Chairman of the investigation.

1.3 Organization of the Report

This report presents a synthesis of the mass of information and opinion collected. Source material is gathered in appendices which are referred to in the text.

We begin in Chapter 2 with an overview of the storm's history. Its approach towards the coast of B.C. is reviewed in the light of the available evidence. Successive forecasts are noted, as well as the progress of the fishing fleet. Chapter 3 is devoted to answering (in the negative) the question: "Were the requirements of the marine community for weather information well met in connection with this storm?". The following chapter gives a broad review of weather services, from data collection to the dissemination of weather reports and forecasts. The scene is then set for a scrutiny of sub-components of the weather services in Chapter 5, where specific weaknesses (as well as strong points) are identified, both generally and within the context of the storm of interest. Our conclusions are presented in Chapter 6, followed by detailed recommendations in Chapter 7.

2. A Short History of the Storm of October 11-12, 1984

The storm which claimed the lives of five fishermen on October 11-12, 1984 approached the British Columbia coast from the Pacific Ocean. We shall first review its progress towards the coast and the forecasts issued as it advanced, as well as the movements of the fishing fleet on which it was to unleash its fury. The chronological synopsis presented here is synthesized from the more detailed information contained in the appendices. All events are timed in terms of Pacific Daylight Time (PDT). The progress of the storm in the days preceding its arrival to the coast may be followed in Fig. 1, which shows the path of the low pressure centre.

Tuesday, October 9

The Department of Fisheries and Oceans announces an opening of the Chum salmon fishery to gill-netters and seiners on the northwest coast of Vancouver Island. Gill-netters are small (8-10 m long), one or two man boats which fish by dragging a net behind them in which fish are caught by their gills. Seiners are larger boats (14-20 m long), with a five to six man crew which fish by putting out a net in a circle which they then close like a purse to catch the fish enclosed within. On that occasion, fishing is to be allowed for a 24-hour period starting at 10:00 Wednesday, October 10. The areas to be opened to fishing are located in Lower Nootka and Kyuquot Sounds (fishing sub-areas 25-6, 25-7 and 26-1, 26-2, 26-6, cf. Fig.2). Fishing boats begin to travel to those areas from adjacent west coast harbours, and other areas. Some of the smaller boats are trucked over Vancouver Island to be launched at Gold River (for example). Further details on fisheries openings and fleet movements may be found in J. Scanlon's report (Appendix 16).

On Tuesday, the weather on the west coast of Vancouver Island is overcast and windy. A low pressure system has reached the B.C. coast (its path is shown as B on Fig. 1) and a storm warning (of winds in excess of 47 knots) is in effect. Sustained southeast winds of about 35 knots are observed at many points along the outer coast of Vancouver Island (Estevan, Nootka, Cape St. James - cf. Fig. 3) with gusts up to 50 knots.

On that same day, a series of transmission problems begin to plague the communication system of the Atmospheric Environment Service. A microwave link (circuit 272) feeding data from the main switching node in Toronto to the Canadian Meteorological Centre (CMC) in Dorval fails for about half a day (0855 - 1933) (Appendix 4). As a consequence, there is considerable loss of data for input into the numerical weather prediction model produced at CMC. Prognoses from this model are routinely used as guidance in forecasts issued from regional Weather Centres, including the Pacific Weather Centre in Vancouver (Appendix 5). Further difficulties at the message switching computer operated by CNCP Communications in Toronto caused that system to run on a single (instead of two) disk for most of the time between 09/2208 - 11/0532, a 31.5 hour period during which teletype traffic was slowed down considerably. A great number of low-priority messages were lost in an effort to keep higher-priority information flowing. These communication difficulties may have influenced the quality of forecasting of the storm of October 11-12.

Wednesday, October 10

Morning

The GOES satellites circle the earth's equator at an altitude of 23,000 miles where their orbiting period equals that of the earth's rotation, so that they hover over a fixed point above the equator. Ideally, these satellites are positioned so that their cameras provide the best angles for viewing cloud patterns associated with approaching weather systems. Space crafts are of course not impervious to malfunction, and GOES satellites are occasionally shifted longitudinally to fill in for crippled siblings. At the time of storm, the only satellite imagery available came from a spacecraft located over 98°W (the longitude of Winnipeg). The cloud pattern associated with our storm just became visible to that satellite early (0500) Wednesday morning. At that time, the low pressure centre was over the date line, at 180°W (Fig. 1).

Of the three numerical models available as guidance to Pacific Weather Centre forecasters, two, namely the Canadian Meteorological Centre (CMC) and the US National Meteorological Center (NMC) global models predicted that the storm then at the date line would reach the B.C. coast within 48 hours as a 976 mb low pressure centre. The other model (the Limited area Fine Mesh model: LFM) contradicted the above and predicted a high pressure ridge on the coast on Friday (Appendix 3). We note in passing at this point that the lower the pressure at the centre of a storm, the stronger the winds accompanying it, usually.

Meanwhile, communication difficulties continued at the CNCP computer switching system in Toronto.

The weather continued blustery and overcast on the B.C. coast. Storm warnings were downgraded to gale warnings (wind speeds between 34 and 47 knots) for the west coast of Vancouver Island in the 0515 forecast. Wind speeds of 25-35 knots from the southeast continued to be the norm at most coastal weather stations.

Afternoon

Salmon fishing, which began at 10:00 a.m., continues in Nootka and Kyuquot Sound; estimates of the number of boats involved range from 325 to 500 boats.

In late afternoon (1740) the low pressure area which will eventually develop in the killer storm on the coast is recognized as a remnant of Typhoon Ogden. Infrared satellite photographs show that the low pressure system carried with it a considerable amount of warm and moist sub-tropical air. A San Francisco forecaster (K. Holmes) suggests that this developing cyclonic system be closely monitored, as it is subject to possible intensification because of its moisture content.

The CMC numerical prognosis, based on data of 1700, October 10, indeed continues to show an intensifying low pressure area. The 36-hour prognosis for Friday morning shows a low pressure centre of 977 mb near Cape St. James. US models on the other hand predict a weaker storm further to the northwest.

Weather conditions improve on the west coast of Vancouver Island. Gale warnings are continued in the 11:15 forecast but dropped in the evening (1915) forecast. Storm warnings in Queen Charlotte Sound are downgraded to gale warnings in the evening. The outlook for Thursday morning on the west coast of Vancouver Island calls for winds of 15 to 25 knots from the south to southwest. Showers continue.

Thursday, October 11: The Last Act

Scene I: The Calm before the Storm

0515. The early morning forecast calls for winds variable with speeds of 5-10 knots, increasing to southeasterlies of 10 to 20 knots in the evening and of 20-30 knots from the same directions on Friday morning. The Pacific Weather Centre prognosis based on data and computer guidance available at that time predicts a moderate storm with a low of 970 mb by Friday morning.

Satellite imagery shows the cloud pattern associated with the storm continuing towards the coast without giving good indication of its strength or future development. The whole system appeared to be moving eastward at about 30 knots.

0532. The second disk goes back into service at the CNCP switching computer. Clearing the backlog and message queues continues all day.

1000. A mediocre fishing day finishes in Kyuquot and Nootka Sounds. The fleet begins to disperse. Some boats have to wait a few hours to transfer their catch to packers.

1100. Weather reports issued at that time and for the rest of the daylight hours on conditions prevailing at coastal lighthouses show light winds (below 15 knots) everywhere. Some ships reporting from the vicinity of the approaching low pressure area (whose centre now lies about 1100 km off the coast - Fig. 1) report falling pressures, an indication of the continuing progress of the storm towards the coast.

Numerical models based on early Thursday morning (0500) data back off on the development of the storm. The CMC and US-NMC models showed lows of 987 and 995 mbs for our storm at 0500 Friday. The LFM model was concordant with the others with a 982 mb low.

1115. The mid-day forecast was still not alarming. Winds from the southeast with speeds of 10-20 knots were called for on the west coast of Vancouver Island, increasing to 20 to 30 knots Friday morning. Gale warnings continued in force for offshore areas (Bowie, Explorer and west coast of the Queen Charlotte Islands) and for Queen Charlotte Sound to the north of Vancouver Island.

This forecast as well as weather reports coming from coastal lighthouses had nothing in them at that time to alarm fishermen planning to return home from the west coast opening. The attitude of fishermen at that time is resumed in J. Scanlon's report (Appendix 16).

The prognosis for Friday morning (0500) prepared by Pacific Weather Centre, based on computer model runs and available data showed a 988 mb low; not a very stormy low pressure centre and certainly not one for which storm warnings were envisaged at that time. The forecasters had probably been influenced by the numerical models (which eventually proved wrong) in backing off the possible development of the storm.

Scene II: The Gathering Storm

1700. Two ships reporting in the southeast quadrant of the low indicate falling pressures. The US-NOAA buoys (Fig. 1) also report rapidly falling pressures. The storm is developing.

However, the CMC as well as the US global model continue to miss the deepening, showing respectively, at that time 986 and 985 mb lows. The LFM had an even less severe storm with a 992 mb low.

1900. Gale warnings are generalized to all coastal waters except Juan de Fuca Strait. Southeasterly winds of up to 40 knots are forecast for Friday morning.

1915. The evening forecast had gale warnings in store for the west coast of Vancouver Island predicting winds of 10 to 20 knots overnight with up to 40 knots on Friday afternoon (rather than morning as forecast at 1900; this may have caused some confusion). Winds reported at that time from lighthouses were still light (less than 20 knots) from the south and the southeast.

2000. The NOAA buoys continue to report falling pressures. By this time, it is clear (at least a posteriori) that rapid intensification was taking place (cf. J. Knox's analysis, Appendix 9). The satellite picture obtained at this time appeared to indicate that the storm was changing character.

2130. The forecast issued by the National Weather Service in Seattle at that time and retransmitted by the Tofino Coast Guard Radio at 2200 calls for winds of 20 to 35 knots by Friday morning and for increasing wind waves (to 4 ft.) and swell (to 10 ft.) during the night (Appendix 7).

2300. The computer models persisted in showing a consistently weak storm. The CMC and US models had low pressure centre prognoses of 985 mb for the storm on Friday morning (0500). The LFM was even further off with

a 992 mb low. However, the NOAA buoys continued to indicate rapidly falling pressures. The sea level pressure analysis produced at that time at PWC showed a 964 mb low about 500 km west of Vancouver Island. The forecasters decided to issue a storm warning. Up to that time, there has been no warning of the severity of the gathering storm or of the seas that it would unfurl.

Scene III: Too Late

During the night, heavy seas preceding the storm are felt on the coast before winds of storm intensity are reported anywhere. Around 10 p.m., the Producer (a 40 ft. boat) reports taking water over the stern 10 miles SE of Quatsino Light (Fig. 3) and sinks soon afterwards. A few minutes later the Scallywag (a 34 ft. troller) sinks just off Long Beach (between Tofino and Amphitrite Pt.). The Invercom (a 54 ft. boat) is abandoned off Amphitrite Point around 11 p.m.

2300. Gale warnings are revised to storm warnings for the West Coast of Vancouver Island and adjacent areas, with southeasterly winds of 45-55 knots expected Friday morning.

2315. Completely revised forecasts are issued and disseminated at that time for all marine areas.

These warnings came too late: 4 boats have already been sunk (the three above and the Lady Val II which turned over at about 2330 near Quatsino) by the heavy seas running ahead of the storm: fortunately, their crews were rescued. Storm winds begin to be experienced at coastal lighthouses through the night.

Friday October 12

0200. Sustained winds of 36 knots, with gusts of up to 61 knots, are reported from Estevan Point (Fig. 3).

0300. Sustained storm force winds (50 knots) are reported from the automatic weather station at Lawn Point (Fig. 3).

0400. Winds at Lawn Point peak at 63 knots. Cape St. James reports sustained winds of 50 knots, gusting to 72 knots.

0450. The Miss Robyn (crew R. Cowlan and R. Macowski, lost at sea) and the Silver Triton (crew J. Cartwright and T. Szezuka, lost at sea) sink near the north end of Vancouver Island. The rest of the fleet limps home or into a few safe harbours.

Also drowned was C.A. Casey, whose vessel the Hurricane I suffered difficulties near Victoria and sank.

3. Weather Services to Mariners in the Storm of October 11-12, 1984

In keeping with our mandate, we now address the question of how well Environment Canada met the requirements of mariners for weather information prior to the storm of October 11-12, 1984. From the sketch of the storm history presented above, it appears that there would have been too little warning for some, and that wind speeds were underestimated in some critical areas. To arrive at a more precise understanding of the circumstances, we shall review the means by which information is transmitted to mariners and the nature of the forecasts and weather reports issued before the storm. We shall focus our attention to the coastal and offshore areas on the northwest side of Vancouver Island where the fishing fleet was at sea.

3.1 The Transmission of Weather Information

The dissemination of weather information to mariners is the responsibility of the Canadian Coast Guard. Radio transmission takes place from stations at Alert Bay (with peripheral antenna at Holberg) and Tofino (physically located at Amphitrite Point, with peripherals at Eliza Dome and Mt. Ozzard; Fig. 3).

Two types of weather information are broadcast to mariners. Weather forecasts are issued by the Atmospheric Environment Service three times a day; at 5:15 a.m., 11:15 a.m. and 7:15 p.m. Warnings and revised forecasts may also be issued as the occasion demands. The forecasts are transmitted to Coast Guard Radio Stations by telex, or teletype; they describe weather conditions to be expected within about a day from the time of issue in a number of marine forecast areas (Fig. 2). Wind speeds and directions, cloud cover, precipitation and visibility are predicted for each region.

The other kind of weather information available to mariners from Coast Guard Radio consists of reports on wind speed and direction, cloud cover, visibility and sea state from lighthouses along the coast (Fig. 3). This information is collected by lighthouse keepers every three hours and channelled through Coast Guard communication network for passing on to the Atmospheric Environment Service. Information transmitted to mariners is selected by Coast Guard Radio from the data sent on to AES. Note that un-manned automatic meteorological stations report directly to AES and that their information is not available to Coast Guard Radio at the time at which it is collected.

The Coast Guard broadcasts to mariners on several channels. Of particular interest for nearshore operations such as coastal fisheries or towing are VHF transmissions of the Continuous Marine Broadcast (CMB) which continuously reports weather forecasts and local reports. The Tofino and Alert Bay station and their peripherals transmit this information on channel 21A (161.65 MHz). Warnings and sudden changes are issued on the emergency channel (channel 16; 156.8 MHz), if available, before updating the CMB.

Forecasts and weather reports are quite different in nature. The latter refer to actual conditions; mariners count heavily on them for a look ahead at conditions to be expected at the point of arrival, especially on short runs during which weather conditions are not expected to change significantly. Information on current weather ahead is also commonly used by airline pilots to chart their course, avoid storms and select alternate landings when necessary. Forecasts on the other hand are more abstract, describing a future occurrence not yet realized anywhere. They have to be taken on faith and are used for longer term planning. That mariners do take weather forecasts seriously and plan their movements with them in mind is evident from the reports collected by Scanlon (Appendix 16).

3.2 Forecasts and Reports Issued to the Storm of October 11-12, 1984

3.2.1. Weather forecasts are issued by the Pacific Weather Centre over the period 0515, 10 October - 0515, 12 October are included in Appendix 6.

The forecasts issued during and just after the fishing period (at 0515 and 1115 on Thursday) were consistent in calling for winds of 20-30 knots on the west coast of Vancouver Island. No real indication of a possibly dangerous storm was given in the weather synopsis. The evening forecast (1915) featured gale warnings, but only for Friday afternoon. Overnight winds of only 10-20 knots were expected.

Only at 11:00 p.m. on Thursday was a storm warning suddenly issued. Boats at sea were hit by waves produced by the storm an hour before the warning.

3.2.2. The log books of Canadian Coast Guard Radio from its Alert Bay and Tofino stations were examined and compared with marine weather reports obtained by Pacific Weather Centre. Attention was focussed on reports issued from 0900 on Thursday, October 11 to early Friday morning. Fishermen would

have used this information in leaving the mouths of Kyuquot and Nootka Sounds to assess weather conditions ahead. The reports issued by Coast Guard were found to be conform with the information on file at PWC and to have been put out in a timely fashion within a few minutes of the quoted observing time.

Wind conditions at selected points over the period of interest are shown in Table 3.1. It is clear that at any time on Thursday following closure of the fishery in Kyuquot and Nootka Sounds, fishermen heading northwards (towards Quatsino, Cape Scott, Cape St. James) or southwards (Nootka, Estevan, Lennard Is., Amphitrite Pt.) would not have been deterred by weather conditions ahead. No gale force winds were reported from coastal weather stations until 0500 on Friday, by which time a storm warning had been in effect for nearly six hours.

3.3 Conclusions

Weather reports issued by the Coast Guard provided accurate and timely information at lighthouses along the coast. Unfortunately, since the storm came from the west and hit the fleet before it did the coastal weather stations, this information could not provide any warning of its presence.

The storm warning issued at 11:00 p.m. on Thursday came too late to be of any help to that part of the fleet (about 40 boats) which had already committed itself to long runs (around Cape Cook or Cape Scott) without safe harbours on the basis of the early milder forecast of 19:15.

The crucial information which could have given timely warning of the storm, either a report from an offshore location or an earlier forecast, was not available to fishermen on the night of October 11, 1984.

Table 3.1. Wind Speeds at Selected Lighthouses on October 11-12, 1984

Time	Oct. 11	—	—	—	—	Oct. 12	—
Station	1100	1400	1700	2000	2300	0500	0800
Cape St. James		SW4	S5	SE9	SE24	E62	E66
Cape Scott		SE2	S15	SE10	SE11	SE9	SE42
Quatsino		SE8	S10	SE12	SE14	SE40	SE50
Nootka	N2	NW10	SE16	SE9	E2	SE23	SE40
Estevan	SE6	W10	SE8	SE12	SE16	SE38	SE40
Lennard Is.	S18	SW12	S6	E8	E15	SE30	SE25
Amphitrite Pt.	SW5	W9	S3	SW10	SE20	SE40	SE37

4. Overview of Weather Forecasting and Reporting Processes

Before reporting on our scrutiny of the various elements of the weather forecasting and reporting processes and identifying weaknesses which may have contributed to the lack of timeliness of forecasts we provide a broad review of modern weather services which will help in understanding how these various elements fit together.

We identify four systems contributing to the structure of weather services: data acquisition, data transmission, analysis and forecast preparation, and forecast and weather dissemination. These may be seen as analogous to the senses, the nerves, the brain and the mouth of a biological entity.

4.1 Data Acquisition

Weather information, consisting of measurements of barometric pressure, wind speed and direction, air temperature and humidity, cloud type and cover and precipitation type and amount is collected from a variety of measuring stations. Not all stations collect each and every type of information. Some stations are equipped for upper-atmosphere soundings with balloon-mounted radio sondes which provide information about winds and temperatures above ground. Other, more specialized instruments, such as radars or satellite-mounted sensors provide input over broad areas rather than at a single point.

Ground and sea level observing stations, fully manned meteorological stations (such as at major airports), automatic reporting sites, ships at sea, moored or drifting buoys in the ocean, are all coordinated into a Global Data System, harmonized through international collaborations embodied in the World Meteorological Organization. All these stations report at regular intervals through a hierarchy of regional and national weather centres; the data are shared by all countries for weather reporting and forecasting.

The data acquisition stations available to the Pacific Weather Centre from the Pacific Ocean include ships at sea, moored and drifting buoys and coastal stations. Fig. 1 shows the disposition of sea level data sources a few hours before the storm of October 11/12 hit the coast. The moored buoys, anchored in 3000 m of water, are operated by the US National Oceanic and Atmospheric Administration (NOAA) and report on wind speed and direction as well as on barometric pressure and air and water temperatures. Drifting buoys operated by the Canadian Atmospheric Environment Service do not carry anemometers and hence do not report wind speed or direction.

4.2 Data Transmission

The mass of data collected by meteorological sensors must be channelled through communication centres to local forecasting and reporting centres as well as to numerical prediction units.

Communications take place through teletype, telex, microwave and radio links. Each regional weather centre is equipped with a computer whose function is to handle incoming and outgoing messages. The various regional units communicate between each other in addition to receiving data and disseminating reports and forecasts. For example, the Pacific Weather Centre receives information from the Canadian Meteorological Centre in Dorval, in the form of numerical prognoses to be used as guidance in the formulation of forecasts.

Clearly, the data transmission system is an essential part of the whole weather services system. A failure reduces data input from field stations and isolates individual units; a serious and prolonged failure causes a paralysis which may render the forecasting process impossible.

4.3 Analysis and Forecast Preparation

The forecasting team sits, like a spider in the middle of its web, at the focus of the data inputs of a weather centre. Its members must continuously assimilate hundreds of different contributions from a variety of sources, assess their relevance and reliability and synthesize their individual effects into a broad picture of the evolving weather. The forecasters efforts result in analyses, which put together currently available information, and prognoses which are extrapolations of current trends into a later situation. Forecasts are issued on the basis of these prognoses. Examples of analyses and prognoses are shown in Appendix 3.

The forecaster's task is a delicate and responsible one, described more fully in Appendix 8. He or she must patch together, usually on the basis of incomplete information, a self-consistent representation of current weather conditions. New information, opinions and advice are continuously flowing in the form of field data, numerical computations from CMC and US sources, and comments from other forecasting units (Seattle, Portland, San Francisco, for example). Conflicting information has to be weighed and selected; decisions have to be made on a tight schedule to issue forecasts and reports at assigned times.

Forecasts and reports for a particularly important group of users may be assigned to a specialist, whose responsibility focusses on the needs of that group. Only aviation and forestry meteorology currently utilize a specialized forecaster. We will suggest below that a marine specialist also be assigned to coastal weather offices.

4.4 The Dissemination of Weather Information to Mariners

As we have seen in the previous chapter, Pacific Weather Centre issues three marine forecasts per day, at 0515, 1115 and 1915. These are made known to mariners in a number of ways: by cable TV, by a VHF radio station operated by the Atmospheric Environment Service in Victoria, and by the

Canadian Coast Guard radio stations. Emergency forecasts and storm or gale warnings are issued through the same channels whenever necessary.

Weather reports transmitted by Coast Guard radio stations may be delayed by higher priority messages, such as distress calls; they may be inaudible because of radio transmission difficulties. Weather messages may also be missed when fishermen are not listening to the radio, or listening to other channels.

5. Weaknesses Identified in the Forecasting and Weather Reporting Processes

We will now identify in detail, on the basis of the evidence available, weaknesses perceived in the four steps identified earlier in the provision of weather services. These weaknesses will fall into two categories: those specific to the storm of October 11-12, 1984, and those more generally associated with weather forecasting and reporting in the Pacific coastal areas. It will not in general be possible to keep these two categories completely separate. We will also not limit our comments to weak points, but will also identify important features which should be continued or strengthened.

5.1 Weaknesses in Data Acquisition

5.1.1. The problems of meteorological data collection over the Pacific Ocean are those commonly encountered over all other oceans. Much of the information is received from commercial vessels at regular intervals (every 6 hours); these ships are moving from port to port and not at any time positioned in an optimal way to sample the weather. In addition, radio operators are asleep at night, and no (or very little) information is reported which may be used for the Pacific Weather Centre's (PWC) 0515 forecast.

5.1.2. In addition to ships, there are NOAA buoys, disposed as a picket fence about 300 miles offshore. These are extremely useful in coastal forecasts and should be kept in position and perhaps added to.

5.1.3. The Atmospheric Environment Service also deploys drifting buoys which gradually (at a rate of a few miles a day) approach the coast on the North Pacific Drift current. These buoys report atmospheric pressure but not wind speed or direction.

5.1.4. It has been noted by a number of correspondents (e.g. Appendix 11) that Fisheries and Oceans Vessels do not report regularly while on patrol or survey in coastal waters. The Parizeau for example was reported to have been near the mouth of Queen Charlotte Sound at the time of the storm. There are very few large vessels on the B.C. coast and most (if not all) belong to the Federal Government - they could perhaps play more of a "big brother" role.

5.1.5. Malfunctions and shifts in position of the GOES satellites made it difficult to interpret the early images obtained from the storm.

5.1.6. The absence of the weathership formerly on duty at Station P (location shown in Fig. 1) has been blamed by a number of mariners' groups for an alleged deterioration of weather services. While all parties agree that observations from Station P, and particularly the upper air radio sonde observations were precious, no one can affirm that such observations would (or would not) have made a difference in the forecasts issued. At least one expert (Appendix 9) still feels strongly on the need for the weathership.

The explosive intensification of the storm took place landwards of the former Station P position, which suggests that data from that location would not have helped. On the other hand, it may be argued that upper air data might have revealed something about the likelihood of future intensification. We can only conclude that a weathership would not be the panacea and the cure-all that is claimed by some. The weathership has, however, become a symbol for a real need, which we suggest will be better satisfied by other data and analysis systems now under development or recommended in Chapter 7.

5.2 Weaknesses in Data Transmission

The communication difficulties experienced by the Atmospheric Environment Service and documented in Appendix 4 may have played a role in the quality of the forecast of the storm of October 11-12, 1984. Fewer data were available, some of them over the Pacific, in a quantity which will become known only when all ship logs have been reported in. That the communication breakdown might not have had too severe effects is suggested by the fact that none of the west coast US forecasting offices did any better than the Pacific Weather Centre in predicting the intensity and timing of the storm. The US computer prognoses were also no better (or worse) than that produced by the Canadian Meteorological Centre, although the latter suffered a considerable loss of data input.

5.3 Weakness in Analysis and Forecasting

The most striking weakness related to the storm of October 11-12, 1984 was the failure to forecast the rapid deepening of the storm and to issue a timely warning of the strength of the winds and waves to be expected in the night of Thursday to Friday. This failure may be attributed in part to the paucity of supporting data, to the over-reassuring guidance received from the numerical models and to the inability to recognize the signature of the storm in satellite imagery (or elsewhere) as that of one susceptible of explosive deepening. Our recommendations will address the various causes and conditions which were responsible for this weakness.

It also appears that waves may have been running ahead of the storm, an unusual but possible phenomenon, a situation which was also not forecast in any way. It should be noted that AES does not produce wave forecasts but plans are underway to do so in the near future.

5.4 Weaknesses in the Dissemination of Weather Information

Although some apprehensions were expressed at the possibility of delays in the issue of weather warnings because of higher priority forecasts (i.e. emergency and distress calls) and at the inaudibility of Coast Guard Radio in some specific locations (such as inside Nootka Sound), all reports

indicated that most fishermen were aware of weather reports and forecasts at all times, either directly or from having heard them from other fishermen. Scanlon's report (Appendix 16), however, indicates that late on Thursday night, some fishermen might have been confused about weather prospects. As they were then already in the grip of the storm, this would not have made much difference to their fate. No serious weaknesses were identified in this respect, and our recommendations take on a premonitory rather than corrective tone.

6. Conclusions

In this report, we have reviewed the circumstances preceding and accompanying the storm of October 11-12, 1984 on the west coast of Vancouver Island. The focus of our study has been on the adequacy of weather information provided to mariners on that occasion, but our examination of the processes involved in producing weather reports and forecasts has been much broader and has led us to general recommendations pertinent to marine weather services on the B.C. coast.

6.1 With respect to the storm of October 11-12, 1984, it is our conclusion that the weather forecasts and reports put out at that time did not provide adequate warning of the approach of the storm. No forecasts were issued of the heavy seas which preceded the arrival of the storm and were responsible for many of the sinkings (to reiterate, wave forecasts are not currently part of the AES program, but will be in the near future); the wind speed forecasts which were issued came too late to be useful. Weather reports from coastal lighthouses could not warn of the danger approaching from the ocean.

The reasons for lack of timeliness of the forecast and the lack of reports from suitable locations are in part associated with the general circumstances of weather services on the west coast. Specific reasons are also found in the unusual character of the storm of October 11-12, 1984 and to a lesser extent in certain malfunctions of the weather information system prior to that storm. Recommendations addressing these specific points are oriented towards preventing a recurrence of that particular tragedy.

6.2 With regards to the general provision of weather services to mariners on the B.C. coast, we have identified a number of weaknesses in data acquisition, forecast preparation and information dissemination which would contribute in a general way to marine safety. These weaknesses are characterized within the current context of weather observation and analysis: we have not engaged in a science fiction exercise which would call for massive long term technological development. Our recommendations for improvement are within the range of the possible, immediately or in the short term.

It is our general view that reliable weather services are as acutely needed by mariners as they are by aviators and that the difference in the quality of services provided to those two groups is not justified by a difference in needs. Our recommendations aim at upgrading weather services to mariners towards those provided to aviators by increasing the resources in equipment and manpower assigned to the former.

There are about 10,000 commercial fishermen in B.C., bringing home a catch with a value of the order of 500 million dollars. They earn a hard living as primary producers and are accompanied in their need for weather services by about 100,000 sports fishermen who also contribute significantly to B.C.'s economy. Coastal transport, tug boats, the coastal forest industry, cruise ships and possibly soon offshore oil exploration require rather more reliable services then those hitherto provided and have not been complaining without reason!

7. Recommendations

Our recommendations are presented as means of correcting the weaknesses identified in Chapter 5. The detailed list presented here follows closely on the points listed in that chapter: no additional justification is required at this stage.

The recommendations may be grouped in two categories: those specific to the storm of of October 11-12, 1984 and others pertinent to the

provision of marine weather services on the west coast. As the first category is shorter, it is presented first. We emphasize, however, that our general recommendations would provide for better overall reports and forecasts and a safer marine environment and consequently are of a more fundamental importance than the few immediate steps recommended to deal with the specific problem of the storm of October 11-12.

7.1 Recommendations Specific to the Storm of October 11-12, 1984

To improve forecasting of this kind of storm in the future, we recommend that:

A1. A workshop be held to explore the understanding and detection of explosive deepening of storms which transform themselves from warm-core remains of tropical storms to cold-core extra-tropical cyclones. This workshop should be international in scope, with participation of operational coastal forecasters from weather offices in San Francisco, Portland, Seattle, Vancouver and Anchorage. The participation of Ken Holmes from the NWS San Francisco office should be secured.

A2. Research on the physics of rapid deepening of process of storms of the type seen on October 11-12, 1984 be encouraged, either by direct commission, or via the AES subvention program to universities or in collaboration with other interested parties, such as the NOAA Pacific Marine Environmental Laboratory in Seattle.

A3. In order to assess the possible influence of the data which were not available to the numerical modelling process because of communication difficulties, the Canadian Meteorological Centre should be requested to rerun their numerical prognoses for the period of interest with all the data which will have later become available.

7.2 General Recommendations on the Provision of Weather Services to Mariners on the B.C. Coast

These are grouped under a number of general recommendations, identified as B1-B5 and presented last, and a series of more specific recommendations falling under the itemized weaknesses categories presented in Chapter 5, which are enumerated first.

Specific recommendations for improvements are proposed under the headings of:

7.2.1.1 Data Acquisition

Weather reports from ships at sea are an important data source. Measures should be taken to obtain regular, including night-time, reports by:

a) offering some form of incentive to radio operators to transmit weather information at night, and

b) by furthering the development and utilization of automatic or semi-automatic data collection platform to be put on commercial and government vessels.

7.2.1.2 The NOAA buoys are invaluable in forecasting Pacific storms. Environment Canada should collaborate with NOAA in planning for continued maintenance and possible future deployments of these buoys. We are getting at least as much benefit from these buoys as are the US and we should put in our penny's worth if we are to have any influence on future plans regarding their disposition.

7.2.1.3 The drifting buoys deployed by AES would be even more useful if they could report winds. Development and testing of a rugged anemometer that could be installed on these buoys should be proposed as a challenge to Canadian marine technology.

7.2.1.4 Means should be taken to ensure that Federal Government survey and fisheries patrol ships should report weather conditions on a regular basis when in coastal waters. They venture out further than fishing vessels and may be able to provide warning of forthcoming conditions.

7.2.1.5 Canada should press the US government to maintain an adequate back-up for the GOES satellite system.

7.2.1.6 We do not recommend that Weathership P be re-installed, but we remind the Minister of the commitments made by a predecessor Appendix 17) for an "alternative system which will continue to permit reliable weather information for the West Coast". The satellite imagery and drifting buoys program are a part of this alternative system; other developments outlined below will also contribute to improved weather information.

7.2.1.7 We recommend that the Automatic Shipboard Aerological Program be continued and deployed on an operational basis. This program consists of installing on commercial vessels containers fitted for upper air measurements via a simple launching and tracking system of weather balloons. This program would supply upper air data which have been unavailable since the removal of the Weathership.

7.2.1.8 The installation of a weather radar at one or two locations on the west coast of Vancouver Island has been suggested as means of detecting approaching squall lines and severe convection clouds. It is recommended that renewed consideration be given to this kind of system, with direct long distance input of the information to the Pacific Weather Centre.

7.2.1.9 We urge the Department of the Environment not to forget, in its program to automate coastal weather stations, that mariners depend heavily on reports of actual weather conditions received from these stations. These lighthouse reports are currently disseminated by the Coast Guard, who receives them from lighthouses before transmitting them to the Pacific Weather Centre.

If automated stations were to transmit directly to the data network, without passing through the hands of the Coast Guard, they would not be available as guidance to mariners, who would then suffer a real loss. This should be prevented against.

7.2.1.10 It has been suggested that feedback between mariners and the weather centre could be of mutual benefit to both sides by providing additional sources of data and by helping to tailor the forecasts to the needs of fishermen or marine users.

We recommend that a program similar to that known as MAREP and operated by Josie Dyas out of Westport, Washington be tried on the B.C. coast. This program has a person on shore who talks to both the fleet and the Seattle weather office, communicating information in a form which is readily accepted and useful to both parties.

7.2.2 Data Transmission

In this respect, we can only encourage the Atmospheric Environment Service to continue to upgrade and modernize its communication system. The vast organism with which we have compared the weather information system relies heavily on its internal "nerve" system for the reliability and promptness of its responses. It has also been noted that Coast Guard Radio should be encouraged to keep pace with this development.

7.2.3 Analysis and Forecasting

In addition to the storm-specific recommendations made above, and which are rather ad hoc in the context of forecasting operations, we also suggest the following steps towards systematic improvement of marine forecasts.

7.2.3.1 The importance of marine weather services need to receive added recognition. We recommend very strongly that marine forecasting be assigned as a specific and individual responsibility in coastal weather centres (such as PWC). Only under such specialization is there likely to

develop the experience and familiarity with Pacific storms which will ensure full benefit of human judgement and overcome undue reliance on numerical forecasts. An experienced marine forecast specialist might have been able to recognize at an earlier time signs of rapid development in the storm of October 11-12.

7.2.3.2 When the initial analyses appear to be insufficient, "bogus" data are currently introduced in the numerical models run by CMC. This procedure has been subject to criticism and we recommend that the necessity of its continuation be re-evaluated.

7.2.3.3 A wave forecasting service should gradually be introduced; development under way along these lines at AES should be refined in the light of the best available methods and put on an operational footing as soon as possible.

7.2.4 The Dissemination of Weather Information

As no serious weaknesses were uncovered on this matter, our recommendations are for improvements in quality and level of service rather than for corrections to the existing system.

7.2.4.1 As the Atmospheric Environment Service improves its internal communication network and the selectivity of its means of disseminating information, it is important that the Coast Guard keep up with developments.

7.2.4.2 The gradual abandonment of live reports in favour of taped broadcasts must not be detrimental to the timeliness of the information provided. Recent reports from a tug boat operator indicate weather reports not being brought up to date for many hours on a marine broadcast tape. Outdated information may be worse than no information at all!

7.2.4.3 Some means has to be found to communicate to mariners the degree of confidence placed by forecasters in their predictions. The MAREP program mentioned above (in 7.2.1.10) could do service in this respect.

7.2.5 Other Recommendations

7.2.5.1 There appears to exist no standard consultation between Environment Canada and Fisheries and Oceans in deciding whether a fishery opening would be advisable from a safety point of view. Special arrangements have been worked out for the herring fishery and could be broadened to cover all fishery openings.

7.2.5.2 It is important that the federal agencies responsible for marine weather services and safety gain the confidence and collaboration of the users of the information and services which they provide. This collaboration could be furthered by the establishment of MAREP type programs (cf. above), by the coordination of the activities of all participants in marine activities and by periodic non-confrontational reviews of the performance of government services.

7.3 General Recommendations (B1-B5)

B1. The general level of weather services provided to mariners should be enhanced towards that available to aviators by the dedication of additional personnel and resources to marine forecasting and weather reporting.

B2. Specialist marine forecasting positions should be created in coastal weather offices.

B3. Active development of a number of marine meteorological data acquisition systems should be pursued.

B4. Consultation between the Department of Fisheries & Oceans and the Atmospheric Environment Service should take place before fisheries openings.

B5. Mechanisms for closer collaboration between the Atmospheric Environment Service and mariners, and in particular fishermen, should be explored in the matter of collection and dissemination of weather information. Included in this collaboration should be a definition of user requirements for such items such as needed lead times for warnings, critical wind speeds/directions, critical wave heights, etc.

Appendix 1.

Terms of Reference and membership of the investigation panel.

Terms of Reference - LeBlond Investigation

Purpose

Conduct an investigation of the marine storm of October 12, 1984.

To determine how well Environment Canada met the requirements of the marine community for weather information (observations, forecasts and warnings) in the storm of October 12, 1984.

To identify if problems existed in the reception, production and dissemination of marine weather information and supporting guidance.

To determine if changes should be made in the reception, production and dissemination process and, if so, in what areas and what form should they take.

Activities

Analyse the nature of the storm, its origin, development and path.

Review the data and guidance available to the meteorologist in the preparation of the marine forecasts.

Review the procedures used to prepare and issue the forecasts.

Review the dissemination of the marine forecasts to the fisherman on-land and at-sea, and the utility of those forecasts in the hands of the fishermen.

Prepare report on the progress of the investigation to the ADM of the Atmospheric Environment Service after each two week period.

Submit a final report and recommendations to the Minister of Environment by November 30, 1984.

Investigators

1. Prof. P. LeBlond - U.B.C.- Chairman
2. G. Wells - Chief, Forecast Operations, Pacific
3. Dick Nellis - Chief, Weather Services Atlantic
4. B. Forsyth - Fisheries Association of British Columbia
5. A. Kaario - United Fishermen & Allied Workers' Union

Location

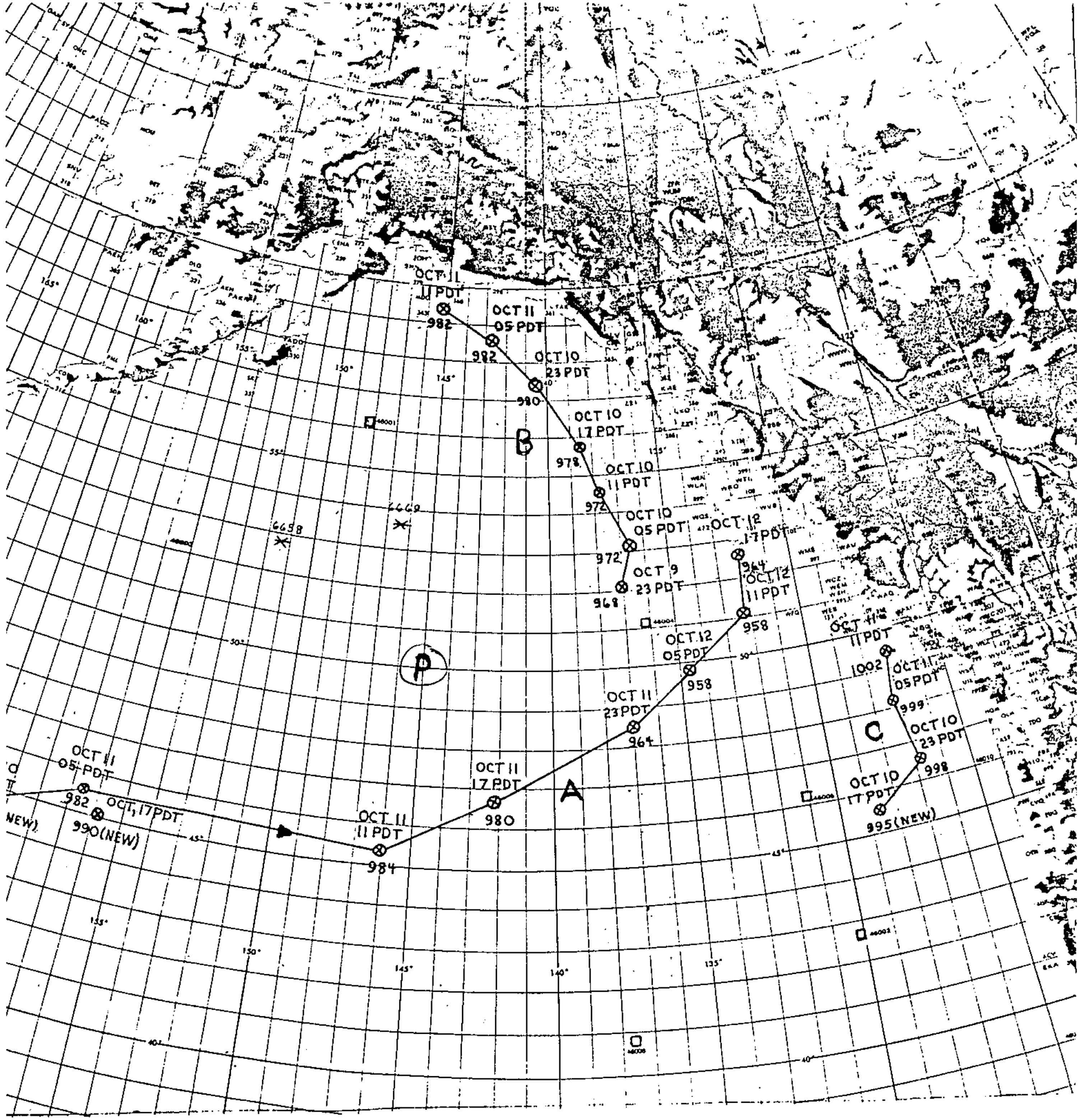
Offices of the Atmospheric Environment Service
1200 West 73rd Avenue
Vancouver, B.C. V6P 6H9
(604) 732-4673

w/p B243

Figure 1. The path of low pressure centres in the northeast Pacific during the period October 9-12, 1984. The storm of principal concern is labelled A; dates and times (PDT) show its progress. The interruption in the path reflects uncertainty as to its position on October 10. Storm B was responsible for storm-strength winds on the B.C. coast earlier in that week. Storm C was weak and of little concern.

The map also shows where weathership P used to be stationed (shown by a P at 50°N, 145°W).

The location of the moored NOAA meteorological buoys is shown by squares; that of the drifting buoys at 1100 PDT on Thursday, October 11 is indicated by stars.


A
B
C
P
OCT 11 11 PDT
982
OCT 11 05 PDT
982
OCT 10 23 PDT
980
OCT 10 17 PDT
978
OCT 10 11 PDT
972
OCT 10 05 PDT
972
OCT 9 23 PDT
968
OCT 12 17 PDT
964
OCT 12 11 PDT
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OCT 12 05 PDT
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964
OCT 11 17 PDT
980
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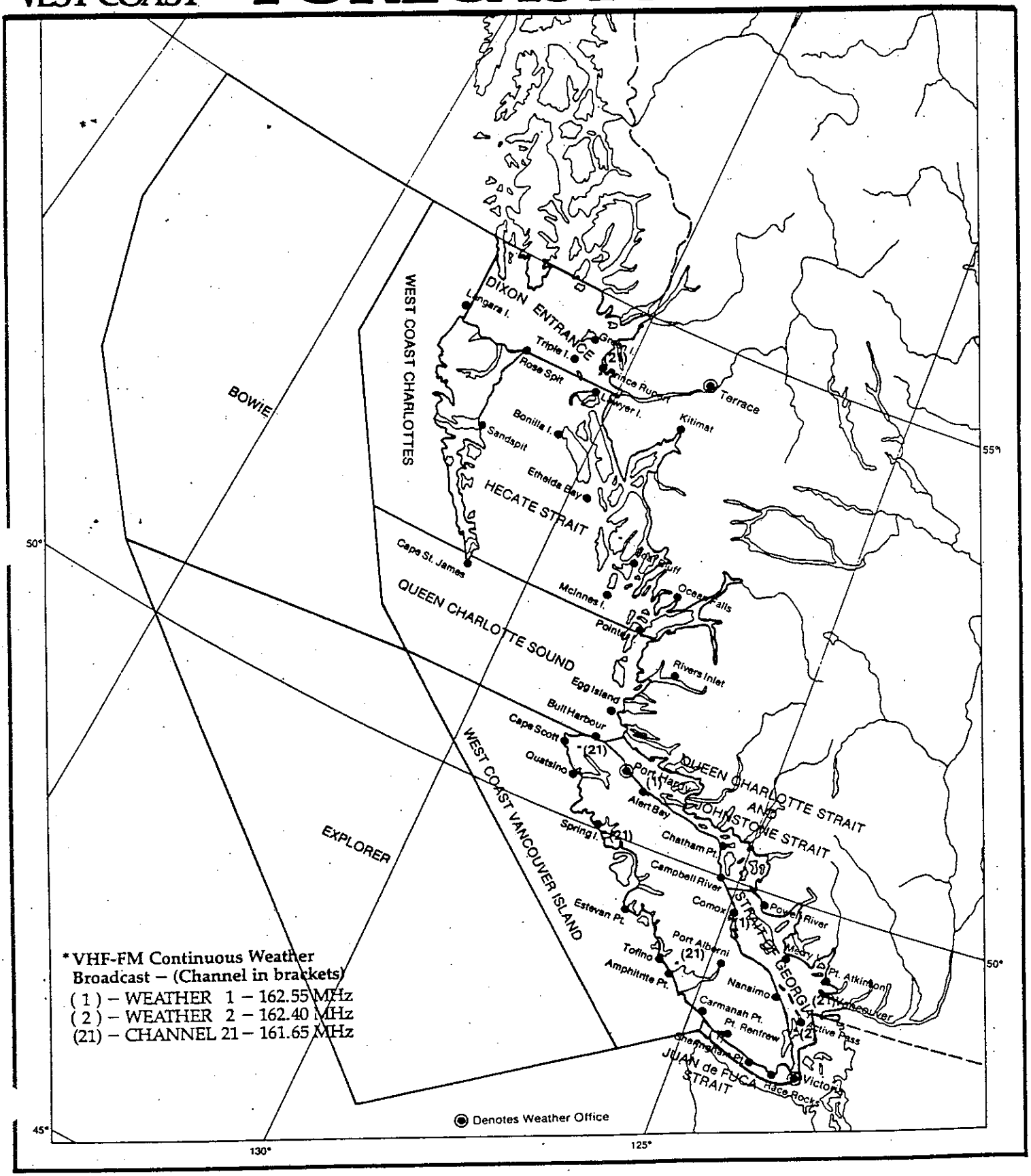
984
OCT 11 05 PDT
982
OCT, 17 PDT
990 (NEW)
OCT 11 11 PDT
1002
OCT 11 05 PDT
999
OCT 10 23 PDT
998
OCT 10 17 PDT
995 (NEW)
6658
6669

ENVIRONMENT CANADA

MARINE WEATHER FORECAST AREAS

WEST COAST



*VHF-FM Continuous Weather Broadcast – (Channel in brackets)

(1) – WEATHER 1 – 162.55 MHz
(2) – WEATHER 2 – 162.40 MHz
(21) – CHANNEL 21 – 161.65 MHz

Figure 2

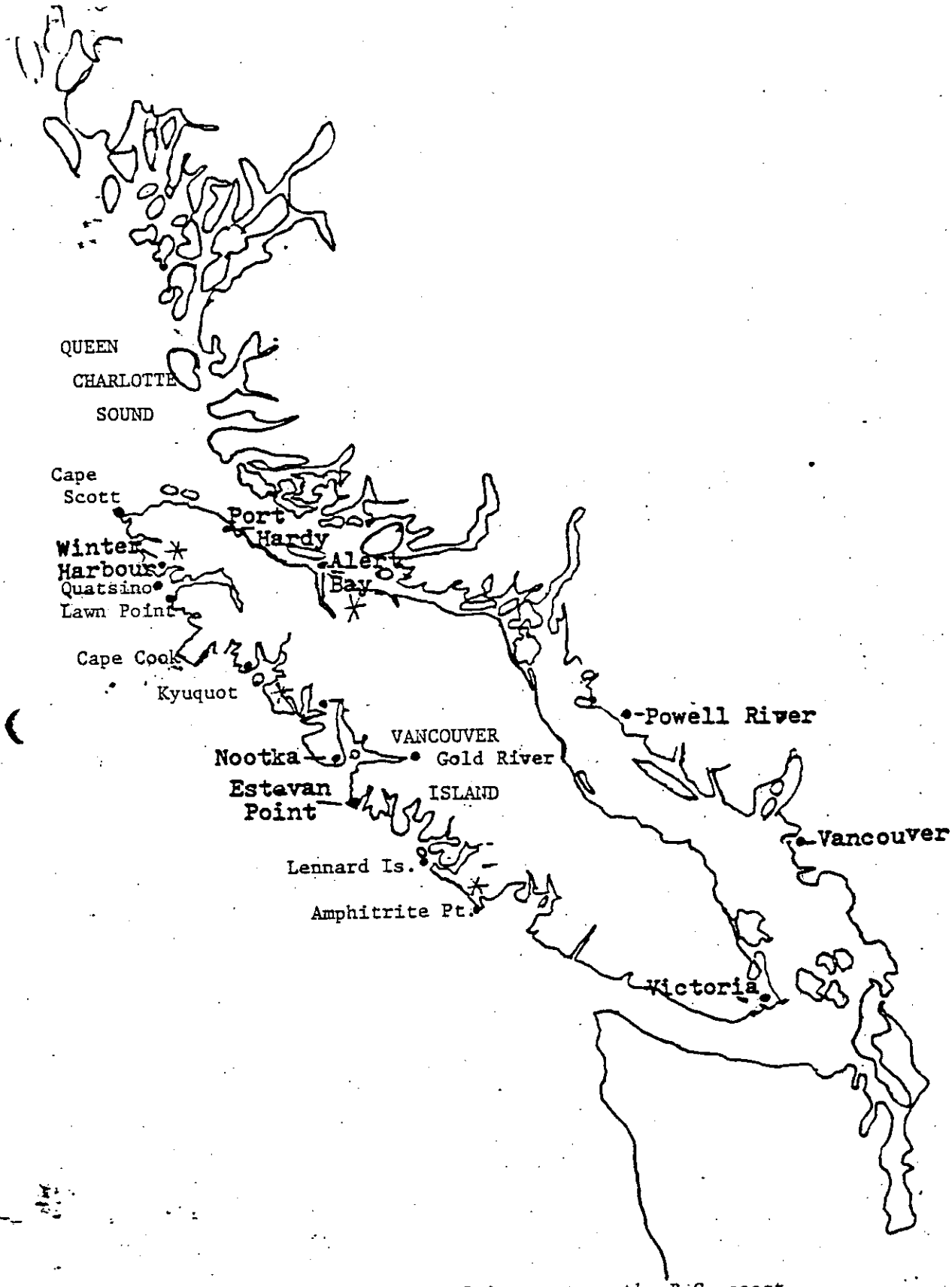


Figure 3 Locations of interest on the B.C. coast.
Coast Guard Radio locations are shown by asterisks.

List of Appendices

Most of the evidence and opinions on which this report is based is contained in the appendices attached hereto. They are organized and classified as follows:

Information Pertinent to the Conduct of the Investigation

1. Terms of Reference
2. Agenda of Investigation Panel Meeting, November 22-23, 1984

Major Meteorological Documents

3. Technical Summary of the Storm of October 11-12
4. Status of Communication System
5. Review of Guidance Provided by CMC
6. Forecasts Issued by Pacific Weather Centre, October 10-12
7. Coast Guard Radio Stations Broadcasts
8. The Forecasting Process

Scientific Submissions

9. Report from J. Knox
10. Report from P. Haering
11. Letter from M. Miyake
12. Letter from A. Bennett

Submissions from Mariners

13. Letter from Pacific Trollers Association
14. Letter from Canadian Merchant Service Guild
15. Letter from UFAWU

Surveys

16. J. Scanlon's Report
16A. Comments by Investigation Team on Scanlon's Report

Other

17. Letter form Mr. Roberts

Appendix 2.

Agenda of meeting of November 22, 23, at the offices of the Pacific Weather Centre, 1200 West 73rd Avenue, Vancouver, B.C.

Storm of October 11-12, 1984 Investigation

Meeting of November 22, 23, 1984

AGENDA

Thursday: 3:30 p.m. to approx. 6:00 p.m.

1. Review of mandate; interpretation and discussion of responsibilities.

2. Survey of material in hand on:

   a) data acquisition and transmission
   b) forecast history of the storm
   c) the forecasting process
   d) forecast dissemination
   e) needs of mariners for weather reports and forecasts
   f) Scanlon's report

3. Assessment of sufficiency of information surveyed above in terms of need to answer following questions:

   a) What factors affected the quality and timeliness of the forecasts issued before the storm?

   b) What information is required by mariners?

Friday: 9:00 a.m. to approx. 3:00 p.m.

4. Detailed discussions of relative influence of the various factors which affected forecasts.

   - identification of critical or weak links
   - suggestions for improvements

5. Identification of perceived weaknesses in weather reports and forecasts provided to mariners and in the means by which they are disseminated.

   - suggestions for improvements

6. Discussion of structure of final report and of broad lines of recommendations.

Appendix 3.

Technical summary of the storm of October 11-12, 1984, prepared by Pacific Weather Centre.

Government of Canada / Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE

TO / À: PAED

FROM / DE: PAEM

SECURITY - CLASSIFICATION - DE SÉCURITÉ
OUR FILE/NOTRE RÉFÉRENCE: 8770-1 (PAEM)
YOUR FILE/VOTRE RÉFÉRENCE:
DATE: October 23, 1984

SUBJECT / OBJET: Technical Summary of the Storm of October 11/12

1. Attached for your review is a technical summary (prepared by B. Hammond) highlighting the sequence of events leading to the onslaught of storm force winds along the west coast.

2. Further to the technical details of the analysis, I draw your attention to the factors at the end of the report - i.e. questions about the impact of the disk failure at SSC; the value of GOES 6 imagery coupled with the loss of visual data from GOES-1; the importance of the NOAA fixed buoys; the inconsistent behaviour of the models (except the LFM which never did handle the situation well); the preliminary pre-suppositions of the reason for the explosive deepening; and the timeliness of the issue of warnings. All these items need further investigation.

3. We are continuing to examine other issues such as the performance of the communications system in disseminating the information. Furthermore, all meteorologist staff associated with the storm are being interviewed for their accounts of the event.

G.E. Wells

attach.

cc: PAEW
PAEO
PAEC
PAEMO
PAEMM

Pacific Storm of October 11/12, 1984

1. Introduction

Friday October 12, 1984 proved a fateful day for numerous West Coast fishermen. A rapidly intensifying low pressure area sped towards the coast packing Storm Force winds. This resulted in the loss of several fishing boats and more importantly, the loss of five lives.

This report will attempt to examine the sequence of events leading up to the disaster and attempt to examine some of the meteorological factors influencing the development.

2. The Sequence of Events

The storm reached its maximum intensity Friday morning (12/1200 GMT). The scenario begins 48 hours previous.

2.1 Wednesday Morning

Early Wednesday morning at 10/1200 GMT the system was near the dateline (180° W).

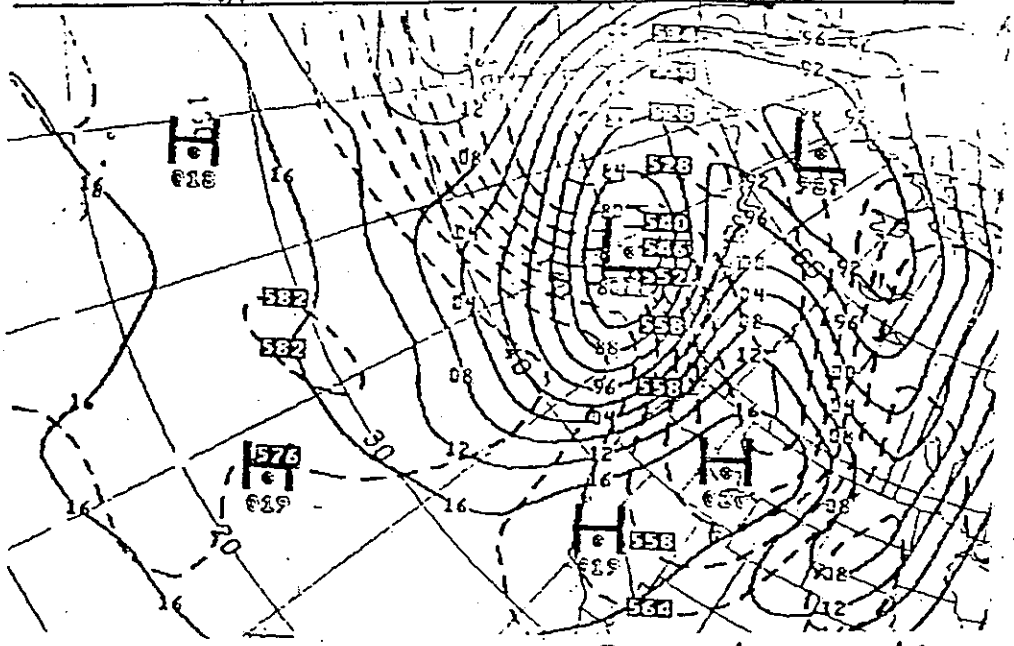
The 48 hour numerical model prognoses based on 10/1200Z data were at odds. The U.S. spectral and the CMC spectral progs both tracked the system towards the B.C. Coast and deepened it to 976 mbs. The 48 hour LFM prog showed a ridge over the coast.

The central communications (SSC) facility in Toronto experienced a disk failure at 10/0508Z. The system operated on one disk for the next 31.5 hours. Before the disk failure, there were also circuit problems between Toronto and CMC in Montreal. (What impact did delayed or lost data have on the model runs during and after re-implementation of the disk?)

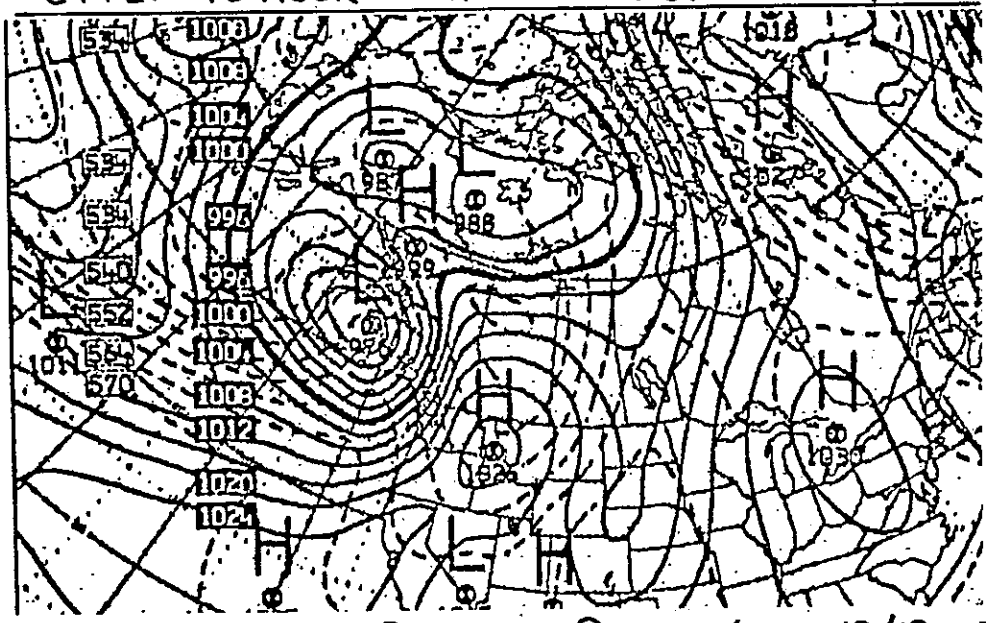
Attachments:

US Spectral	48 Hour Surface Prog Valid 12/1200Z
CMC	48 Hour Surface Prog Valid 12/1200Z
LFM	48 Hour Surface Prog Valid 12/1200Z

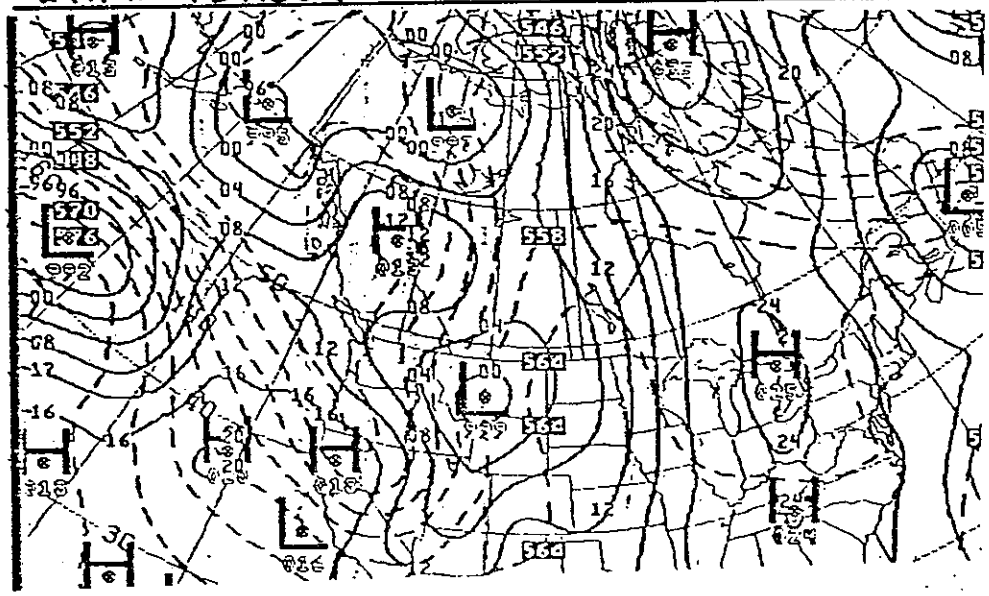
U.S. SPECTRAL 48 HOUR SURFACE PROG. VALID 12/1200Z



C.M.C. 48 HOUR SURFACE PROG. VALID 12/1200Z



L.F.M. 48 HOUR SURFACE PROG. VALID 12/1200Z



2.2 Wednesday Evening (October 10)

The cirrus shield ahead of the system was evident on the western edge of the satellite picture. The cloud mass was the remnants of typhoon OGDEN, which had now become extratropical and was caught up in the Westerlies. The key piece of data at this time came from drifting buoy 6659 at 42 N 160 W. Between 11/0000Z and 11/0400Z the pressure at the buoy fell 5.3 mbs.

2.3 Wednesday Night (October 10/11)

Information was rather sketchy overnight. On the 11/1200Z surface analysis there were no ship reports and only one buoy report within 450 nmi. of the centre. The satellite imagery still showed an amorphous "blob" of cloud approaching, however, the water vapour image showed clearly the presence of two streams. This confirmed the presence of warm subtropical air in the system and was a clue that this system might be different from the usual, having the potential for significant development due to the presence of very warm air (hence strong baroclinicity) and possibly high moisture content to promote latent heat release.

The CMC spectral run based an 11/0000Z data persisted in showing an intensifying low pressure area. The 36 hour prog for Friday morning (12/1200Z) showed a 977 mb centre near Cape St. James. At 11/0000Z a bogus point was entered on the CMC model at 43 N 155 W. This bogus data may have made it into this model run.

The U.S. spectral backed off on development showing a 984 mb centre farther to the northwest. The LFM run fell in line with the U.S. spectral.

The communications disk was still down in Toronto.

The PWC prog for 12/1200Z based on this model run showed a 970 mb centre near 50 N 140 W.

2.4 5 a.m. Thursday (October 11)

Gale Warnings in effect for all northern B.C. coastal areas and the off-shore areas calling for southeast 20 to 40 knots developing overnight.

Attachments:

FXCNI CWVR 11/0600Z
FXCNI CWVR 11/1100Z
FPUS 3 KSFO 11/0358Z
FPUS 3 KSFO 11/0958Z
FPUS 3 KSEA 11/1000Z
TBXX 6 KSFO 11/1230Z
FPCN 20 CWVR 11/1215Z
TBXX 6 KSFO 11/0040Z
TBXX 6 KSFO 11/0640Z
PWC Satellite Analysis 11/1200Z
PWC Water Vapour Imagery 11/1131Z
PWC Surface Analysis 11/1200Z
U.S. Spectral 36 hr Surface Prog Valid 12/1200Z
CMC 36 hr Surface Prog Valid 12/1200Z
LFM 36 hr Surface Prog Valid 12/1200Z
PWC Prog Valid 12/1200Z

DATA FROM OCTOBER 11 1984 0000Z TO OCTOBER 11 1984 1200Z

FXCN1 CWVR 110600 220-84101105:41

DATA EITHER SLO COMING IN OR MISG DUE TO COMPUTER PROBS...

500MB/SAT...GULF LO CONTINUES WKNG TREND. MEANWHILE STG VORT CNTR OFF WASH CST CONTINUES SLO NNEWD DRFT. VRY COLD AIR AND HVY CNVCTV ACTIVITY ASOCTD. XPCT CONTINUED WKNG AS TROF EASES ONSHR AND NXT PAC SYS APRCHS. THIS NXT SYS IS A PROB AS DATA IS SPARSE AND MODELS DIFFER ON SOLUTION.

SFC...SFC LO OFF WASH CST XPCTD TO WKN AS UPR TROF MVS INLAND. FNTL BAND OVR INTR CONTINUES EWD TO ALTA THURS EVE. RDGG OVR BC AHD OF NXT PAC SYS. SAT PIX NOT MUCH HELP WITH THIS SYS AS YET... MODELS START WITH IT NR 43N 158W HOWEVER BOUY 6659 AT 42N 160W HAS FALLEN 5.3 MB TO 989.7 IN LAST 4 HRS SO LO CNTR MAY STILL BE WEST OF 160W. FOR THIS REASON WILL LEAN TWRDS SLOER MTN OF US SPECT.

WX...RN ACCOMPANIES FNTL BAND ACROSS INTR. SHWRS CST UNTIL UPR TROF PASSES AND AMS BEGINS TO STBLZ. RN AND INCRSG SELY WNDS ON THE CST FRIDAY AS NXT PAC SYS APRCHS.
COOLER TMPS THU WITH FROST LIKELY THU NITE IN THE OK.

END
HAMMOND

FXCN1 CWVR 111100 220-84101111:18

DATA EITHER SLO COMING IN OR MISG DUE TO COMPUTER PROBS...

500MB/SAT...GULF LO CONTINUES WKNG TREND. MEANWHILE STG VORT CNTR OFF WASH CST CONTINUES SLO NNEWD DRFT. VRY COLD AIR AND HVY CNVCTV ACTIVITY ASOCTD. XPCT CONTINUED WKNG AS TROF EASES ONSHR AND NXT PAC SYS APRCHS. THIS NXT SYS IS A PROB AS DATA IS SPARSE AND MODELS DIFFER ON TIMING AND DEGREE OF DVLPMNT...HOWEVER IT IS XPCTD TO BE A STG DEEPENER.

SFC...SFC LO OFF WASH CST XPCTD TO WKN AS UPR TROF MVS INLAND. FNTL BAND OVR INTR CONTINUES EWD TO ALTA THIS EVE. RDGG OVR BC AHD OF NXT PAC SYS. SAT PIX NOT MUCH HELP WITH THIS SYS AS YET... MODELS START WITH IT NR 43N 158W HOWEVER DATA INDICATES IT MAY BE FARTHER W. WILL LEAN TWRDS SLOER US MODELS FOR NOW HOWEVER DVLPMNT XPCTD TO BE STGR...NR IN LINE WITH CAN SPECT.

WX...RN ACCOMPANIES FNTL BAND ACROSS INTR. SHWRS CST UNTIL UPR TROF PASSES AND AMS BEGINS TO STBLZ. RN AND INCRSG SELY WNDS ON THE CST FRIDAY AS NXT PAC SYS APRCHS. GALE WRNG IN EFFECT FOR OFSHR AND N CST WTRS.
COOLER TMPS TDY WITH OVRNGT TMPS IN THE OK DROPPING TO NR FRZG.

END
HAMMOND

TELETYPE ARCHIVE DATA RETRIEVAL
DATA FROM OCTOBER 11 1984 0400Z TO OCTOBER 11 1984 1200Z

FPUS3 KSFO 110358 220-84101104:32
NEW LFM IN GOD AGRMNT WITH FRVS PROGS. FNT JUST N OF SFO MVG EWD 30KT. TROF JSUT OFFSHR RQ.FLY 125W PROGS TO RCH SIERNV BY 12Z... XPT FNT TO WKN AS TROF CATCHES IT WITH NOT MUCH FRTHR S THAN MRY BAY. WRM OVRRNG TO RCH PACNW AND NWCA THUR NGT DECG FRI. WL PUT SOME TRWS IN NW AND SHASTA/SISKIYOU MTNS. PLANKINTON EKA 868 SFO 953 RBL 965 SAC 952 FAT 132 BFL -22 SMX 122.
CA...ADVISORIES...TNGT SCA..PT ST GEORGE TO PT CONCEPTION AND SFO BAY

FPUS3 KSFO 110958 220-84101110:54
STLT SHOWS FNT STG ENUF TO MOVE ALL THE WAY THRU THE DIST. LEAF CLD HAS FRMD S OF 35 NR 125 W AND THIS DVLPMNT AREA WILL SPREAD PCPN OVR ALL OF CNTRL CA TDY. AT PRESENT SPD..UPR TROF WILL BE THRU THE AREA BY AFTN IN THE N AND ERLY EVNG IN THE S. NXT THREAT OF PCPN WI WRM ADVCTN APEA NOW REACHING 145W. THIS OVERRUNNING PCPN WILL BE MSTLY IN THE N BUT IF THE RDG INCRSS AS MUCH AS FCST BY THE PROGS A THREAT OF PCPN MIGHT EXIST FOR THE WHOLE DIST THIS WK/END. AS OF NOW THE FCSTS BYD 48 HRS LOOK OVERDONE WHEN IT COMES TO THE FCST AMP OF THE TROFS AND RDGS SO WILL UPDATE THE XTNDD TO DCR THE TREAT OF PCPN OVR CNTRL CA. EKA 436 SFO 412 RBL 614 SAC 822 FAT 831 BFL 631 SMX 83-. JAGNER
CA...ADVISORIES...TDY SCA..PT ST GEORGE TO PT CONCEPTION
T.A. ZONES 5 AND 10

FPUS3 KSEA 111000 220-84101111:05
SLY FLO ALF WA AS SHARP TROF EWD TO CST. FNT MADE BROAD WITH WVS COVERS WA. SFC TROF NR CST APRS STGR THN MODEL. MNR RDG VCNTY 145W MARKED BY CNSDRBL OVRNG WITH MSTR FM OGDEN. PROGS SMLR FLLG SFC TROF AND BLDG SFC RDG INLD WITH CD AIR FM TROF. PROGS DIFFER IN SPEED MVG DVLPG LO FM 160W NEWD TO BC AND WRM FNT RN INTO WA. PREFER SLOWER SGM BUT STILL NEED TO SPEED UP ERLR FCST. PROGS MAY NOT BE HANDLING LOW PROPERLY DUE TO TWO CNTRS AND STG JET. WILL BE CAUTIOUS WITH WND TREATMENT FRI.
UIL 868 OLM 657.
KIERULFF
WA...ADVISORY...TDA..SCA CST.

SFSS SFO SIM..VALID 11/0600Z...GRAPHICAL SIM..WSM..AVBL IN AFOS.
NOTE...WESTERN STLT..GOES-1 NR 130W..HAS BECOME INOPERABLE.
GOES-6 NR 98W CONTS TO OPERATE NORMALLY.
DESPITE 200KT NWLY AIREP WNDS THRU 43/140 AT 18Z..NO FTHR DIGG OF
OFSHR TROF APRNT AND JET AXIS HAS LIFTD A DEG NWD IN THE BOTTOM OF
TROF PAST 6HRS. STILL..STG FLOW INDCG STG THERMAL PACKING AND APRNC
OF VRY CD CU/CBS IN THE TROF SUGS COLDER CNTRL TEMPS IN TROF THAN
ANLYZD BY MRNG LFM. SP BETTER WITH NEG 30C AT H5 BUT EVEN COLDER
IS PSBL WITH THIS PAT. ESTM PSN OF TROF AXIS AT 00Z FM UPR LOW NR
56/139 TO 50/138 TO 40/130. SRN END SHFTG EWD ABT 20KT WITH UPR LOW
QSTNRY PAST 6HRS. JTSTR AXIS ESTMD FM 50/150..45/140..41/135..40/130
...45/125..55/127. A BRANCH SPLITS AWAY AND FLOWS INTO THE TROPICS
FM NR 41/135 THRU 32/130. SPLIT NWLY FLOW PRODUCG A NICE DELTA PAT
IN CD CLDS OFF CA CST. PAT SUGS THAT FNT IS A LTL STGR S OF THE
POLAR BRANCH OF JET THAN IT WOULD BE IF SRN BRANCH WERE NOT PRESENT
OR IF THE SRN BRANCH WERE CSDRBLY WKR.
FNTL BAND ABT 130NM WIDE HAS BACK EDGE OF DNSR PTN FM 50/127..43/125
...39/126..35/132. A VORTCNTR IS BHD THE FNT AND LCTD NR 45/129 MOVG
NEWD 20KT PAST 6HRS. FLAT WV APRNT ON FNT AHD OF IT NR VRISL AND MOVG
NWD ABT 25KT. CD CU/CBS BHD BTWN 40-45N FM 128-123W SUG PSBL 2ND
VORTCNTR NR 42/137 MOVG EWD ABT 20KT.
BROAD OVRRNG CLD MASS EXTDS WWD FM THE OFSHR TROF WITH DNSR PTN
FM ABT 145W WWD BTWN 42-50N. GMS DATA INDCS THE WWD EXTENT OF THE
MSTR/CLD BAND IS NR 178W BTWN 42-47N. AT 21Z..RMNS OF TROP STRM
OGDEN ARE BTWN 170-180W FM 40-45N MOVG EWD ABT 30KT PAST 6HRS.
12HR SP SFC MODEL INDCS LOW NR 41/171 994MB FOR 00Z. PSN RSNBL
THO APRNTLY NOT DP ENUF BY LCL ANLYS. WM CORE FEATURES IN WLYS
SMTIMES DVLP RPDLY WITH LTL OR NO CYC EVDNC IN HI CLDS ABV THEM.
AREA SHUD BE CLOSELY MONITORED. HOLMES

TBXX6 KSFO 110640 :220-84101107:42
SFSS SFO SIM..VALID 11/0600Z...GRAPHICAL SIM..WSM..AVBL IN AFOS.
NOTE...WESTERN STLT..GOES-1 NR 130W..HAS BECOME INOPERABLE.
GOES-6 NR 98W CONTS TO OPERATE NORMALLY.
LFM/SPEC INIT LOOK PRETTY GOOD THIS EVE WITH LFM SLGTLY PREFERRED
WITH BETTER POS ON VORT FEATURES IN THE ERN PAC TROF AND SLGTLY
STRGR VORT PAT OFF PACNW.
FNT AT 05Z APPRS TO BE NRG THE WA/ID BDR IN THE N..EXTNDG SWD ACRS
FAR ERN OR THEN SSWD ACRS NWRN CRNR NV OVR THE NRN SIERNEV AND
OFSHR IN THE SRN PTN OF THE S.F. BAY AREA WSWD..34/125..31/145.
PCPN OCRG ALG MST OF THE FNTL ZN WWD TO BTN 125/130 WITH ISOLD TRW.
HI CLDS AHD OF ZN OVR MST OF ID AND ALL BUT ERN QRTR NV WITH RN
BGNG IN WRN SXNS ID/NV. VORT MAX NR 46/128 MOVG NEWD 15-20 KT HAS
SHOWN LTL CHG WITH SCT TRW IN AREA FM MAX NWD TO ABT 50N THEN EWD
TO VRISL. PSBL VORT MAX MENTIONED IN ERLYR SIM NOT APPRNT.
JET AXIS ALG 51/150..40/130..39/128 THEN NNEWD OVR EXTRM SW OR..NW
WA INTO NRN BC.
WV DATA NOT AVBL BUT TROF DOES NOT APPR TO HAVE DUG SWD. TROF
EXTNDS FM NR 57/140..45/130..39/128. LTL EWD MVMNT OF TROF NOTED
IN N BUT ALG 40N TROF LN HAS MVD E 15-20KT. LFM MOVES THE TROF
LN INTO THE SIERNEV BY 12Z BCMG MORE NEG TILT. GIVEN CURRENT POS
THIS APPRS TO BE TOO FAST.
BACK EDGE OF BAROCLINIC ZN CONTS ALG THE WA/OR CSTS. SHWRS ARE OCRG
IN THE COLD AIR AHD OF THE TROF LN AS WELL AS THE TRW ASSOCD WITH
VORT MAX MENTIONED ABV. SCT SHWRS ALSO APPRNT FEW DEGS BHND TROF
LN.
DELTA PAT FRMD BY SPLIT IN JET BTN 130/140W BCMG LESS IMPRESSIVE
AS BR DROPPING SWD APPRS TO BE TAKING ON A MORE WLY COMPONENT
PAST FEW HRS. UPRSTRM RDG ALG 150 HAS PUSHED NWD A DEG OR TWO
ALSO WITH CONSIDERABLE THINNING OF THE HI CLDS SPILLING OVR THE
RDG BTN 140/150 AND BTN 40/50. THIS MSTR REMNANTS OF T.S. OGDEN.
TSTMS IN EXTRM SERN AZ ABT OVR BUT VORT MAX NR 30/110 MOVG ENEWD
ABT 15 KT MAY SPARK A FEW MORE BFR THE NIGHT IS OUT. ONLY CSTL

TELETYPE ARCHIVE DATA RETRIEVAL

DATA FROM OCTOBER 11 1984 1200Z TO OCTOBER 12 1984 0000Z

LTBXX6 KSFO 111230 :220-84101113:07
SFSS SFO SIM..VALID 11/1200Z...GRAPHICAL SIM..WSM..AVBL IN AFOS.
NOTE...WESTERN STLT..GOES-1 NR 130W..HAS BECOME INOPERABLE.
GOES-6 NR 98W CONTS TO OPERATE NORMALLY.
ERN PAC TROF CONTS TO BCM MORE NEGATIVELY TILTED BUT BOTH MODELS
TOO FAST. UPR LO IN GLFALSK ON IMAGERY HORIZON BUT APPRS NR
56/142 WITH VORT MAX APROX 56/140. MVMNT APPRS TO BE NNWWD 5-10KT.
TROF APPRS TO EXTENDS FM LO..42/125 THEN SWD TO 35/126. TROF LN
MOVG EWD ABT 20 KTS ALG 40/45N WITH LTL EWD MVMNT N OF 52N. VORT
MAX OFF WA CST NR 47/127 MOVG NNEWD 20KT WITH RW/TRW N OF THE
CNTR OVR VRISL AND PAC WTRS W TO 130W. LAST CPL HRS APPRS THIS
MAY HAVE BCM A CLSD CIRCLTN. FNTL ZN ATTM THRU EXTRM NWRN MT SWD
THRU CNTRL ID THRU APROX OWY/EKO NV THEN SWWD BTN
RNO/TPH OVR THE CNTRL SIERNEV AND OFSHR BTN MRY AND VBG..29/135.
LGT/MDT PCPN OCRG ALG FNTL ZN. AREAS RN BHND FNT OVR MUCH OF WA/
OR/CA IN BRD BAROCLINIC ZN. JET AXIS FM 51/150..45/135 THRU BOTTOM
OF TROF THEN ACRS EXTRM NW CA AND NWD OVR WRN OR/WA INTO NERN BC.
CONSIDERABLE COLD CU IN BOTTOM OF TROF MNLY AHD OF THE TROF LN
BUT PRBLY OCRG OUT TO 130W BTN 40/45N. BACK EDG OF BAROCLINIC ZN
IS FINALLY MOVG INLD A LTL IN WRN WA/OR.
SGFNT LEAF CLD DVLPMNT HAS OCRD ALG FTNL ZN W OF 125W SO PCPN
LKLY IN BAROCLINIC ZN WWD TO 135W. UPSTRM..MOISTURE FM OLD
T.S. ALREADY UP TO 130W. SFC LO ON LFM NR 45/150 AT 12Z APPRS
REASONABLE. LO NOT APPRNT ON IMAGERY WITH HVY HI CLD COVER BUT
PAC ANLYS SUPPORTS LFM SPEED.
VORT MAX APPRNT IN W/V DATA IN NW MEX NR 29/108 MOVG EWD 10-15KT.
MID/HI CLDS OVR SERN CRNR AZ. COULD STILL BE SOME TRW DVLPMNT
THERE.
PUCEVICH

PGM:MSCHK --- CIRCUL : 220 TIME RCVD: 1246Z

FPCN20 CWVR 121215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15AM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM SATURDAY.

GEORGIA STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEAST 25 TO 35 KNOTS RISING TO 35 TO 45 WITH HIGHER GUSTS THIS MORNING. WINDS DIMINISHING TO 20 TO 30 DURING THE AFTERNOON AND BECOMING SOUTH TO SOUTHEAST 15 TO 20 DURING THE NIGHT.
INTERMITTENT RAIN TODAY. SHOWERS TONIGHT. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

JUAN DE FUCA STRAIT
GALE WARNING CONTINUED.
WINDS EASTERLY 15 TO 25 KNOTS INCREASING TO 20 TO 30 THIS MORNING. WINDS INCREASING OVER EASTERN AND WESTERN ENTRANCES AT TIMES TO SOUTHEAST GALES 35 TO 45. WINDS SHIFTING TO WESTERLY 20 TO 30 THIS AFTERNOON. CLOUDY. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITIES LOWERING TO 1 TO 3 MILES IN RAIN.

WEST COAST VANCOUVER ISLAND.
STORM WARNING CONTINUED.
WINDS SOUTHEAST 45 TO 65 KNOTS WITH HIGHER GUSTS SHIFTING TO SOUTHWEST 30 TO 40 THIS AFTERNOON. WINDS DIMINISHING TO 20 TO 25 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
STORM WARNING CONTINUED.
WINDS SOUTHEAST 50 TO 60 KNOTS WITH HIGHER GUSTS DIMINISHING TO 30 TO 40 THIS AFTERNOON. WINDS DIMINISHING FURTHER TO 20 TO 30 TONIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
STORM WARNING CONTINUED.
WINDS EAST TO SOUTHEASTERLY 45 TO 65 KNOTS WITH HIGHER GUSTS. WINDS DIMINISHING TO SOUTHEAST 35 TO 45 DURING THE AFTERNOON AND TO 20 TO 30 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

WEST COAST CHARLOTTES.
STORM WARNING CONTIUED.
WINDS EAST TO SOUTHEAST 45 TO 65 WITH HIGHER GUSTS. WINDS SHIFTING TO WEST TO NORTHWEST 40 TO 50 THIS AFTERNOON AND DIMINISHING TO SOUTHWEST 20 TO 30 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITIES LOWERING TO 1 TO 3 MILES IN RAIN.

END PART 1

FPCN20 CWVR 121215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15AM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM SATURDAY.

BOWIE
GALE WARNING UPGRADED TO STORM WARNING.
WINDS NORTHWESTERLY 45 TO 55 KNOTS BECOMING WESTERLY 40 TO 50 THIS AFTERNOON. WINDS DIMINISHING TO SOUTHWESTERLY 20 TO 30 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

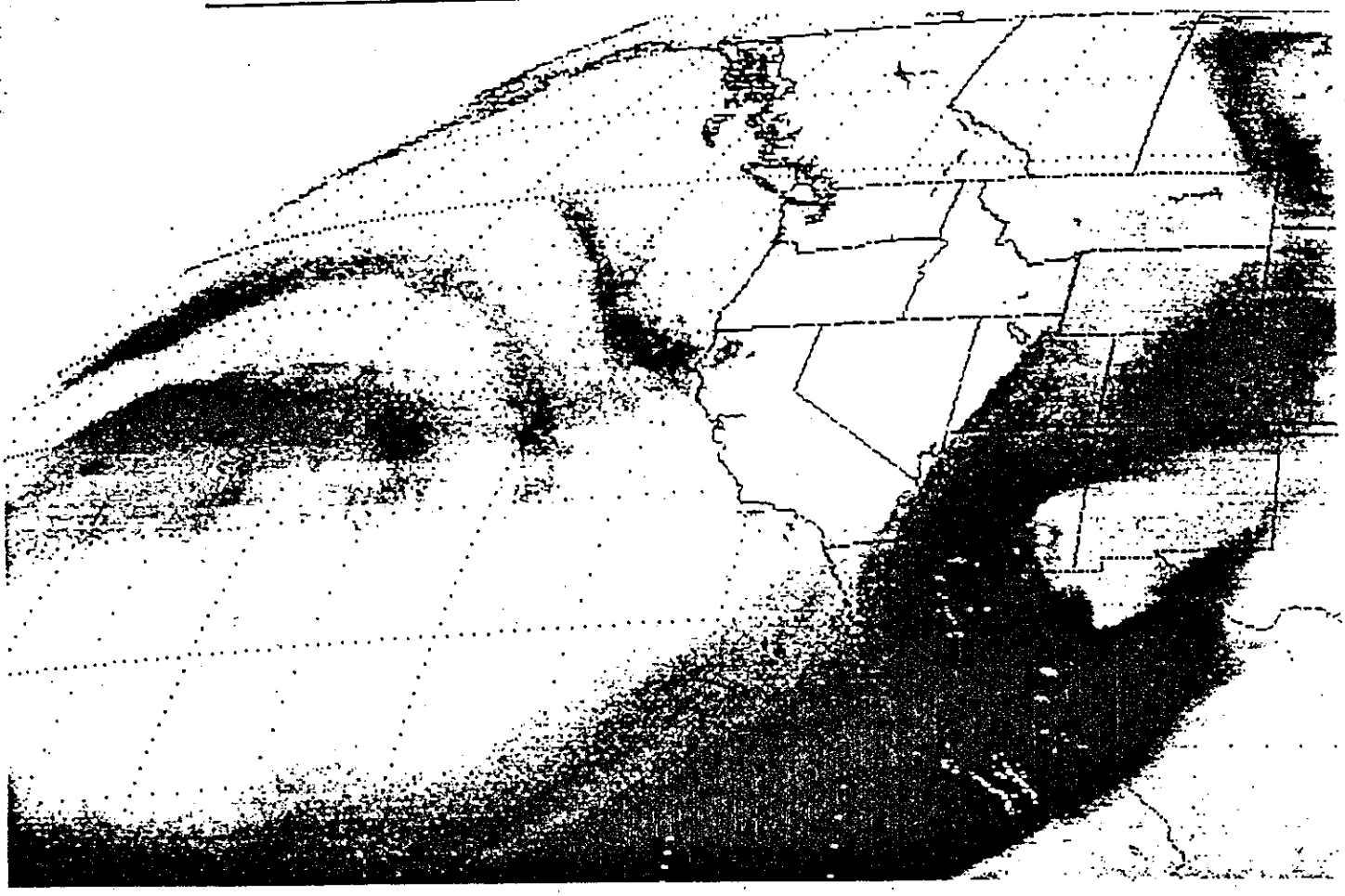
EXPLORER
GALE WARNING CONTINUED.
WINDS SOUTHWEST 35 TO 45 KNOTS DIMINISHING TO 20 TO 30 THIS AFTERNOON. WINDS DIMINISHING FURTHER TO 15 TO 20 OVERNIGHT. FREQUENT SHOWERS TODAY LOWERING VISIBILITY TO 1 TO 3 MILES. DECREASING SHOWERS TONIGHT.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM FRIDAY.
SOUTH COAST...MODERATE TO STRONG SOUTHERLIES EXCEPT WESTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG SOUTHERLIES.
OFFSHORE ..STRONG SOUTHWEST WINDS.

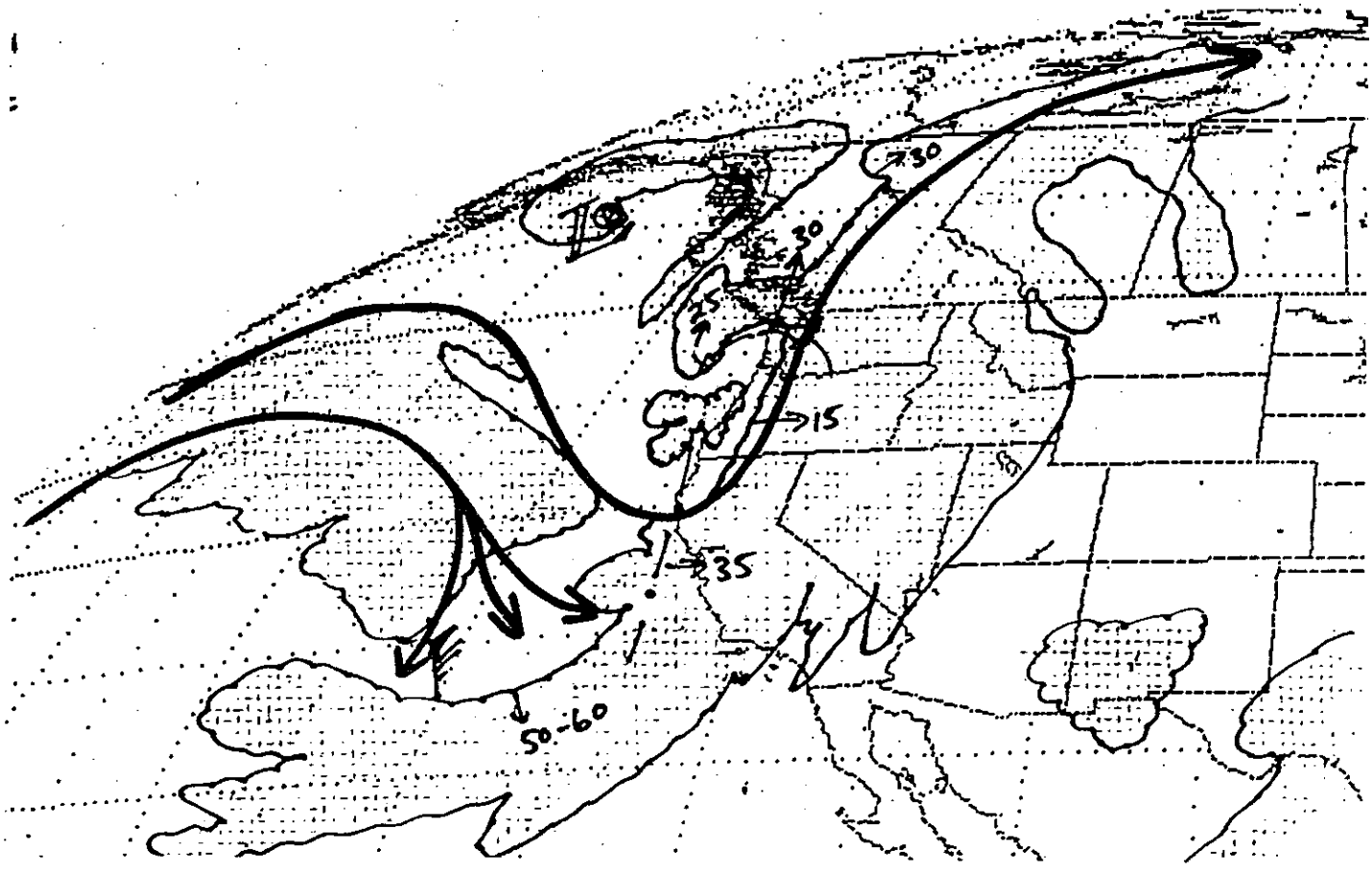
END

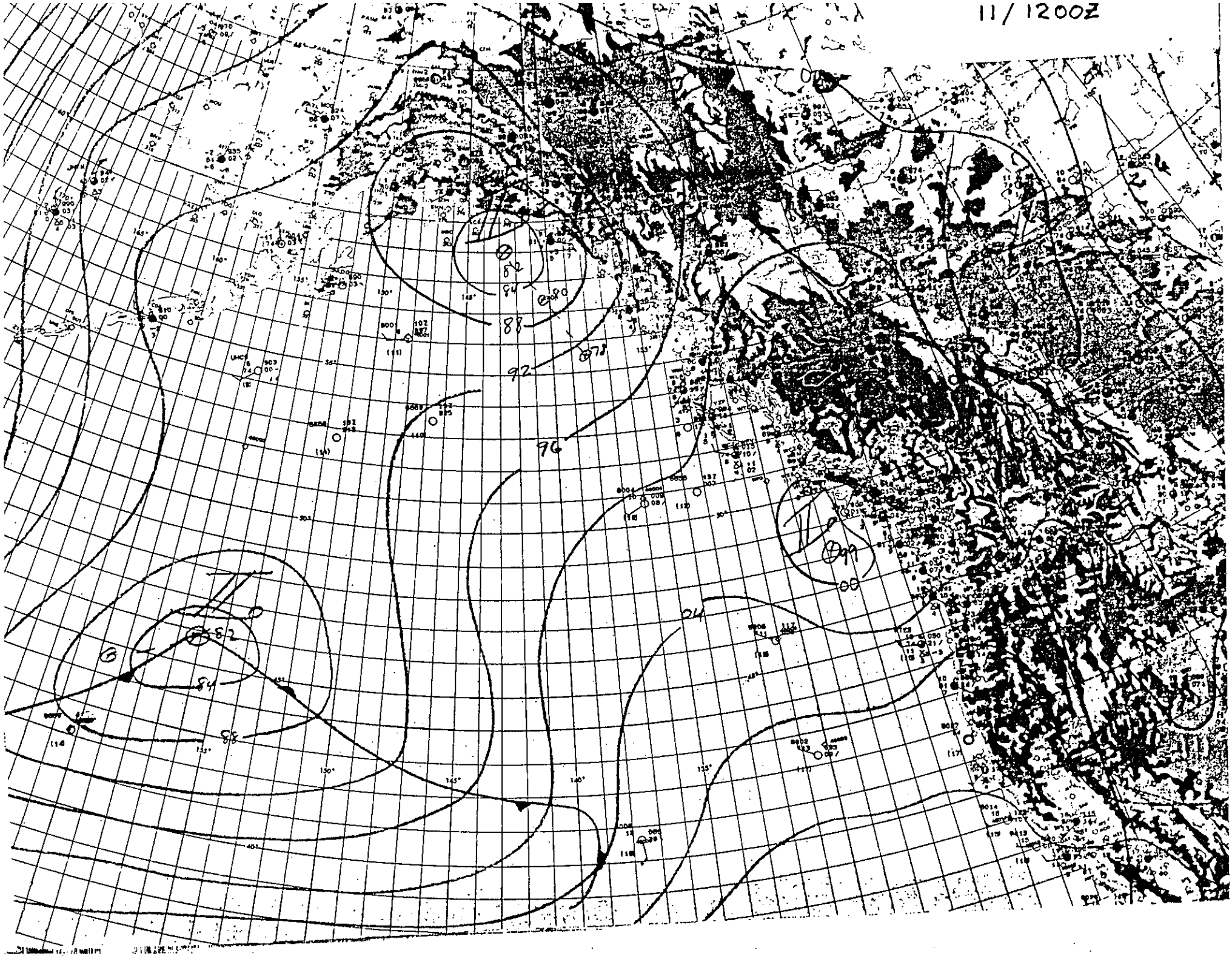
SYNOPSIS
A LOW PRESSURE CENTRE OF 970 MILLIBARS NEAR 51N 130W THIS MORNING WILL DEEPEN AND MOVE NORTH INTO THE GULF OF ALASKA. A FAST MOVING FRONT ASSOCIATED WITH THE LOW FROM JUST WEST OF THE CHARLOTTES TO 46N 127W THIS MORNING WILL MOVE ON TO THE COAST BY MIDDAY. STORM FORCE SOUTHEAST WINDS ARE EXPECTED OVER MOST WATERS AND EXCEPT GEORGIA AND JUAN DE FUCA STRAIT WHERE GALES ARE EXPECTED. WINDS WILL DIMINISH AS THE FRONT AND LOW MOVE AWAY.

PWC WATER VAPOUR IMAGERY 11/1131Z

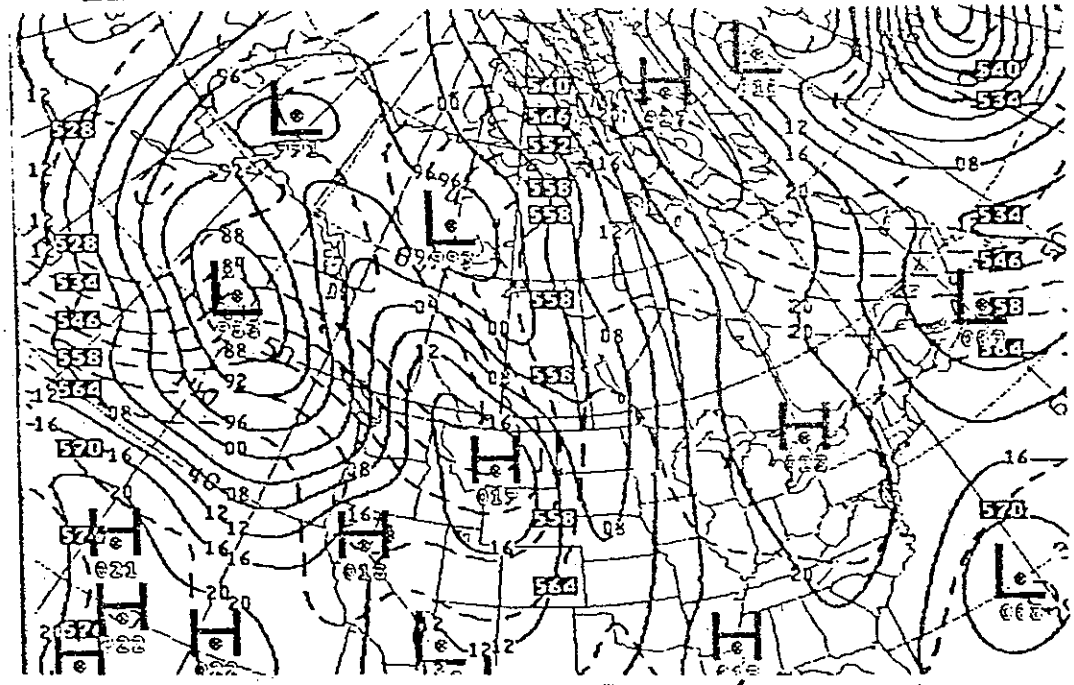


PWC SATELLITE ANALYSIS 11/1200Z

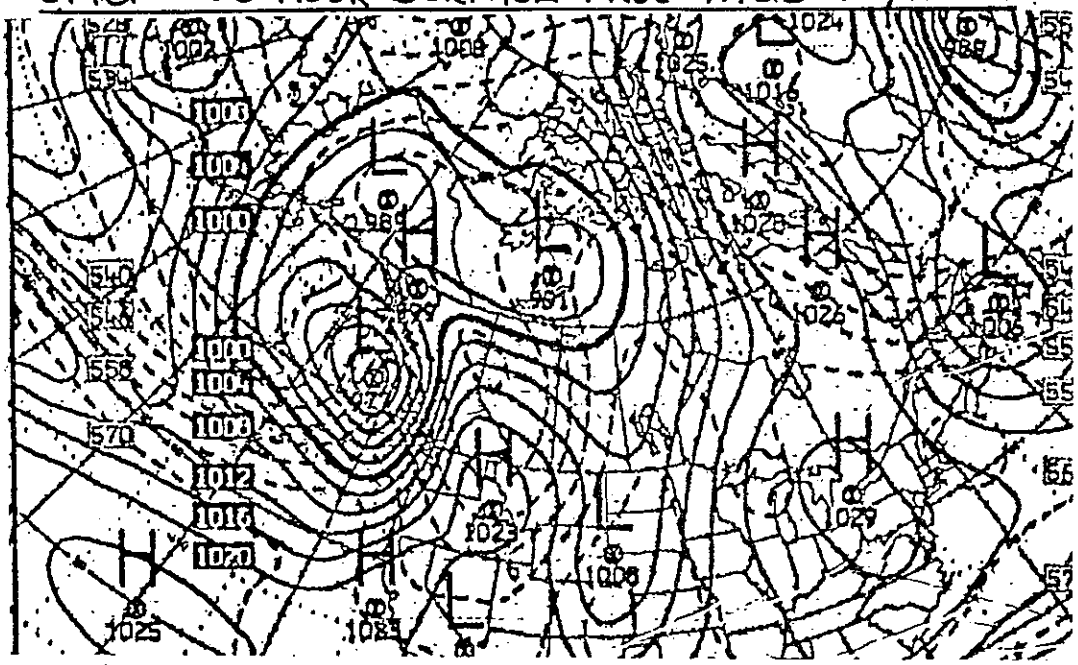



11/1200Z

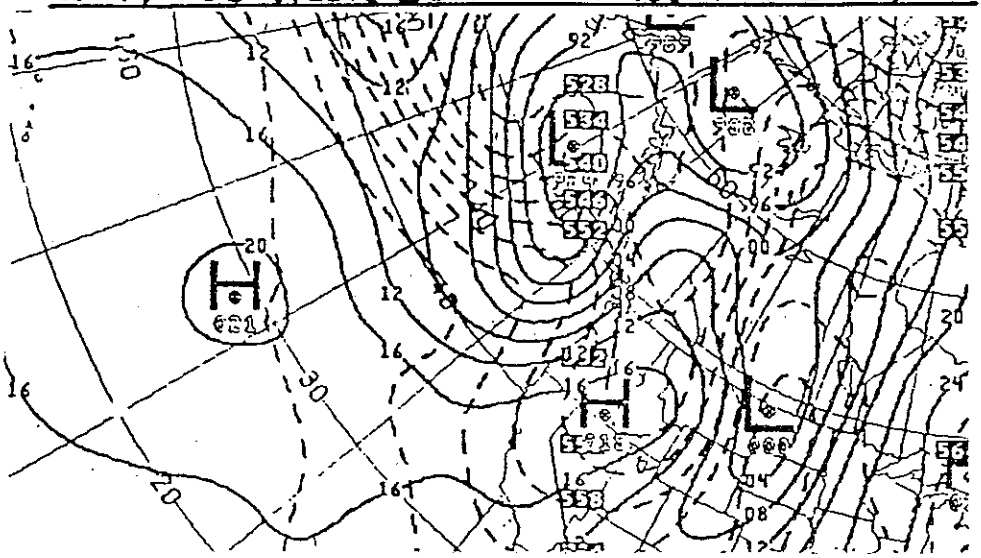
U.S. SPECTRAL 36 HOUR SURFACE PROG VALID 12/1200Z



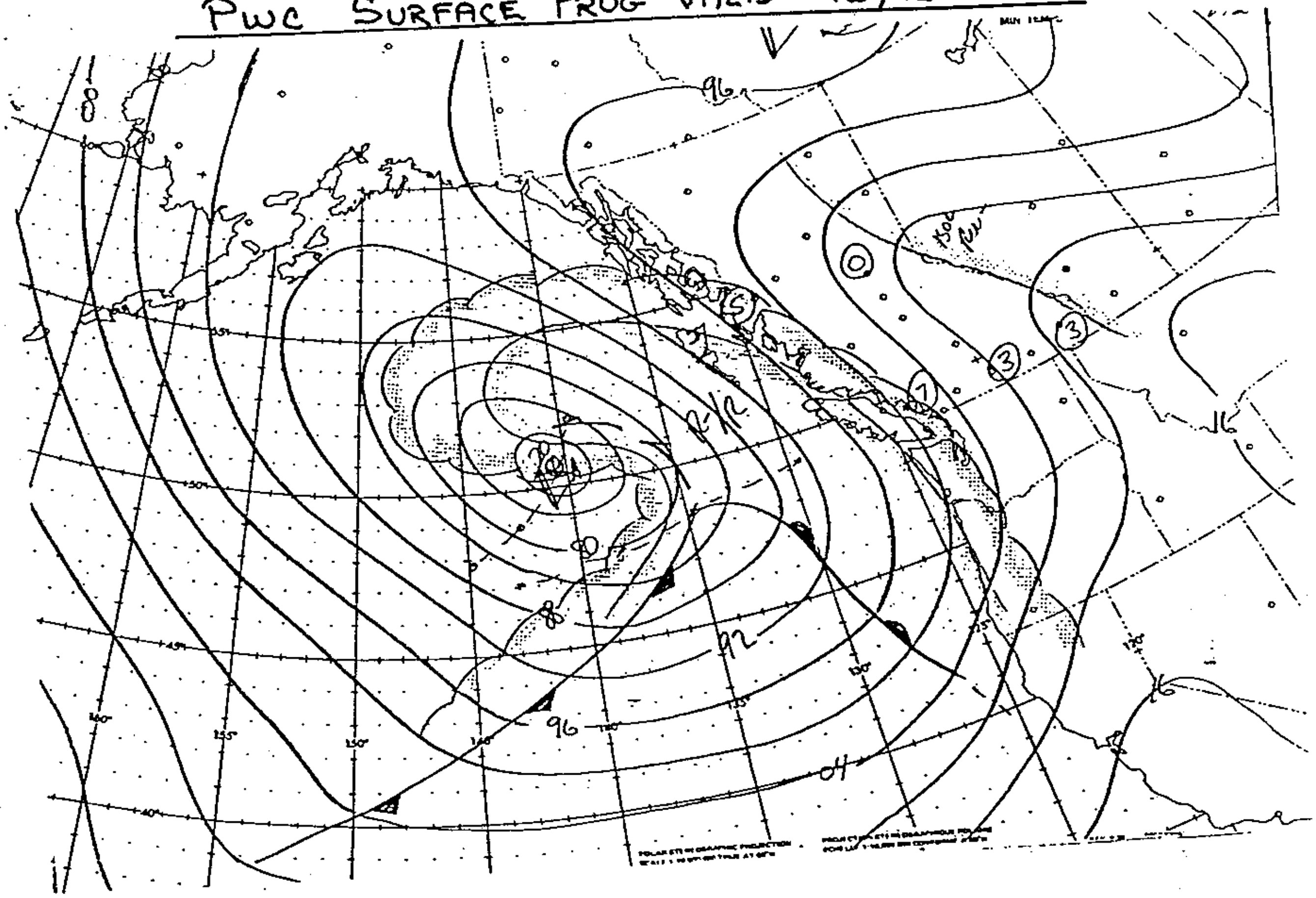
GMC. 36 HOUR SURFACE PROG VALID 12/1200Z



L.F.M. 36 HOUR SURFACE PROG VALID 12/1200Z



PWC SURFACE PROG VALID 12/1200Z



2.5 Thursday Morning (October 11)

On the 11/1800Z surface analysis there were 5 ships within a 300 nmi. radius of the low centre. 3 of the ships were east of the low. 2 of these ships reported strong falling pressures as follows: KLHZ falling 50 (i.e. 5 mbs/3 hrs) and UZUA falling 70.

On the satellite imagery the cirrus with the system had pushed northward about 3° in the last 6 hours, indicating building of the ridge ahead of the system. The ridge line was moving east at about 30 knots. The dry "slot" was now evident. Farther to the west, cold convective clouds could be seen. The flow into the system was becoming slightly more meridional indicating sharpening of the following trough. The southern warmer valued stream however seemed to be breaking through to the south which would lead to a split in the system if it continued.

The model run based on 11/1200Z data proved very interesting. The CMC spectral 24 hour prog for 12/1200Z backed off on development showing a 987 mb low at 53 N 141 W. Did the bogus data entered on the 11/0000Z analysis affect the way the model handled the low? Was the lack of data on the communications system a factor? or both?

The U.S. Spectral continued to back off on development showing a 995 mb low at 50 N 140 W.

The LFM was similar to the previous run showing a 982 mb low near 54 N 141 W.

The communications disk was repaired and operating at 11/1232Z although the backlog on the circuit lasted for several hours.

The PWC prog for 12/1200Z, based on this model run, showed a 988 mb centre near 53 N 141 W. The forecasters had also backed-off.

2.6 Thursday Afternoon (October 11)

Gale Warnings were extended to southern coastal areas at 7 p.m. (12/0200Z). The 7:15 p.m. forecast for West Coast Vancouver Island called for winds increasing to southeast 30 to 40 knots Friday afternoon.

Attachments:

FXCN 1 CWAO 11/1715Z
FXCN 1 CWAO 11/2245Z
FXCN 1 CWVR 11/1900Z
FXCN 1 CWVR 11/2200Z
FPUS 3 KSFO 11/1558Z
FPUS 3 KSEA 11/1600Z
FPUS 3 KSEA 11/2200Z
FPUS 3 KSFO 11/2158Z
TBXX 6 KSFO 11/1815Z
TBXX 6 PANC 11/2159Z
FPCN 20 CWVR 11/1815Z
WWCN 1 CWVR 12/0200Z
FPCN 20 CWVR 12/0215Z
PWC Surface Analysis 11/1800Z
U.S. Spectral 24 Hour Surface Prog Valid 12/1200Z
CMC 24 Hour Surface Prog Valid 12/1200Z
LFM 24 Hour Surface Prog Valid 12/1200Z
PWC 18 Hour Prog Valid 12/1200Z

FXCN1 CWAO 111715 220-84101118:29

NEW V9 APPRS RSNBL AND ACPTD WITH MINOR CHGS. NO SIG CHGS FM PREVIOUS SUBJ 48 HR.
RPDLY MOVG PAC LO WILL HAVE REACHED BC CST BY 36HR BRINGING XTNSV PCPN. WRN AIR PUSH OVR PRAIRIES WILL SLOLY COME TO AN END OVR NX FEW DAYS AS MAJOR S/W CROSSES ROCKIES. LO SLIDING OVR LABRADOR WILL BGN DVLPMNT AS IT MOVS ARD TROF BYD 36 HRS.
NEW LFM SIMILAR TO V9 AT 36 HRS XCP IN SMALL FEATURES OVR USA. THIS MAY BE DUE TO LTL NON CANADIAN U/A DATA IN ANAL THIS MORNING. TREND PRFRD TO V9 FOR SPEED OF PRAIRIES S/W.
60 HR PROG CONTINUES PREVIOUS TRENDS AS INDCTD BY 60 HR V9. DIAGNOSTIC QPF PRFRD.
END/LAURENCE

FXCN1 CWAO 112245 220-84101122:37

MODELS ALL HANDLE STN IN SIMILAR FASHION BUT VARY IN DETAILS. V9 AND GLOBAL MORE ALIKE AND THEY ARE PRFRD.
LABRADOR LO WILL TURN ARD TROF DRG PRD AND BGN INTENSIFICATION. GLOBAL DEPTH PRFRD HERE. QUE RDG MAY NOT BE AS INTENSE AS V9 SLN USED IN PROG. JOSEPHINE IS FCST TO KEEP MOVG VRY SLOLY.
STG S/W CROSSES ROCKIES DRG PRD AND LONG RANGE PROG INDCT TROF OVR CNTRL N AMERICA.
MODELS DIFFER IN TREATMENT OF PAC LO. V9 AND GLOBAL BRING IT TO ALSK PANHANDLE BY 48 HRS WITH V9 DPR. LFM MOVS LO TO NRN GLFALSK. V9 SLN PRFRD AS ANAL SHOWS LO DPR THAN 12 HR GLOBAL. THIS SYS LIKELY TO BRING BC LOTS OF RAIN.
DIAGNOSTIC QPF PRFRD.
END/LAURENCE

TELETYPE ARCHIVE DATA RETRIEVAL

DATA FROM OCTOBER 11 1984 1200Z TO JANUARY 17 1984 0700Z

FXCN1 CWVR 111900 220-84101118:31 ...CONT...
DATA EITHER SLO COMING IN OR MISG DUE TO TORONTO COMPUTER PROBS...

500MB/SAT...GULF LO CONTINUES WKNG TREND. VORT MAX OVR W CST VRISL CONTS NNE AT 20 KTS WITH TROF TO CSLIF CST MOVG EWDS 15 KTS. HVY CVCTV CLDS WITH VORT CNTR AND E OF TROF. OLD FNTL STRM RMNS N-S ALG 120W MOVG E 15 KTS WITH LYRD CLDSD OVR ALL OF BC INTR. UPSTRM FNTL STRM RMNS S OF 50N BUT SFC ANAL RMNS IN DOUBT DUE TO LAK OF SHIP RPRTS AND POOR RESOL OF SAT PICS DUE TO SYS BEING ON EDG OF PICS.
S/WV NR.40/140 WILL CONT MOVG E AND RCH CALIF BY FRI. NXT SYS ALG 155W MOVG EWDS ABT 25 KTS AND NUM PROGS DEVELOP THIS INTO MAJ STORM WITH S/WV CROSSNG BC CST BY FRI AFTN. THIS APRS TO BE 6 TO 12 HRS FAST DUE TO POOR ANAL THIS MRNG. AMNT OF DVLPMNT FCST IS ALSO A LTL SUSPCT BUT CANT SEE HOW MUCH COLD AIR IS BHND SYS TO PROMOTE DVLPMNT.

SFC...SFC LO OFF WASH CST XPCTD TO WKN AS UPR TROF MVS INLAND. FNTL BAND OVR INTR CONTINUES EWD TO ALTA THIS EVE. RDGG OVR BC AHD OF NXT PAC SYS. 980MB LO MOVS TO N CHRLTS BY FRI AFTN WITH FNTL WVNR 50/130 AND SELY NR GALE FORCE GRAD ALG CST.

WX...RN ACCOMPANIES FNTL BAND ACROSS INTR. SHWRS CST UNTIL UPR TROF PASSES AND AMS BEGINS TO STBLZ. RN AND INCRSG SELY WNDS ON THE CST FRIDAY AFTN AS NXT PAC SYS APRCHS. GALE WRNG IN EFFECT FOR OFSHR AND N CST WTRS.
COOLER TMPS TDY WITH OVRNGT TMPS IN THE OK DROPPING TO NR FRZG.

END
THOMAS

FXCN1 CWVR 112200 220-84101122:31

500MB/SAT...QSTNRY GULF LO CONTINUES WKNG. VORT MAX NR 50/125 CONTS NNE AT 20 KTS WITH TROF TO WRN NEVADA MOVG EWDS 20 KTS. HVY CVCTV CLDS WITH VORT CNTR AND E OF TROF. OLD FNTL STRM RMNS N-S ALG 118-120W MOVG E 15 KTS WITH LYRD CLDS OVR ALL OF BC INTR. UPSTRM FNTL STRM RMNS S OF 50N WITH DVLPNG VORT MAX NR 47/143 MOVG E 15-20 KTS BUT PRBLY WILL ACCEL. FNTL STRCTR NOT CLASSICAL BUT GUD SFC LO DVLPNG.
THIS S/WV WITH STG SFC FNT WILL RCH CST BY FRI AFTN WITH SFC LO MOVG TO N CHRLTS AS 976MB CNTR.

SFC...SFC LO OVR VRISL XPCTD TO WKN AS UPR TROF MVS INLAND TNGHT. FNTL BAND OVR INTR CONTINUES EWD TO ALTA OVNGHT. RDGG OVR BC AHD OF NXT PAC SYS. 976MB LO MOVS TO N CHRLTS BY FRI AFTN WITH FNTL WVNR 50/130 AND SELY NR GALE FORCE GRAD ALG CST.

WX...OCCNL RN INTR WITH FNTL BND TNGHT. SHWRS CST UNTIL UPR TROF PASSES AND AMS BEGINS TO STBLZ. RN AND INCRSG SELY WNDS ON THE CST FRIDAY AFTN AS NXT PAC SYS APRCHS. GALE WRNG IN EFFECT FOR OFSHR AND N CST WTRS.
COOLER TMPS WITH OVRNGT TMPS IN THE OK DROPPING TO NR FRZG.

END
THOMAS

FPUS3 KSFO 111558 220-84101116:42
NEW LFM NOT AVBL ATTM....THO H5 PLOT QUITE DIFFERENT FM PREV RUN WHCH WAS NOT DEEP OR SHRP ENUF. THS SHUD ALLOW WRM OVRRNNG AMS BTN 130 AND 140W TO SPRD OVR DIST TNGT. XTRAP HS BCK EDGE TO THE CST ABT 14Z FRI. TYPICAL DIRTY RDG MST OF DIST WI CHC LGT PCPN XCPT N OF 40N WHERE RAIN LIKELY. SHRT TERM HS TROF CROSSNG DIST TDY AND ENUF MSTR AND INSTBLTY FOR SCT RW- WI TRW-. CLDS OVRNGT SHUD KP TEMPS UP AND MINIMIZE FOG.
EKA 663 SFO 631 RBL 662 SAC 632 FAT +2- BFL 81- SMX +3-.NULL
CA...ADVISORIES...TDY SCA..PT ST GEORGE TO PT CONCEPTION
TDY TA...ZNS 9..10.

FPUS3 KSEA 111600 220-84101116:50
NEW LFM NOT SEEN. UPR TROF OFSHR MOVG EWD BUT STILL SLOWR THAN PREV LFM/SP MDLS. SAPIX SHW CSDRBL CB/TCU OFSHR CNTRL AND SRN ORE CST BUT NOT SO MUCH OFSHR AST AND HGM. AMT OF SHWRS IN W TDA WILL DEPEND ON WTHR ENHANCED POCKET CONTS EWD OR ROTATES NEWD UP THIS WAY. BAROCLINIC BND HAS BCK EDGE VCNTY PGTSND AND WILL BE SLO TO MOV EWD. RN LIKLY TO CONT ALG ERN BDR FOR SOM TIME. NO MJR CHGS TO PREV FCSTS.
UIL 868 OLM SEA 657 YKM 323 GEG 813 ALW 813. GPH
WA...ADVISORY...TDA..SCA CST.

FPUS3 KSEA 112200 220-84101121:40
BAROCLINIC CLD BND GRDLY CLRG ACRS ERN WA AS NEG TILTED TROF ROTATES INLND. BCK EDGE SHUD CLR SE CRNR WA BY DRK AND NE CRNR ERY MRNG. MAIN FCST PROB OF DAY IS SYS IN ERN PAC CONTAINING TROP MSTR FROM OLD TYPHOON OGDEN. VORT MAX NR 45/151 ACRDG TO SIM MSG MOVG ENE 45 KTS. ASSOCD SFC LO ABT 45/145 AND OVRNG RN EWD TO ARND 138W. EDGEWISE LUK ON SAPIX APPRS TO SHW COLD AIR CU ON BCKSIDE OF VORTMAX. NEW LFM AND SP DONT HAV TROP MSTR IN ANALYS AND ALSO BELIEVE BOTH TRY TO ELIMINATE TROF ALG BC CST TOO FAST. LFM UNREALISTIC IN CURLING LO NWD TWRDS ANC. MN WRM ADVCTN EWD AND SHIP VCNTY 43/143 SHWS 7 MB FALL. WILL SPRD OVRNG RN INTO W SIDE FRI AND E SIDE FRI NGT. SFC LOW TRCKG TO ARND YZT LATE FRI AND MAY INTENSIFY RPDLY IF TROF AXIS STILL ARND. PSBL HVY OVRNG RNS BGNG LATE FRI BUT WND ON W SIDE WILL HAV TO AWAIT MVMNT OF LO INLND.
UIL 489 OLM SEA 368 YKM -36 GEG 324 ALW 235. GPH
WA...ADVISORY...TNGT..SCA CST AND INLND WTRS.

FPUS3 KSFO 112158 220-84101121:49
SP AND LFM IN GUD AGRMNT MOVG TROF INLD TO NR UT IN 24HR WI WK RDG ALG THE W CST. MDLS AND PIX SHW OVRRNNG PATTRN IN THE N AS REMNENTS OF OGDEN SPLITS WI SML PTN OF THE MSTR NR THE CA/OR BDR. HV CNCLLD TA IN THE SIERNEV WI DCRSG SHWRS. MAIN PROB OVRNGT CUD BE DVLPMNT OF GND FG AND LWRG TEMPS...THO TRND IS TO RECOVER TEMPS MST AREAS WI RISING HTS NXT 36HRS TO NR NRMLS.
EKA 632 SFO 11- RBL 31- SAC 11- FAT --0 BFL 1-0 SMX --0.NULL
CA...ADVISORIES...TDY SCA..PT ST GEORGE TO PT CONCEPTION FOR SWELLS.

TBXX6 KSFO 111815 220-84101118:56
SFSS SFO SIM..VALID 11/1800Z...GRAPHICAL SIM..WSM..AVBL IN AFOS.
BROAD DIRTY RDG MOVG OVR ERN PAC BHND VRY ACTV FNTL BND NOW OVR
THE RGN. INTIAL LFM LOOKS WK NR 150W WHEM COMPARED TO 12Z IMAGERY.
ALSO NOT GOOD ON DETAILS OF CSTL TROF.
LATEST DATA SHOWS JET AXIS ALG LINE THRU 41/160..44/150..46/140..
43/135..SFO..RNO..SCNTRL WA..50/122. A 2ND BRANCH OF THE JET NOW
CUTOFF FM MAIN PTN LIES ALG AXIS 37/135..30/132. THIS PTN WKNG.
FLAT RDG AXIS 42/132..52/140 SHFTG EWD 35KT. MSTR WI THIS DIRTY
RDG FM TYPHOON OGDEN..IS VRY DNS AND CVRS LARGE AREA WITH LDGE
AT A POINT NR 40/125..EXTDG FM THIS POINT TO 50/139 AND ALSO TO
35/132. THE EDGE MOVG EWD TWD WA/OREG CST AT 40KT AND EXTRAP TO
NWRN CRNR OREG NR 01Z. IT IS MOVG ONLY 30KT S OF 40N AND SHOULD
MAKE CNTRL CA CST NR 02Z. BACK EDGE S OF 40N IS NR 139W 35/40N
SHFTG EWD 40KT. CLDS S OF 40N DCRG AT A MDT PACE. N OF 40N..CLDS
EXTD BACK TO 155W WHERE VORT CNTR 45/151 MOVG 45KT ENEWD LOOKS
STGR THAN THAT ON INITIAL LFM. ASSOCD SHRTWV EXTDS THRU 40/144.
MDT/HVY PCPN ESTD WI CLD MASS AHD OF THIS FEATURE.
CSTL TROF ALG AXIS THRU VORT CNTR 48/126..SFO..30/121. WV LENGTH

TBXX6 KSFO 111815 220-84101118:56 ...CONT...
OF TROF STILL DCRG AS VORT CNTR MOVS NNEWD 20KT AND TROF PUSHES
EWD 15/20KT. VORT CNTR NOT HANDLED BY LFM. LOBE BCMG STRETCH
AND DVLPMT OF VORT CNTR NR NWRN CRNR OF NV SUGD BY IMAGERY
SHFTG EWD OVR NV WHILE NRRLY STNRY OVR WA. COLD AMS CNVTN
DCRG WI THE TROF AT FAIRLY RPD PACE. ONLY ISOLD OVR EXTREME NRN
CA. SCT WKNG OVR WRN WA..WRN OREG. SCT CVNTN STILL OFSHR PACNW
TO 130W. FNTL BND ID..EXTREME NWRN MT..ERN WA..ERN OREG..NV..
OVER SAN JOAQUIN. PTN ERN OREG..WRN ID BEING ENHNCD BY DVLPG
VORT CNTR NW CRNR NV..EMBDD CNVTN NR FNT ITSELF SEEN ON EHNCD
IMAGERY AS NARROW BND ID PHDL..NERN CRNR NV..CNTRL NV..S OF TPH..
VBG. ONLY LGT PCPN ESTD OFSHR WI THE 1 DEG WIDE BND WHICH EXTDS FM
VBG..30/128. SCT/BKN MID/HI CLDS EXTDS AHD OF THE FNTL BND INTO CNTRL
MT..WRN UT..WRN AZ..SRN CA.
GERST.

TBXX6 PANC 112159 220-84101122:18

WSFO ANC SIM. IMAGERY THRU 2030Z

SATELLITE INTERPRETATION OF SFC LOWS...

NO.	PSN	MOVMT	REMARKS
1.	59-60/145W	NE 15-20 KTS	LTLCHG
2.	46/147W	E 40-50 KTS	DFUS/DVLPG SLGTLY
3.	76/170W	QSTNRY	DPNG SLGTLY/DFUS
4.	59/165E-170E	EST ENE 15 KTS	DVLPG/DFUS

ERN N PAC..GLF AK..SE AK..
LOW NO. 2 APPEARS TURNING SLGTLY ENE WITH NRN EDGE OF CI SHIELD
BECOMING ENTRAINED NEWD AT 15-25 KTS ALG 54/140W-145W..TWDS NERN
GLF AK. THIS SYS IS TRYING TO MERGE WITH LOW NO. 1 IN GENL AGRMNT
WITH MACH-PROGS. LOW NO. 1 IS STILL EVIDENT VERY CLOSE TO PRINCE
WILLIAM SND WITH NEG TILT TROF PIVOTG SLOWLY EWD OVR SE AK AND
B.C. CST. UPR LOW IS DROPPING SLOWLY SWD NR 53/162W.

MNLND AK..ARCTIC..BERING SEA..
VORT/WEAK LOW WAS ON LATEST NOAA6 CNTRD OVR 67/150W MOVG SLOWLY
WWD TWDS UPR COL OVR W CST OF MNLND AK. XTNSV LOW-MID CLDS WERE
OBSCG MOST OF MNLND AK..ARCTIC..AND BERING SEA. FEW CLR AREAS
WERE OVR CAPE LISBURNE AND BRISTOL BAY. A LARGE SURGE OF COLD CU
IS MOVG SE THRU ALEUTIAN ISLANDS. BOTH LOWS 3 AND 4 APPEAR DVLPG
SLGTLY BUT ARE DFUS.

CALZADA OCT 84

PGM:MSCHK --- CIRCL #: 220 TIME RCVD: 1816Z

FPCN20 CWVR 111815
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.15AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON FRIDAY.

GEORGIA STRAIT
SMALL CRAFT WARNING.
WINDS SOUTHEAST 5 TO 15 KNOTS RISING AT TIMES TO 20 KNOTS.
WINDS INCREASING TO SOUTHEAST 15 TO 25 KNOTS FRIDAY MORNING.
MOSTLY CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG PATCHES.
VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS VARIABLE 5 TO 15 KNOTS OCCASIONALLY WEST 15 TO 20 TODAY.
WINDS BECOMING EASTERLY 10 TO 15 KNOTS TONIGHT INCREASING TO 15 TO 25 FRIDAY MORNING. CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG PATCHES. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

WEST COAST VANCOUVER ISLAND.
WINDS SOUTHEAST 10 TO 20 KNOTS TODAY INCREASING TO 20 TO 30 FRIDAY MORNING. MOSTLY CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER TODAY. A FEW MORNING FOG PATCHES. RAIN BEGINNING FRIDAY NEAR NOON.
VISIBILITIES AT TIMES 3 MILES IN PRECIPITATION AND NEAR ZERO IN FOG.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
SMALL CRAFT WARNING.
WINDS LIGHT OCCASIONALLY SOUTHEAST 10 TO 15 KNOTS. WINDS INCREASING TO SOUTHEAST 15 TO 25 FRIDAY MORNING. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER TODAY. A FEW MORNING FOG PATCHES. VISIBILITIES LOWERING AT TIMES TO 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING CONTINUED.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS INCREASING TO SOUTHEAST 25 TO 35 KNOTS BY FRIDAY MORNING. CLOUDY WITH SHOWERS. A FEW MORNING FOG PATCHES. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING CONTINUED.
WINDS SOUTHWEST 10 TO 15 KNOTS BECOMING SOUTHEAST 10 TO 20 KNOTS TONIGHT AND INCREASING TO SOUTHEAST 25 TO 35 KNOTS FRIDAY MORNING.
MOSTLY CLOUDY WITH A FEW SHOWERS. RAIN BEGINNING NEAR NOON FRIDAY
VISIBILITIES 2 TO 4 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

BOWIE
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 20 KNOTS BECOMING SOUTH TO SOUTHEAST 15 TO 25 TONIGHT AND INCREASING TO SOUTHEAST 25 TO 35 KNOTS OVERNIGHT.
MOSTLY CLOUDY WITH ISOLATED SHOWERS. RAIN BEGINNING FRIDAY MORNING.
VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 1817Z

FPCN20 CWVR 111815
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.15AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON FRIDAY.

EXPLORER
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 20 KNOTS INCREASING TO 15 TO 25 TONIGHT.
WINDS INCREASING SOUTH TO SOUTHWEST 25 TO 35 RISING AT TIMES TO 40 BY FRIDAY MORNING. MOSTLY CLOUDY WITH A FEW SHOWERS. RAIN BEGINNING FRIDAY MORNING. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

FURTHER OUTLOOK FOR 24 HOURS BEYOND NOON FRIDAY.
SOUTH COAST...STRONG TO GALE FORCE SOUTHEAST EXCEPT STRONG EASTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG TO GALE FORCE SOUTHEAST.
OFFSHORE...GALE FORCE WEST TO SOUTHWGEST WINDS.

END

SYNOPSIS
A SURFACE TROUGH EXTENDING ALONG THE COAST TODAY WILL MOVE EASTWARD AS A WEAK RIDGE OF HIGH PRESSURE BUILDS OVER THE COAST TONIGHT. ANOTHER PACIFIC FRONTAL WAVE WILL APPROACH THE SOUTH COAST FRIDAY. MODERATE TO FRESH WINDS OVER MOST WATERS WILL GRADUALLY INCREASE AHEAD OF THE NEXT WAVE. FRESH TO STRONG SOUTHEASTERLY WINDS WILL DEVELOP IN THE SOUTH AND STRONG GALE FORCE WINDS OVER THE NORTH COAST AND OFFSHORE AREAS.

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 142Z

WWCN1 CWVR 120200
GALE WARNING FOR ALL SOUTH COAST WATERS EXCEPT JUAN DE FUCA STRAIT ISSUED BY ENVIRONMENT CANADA AT 7 PM PDT THURSDAY OCTOBER 11 1984

A FRONTAL SYSTEM NEAR 45N 139W WILL CONTINUE EASTWARD AND REACH VANCOUVER ISLAND FRIDAY AFTERNOON. WINDS ARE EXPECTED TO INCREASE TO SOUTHEASTERLIES 30 TO 40 KNOTS AHEAD OF THE SYSTEM FRIDAY MORNING AND ABATE TO STRONG SOUTHWESTERLIES IN THE EVENING.

END

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 147Z

FPCN20 CWVR 120215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

GEORGIA STRAIT
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS RISING AT TIMES TO 25.
WINDS INCREASING TO SOUTHEAST 25 TO 35 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES LOWERING TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS WESTERLY 10 TO 20 KNOTS SHIFTING TO EASTERLY 10 TO 20 OVERNIGHT AND INCREASING TO 20 TO 30 KNOTS FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

WEST COAST VANCOUVER ISLAND.
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS TONIGHT INCREASING TO 30 TO 40 FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES 2 TO 4 MILES IN PRECIPITATION AND NEAR ZERO IN FOG.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS. WINDS INCREASING SOUTHEAST 25 TO 35 BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE AFTERNOON. VISIBILITIES LOWERING TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING CONTINUED.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS INCREASING TO SOUTHEAST 15 TO 25 OVERNIGHT AND TO SOUTHEAST 30 TO 35 KNOTS BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES REDUCED TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING CONTINUED.
WINDS SOUTHWEST 10 TO 15 KNOTS BECOMING SOUTHEAST 10 TO 25 KNOTS OVERNIGHT AND INCREASING TO SOUTHEAST 30 TO 35 KNOTS FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

-END PART 1

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 149Z

FPCN20 CWVR 120215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

BOWIE
GALE WARNING CONTINUED.
WINDS SOUTHERLY 10 TO 20 KNOTS INCREASING TO 15 TO 25 OVERNIGHT.
WINDS INCREASING TO SOUTHEAST 30 TO 40 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 2 TO 4 MILES IN SHOWERS AND NEAR ZERO IN FOG.

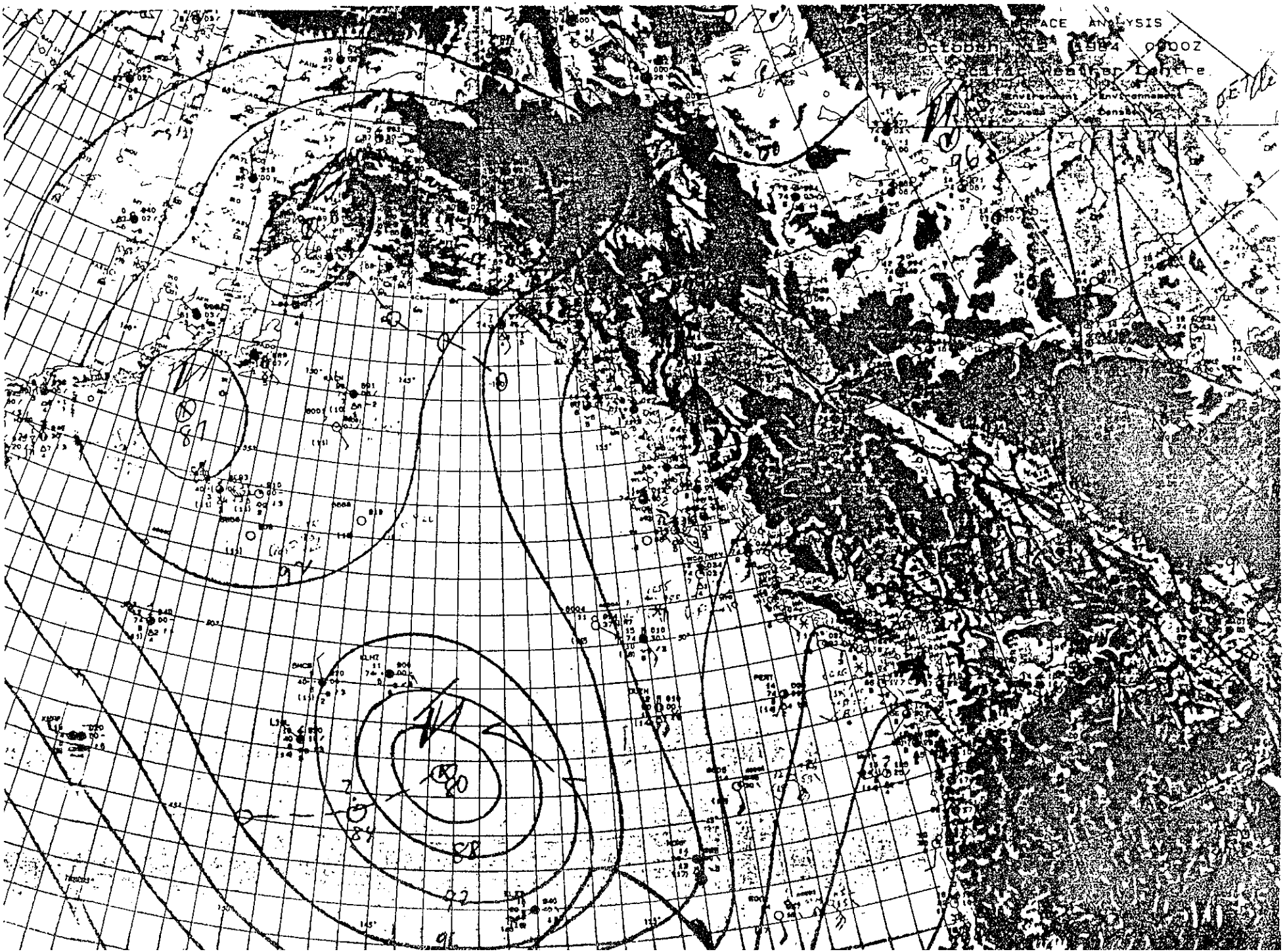
EXPLORER
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 25 KNOTS INCREASING TO SOUTH TO SOUTHWEST 25 TO 35 OVERNIGHT AND RISING AT TIMES TO 40 FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE MORNING.
VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM FRIDAY.
SOUTH COAST...FRESH TO STRONG SOUTHWEST WINDS EXCEPT WESTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG TO GALE SOUTHWESTERLY.
OFFSHORE...STRONG TO GALE FORCE WEST TO SOUTHWEST WINDS.

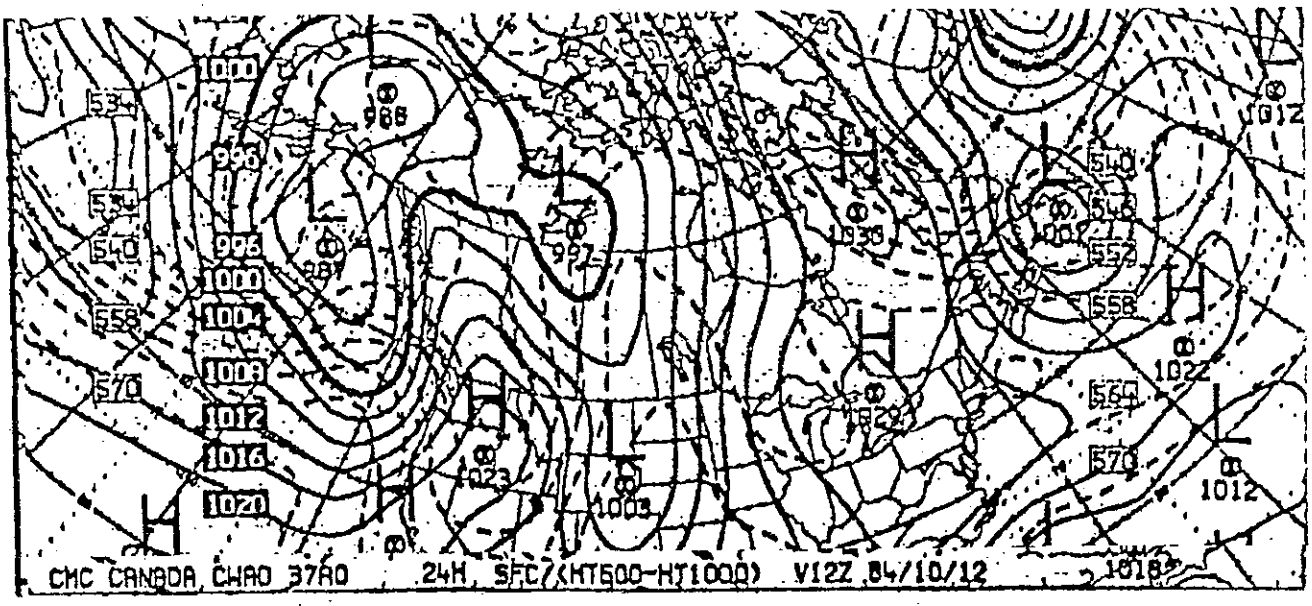
END

SYNOPSIS
A WEAK RIDGE OF HIGH PRESSURE WILL MOVE ONTO THE COAST TONIGHT. ANOTHER PACIFIC FRONTAL WAVE NEAR 45N 139W WILL CONTINUE EASTWARD TO REACH VANCOUVER ISLAND FRIDAY AFTERNOON. MODERATE TO FRESH WINDS OVER MOST WATERS TONIGHT WILL GRADUALLY INCREASE AHEAD OF THE NEXT WAVE. SOUTHERLY GALES WILL DEVELOP OVER THE OFFSHORE AREAS BY FRIDAY MORNING AND WILL SPREAD TO ALL COASTAL WATERS BY FRIDAY AFTERNOON EXCEPT FOR JUAN DE FUCA STRAIT. JUAN DE FUCA WINDS WILL BE MODERATE TO FRESH WESTERLY AHEAD OF THE RIDGE AND WILL SHIFT TO EASTERLY OVERNIGHT AND RISE TO STRONG EASTERLY BY FRIDAY AFTERNOON.

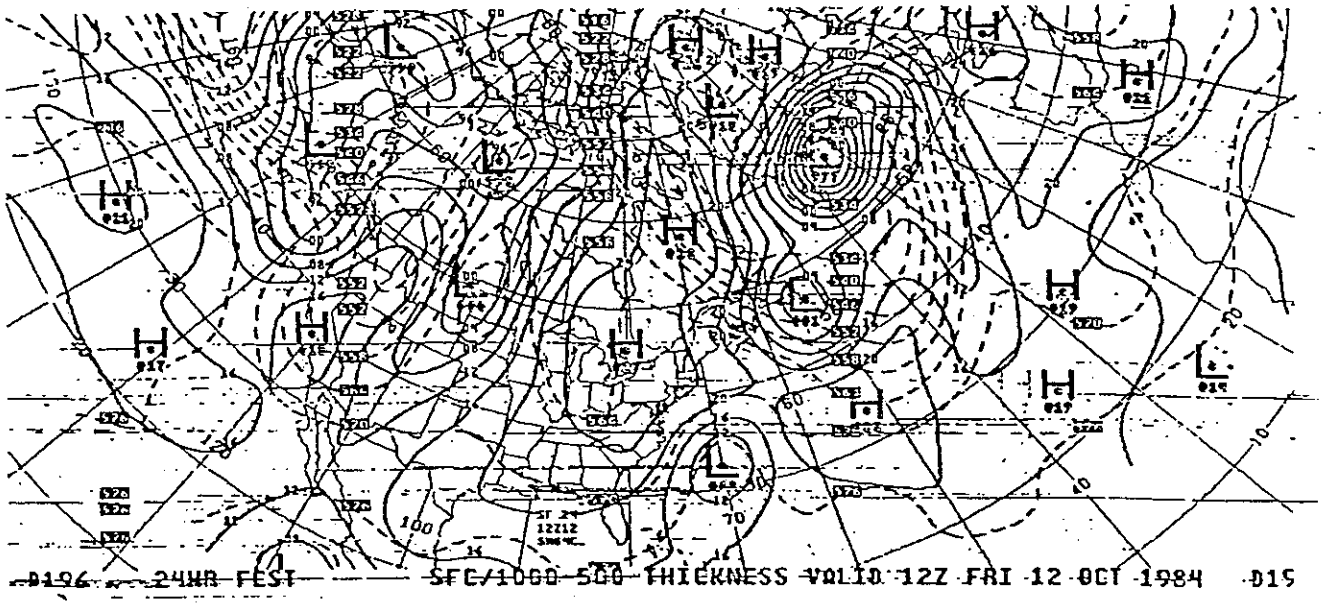
PWC SURFACE ANALYSIS 120000Z



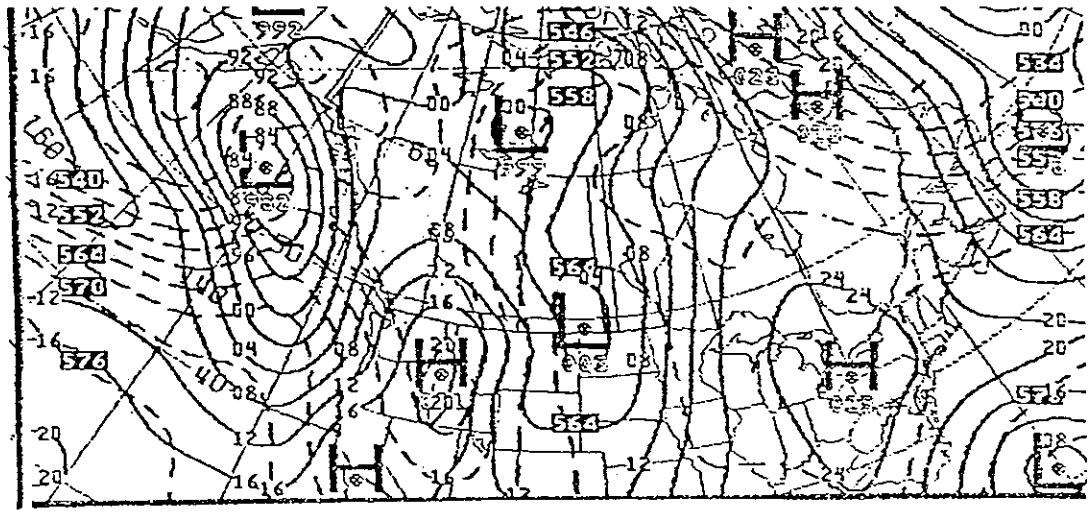
CMC 24 HOUR SURFACE PROGNOSIS VALID 121200Z



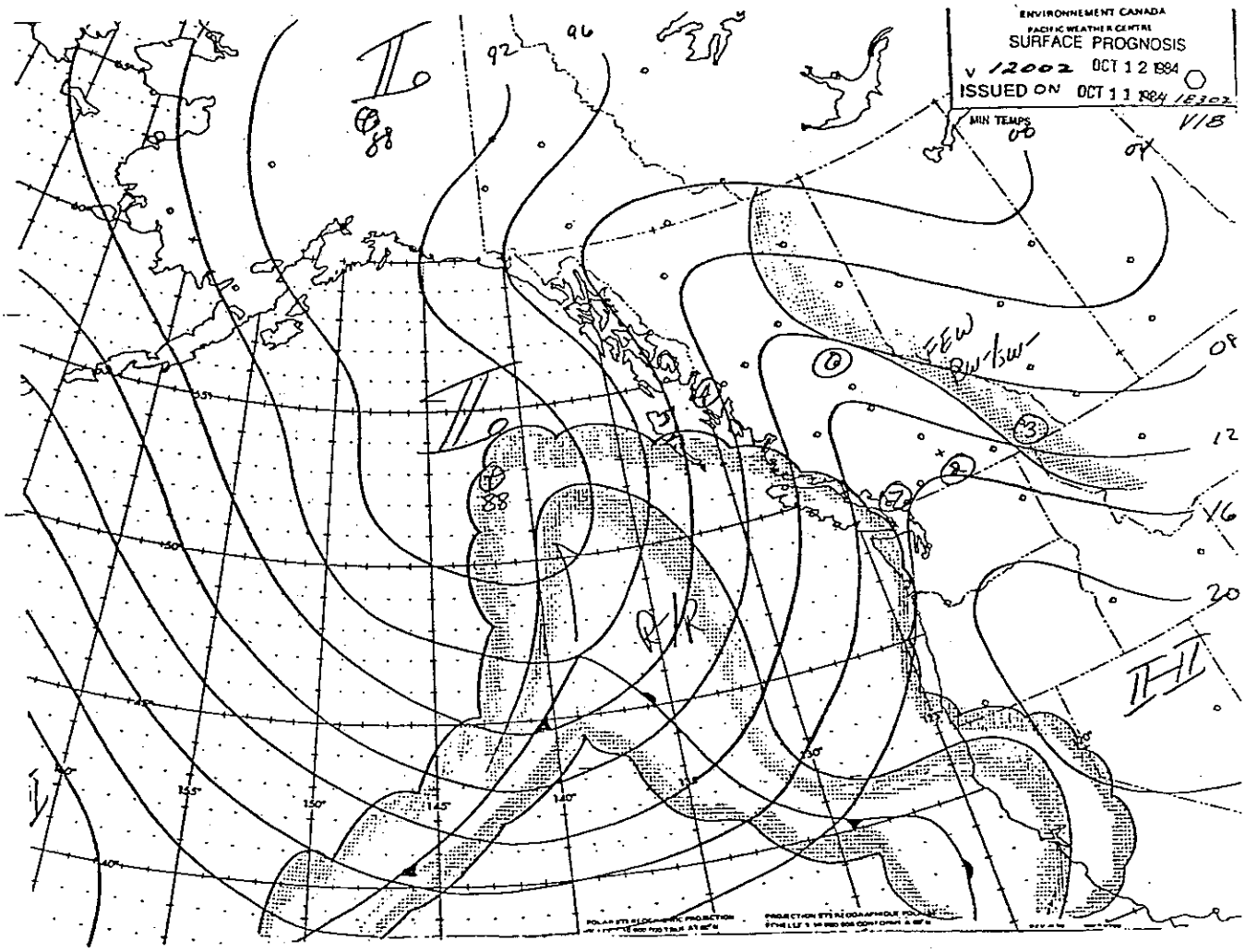
U.S. SPECTRAL 24 HOUR SURFACE PROGNOSIS VALID 121200Z



LFM 24 HOUR SURFACE PROGNOSIS VALID 121200Z



PWC 18 HOUR SURFACE PROGNOSIS VALID 121200Z



2.7 Thursday Evening (October 11)

The low was now into the developing stages. The 12/0000Z surface analysis showed a 980 mb centre at 47 N 142 W. Two ships in the southeast quadrant from the low reported pressure tendencies as follows: ELX3 falling - 40and HONF falling 90. The stationary buoys reported pressure tendencies as follows:

6004	50.9 N	135.9 W	falling 37
6005	46.1 N	131.0 W	falling 30
6002	42.5 N	130.0 W	falling 16

On the satellite imagery, the cirrus edge was now within 100 nmi. of the coast, a speed of about 35 knots in the past 6 hours. The following cold trough was more evident now. The structure of the system was not classical.

Another factor leading to strong pressure gradients over the coast was the rising pressures over British Columbia. These were due to cold air moving in over the province as the cold trough ahead of the system was forced inland.

The buoy reports for 12/0300Z (8 p.m. PDT) were as follows:

6004	50.9 N	135.9 W	falling 55
6005	46.1 N	131.0 W	falling 59
6002	42.5 N	130.0 W	falling 35

By this time it was apparent that rapid intensification was taking place.

The satellite picture at 12/0300Z showed a possible vorticity centre forming at 48 N 134 W. This centre moved northeastward becoming absorbed in the frontal zone by 12/0600Z. The centre was probably a factor in the rapid deepening that took place in this time period.

The 12/0600Z surface analysis showed a 964 mb centre at 49 N 137 W. The buoys reported as follows:

6004	50.9 N	135.9 W	falling 84
6005	46.1 N	131.0 W	falling 83
6002	42.5 N	130.0 W	falling 32

There was only one ship report within 360 nmi. of the centre at this time. On the satellite imagery the cirrus shield continued to be pushed northward. The cold air was now being pulled in behind the low.

The CMC 12 hr prog valid 12/1200Z was similar to the previous 24 hr prog showing a 986 mb low centre near 52 N 139 W. The U.S. spectral 12 hr prog showed a 985 mb low centre near 52 N 137 W, 10 mb deeper and closer to the coast than the previous 24 hr prog.

The LFM had a 992 mb centre at 50 N 135 W.

By this time the communications situation was back to normal.

Gale Warnings were upgraded to Storm Warnings at 11 p.m. Thursday (12/0600Z) for all marine areas except Georgia Strait and Juan de Fuca Strait.

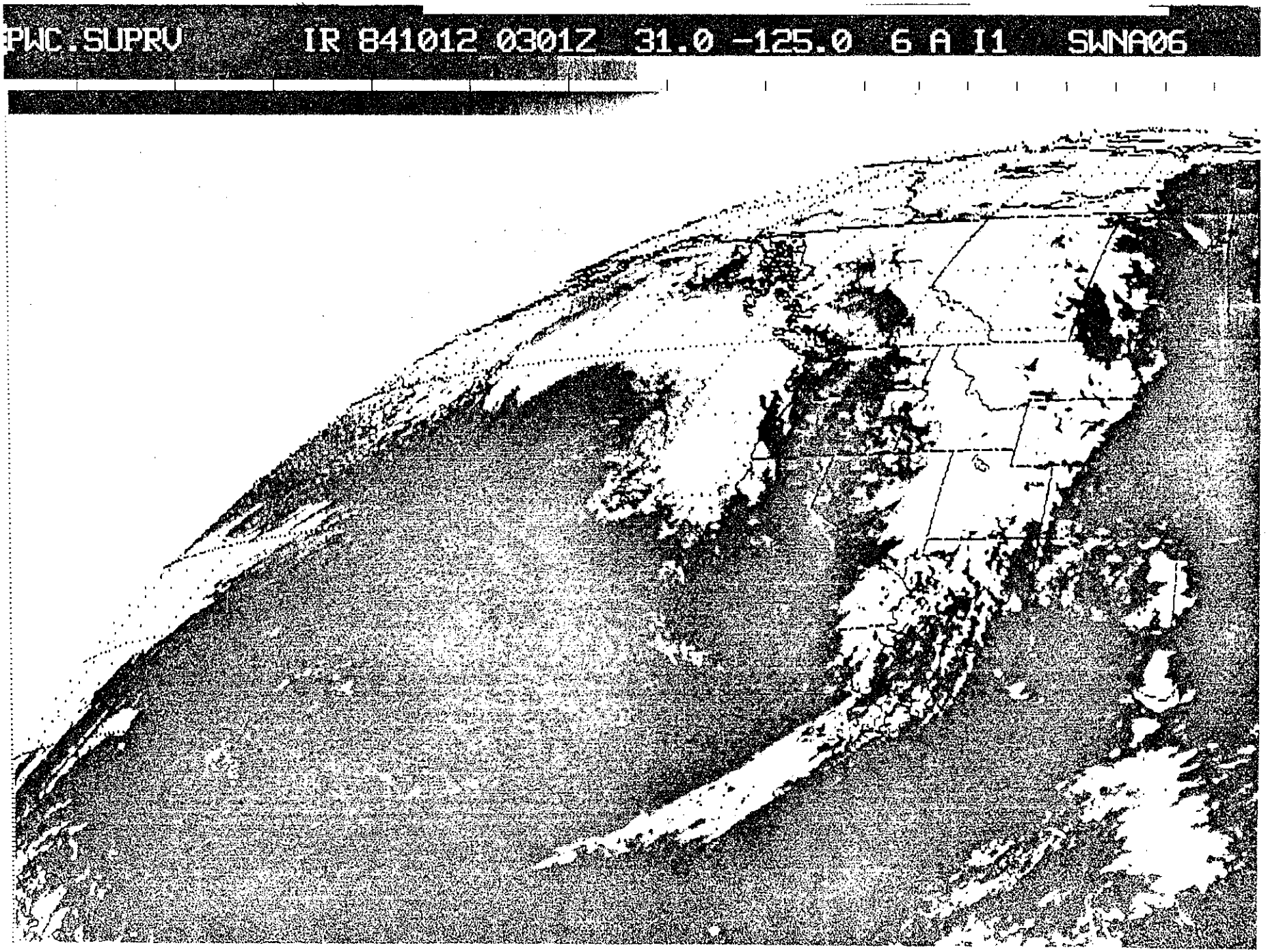
A Gale Warning was in effect for Georgia Strait. The forecast for West Coast Vancouver Island called for winds increasing to southeast 40 to 50 knots with higher gusts Friday morning.

At 11:30 p.m. Thursday a Gale Warning was issued for Juan de Fuca Strait.

Attachments:

FXCN 1 CWAO 12/0515
FXCN 1 CWVR 12/0600
FXCN 1 CWAO 12/1045
FPUS 3 KSEA 12/0400
FPUS 3 KSFO 12/0358
FPUS 3 KSFO 12/0958
TBXX 6 KSFO 12/0045
TBXX 6 PANC 12/0416
TBXX 6 KSFO 12/0645
WWCN 1 CWVR 12/0600
WWCN I CWVR 12/0630
FPCN 20 CWVR 12/0630 AMD
PWC Surface Analysis 12/0000
PWC Surface Analysis 12/0600
PWC Satellite Imagery 12/0301
U.S. Spectral 12 Hour Surface Prog Valid 12/1200
CMC 12 Hour Surface Prog Valid 12/1200
LFM 12 Hour Surface Prog Valid 12/1200

PWC SATELLITE IMAGERY 120301Z



TELETYPE ARCHIVE DATA RETRIEVAL
DATA FROM OCTOBER 12 1984 0000Z TO OCTOBER 12 1984 1200Z

FXCN1 CWAO 120515 220-84101205:44
PAC LO TO BCM ABSORBED BY UPR LO...ASCTD FNTL WV MVG
RPDLY INLAND AND WKNG UNDER INFLUENCE OF SPLIT FLO.
W CST TROF IN SRN CURRENT PROGRESSING EWD AND SHLD
LWR SFC PRES OVR CNTRL US BUT VERY LTL THERMAL
CONSTRAST FOR DVPLMT.
LONG WV RDG TO HOLD NR 60W AND WRM AIR WILL CONTINUE
TO PUSH NWD W OF RDG...DVPLMT OF LO OVR NW-TERRITORIES
WILL BE LIMITED BY WK UPR DYNAMICS.
NFLD LO WILL DCLRT AS IT ROUNDS TROF AND WILL BCM VERT
BY 36 HRS.
MODEL GPF PATN LOOKS RSNBL BUT AMTS SEEM WK OVR W CST.
AMS DRY AND DYNAMICS WK FOR MUCH VERT MOTN INLAND AND
ESPLY CNTRL CAN.
END/WORONKO

FXCN1 CWVR 120600 220-84101205:50

500MB/SAT..FNTL SYS OFFSHR CONTS MOVG E 30-35KTS BOTH ALG BACK
EDG CLD SHIELD AND LEADING CI EDGE. COLD TROF PRESENTLY ALG CST
HAS LTL CHANCE TO RECOVER FM INSTBLTY WX TO FNTL. SOME SPLITTING
AND SLOWING IS XPCTD AS FNT MOVS TO CST ERLY FRI. LFM SEEMS TO
HAV BEST INITIALIZATION AND IS ACCEPTED. THUS S/W TROF MOVS
INLAND LATE FRI AFTN/EVE FOLLOWED BY COLD UNSTBL AMS.

SFC...FNTL SYS MOVG TO CST ERLY FRI AND INLAND BY EVE. 980 MB
LO AT 00Z NR 47/142 CONTG NE 25-30 AND DPNG. PRESS FALLS AT
6004 AND 6005 IN EXCESS OF 6 MB/ 3 HRS SO XPCT GALE TO STORM
FORCE WNDS AHD OF FNT AND MARINE WNDS LIKELY TO BE REVISED UPWARDS.

WX...FEW SHWRS CST AND INTR GRDLY DSPTG. ICRSG CLD CST WITH RN
AND WND ALG OUTER CST FRI MRNG AND INNER CST BY AFTN. OCNL RN
AHD FNT SPRDG TO INTR FRI AFTN. FEW SHWRS AS FNT MOVS INLAND.
WND WARNINGS MAY BE POSTED ALG OUTER CSTS. PCPN AMTS ESTD UP
TO 25 CMS XCP MORE OUTER CST.

END
CHU

FXCN1 CWAO 121045 220-84101210:43
MODELS IN GEN AGREEMENT ALTHO LFM PRES TOO HI OVR
NWRN CONTINENT.
LO OFF BC CST BCM VERT AS FNTL WV RPDLY MVS INLAND...WV
WKNG DUE TO SPLIT FLO AND LOSS OF UPR SUPRT.
LONG WV RDG PERSISTING OVR ERN CONTINENT AND WARM AIR
WILL CONTINUE TO PUSH NWD ACRS CNTRL CAN...WK UPR DYNAMICS
WILL HINDER DVPLMT IN TROF ALTHO NW TERRITORIES LO HAS
BETTER TEMP CONTRAST AND MODELS PREDICT SOME DPNG.

FPUS3 KSEA 120400 220-84101203:55
SATL SHWS TDAS BACLN ZN HS ALMST CLRD THE E BDR OF WA AND INSTBLTY CLDS NRLY GONE W WA. LDG EDG OF OVRNG FM CLOSELY FOLWG OFSHR SYST ALRDY UP TO 126W W/BCK EDG 132W SUGG SYST COMG IN A BIT FSTR THAN ERYR FCST. NEW LFM PUTS AXIS OF MINI RDG BTWN SYSTS ON CST AT 12Z W/PVA UP TO AXIS SO OVRNG PCPN LKLY TO OCCUR ON CST BFR MRNG AND INTO W WA DURG THE MRNG. KPG IN MIND THAT WRM MOIST OVRNG AIR IN INCOMG SYST CONTAINS RMNS OF FORMR TRPCL STM..WILL KP FCST OF SBSTNL PCPN BUT MOV UP START TM AS SUGD ABV. NEW FOUS72 BGNS HVY AMTS W WA BTWN 12Z AND 18Z AND CONTS THEN THRU 00Z W WA WITH TAPRG SHWRS THRAFTR. LFM MOVS PVA TO NRN E WA BDR BY 00Z SAT AND KPS WA UNDR STG WLY CYCLNC FLO THRU SAT. SO WILL KP SHWRS THRU FCST PRD. WILL DCR POPS E WA FOR RMNDR TNGT AND ERY FRI AS SHWRS HV NRLY ENDD AND RMNDR OF ERYR FCST STILL LKS GD FOR CHC SHWRS E WA ON THRU SAT. ELLIS.
UIL 687 SEA OLM 376 YKM -33 GEG 234 ALW 135.
WA...WARNING...TNGT...GALE CST.
ADVISORIES...TNGT...SCA STRAIT/INL

FPUS3 KSFO 120358 220-84101204:07
JET ARCHG NWD AS IT CROSSES WRM OVRRNG CLDS HAS JUST ABT RCHD OR BRDR. CHC OF PCPN S OF JET QUITE SML AS NEW LFM QPF PROGS INDC. THRFR WL SVRLY RESTRICT PCPN IN ZONES TO NW..NE AND SHASTA/SISKIYOU. WL REMOVE CLDS FM MOST OTR ZONES...AND FOG FM SAC VLY DUE WIDE TMP/DEWPT SPREADS. PLANKINTON EKA 211 SFO 000 RBL 110 SAC FAT BFL SMX 000.
CA...ADVISORIES...TNGT SCA..PT ST GEORGE TO PT CONCEPTION

FPUS3 KSFO 120358 220-84101209:53
AM UNEASY ABT FCSTS. FNT APCHG PAC/NW MOVG EWD NRLY 60 KT AND IS RMNS OF OLD TYPHOON. PARENT SFC OFF BC CST DOWN TO 974 MB. LFM LOOKS VRY DEFICIENT IN MSTR. FCSTS HV BN BASED ON RPDLY RSG H5 HGTS BUT CUD BE TO HI. EXPC CSDRBLY MORE OVRNG THAN MODELS INDC. AFT SYS MOVS THRU MODELS LOOK OK WITH RSG HGTS BUT CONTD ONSHR FLOW SAT. ALSO WL HV TO UPDATE 3-5 DAY ON BASIS OF EXTDD PROGS WHICH INDC MUCH LWR HGTS AND SOME THRT PCPN INTO DIST MON. EKA 72-
SFO -1- RBL 110 SAC --0 FAT 000 BFL 000 SMX 000. EWING
CA...ADVISORIES...TDA SCA..PT ST GEORGE TO PT CONCEPTION

FPUS3 KSFO 120958 220-84101209:53
AM UNEASY ABT FCSTS. FNT APCHG PAC/NW MOVG EWD NRLY 60 KT AND IS RMNS OF OLD TYPHOON. PARENT SFC OFF BC CST DOWN TO 974 MB. LFM LOOKS VRY DEFICIENT IN MSTR. FCSTS HV BN BASED ON RPDLY RSG H5 HGTS BUT CUD BE TO HI. EXPC CSDRBLY MORE OVRNG THAN MODELS INDC. AFT SYS MOVS THRU MODELS LOOK OK WITH RSG HGTS BUT CONTD ONSHR FLOW SAT. ALSO WL HV TO UPDATE 3-5 DAY ON BASIS OF EXTDD PROGS WHICH INDC MUCH LWR HGTS AND SOME THRT PCPN INTO DIST MON. EKA 72-
SFO -1- RBL 110 SAC --0 FAT 000 BFL 000 SMX 000. EWING

ITBXX6 KSFO 120045 220-84101201:15
SSFSS SFO SIM..VALID 12/0000Z...GRAPHICAL SIM..WSM..AVBL IN AFOS.
FESTM UPR TROF LINE AT 00Z FM 53/130 THRU AST TO RNO TO LAX MOVG EWD
ABT 20KT PAST 6HRS. PSN IS A LTL W OF 12HR PROGS. THERE IS AN APRNT
VVORTCNTR VCNTY BKE MOVG NEWD 23KTS. NO CNTR APRNT IN NW NV AS INDCD
BBY MODELS. BACK-EDGE OF ASSOCD FNTL BAND EXTDS FM 80NNW GEG THRU
SSE CORNR OF OREG TO NR BIH. MOVMT HAS BN EWD ABT 20KT NRN WA AND IN
CCNTRL NV PAST 6HRS WHILE EWD ABT 30KT IN ERN WA AHD OF THE VORTCNTR.
SSCTD CNVTV CU BHD FNT-ACRS NRN CA WA/OR WWD TO 125W. TRAILING PTN OF
FFNT..MAINLY LWR CLD BAND STRETCHES FM NR NTD THRU 30/125 AND HAS
BBN MOVG SEWD ABT 15KT ALG THE SRN CA CST. SML ROPE CLD EMBDD SUGS
BBRIEF SHWR WITH FROPA. OVR THE RGN THE LEAD EDGE OF DNSR PTN OF
FFNTL BAND IS FM CTB TO SE CORNR ID TO LAS. ADNL HI CLDS AHD BUT
AARE GENLY THN IN CNTRL MT ERN UT WRN AZ AND SRN CA.
UUPSTRM OVRRNG CLDS FM APRNT WM-CORE SYS CNTRD VCNTY 46/144 THO CENTER
IIS NOT WELL DFND..TYPICAL OF EARLY DVLPMT OF WM CORE SYSS. PAT SUGS
LLKLYHD FOR STG DPNG NXT 12HRS OR MORE. PSN IS WEST OF SFC PROGS
FFOR 00Z WHICH IS PRBLY WHY THEY ARE FAST WITH INLAND TROF AS WELL.
AALSO MODELED DEPICTION OF THE ASSOCD UPR TROF LOOKS TOO FLAT AND
TTOO FAR E. SFC LOW MOVG ENEWD 45KT PAST 6HRS AND EXTRAPS TO NRN WA/
BBC CST BTWN 12-18Z AT PRESENT MOVMT.
LEAD EDGE OF OVRRNG CLDS IS FM 50/131..45/130..40/128..38/130..
440/132. PTN S OF 40N TNDG TO DSPT IN NWLY FLOW BUT STILL DNS ENUF
TTO HAVE SPKLS NR 40N. CSDRBL DSPTN OCRG ALG LEAD EDGE SO ITS MOVMT
DDFCLT TO ASSESS. APPRS TO BE SHFTG EWD ABT 30KT HWVR. CD FNTL BAND
IIS SO FAR ONLY LWR CLDS THRU 43/140..40/145..38/150. BPN CELL CD CU
AAPRNT FTHR UPSTRM S OF ALEUTIANS.
EESTM JTSTR AXIS 41/160..44/140..43/130..35/122 WITH A BRANCH FM
443/130 THRU SAC TO 70E RNO AND NWD ALG BACK EDGE OF FNTL BAND.
HHOLMES

ITBXX6 PANC 120416 220-84101204:27

WWSFO ANC SIM. IMAGERY THRU 0230Z

SSATELLITE INTERPRETATION OF SFC LOWS...

NO.	PSN	MOVMT	REMARKS
11	75N170W	ESE 10KT	DFUS AND LTLCG
22	62N152W	WNW 15KT	DFUS AND LTLCG
33	60N148W	WNW 15KT	DFUS LTLCG
44	53.5N156W	ESE 15KT	LTLCG
55	48N140W	ENE 50KT	SLT DPNG
66	39.5N171W	E 25KT	LTLCG
77	55N171E	E 25KT	SLT DPNG

AARCTIC..MNLD N OF 63N..NERN BERING.....THESE AREAS GENLY ARE MOT-
TTLED WITH CLR AND LO CLD PATCHES AND WITH FEW SML MID/HI CLD PATCHES.
SSGFNT LRG LO-MID CLD PATCH IS ONE THAT FANS NEWD FM OTZ TO 78/138

TTBXX6 PANC 120416 220-84101204:27 ...CONT...
AAND 71/135. THIS LRG PATCH IS MOVG NW AT 10-15KT.

RRMNDR MNLD EXCP BRISTOL BAY REGION.....BKN HI AND SCT/BKN LO/MID
CCLDS CVR SWATH OF MNLD AND ADJ BERING BTWN 60 AND 63N AND 155-170W
AAND THEN SLANTS ESE TO 140W BTWN 59 AND 62N. THIS SWATH OF CLDHS
IIS ROTG CYCLY ABT PT 60/155 WHILE MOVG W AT ABT 15KT.

GGLFAK..SE AK..RMNDR BERING..N PAC.....BERING W OF 175W IS GENLY
CCVRD WITH BKN/OVC LO CLDS EXCP THE SIBERIAN CSTL WTRS ARE CLR.
OOPEN CELLED LO CLDS CVR BERING AND ADJ N PAC E OF 175W AND EWD TO
1150W IN SWRN GLFAK THEN IN ABT 6DEG SWATH BTWN 53 AND 59N TO OVR
SSE AK. THE LO CLDS ARE BUILT TO MDT CNVTV ABT LOW NO.4 OUT 120-
1180NM FM CNTR.
DNS FNTL CLD BAND 180-300NM WIDE HOOKS ABT LOW NO.5 ALG AXIS
448/143-52/140-51/135-45/130-40/128. BAND IS MVOG ENE AT ABT 50KT.
JTSTR IS RUFLY ALG 38/140-40/150-38/170E-35/180-42/160-44/135-
550/135-54/132.
MID/HI CLD MASS ABT 300NM WIDE CAPS LOW NO.7 RUFLY ALG 170E
FFM 55-65N. ONLY A NRW BKN CHAIN OF MID CLDS HOOKS ABT LOW NO.7 FM
L55/171-50/169-45/161-40/150. CHAIN IS MOVG E AT 20-25KT.

NMACH MODELS SLOG AND MOVG LOW NO.5 IN MORE NRLY DRCTN APPRS RSNBL.

TTAKASUGI 12 OCT 84

TTBXX6 KSFO 120645 220-84101206:50
SSFSS SFO SIM..VALID 12/0600Z...GRAPHICAL SIM..WSM..AVBL IN AFOS.
FESTM TROF LINE AT 06Z FM 55/129 THRU NRN WA CASCDS THRU SE CRNR OR
TTO JUST W OF DRA TO NWRN CRNR BAJA PEN. TROF MOVG EWD 20-20KT
NNRN/CNTRL PTNS AND 15KT SEWD ALG SRN PTN. BOTH LFM/SPEC MODELS
IINIT HAD TROF LN A LTL TOO FAR E AT 00Z. ALSO VORT MAX NR LKV/OR
VVCNTY NOT APRNT AT 00Z BUT WAS FARTHER N VCNTY BKE. VORT MAX BCMG
RRATHER ILL-DEFINED BUT APPRS APROX 100E BKE MOVG EWD 15KT.
FFNTL BAND ABT 6-8 DEGS WD OVR MST OF MT AND ERN ID SWD OVR WRN WY
AALL OF UT AND AZ INTO NW MEX AND FAR SRN PTN OF CA. PCPN OCRG
MMNLY OVR NW MT SERN ID/WRN WY SWD OVR MST OF UT INTO NW AZ. S OF
TTHAT MNLY MID/HI LVL CLDS. INSTABLTY SHWRS HV ALMST ENDD IN THE
TTROF BHND THE FNTL BAND.
JJET AXIS FM 40/155..44/140..44/130 THEN SEWD OVR NW CA ACRS CNTRL
SSIERNEV TURNING NEWD TO NE TIP NV THEN NWD THRU THE ID PANHNDL
IINTO SERN BC. OVRRNG CLDS FM UPSTRM SYS HAVE MOVED RPDLY ONSHR
AALG CSLT BC/WA AND NRN OR. CLDS HV SPRD OVR SWRN CRNR OR AND NW
CCA. APPRS TO MNLY MID/HI CLDS ATTM. RADAR INDICATES PCPN OFF OR
CCST AT 0530Z AND APPRS ON IMAGERY TO EXTND SWD TO 40N AND WI HRS
OOF MVG ONSHR. SHWRS APR TO EXND BACK TO 130W THO HVYST LINE IS
AALG 125W. APRNT SHRTWV RM VORT MAX NR 48/145..40/130. MOVG ENEWD
445 KTS.
PPUCEVICH

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 6 7Z

WWCN1 CWVR 120600
STORM WARNING FOR WEST COAST VANCOUVER ISLAND QUEEN CHARLOTTE AND JOHNSTONE STRAITS AND ALL NORTH COAST WATERS
ISSUED BY ENVIRONMENT CANADA AT 11 PM PDT THURSDAY OCTOBER 11 1984

A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY. AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING. WINDS ARE EXPECTED TO INCREASE TO SOUTHEASTERLY 45 TO 55 KNOTS WITH HIGHER GUSTS AHEAD OF THE FRONT AND ABATE TO STRONG TO GALE FORCE WESTERLIES IN THE AFTERNOON AND EVENING BEHIND THE SYSTEM.

END

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 653Z

WWCN1 CWVR 120630
GALE WARNING FOR JUAN DE FUCA STRAIT ISSUED
BY ENVIRONMENT CANADA AT 11.30 PM PDT THURSDAY OCTOBER 11 1984

A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY. AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING. STRONG EASTERLY WINDS ARE EXPECTED AHEAD OF THE FRONT WITH GALES OVER THE EASTERN AND WESTERN ENTRANCES. WINDS WILL SHIFT TO STRONG WESTERLIES BEHIND THE FRONT FRIDAY AFTERNOON.

END

PGM:MSCHK ---CIRCU: 220 TIME RCVD: 641Z

FPCN20 CWVR 120630 AMD
PART 1 OF 2
REVISED MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY
ENVIRONMENT CANADA AT 11.30PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

GEORGIA STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEAST 10 TO 20 KNOTS RISING AT TIMES TO 25.
WINDS INCREASING TO SOUTHEAST 30 TO 40 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES AT TIMES 1 TO 4 MILES IN RAIN AND MIST.

JUAN DE FUCA STRAIT
GALE WARNING ISSUED.
WINDS EASTERLY 10 TO 20 KNOTS INCREASING TO 20 TO 30 FRIDAY MORNING
WINDS INCREASING OVER EASTERN AND WESTERN ENTRANCES AT TIMES TO
SOUTHEAST GALES 35 TO 40. WINDS SHIFTING TO WESTERLY 15 TO 25
FRIDAY AFTERNOON. CLOUDY. RAIN BEGINNING BY FRIDAY AFTERNOON.
VISIBILITIES AT TIMES 1 TO 4 IN RAIN AND MIST.

WEST COAST VANCOUVER ISLAND.
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS INCREASING TO 40 TO 50 WITH HIGHER
GUSTS FRIDAY MORNING. WINDS BECOMING SOUTHWEST 25 TO 35 FRIDAY
AFTERNOON. MOSTLY CLOUDY TONIGHT. RAIN FRIDAY.
VISIBILITIES 1 TO 4 MILES IN RAIN AND MIST.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS. WINDS INCREASING SOUTHEAST 35 TO
50 BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH
RAIN BEGINNING IN THE MORNING. VISIBILITIES LOWERING TO 2 TO 4
MILES IN RAIN AND MIST.

END PART 1

PGM:MSCHK --- CIRCU: 220 TIME RCVD: 711Z

FPCN20 CWVR 120630 AMD
PART 2 OF 2
REVISED MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.30PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING UPGRADED TO STORM WARNING.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS INCREASING TO SOUTHEAST 25 TO 35 OVERNIGHT AND TO SOUTHEAST 40 TO 55 KNOTS BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES REDUCED TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

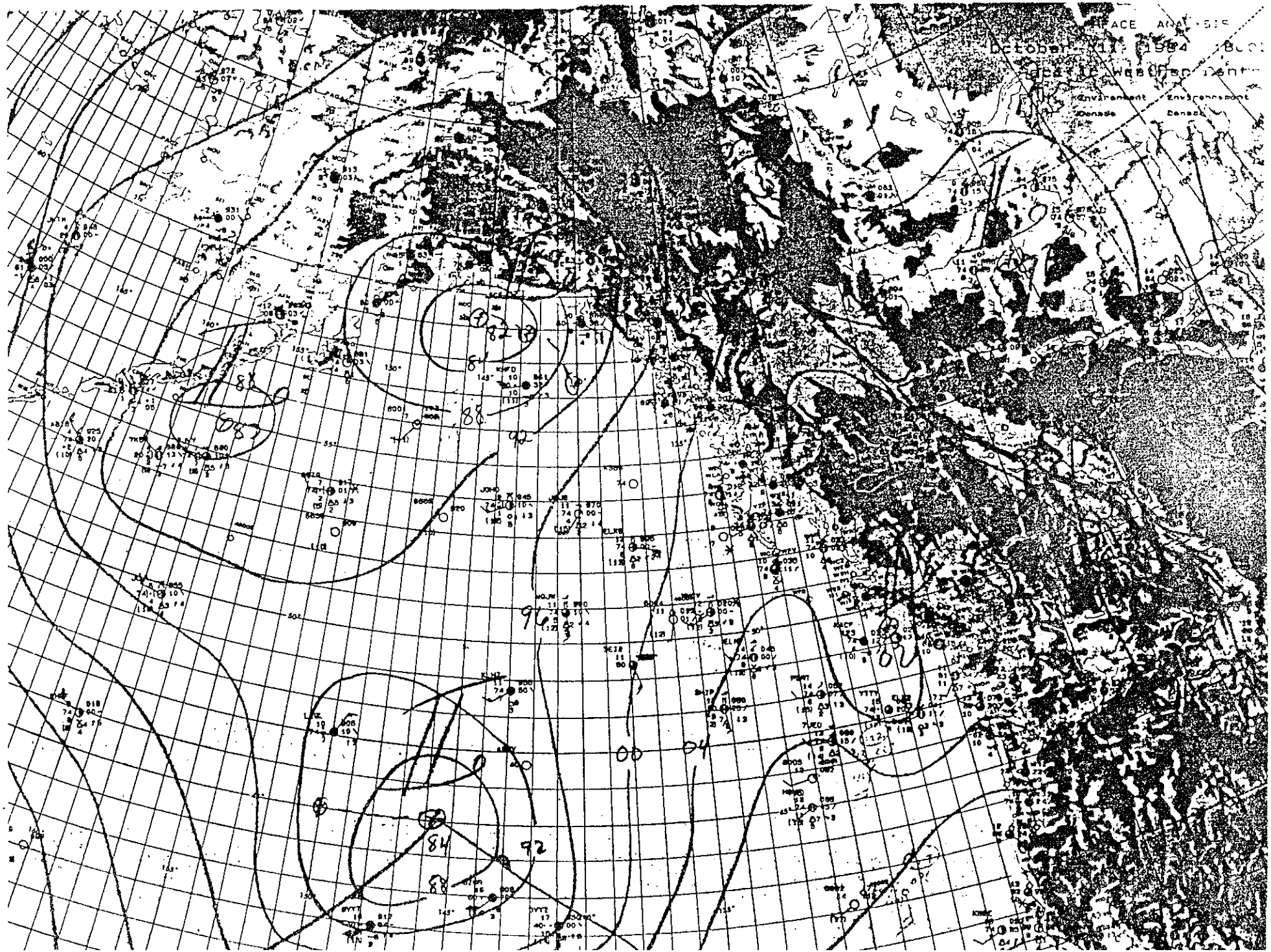
WEST COAST CHARLOTTES.
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS INCREASING TO 25 TO 35 OVERNIGHT AND 40 TO 55 FRIDAY MORNING. WINDS SHIFTING TO SOUTHWEST 35 FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 1 TO 4 MILES IN RAIN AND MIST.

REMAINDER FORECASTS UNCHANGED FROM 7PM ISSUE.

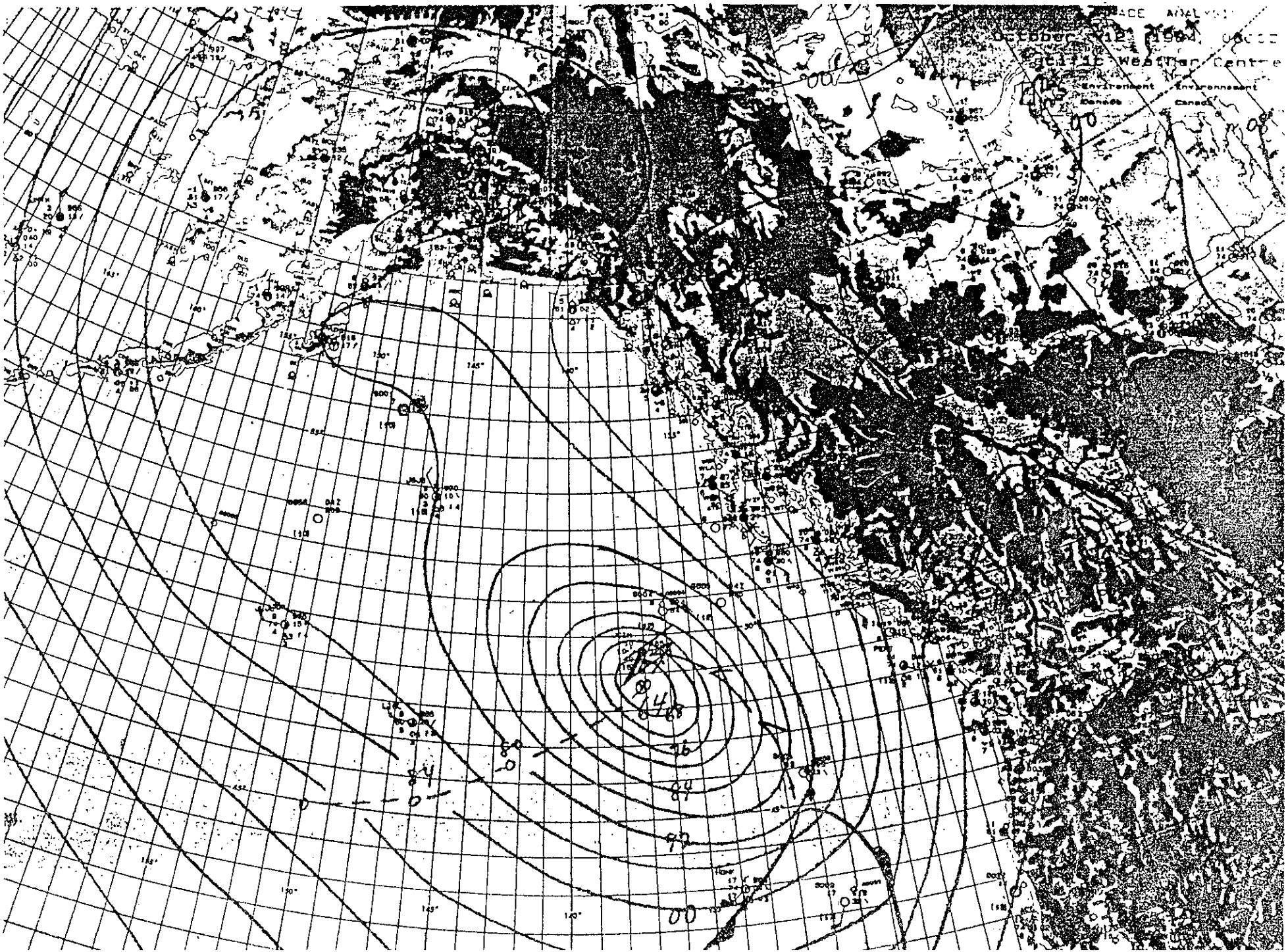
END

REVISED SYNOPSIS
A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY. AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING AND INLAND LATE FRIDAY. WINDS ARE EXPECTED TO INCREASE TO GALE TO STORM FORCE SOUTHEASTERLIES AHEAD OF THE FRONT AND ABATE TO STRONG TO GALE FORCE WESTERLIES BEHIND THE DISTURBANCE.

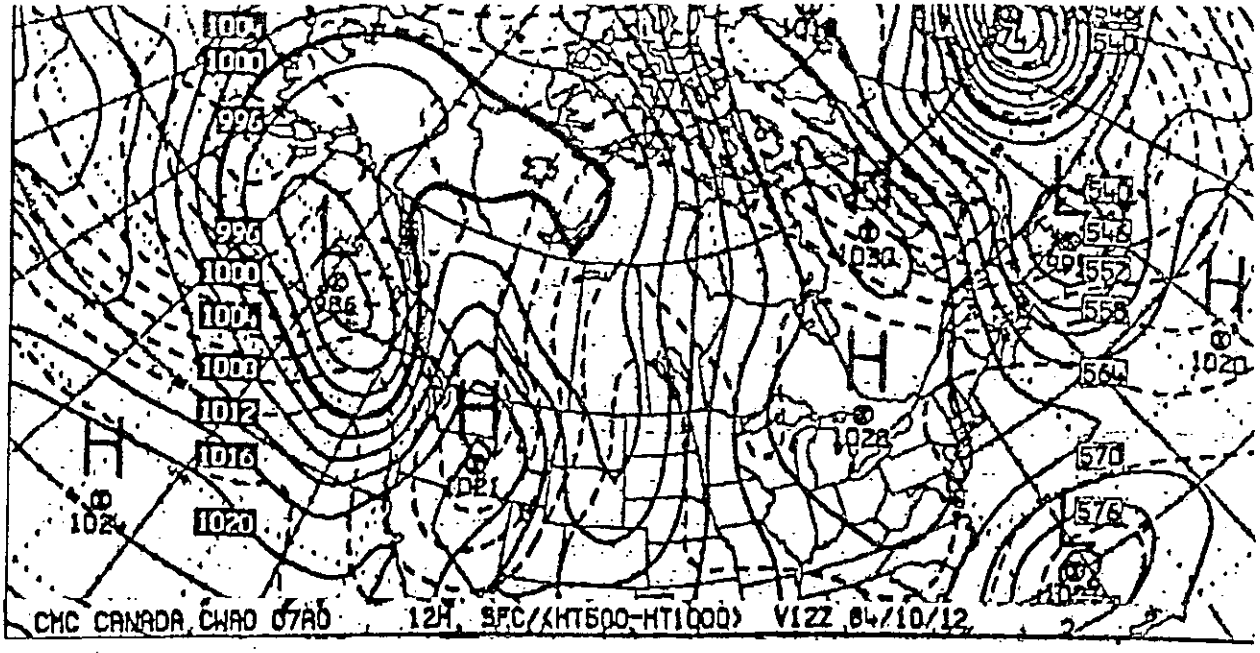
PWC SURFACE ANALYSIS 111800Z



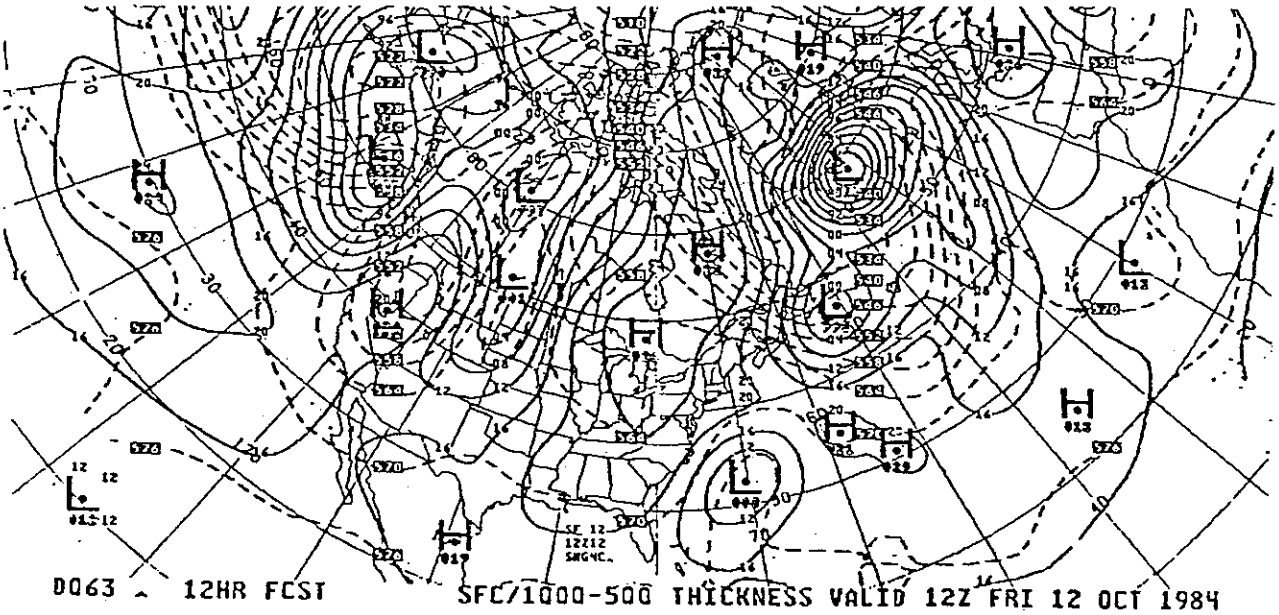
PWC SURFACE ANALYSIS 120600Z



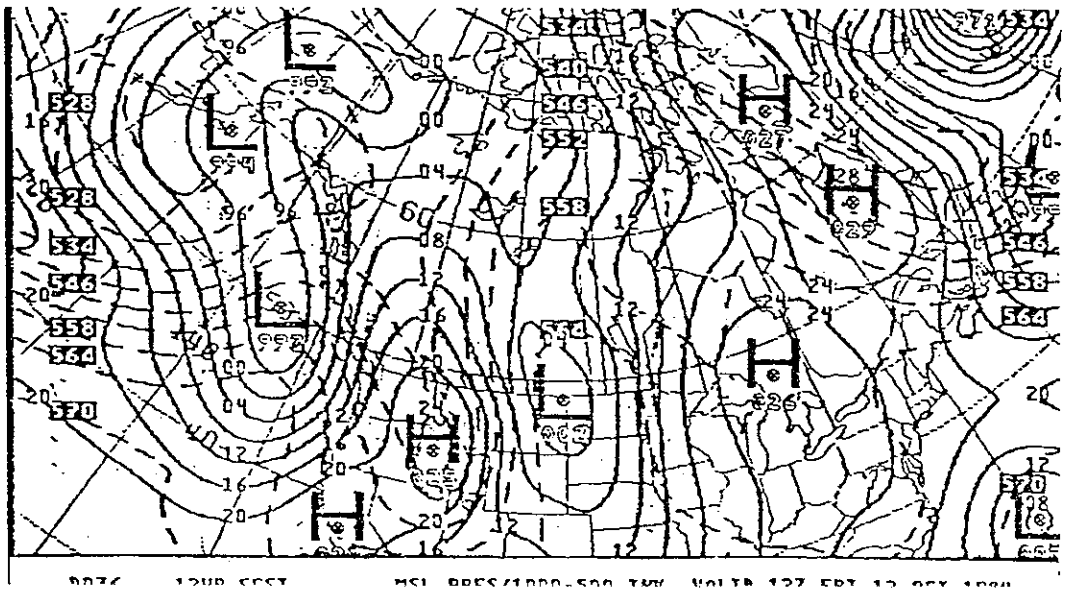
CMC 12 HOUR SURFACE PROGNOSIS VALID 121200Z



U.S. SPECTRAL 12 HOUR SURFACE PROGNOSIS VALID 121200Z



LFM 12 HOUR SURFACE PROGNOSIS VALID 121200Z



2.8 Thursday Night/Friday Morning - October 12

Overnight the storm continued to intensify. At 3 a.m. Friday, Storm Force winds were first reported on the coast. By 12/1200Z (5 a.m. Friday) the surface analysis showed a 958 mb centre near 50° N 135° W.

The satellite imagery now indicated a more classical structure with the storm in the fully developed stage.

Storm Warnings were continued on the 5 a.m. Friday forecast (12/1200Z).

Attachments:

FPCN 20 CWVR 121215
PWC Surface Analysis 12/1200

PGM:MSCHK --- CIRCUIT : 220 TIME RCVD: 1246Z

FPCN20 CWVR 121215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15AM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM SATURDAY.

GEORGIA STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEAST 25 TO 35 KNOTS RISING TO 35 TO 45 WITH HIGHER GUSTS THIS MORNING. WINDS DIMINISHING TO 20 TO 30 DURING THE AFTERNOON AND BECOMING SOUTH TO SOUTHEAST 15 TO 20 DURING THE NIGHT.
INTERMITTENT RAIN TODAY. SHOWERS TONIGHT. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

JUAN DE FUCA STRAIT
GALE WARNING CONTINUED.
WINDS EASTERLY 15 TO 25 KNOTS INCREASING TO 20 TO 30 THIS MORNING. WINDS INCREASING OVER EASTERN AND WESTERN ENTRANCES AT TIMES TO SOUTHEAST GALES 35 TO 45. WINDS SHIFTING TO WESTERLY 20 TO 30 THIS AFTERNOON. CLOUDY. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITIES LOWERING TO 1 TO 3 MILES IN RAIN.

WEST COAST VANCOUVER ISLAND.
STORM WARNING CONTINUED.
WINDS SOUTHEAST 45 TO 65 KNOTS WITH HIGHER GUSTS SHIFTING TO SOUTHWEST 30 TO 40 THIS AFTERNOON. WINDS DIMINISHING TO 20 TO 25 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
STORM WARNING CONTINUED.
WINDS SOUTHEAST 50 TO 60 KNOTS WITH HIGHER GUSTS DIMINISHING TO 30 TO 40 THIS AFTERNOON. WINDS DIMINISHING FURTHER TO 20 TO 30 TONIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
STORM WARNING CONTINUED.
WINDS EAST TO SOUTHEASTERLY 45 TO 65 KNOTS WITH HIGHER GUSTS. WINDS DIMINISHING TO SOUTHEAST 35 TO 45 DURING THE AFTERNOON AND TO 20 TO 30 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

WEST COAST CHARLOTTES.
STORM WARNING CONTIUED.
WINDS EAST TO SOUTHEAST 45 TO 65 WITH HIGHER GUSTS. WINDS SHIFTING TO WEST TO NORTHWEST 40 TO 50 THIS AFTERNOON AND DIMINISHING TO SOUTHWEST 20 TO 30 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITIES LOWERING TO 1 TO 3 MILES IN RAIN.

END PART 1

PGM:MSCHK --- CIRCU: 220 TIME RCVD: 1247Z

FPCN20 CWVR 121215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15AM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM SATURDAY.

BOWIE..
GALE WARNING UPGRADED TO STORM WARNING.
WINDS NORTHWESTERLY 45 TO 55 KNOTS BECOMING WESTERLY 40 TO 50 THIS AFTERNOON. WINDS DIMINISHING TO SOUTHWESTERLY 20 TO 30 OVERNIGHT.
RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

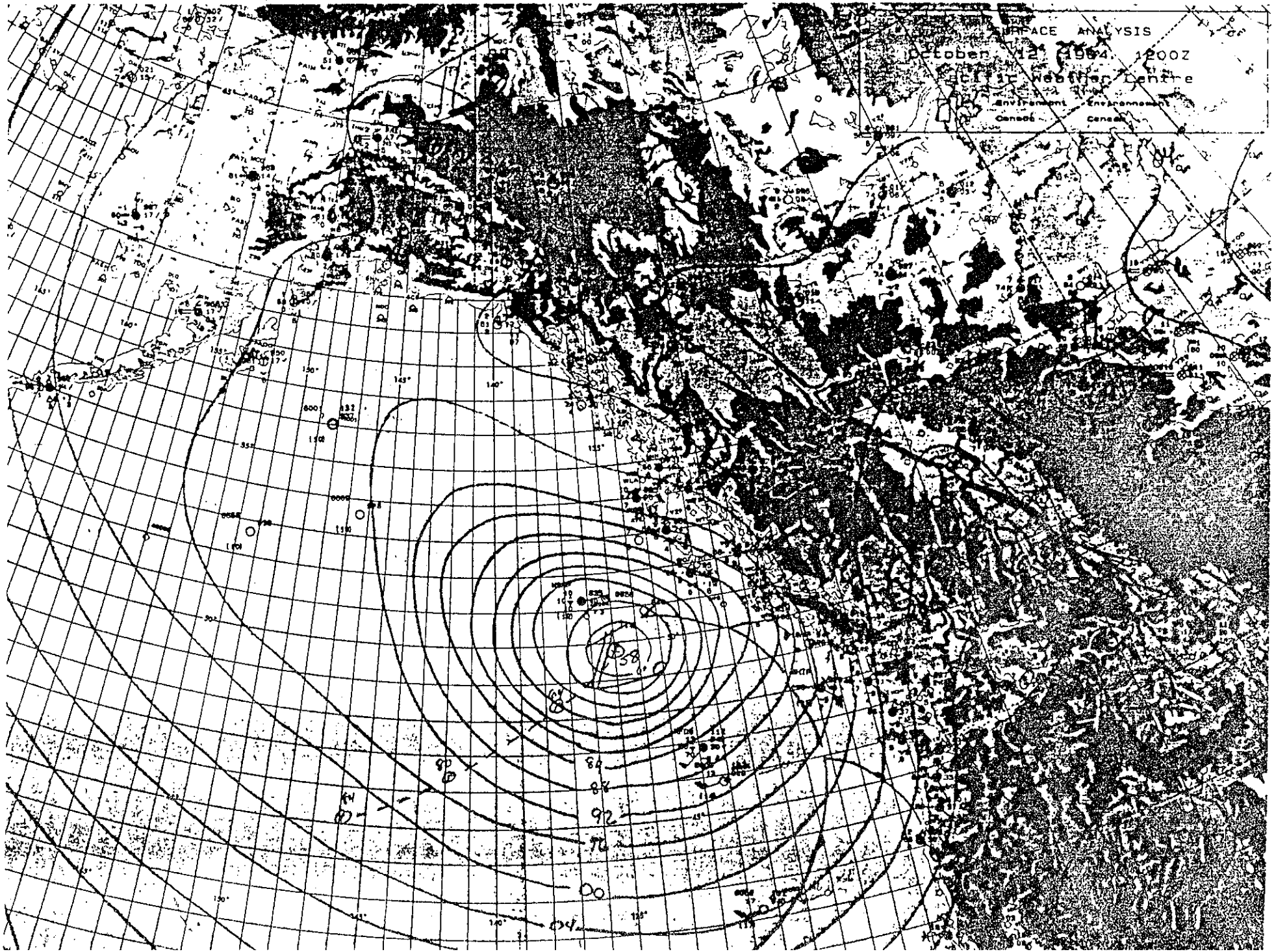
EXPLORER
GALE WARNING CONTINUED.
WINDS SOUTHWEST 35 TO 45 KNOTS DIMINISHING TO 20 TO 30 THIS AFTERNOON. WINDS DIMINISHING FURTHER TO 15 TO 20 OVERNIGHT.
FREQUENT SHOWERS TODAY LOWERING VISIBILITY TO 1 TO 3 MILES.
DECREASING SHOWERS TONIGHT.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM FRIDAY.
SOUTH COAST...MODERATE TO STRONG SOUTHERLIES EXCEPT WESTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG SOUTHERLIES.
OFFSHORE...STRONG SOUTHWEST WINDS.

END

SYNOPSIS .
A LOW PRESSURE CENTRE OF 970 MILLIBARS NEAR 51N 130W THIS MORNING WILL DEEPEN AND MOVE NORTH INTO THE GULF OF ALASKA. A FAST MOVING FRONT ASSOCIATED WITH THE LOW FROM JUST WEST OF THE CHARLOTTES TO 46N 127W THIS MORNING WILL MOVE ON TO THE COAST BY MIDDAY. STORM FORCE SOUTHEAST WINDS ARE EXPECTED OVER MOST WATERS AND EXCEPT GEORGIA AND JUAN DE FUCA STRAIT WHERE GALES ARE EXPECTED.
WINDS WILL DIMINISH AS THE FRONT AND LOW MOVE AWAY.

PWC SURFACE ANALYSIS 12 1200Z



3. Extraneous Factors Affecting the Forecast Production:

The Sub-Systems Control facility in Toronto experienced a disk failure at 10/0508Z. The system operated on one disk until 11/1232Z. During the 31 1/2 hours that the disk was down transmission of traffic was delayed. In order to facilitate transmission of the latest data the messages waiting in the queue had to be cleared several times. Pertinent data may have been lost. Even when the disk was repaired, it took several hours for the system to return to normal. At 11/1916Z there were 152 messages waiting in the queue for circuit 220. This missing data may have had an impact on all three models.

The GOES satellite imagery was of less value than in the past due to the satellite position over 98° W. Features on the satellite picture become of marginal use west of 150 W and of no significant values west of 160 W.

It should also be noted that GOES 1, situated over 128 W was no longer producing visual imagery. The sensor malfunctioned on the previous weekend (October 7-8).

4. Summary:

The situation leading to the development of this storm appeared to be unusual in several respects.

The storm contained the remnants of Typhoon OGDEN. Very warm moist air was present in the system. This likely resulted in dramatic latent heat release and strong baroclinicity - both factors supporting strong development.

The satellite imagery reflected the warm temperatures. The signature of the storm appeared to be different from that of a classic Pacific low pressure area. It was not obvious from the imagery that major intensification was taking place until it was well underway.

The communications difficulties compounded the problem. The numerical models presented an intensifying storm in the long range but the analysis was questionable and the communications disruption was in progress. The models also differed on the solution. The 5 a.m. Thursday Marine Forecast issued a Gale Warning for the offshore marine areas and all North Coastal marine areas.

As time progressed into Thursday, there was still backlogged data waiting for transmission, however, the communications hardware problem was now solved. The numerical models were now backing off on intensification of the storm. There was a reasonable data field although some of the ship and buoy reports conflicted. The Gale Warning was extended to South Coastal Waters at 7 p.m. The forecast called for southeast gales developing over West Coast Vancouver Island, Friday afternoon.

On Thursday evening the stationary buoy reports made it apparent that major storm development was underway. The communications situation was back to normal. The satellite imagery confirmed major intensification. At

11 p.m. Thursday, Gale Warnings were upgraded to Storm Warnings for all coastal waters except Georgia Strait and Juan de Fuca Strait. A Gale Warning was issued for Juan de Fuca Strait at 11:30 p.m. The new numerical model runs based on 12/0000Z data (Thursday afternoon) continued to grossly underestimate the amount of intensification.

The storm continued to intensify overnight reaching its maximum depth estimated at 958 mb early Friday morning at 12/1200Z.

Points to Note:

The models did not handle the explosive deepening well. Central pressure of the low was grossly underestimated. The models did not appear to handle well the latent heat release of tropical moisture entrained into the system.

Every piece of data must be weighed carefully - especially in data sparse regions. The data from the stationary buoys positioned about 275 miles off the coast were absolutely-crucial in the determination of explosive deepening.

Attachment:

Briefing Note on the Friday Storm
Statement on the Storm

Environment Canada Environnement Canada

MEMORANDUM NOTE DE SERVICE

ADMA - Ottawa
Attn: MetL

PAED - Vancouver

SECURITY - CLASSIFICATION - DE SÉCURITÉ

OUR FILE/NOTRE REFERENCE
1410-1 (PAEMM)
8001-132/V7 (PAEMM)

YOUR FILE/VOTRE REFERENCE

DATE
October 15, 1984

SUBJECT
OBJET

Briefing Note on Storm Force Winds Over B.C. Coastal Waters
Friday October 12, 1984

1. FACTS: SUMMARY OF EVENTS

1.1 A storm which intensified quickly some 300 miles to the west of Cape Scott during the evening of Thursday, October 11 and early morning of Friday October 12 brought storm force winds to most B.C. Coastal areas on Friday.

1.2 Some Reported Wind Speeds and Times of Occurrence

1.21 At 11 p.m. on Thursday, October 11 the strongest reported wind was from Cape St. James - southeast 24 knots gusting to 31.

1.22 At 2 a.m., Friday, October 12, 1984 the automatic reporting station at Estevan Point reported sustained winds of 36 knots with gusts to 61. Highest winds from this station were reported at 8 a.m. - sustained winds 36 knots with gusts to 70 knots.

1.23 First reports of sustained storm force winds occurred at 3 a.m. on Friday at the automatic station of Lawn Point at 50 knots. The next hour it peaked at 63 knots. Cape St. James also reported a sustained storm force wind at 4 a.m. of 50 knots gusting to 72.

1.24 Some reported wind speeds at 5 a.m., Friday, October 12:

Amphitrite	southeast 40 gusting to 49
Cape St. James	east 62 gusting to 74
Estevan Point	southeast 38 gusting to 58
Scarlett Point	southeast 45 gusting to 65
Cape Scott	southeast 9
Quatsino	southeast 40 and gusting

1.25 At 8 a.m. Cape Scott reported a southeast wind of 42 knots gusting to 76 with estimated winds over seas southeast 65 and gusting.

1.26 The strongest reported wind appears to have been from Cape St. James at 66 knots with gusts of 89 knots.

2. SUMMARY OF FORECAST WARNINGS

2.1 Gale warnings with this system were in effect on the Thursday, 5 a.m. marine forecast for gale force winds of up to 40 knots for Thursday night for all northern B.C. coastal areas and the off-shore areas.

2.2 The gale warnings were extended to southern coastal areas on the 7 p.m. marine forecast of Thursday, October 11.

2.3 The gale warnings were up-graded to storm warnings (45-55 knots and higher gusts) at 11 p.m., Thursday, October 11 for all marine areas except Georgia Strait and Juan de Fuca Strait where gales of 40 knots were forecast. All coastal forecasts were revised.

2.4 The 5 a.m. forecast of Friday, October 12, 1984 continued the storm warnings.

3. SUMMARY OF ACCURACY AND LEAD TIME

3.1 Indications that a storm would affect some of the area occurred about 18 hours before the onset of gales.

3.2 The extension of the gale warnings to the southern marine areas was correct but the timing was slow.

3.3 The severity of the storm was under forecast.

3.4 The lead time of (the forecast of) the occurrence of storm force winds was about 4-5 hours.

4. IMPACT

4.1 Loss of life (4 estimated).

4.2 Property damage.

4.3 Loss of 4-6 fishing vessels.

STATEMENT ON THE OCTOBER 12TH

PACIFIC COAST STORM

AT 5:15 a.m., Thursday, October 11, Gale Warnings were in effect for the Offshore Areas, Queen Charlotte Sound, and areas north. These warnings were based primarily on satellite imagery covering the eastern Pacific.

Warnings for these areas were continued on the 11:15 a.m. forecast with some additional information from voluntary ship observations and buoy information.

At 7:00 p.m., the gale warnings were extended to include West Vancouver Island. Additional to the satellite data, ships' observations, additional buoy data, and some coastal weather stations contributed to the extended warnings.

At 11:30 p.m., gale warnings were upgraded to Storm Warnings based on data received from satellite imagery, ships' observations, buoy information, and coastal weather stations. The storm warnings were in effect from West Coast Vancouver Island northward to the Queen Charlottes. The warnings remained in effect throughout Friday, October 12, 1984.

Appendix 4.

Reports on the A.E.S. communication system.

Government of Canada / Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE

TO / À: PAED

FROM / DE: A/ACPD

SECURITY - CLASSIFICATION - DE SÉCURITÉ:

OUR FILE/NOTRE RÉFÉRENCE: N/4 8770-1 (A/ACPD)

YOUR FILE/VOTRE RÉFÉRENCE:

DATE: October 26, 1984

SUBJECT / OBJET: STATUS OF COMMUNICATIONS SYSTEM

As per your request, I am forwarding to you a copy of a report prepared by ACPN indicating the status of the communications system for the period October 10-12, 1984. The following is a summary of the major points.

1. Disk problems at the CN/CP Collins Switch in Toronto on October 10th at 1008 Z necessitated the clearing of Priority 3 traffic from October 10th at 1600 Z to October 12th, 1750 Z. We are not in a position to determine the content or impact of the messages that were cancelled on the instructions of designated users. The last occurrence of queue clearing on circuit 272 to CMC (for possible input to produce guidance material) was on October 11th at 1800 Z, approximately 12 hours prior to the severe storm in question.

2. Priority 1 (Warnings, Advisories, etc.) messages were not affected.

3. Priority 2 (Canadian Hourlies) messages were not affected, other than for circuit 273, until October 11th, 1800 Z.

4. One hour of MARS data was lost on the 01:00 collection on October 11th.

5. Resolution of disk problems at CN/CP was within normal response levels.

Mitch Kallaur

cc: ACDG
AFDG
ACPD
ACPN

Attach.

8/016/MK

Government of Canada / Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE

TO / À: A/ACPD

FROM / DE: ACPN

SECURITY - CLASSIFICATION - DE SÉCURITÉ:

OUR FILE/NOTRE RÉFÉRENCE: 8215-1 (ACPN)

YOUR FILE/VOTRE RÉFÉRENCE:

DATE: October 26, 1984

SUBJECT / OBJET: COMMUNICATION SYSTEMS STATUS

Further to PAED's request on the above noted subject, following is a status of the communications system on October 10, 11, and 12, 1984.

TELETYPE

The teletype network C8500 message switching computer experienced disc problems and operated on single disc (as opposed to dual disc) during the following time period (times are GMT); 10/10:08 - 10/20:38 and 10/23:30 - 11/01:49. System was in update during 10/20:38 - 10/23:30 and 11/01:49 - 11/12:45.

During this time, the TTY network operated very slowly and circuit queues were very high. Action was taken by SSC to clear selected circuit queues (at request of designated users) to maintain traffic flow. When a queue is cleared, message data in that queue is lost.

Circuits cleared, times, and data volumes that were lost, are detailed in the attachment. We have no means of determining what data is lost when a circuit queue is cleared; we can only speculate. Only the receiving station can identify what data was not received and the impact. The established procedure is that SSC will only clear a circuit queue at the request of the Weather Centre or other designated office. SSC advises the Centres on the number of messages in queue and the Centre in turn advises SSC on what action to take, if any. However, only Priority 3 traffic queues are cleared; Priority 1 (Warnings, Specials, Amendments, Advisories, Radat Reports, and any SPL appended messages) and Priority 2 (Canadian Hourlies, except on CMC circuit 273) traffic queues are not cleared.

The Teletype system operated normally before and after the above times.

FACSIMILE

The facsimile systems operated normally, except for delays and one missing chart as detailed in the attachment.

.../2

CODECON

A CODECON failure was experienced on Oct. 11 - 00:20. This resulted in the loss of MARS data for the 01:00 collection.

OTHER

As a result of the CNCP technicians strike (Aug. 28 - Oct. 15), the following two network enhancements were not implemented:

1) AES order 0087/84 issued July 13, 1984. This order was to provide transmit capability from Comox and Esquimalt on BC regional FAX circuit 1810 in support of the West Coast Sea State Forecast Program.

2) The Teletype network C8500 message switch was not programmed to switch the following MAPS II stations:

WFG - Sartine Island
WRU - Solander Island
WRO - Rose Spit
WEK - Grey Islet

R. Massaroni

R. Massaroni

Attach.

cc: AFSD

RM:vpl

RM410099.2

ATTACHMENT

STATUS REPORT ON COMMUNICATIONS SYSTEM
OCTOBER 10, 11 and 12, 1984

TTY SYSTEM STATUS

All times are GMT.

OCTOBER 10

05:52 - queues cleared on CMC circuit 273 (620 messages lost).

16:00 - CNCP advises SSC that the C8500 is on single disc (2nd disc has failed).

- TTY system is very slow in delivering data.

- message queue on circuit 220 cleared. About 476 messages lost.

- queues on CMC circuits 272 (931 messages lost) and 273 (673 messages lost) were cleared as well.

18:30 - 19:15 - queues cleared on circuits 121 (179 messages lost) and 122 (108 messages lost).

- C8500 still on single disc.

23:30 - CNCP attempts to bring 2nd disc on line but were unsuccessful.

23:35 - 00:00 - queues cleared on circuits 272 (667 messages lost), 273 (738 messages lost), 220 (598 messages lost), and circuit 120 (123 messages lost).

- system still on single disc.

OCTOBER 11

00:35 - C8500 still on single disc and TTY system very slow.

00:47 - 00:48 - C8500 processor switch over.

00:20 - 01:20 - CODECON failed and was rebooted (01:00 MARS reports were lost).

00:58 - queues cleared circuits 121 (104 messages lost) and 122 (74 messages lost). System still on single disc.

01:10 - CNCP want to add 2nd disc. SSC advised them to hold off until further notice (due to experience at 23:30).

01:30 - system running very slow and message queues are extremely high.

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OCTOBER 11 cont...

01:50 - SSC advised CNCP to proceed to add 2nd disc.

02:30 - 2nd disc added and updating.

03:49 - 03:59 - queues cleared on circuit 220 (446 messages lost).

04:16 - 04:30 - queues cleared on circuit 120 (120 messages lost).

05:20 - queues cleared on CMC circuits 272 (942 messages lost) and 273 (650 messages lost).

05:47 - 05:56 - queues cleared on circuit 220 (84 messages lost).

12:00 - queues cleared on circuit 272 (338 messages lost), 273 (380 messages lost), and 220 (143 messages lost).

12:44 - 12:48 - processor switchover.

18:00 - queues cleared on circuits 272 (658 messages lost) and 273 (611 messages lost).

23:55 - queues cleared on circuit 121 (40 messages lost).

OCTOBER 12

17:50 - queues cleared on circuit 220 (25 messages lost).

22:32 - 22:34 - C8500 processor switchover.

.../3

FAX SYSTEM STATUS

OCTOBER 10 - due to computer problems at CMC, CMC chart run for 1801 network from 1340Z to 2051Z between 1 hr. 12 min. to 3 hrs. late.

Details as follows:

32A0	SFC. Analysis	- 2 hrs. 7 mins. late
33A0	500 MB Anal.	- 3 hrs. late
34A0	700 MB Anal.	- 2 hrs. 24 mins. late
35A0	850 MB Anal.	- 2 hrs. 30 mins. late
36A0	Spectral	- 1 hr. 30 mins. late
37A0	Spectral	- 1 hr. 32 mins. late
38A0	Spectral	- 2 hrs. 41 mins. late
39A0	Spectral	- 2 hrs. 39 mins. late
40A0	Spectral	- 2 hrs. 38 mins. late
41A0	Spectral	- 2 hrs. 48 mins. late
42A0	SFC. Analysis Comp.	- 1 hr. 12 mins. late
49A0	250 MB Analysis	- NOT TRANSMITTED
51A0	Atlantic Strip	- 1 hr. 18 mins. late
47A0	500 MB Analysis	- 1 hr. 27 mins. late
53A0	SFC. Analysis Early	- 1 hr. 34 mins. late

OCTOBER 11 - 3A0 - SFC. Analysis Early - 23 mins. late

OCTOBER 12 - 04A0 - 500 MB Analysis - 3 mins. late
12A0 - Spectral - 40 mins. late

All other network operations were normal.

Appendix 5.

Review of meteorological guidance provided, in the form of numerically calculated weather prognoses, by the Canadian Meteorological Centre in Dorval to the Pacific Weather Centre.

Environment Canada / Environnement Canada

Atmospheric Environment / Environnement atmosphérique

MEMORANDUM NOTE DE SERVICE

TO / À: PAED

FROM / DE: CMCD

SECURITY - CLASSIFICATION - DE SÉCURITÉ:

OUR FILE/NOTRE RÉFÉRENCE: 8952-2

YOUR FILE/VOTRE RÉFÉRENCE:

DATE: October 25, 1984

SUBJECT / OBJET: West Coast Storm of October 12, 1984

In a review of the meteorological guidance that was provided by CMC for the storm on October 12, 1984, we have studied our operational and transmitted output for the period October 10-12 and also the operational logs to clarify whether there were any extraordinary operational conditions. Special attention has been paid to forecasts that verify from 00Z to 12Z October 12, which we understand was the period when the loss of life and fishing vessels occurred.

Our investigation revealed that the major constraints under which CMC was operating in the period October 10-12 were: the failure of a micro-wave link between 091555-100233Z; Collins computer operating on only one disc from 100508Z-111232Z; and hardware error on a Cray disc at 101215Z the correction of which was followed by further downtime from 101252Z-101346Z. The two failures in the communications network resulted in a considerable loss in data, while the Cray failure caused a delay of about 1.5 hours in the start of the model run from 101200Z. In spite of this delay all facsimile charts were transmitted except the 250mb. analysis.

The review of the meteorological output indicates that the storm had an origin associated with tropical storm Ogden which was west of the dateline at the beginning of the period in question. The first indication that a possible impulse was breaking rapidly away to the east was a delayed 101200Z report from a drifting buoy at 42N 160W. As this report indicated a pressure fall of 15mb. in 6 hours and the impulse was still on the horizon of the GOES imagery, it could not be substantiated. Nevertheless by 110000Z there was evidence from delayed reports for 101800Z and later satellite imagery that there was in fact a rapidly moving frontal wave. After consultation with the Pacific Weather Centre before the

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model integration began, the supervisor at CMC entered 6 bogus points at 1000mb. in the vicinity of the surface low that had now developed and 1 point at 500mb. to minimize the effect the 1000mb. values would have on the strong flow aloft. In spite of all these problems, the objective and subjective prognoses initialized at 101200Z and 110000Z and valid for either 120000Z and 121200Z generally showed a significant development east of the long wave trough which the Hovmöller diagram indicated at 160W. A similar development had been indicated by longer range prognoses from CMC, NMC and ECMWF; in fact as mentioned in the FXCN1 CWAO 101715 one of these prognoses from ECMWF was used as a trend for the 36 hour forecast valid for 120000Z when the failure of the Cray occurred.

The comparisons of the forecast central pressure and position with actual values at 120000Z and 121200Z are shown in Tables I and II for all prognoses out to 48 hours that were still available at CMC. Some of the analyses have had to be reanalyzed in light of the subsequent developments. It is evident, however, from Tables I and II that the objective prognoses tended to deteriorate as the forecast ranges decreased. This behaviour can probably be ascribed to two main causes: model performance and initial analyses. In particular the common deficiency for the 24 hour prognoses valid at 121200Z tend to suggest a common inability of numerical models to simulate explosive deepening at short time ranges especially when the initial conditions are not well defined. In the case of CMC this difficulty was further compounded by the reduction in data from 100508Z-111232Z, which also would have had an escalating effect especially on the upper air analyses. In order to compensate for at least the deficiences at the surface, bogus data were introduced at 1000mb. for the final analyses at 111200Z and 111800Z.

The 1000mb. analyses at 120000Z and 120600Z were judged at the time not to require any bogus data because there was a reasonable amount of peripheral data. However, a late ship report at 120600Z that was unavailable to the supervisor before the final objective analysis was rejected by this analysis but it indicated that the depth of the low was in the low 960mbs. Since the next supervisor did not at first believe this report until at least he had confirmation at 121200Z, there was no bogus data introduced before the model run at this time. While this may have had consequences in the subsequent prognoses, its main effect in this analysis of events up to 121200Z was that the objective surface analysis from which S1 scores were derived would have a large error in the vicinity of the deep low.

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Owing to this error the S1 scores have not been included but in general they tend to confirm that the CMC spectral model was highly competitive with the others at all forecast ranges over the Pacific region. As a final indication of the strength of the winds that were forecast by the model we show below the 3000 ft. FD wind at Port Hardy valid from 120000Z to 121200Z at the available time ranges.

120000Z	120600Z	121200Z
36hr. 210/19	---	---
24hr. 200/19	---	36hr. 170/60
12hr. 240/10	18hr. 180/16	24hr. 160/36
---	6hr. 170/22	12hr. 150/43

As in most inquiries, a large volume of information accumulates that has to be condensed into a synthesis such as that given here. Even though any of this information can be referred to later, its main conclusions are that CMC provided highly competitive guidance in the form of prognoses in spite of the abnormally large loss of data. This same loss or even delay of data, on the other hand, severely handicapped our ability to provide more accurate surface analyses.

F.J. Lemire

CA/dos
Enclosures

c.c.: AFDG

TABLE I

Low

V.T. 0000Z, 12 Oct. 84. Posn. 47N 140W Central Pressure 980mbs.

Verification - Errors in Central Pressure and Position

Code: C.P. error (mbs)/error(mbs) at position of analyzed low center/direction and distance (n.m.) progged center is from analyzed center.

Hr. Prog.	CMC Spect.	CMC (Subj)	LFM	USG
00	09/09/SW60	—	—	—
12	—	—	—	—
24	10/08/<60	—	11/12/NW180	10/12/W60
36	06/06/<60	16/16/NW360	12/28/WSW900	05/18/SW180
48	01/00/<60	04/06/SW240	22/23/SW300	12/24/W400

TABLE II

Low

V.T. 1200Z, 12 Oct. 84. Posn. 50N 135W. Central Pressure 954mb.

Verification - Errors in Central Pressure and Position

Hr. Prog.	CMC Spect.	CMC (Subj)	LFM	USG
00	25/30/E60	——	——	——
12	20/34/NW200	——	——	——
24	31/28/NW300	——	26/34/NW300	40/42/W200
36	21/30/NE150	22/30/NNW180	30/34/NW300	28/34/NW250
48	20/30/NE150	22/42/NW420	38/58/SW660	21/30/WNW150

Appendix 6.

Forecasts issued by Pacific Weather Centre, October 10-12, 1984.

FPCN20 CWVR 101215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15AM PDT WEDNESDAY 10 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM THURSDAY.

GEORGIA STRAIT
GALE WARNING DOWNGRADED TO SMALL CRAFT WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS RISING AT TIMES TO 30 TODAY.
CLOUDY WITH INTERMITTENT RAIN. SHOWERS THURSDAY. VISIBILITIES 2 TO 3 MILES IN RAIN.

JUAN DE FUCA STRAIT
GALE WARNING DOWNGRADED TO SMALL CRAFT WARNING.
WINDS EASTERLY 15 TO 20 KNOTS INCREASING TO EASTERLY 20 TO 30 THIS MORNING. WINDS SHIFTING TO WESTERLY 20 TO 30 KNOTS THIS EVENING.
CLOUDY WITH INTERMITTENT RAIN. SHOWERS THURSDAY. VISIBILITIES 1 TO 3 MILES IN RAIN.

WEST COAST VANCOUVER ISLAND.
STORM WARNING DOWNGRADED TO GALE WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS WITH A FEW GUSTS TO 30 TO 35 TODAY.
WINDS BECOMING SOUTH TO SOUTHWEST 15 TO 25 THURSDAY MORNING.
CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER. VISIBILITIES 1 TO 3 MILES IN SHOWERS.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEAST 15 TO 25 KNOTS WITH A FEW GUSTS TO 30 TO 35 TODAY.
CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER. VISIBILITIES LOWERING AT TIMES TO 1 TO 3 MILES IN SHOWERS.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
STORM WARNING CONTINUED.
WINDS SOUTHEAST 30 TO 40 KNOTS WITH A FEW GUSTS TO 45 TO 50 THIS MORNING. WINDS DECREASING TO SOUTH TO SOUTHWEST 20 TO 30 THURSDAY MORNING. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER TODAY.
VISIBILITIES 1 TO 3 MILES IN SHOWERS.

WEST COAST CHARLOTTES.
STORM WARNING CONTINUED.
WINDS SOUTHEAST 35 TO 45 KNOTS WITH A FEW GUSTS TO 50 DECREASING TO SOUTHWEST 25 TO 35 THIS AFTERNOON. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER. VISIBILITIES 1 TO 3 MILES IN SHOWERS.

BOWIE.
STORM WARNING DOWNGRADED TO GALE WARNING.
WINDS SOUTHERLY 30 TO 40 KNOTS WITH HIGHER GUSTS. WINDS BECOMING SOUTHWESTERLY 20 TO 35 THIS MORNING THEN TO NORTHWEST 20 TO 35 TONIGHT. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER TODAY.
VISIBILITIES 1 TO 3 MILES IN SHOWERS.

END PART 1

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 1229Z

FPCN20 CWVR 101215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15AM PDT WEDNESDAY 10 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM THURSDAY.

EXPLORER.
GALE WARNING CONTINUED.
WINDS SOUTHWESTERLY 30 TO 40 KNOTS BECOMING WESTERLY 20 TO 35 THIS AFTERNOON. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER TODAY. VISIBILITIES AT TIMES TO 1 TO 3 MILES IN SHOWERS.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 6 AM THURSDAY.
SOUTH COAST...FRESH TO STRONG SOUTHERLIES.
NORTH COAST...FRESH TO STRONG SOUTHWEST BECOMING SOUTH LATER IN THE DAY.
OFFSHORE...FRESH TO STRONG WEST TO SOUTHWEST INCREASING TO SOUTHEAST GALES LATER IN THE DAY.

END

SYNOPSIS
A 970 MB SURFACE LOW AT 53N 137W EARLY THIS MORNING WILL MOVE TO NEAR 59N 145W EARLY THURSDAY MORNING AND WEAKEN TO 990 MB. A COLD FRONT LYING IN A NORTHEAST TO SOUTHWEST LIE THROUGH SOUTH VANCOUVER ISLAND EARLY THIS MORNING WILL MOVE INLAND THIS EVENING. STRONG TO STORM FORCE SOUTHERLY WINDS OVER THE COAST WILL EASE A LITTLE AS THE LOW MOVE NORTH AND WEAKENS BUT A STRONG TO GALE FORCE GRADIENT WILL PERSIST ALONG THE COAST WEST OF THE COLD FRONT.

END PART 2 OF 2

FGM.MSCHK --- CIRCUIT 220 TIME RCVD: 1816Z

FPCN20 CWVR 101815
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.15AM PDT WEDNESDAY 10 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON THURSDAY.

GEORGIA STRAIT
SMALL CRAFT WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS RISING AT TIMES TO 30 TODAY.
CLOUDY WITH INTERMITTENT RAIN. SHOWERS THURSDAY. VISIBILITIES 2 TO 3 MILES IN RAIN.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS EASTERLY 10 TO 20 KNOTS INCREASING TO EASTERLY 20 TO 30 THIS AFTERNOON. WINDS SHIFTING TO WESTERLY 10 TO 20 KNOTS RISING AT TIMES TO 30 KNOTS THIS EVENING. WINDS BECOMING EASTERLY 10 TO 20 KNOTS THURSDAY MORNING. CLOUDY WITH INTERMITTENT RAIN. SHOWERS THURSDAY. VISIBILITIES 1 TO 3 MILES IN RAIN.

WEST COAST VANCOUVER ISLAND.
GALE WARNING CONTINUED.
WINDS SOUTHEAST 15 TO 25 KNOTS RISING AT TIMES TO 35 TODAY.
WINDS BECOMING SOUTH TO SOUTHWEST 15 TO 25 THURSDAY MORNING.
CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER. VISIBILITIES 1 TO 3 MILES IN SHOWERS.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEAST 15 TO 25 KNOTS RISING AT TIMES TO 35 TODAY.
CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER. VISIBILITIES LOWERING AT TIMES TO 1 TO 3 MILES IN SHOWERS.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
STORM WARNING CONTINUED.
WINDS SOUTHEAST 30 TO 40 KNOTS RISING AT TIMES TO 45 TO 50.
WINDS DECREASING TO SOUTH TO SOUTHWEST 25 TO 35 LATER THIS AFTERNOON. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER TODAY.
VISIBILITIES 3 TO 5 MILES IN SHOWERS.

WEST COAST CHARLOTTES.
STORM WARNING CONTINUED.
WINDS SOUTHEAST 35 TO 45 KNOTS RISING AT TIMES TO 50. WINDS DECREASING TO SOUTHWEST 25 TO 35 KNOTS THIS AFTERNOON. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER. VISIBILITIES 2 TO 4 MILES IN SHOWERS.

BOWIE.
GALE WARNING CONTINUED.
WINDS SOUTHERLY 30 TO 40 KNOTS WITH HIGHER GUSTS. WINDS BECOMING SOUTHWESTERLY 25 TO 35 LATER THIS AFTERNOON. WINDS BECOMING NORTHWEST 25 TO 35 TONIGHT. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER TODAY. VISIBILITIES 1 TO 3 MILES IN SHOWERS.

END PART 1

AGM.MSGH --- CIRCA : 220 TIME RCVD: 18182

FPCN20 CWVR 101815
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.15AM PDT WEDNESDAY 10 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON THURSDAY.

EXPLORER.
GALE WARNING CONTINUED.
WINDS SOUTHWESTERLY 25 TO 35 KNOTS RISING AT TIMES TO 40 THIS AFTERNOON. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER TODAY. VISIBILITIES AT TIMES TO 1 TO 3 MILES IN SHOWERS.

FURTHER OUTLOOK FOR 24 HOURS BEYOND NOON THURSDAY.
SOUTH COAST...FRESH TO STRONG SOUTHERLIES.
NORTH COAST...FRESH TO STRONG SOUTH TO SOUTHWEST WINDS OFFSHORE...STRONG TO GALE FORCE SOUTH TO SOUTHWEST WINDS.

END

SYNOPSIS
A 972 MB SURFACE LOW AT 53N 137W THIS MORNING WILL MOVE TO NEAR 59N 143W THURSDAY AFTERNOON AND WEAKEN TO 992 MB. A COLD FRONT LYING IN A NORTHEAST TO SOUTHWEST LIE THROUGH SOUTH VANCOUVER ISLAND EARLY THIS MORNING WILL MOVE INLAND THIS EVENING. STRONG TO STORM FORCE SOUTHERLY WINDS OVER THE NORTH COAST WILL EASE TO STRONG TO GALE FORCE AS THE LOW MOVE NORTH AND WEAKENS. FRESH TO STRONG WINDS WILL PERSIST ON THE SOUTH COAST WITH HIGHER GUSTS JUST WEST OF THE COLD FRONT.

PGM:MSCHR --- CIRC : 220 TIME RCVD: 156Z

FPCN20 CWVR 110215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT WEDNESDAY 10 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM THURSDAY.

GEORGIA STRAIT
WINDS VARIABLE 5 TO 15 KNOTS BECOMING SOUTHEAST 5 TO 15 KNOTS THURSDAY MORNING. CLOUDY WITH SHOWERS. VISIBILITIES AT TIMES 3 MILES IN SHOWERS.

JUAN DE FUCA STRAIT
WINDS WESTERLY 10 TO 15 KNOTS. WINDS SHIFTING TO EASTERLY 5 TO 15 KNOTS THURSDAY MORNING. CLOUDY WITH SHOWERS. VISIBILITIES AT TIMES 3 MILES IN SHOWERS.

WEST COAST VANCOUVER ISLAND.
GALE WARNING ENDED.
WINDS SOUTHERLY 10 TO 20 KNOTS RISING AT TIMES TO 25 THIS EVENING. CLOUDY WITH SHOWERS. CHANCE OF A EVENING THUNDERSHOWER. VISIBILITIES 3 TO 5 MILES IN SHOWERS.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING ENDED.
SMALL CRAFT WARNING.
WINDS SOUTHEAST 10 TO 15 KNOTS RISING AT TIMES TO 20 TONIGHT. CLOUDY WITH SHOWERS. CHANCE OF A EVENING THUNDERSHOWER. VISIBILITIES LOWERING AT TIMES TO 3 MILES IN SHOWERS.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
STORM WARNING DOWNGRADED TO GALE WARNING.
WINDS SOUTHERLY 25 TO 35 KNOTS WITH A FEW HIGHER GUSTS THIS EVENING DECREASING TO SOUTHERLY 15 TO 25 BY THURSDAY AFTENOON. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER THIS EVENING. VISIBILITIES 3 TO 5 MILES IN SHOWERS.

WEST COAST CHARLOTTES.
STORM WARNING DOWNGRADED TO GALE WARNING.
WINDS SOUTHWEST 25 TO 35 KNOTS DECREASING TO SOUTHWEST 15 TO 25 BY THURSDAY AFTERNOON. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER THIS EVENING. VISIBILITIES 2 TO 4 MILES IN SHOWERS.

END PART 1

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 2142

FPCN20 CWVR 110215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT WEDNESDAY 10 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM THURSDAY.

BOWIE.
GALE WARNING CONTINUED.
WINDS WEST TO NORTHWEST 25 TO 35 RISING AT TIMES TO 40 TONIGHT.
WINDS ABATING TO SOUTHERLY 15 TO 25 BY THURSDAY AFTERNOON.
CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER TONIGHT.
VISIBILITIES AT TIMES 3 MILES IN SHOWERS.

EXPLORER.
GALE WARNING CONTINUED.
WINDS WESTERLY 15 TO 25 KNOTS. WINDS INCREASING TO SOUTHWEST 25 TO 35 KNOTS BY THURSDAY AFTERNOON. CLOUDY WITH SHOWERS. CHANCE OF AN EVENING THUNDERSHOWER. VISIBILITIES AT TIMES 3 MILES IN SHOWERS.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM THURSDAY.
SOUTH COAST...MODERATE TO FRESH SOUTHERLIES.
NORTH COAST...MODERATE TO STRONG SOUTH TO SOUTHWEST WINDS OFFSHORE...STRONG TO GALE FORCE SOUTHERLY WINDS.

END

SYNOPSIS
A 972 MB SURFACE NEAR 55N 137W TONIGHT WILL MOVE TO NEAR 59N 143W THURSDAY AFTERNOON AND WEAKEN TO 992 MB. A COLD FRONT LYING IN A NORTHEAST TO SOUTHWEST LIE THROUGH SOUTH VANCOUVER ISLAND EARLY THIS AFTERNOON IS MOVING INLAND THIS EVENING. STRONG TO GALE FORCE SOUTHERLY WINDS OVER THE NORTH COAST WILL EASE TO FRESH TO STRONG SOUTHERLY OVER THE NEXT 24 HOURS AS THE LOW MOVE NORTH AND WEAKENS. MODERATE TO FRESH SOUTHERLY WINDS WILL PERSIST ON THE SOUTH COAST THROUGH THURSDAY NIGHT.

FPCN20 CWVR 111215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15 AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM FRIDAY.

GEORGIA STRAIT
SMALL CRAFT WARNING.
WINDS VARIABLE 5 TO 15 KNOTS BECOMING SOUTHEAST 10 TO 20 KNOTS THIS EVENING INCREASING TO SOUTHEAST 20 TO 30 FRIDAY MORNING.
MOSTLY CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG PATCHES.
VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS VARIABLE 5 TO 15 KNOTS OCCASIONALLY WEST 15 TO 25 TODAY.
WINDS BECOMING EASTERLY 10 TO 15 TONIGHT INCREASING TO 15 TO 25 FRIDAY MORNING. CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG PATCHES. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

WEST COAST VANCOUVER ISLAND.
WINDS VARIABLE 5 TO 15 KNOTS BECOMING WESTERLY 10 TO 20 THIS MORNING. WINDS BECOMING SOUTHEAST 10 TO 20 TONIGHT INCREASING TO SOUTHEAST 20 TO 30 FRIDAY MORNING. MOSTLY CLOUDY WITH OCCASIONAL SHOWERS. CHANCE OF A THUNDERSHOWER. RAIN FRIDAY MORNING. A FEW MORNING FOG PATCHES. VISIBILITIES 3 IN SHOWERS AND NEAR ZERO IN FOG.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
SMALL CRAFT WARNING.
WINDS LIGHT OCCASIONALLY SOUTHEAST 10 TO 15 KNOTS. WINDS INCREASING TO SOUTHEAST 15 TO 20 TONIGHT RISING TO SOUTHEAST 20 TO 30 FRIDAY MORNING. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER. A FEW MORNING FOG PATCHES. VISIBILITIES LOWERING AT TIMES TO 3 MILES IN SHOWERS AND TO NEAR ZERO IN FOG.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING CONTINUED.
WINDS SOUTHERLY 10 TO 20 KNOTS WITH A FEW HIGHER GUSTS THIS MORNING.
WINDS INCREASING TO SOUTHEAST 20 TO 30 KNOTS TONIGHT RISING TO SOUTHEAST 25 TO 40 FRIDAY MORNING. CLOUDY WITH SHOWERS. RAIN BEGINNING FRIDAY MORNING. A FEW MORNING FOG PATCHES. VISIBILITIES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING CONTINUED.
WINDS SOUTHWEST 10 TO 15 KNOTS BECOMING SOUTHEAST 15 TO 25 THIS EVENING. WINDS INCREASING TO SOUTHEAST 20 TO 40 KNOTS OVERNIGHT.
MOSTLY CLOUDY WITH A FEW SHOWERS. RAIN BEGINNING AFTER MIDNIGHT.
VISIBILITIES 2 TO 4 MILES IN SHOWERS AN TO 1 MILE IN RAIN.

END PART 1

PGM:MSCHK --- CIRCUIT : 220 TIME RCVD: 1227Z

FPCN20 CWVR 111215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15 AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM FRIDAY.

BOWIE
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 20 KNOTS BECOMING SOUTHEAST 15 TO 25 BY EVENING. WINDS BECOMING SOUTHEAST 30 TO 40 KNOTS TONIGHT. MOSTLY CLOUDY WITH ISOLATED SHOWERS. RAIN BEGINNING TONIGHT. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

EXPLORER
GALE WARNING CONTINUED.
WINDS BECOMING SOUTHWEST 15 TO 20 KNOTS THIS MORNING THEN SOUTHEAST 15 TO 25 THIS EVENING. WINDS INCREASING TO SOUTHEAST 30 TO 40 TONIGHT. MOSTLY CLOUDY WITH A FEW SHOWERS AND THE CHANCE OF A THUNDERSHOWER TODAY. RAIN BEGINNING TONIGHT. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 6 AM FRIDAY.
SOUTH COAST...STRONG TO GALE FORCE SOUTHEST.
NORTH COAST...STRONG TO GALE FORCE SOUTHEAST.
OFFSHORE...GALE FORCE SOUTHEAST BECOMING STRONG WESTERLY IN THE AFTERNOON.

END

SYNOPSIS
A 982 MB SURFACE LOW AT 59N 142W EARLY THIS MORNING WILL DRIFT NORTHWEST TO THE SOUTH CENTRAL COAST OF ALASKA BY THIS EVENING AND WEAKEN TO 986 MB. A SURFACE TROUGH EXTENDING FROM THE LOW TO TO THE WASHINGTON STATE COAST WILL DISSIPATE TODAY AS A WEAK RIDGE OF HIGH PRESSURE BUILDS OVER THE COAST. A 980 MB LOW CENTRE NEAR 46N 155W EARLY THIS MORNING WILL MOVE NORTHEAST TODAY TO LIE NEAR 51N 140W BY EARLY FRIDAY MORNING AND DEEPEN TO 970 MB.

END PART 2 OF 2

FPCN20 CWVR 111815
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT
CANADA AT 11.15AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON FRIDAY.

GEORGIA STRAIT
SMALL CRAFT WARNING.
WINDS SOUTHEAST 5 TO 15 KNOTS RISING AT TIMES TO 20 KNOTS.
WINDS INCREASING TO SOUTHEAST 15 TO 25 KNOTS FRIDAY MORNING.
MOSTLY CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG PATCHES.
VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS VARIABLE 5 TO 15 KNOTS OCCASIONALLY WEST 15 TO 20 TODAY.
WINDS BECOMING EASTERLY 10 TO 15 KNOTS TONIGHT INCREASING TO 15
TO 25 FRIDAY MORNING. CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG
PATCHES. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO
IN FOG.

WEST COAST VANCOUVER ISLAND.
WINDS SOUTHEAST 10 TO 20 KNOTS TODAY INCREASING TO 20 TO 30 FRIDAY
MORNING. MOSTLY CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER
TODAY. A FEW MORNING FOG PATCHES. RAIN BEGINNING FRIDAY NEAR NOON.
VISIBILITIES AT TIMES 3 MILES IN PRECIPITATION AND NEAR ZERO IN FOG.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
SMALL CRAFT WARNING.
WINDS LIGHT OCCASIONALLY SOUTHEAST 10 TO 15 KNOTS. WINDS INCREASING
TO SOUTHEAST 15 TO 25 FRIDAY MORNING. CLOUDY WITH SHOWERS. CHANCE
OF A THUNDERSHOWER TODAY. A FEW MORNING FOG PATCHES. VISIBILITIES
LOWERING AT TIMES TO 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING CONTINUED.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS
INCREASING TO SOUTHEAST 25 TO 35 KNOTS BY FRIDAY MORNING. CLOUDY
WITH SHOWERS. A FEW MORNING FOG PATCHES. VISIBILITIES AT TIMES
3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING CONTINUED.
WINDS SOUTHWEST 10 TO 15 KNOTS BECOMING SOUTHEAST 10 TO 20 KNOTS
TONIGHT AND INCREASING TO SOUTHEAST 25 TO 35 KNOTS FRIDAY MORNING.
MOSTLY CLOUDY WITH A FEW SHOWERS. RAIN BEGINNING NEAR NOON FRIDAY
VISIBILITIES 2 TO 4 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

BOWIE
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 20 KNOTS BECOMING SOUTH TO SOUTHEAST 15 TO
25 TONIGHT AND INCREASING TO SOUTHEAST 25 TO 35 KNOTS OVERNIGHT.
MOSTLY CLOUDY WITH ISOLATED SHOWERS. RAIN BEGINNING FRIDAY MORNING.
VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

END PART 1

PGM:MSCHK --- CIRC... 220 TIME RCVD: 1817Z

FPCN20 CWVR 111815
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.15AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON FRIDAY.

EXPLORER
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 20 KNOTS INCREASING TO 15 TO 25 TONIGHT.
WINDS INCREASING SOUTH TO SOUTHWEST 25 TO 35 RISING AT TIMES TO 40 BY FRIDAY MORNING. MOSTLY CLOUDY WITH A FEW SHOWERS. RAIN BEGINNING FRIDAY MORNING. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

FURTHER OUTLOOK FOR 24 HOURS BEYOND NOON FRIDAY.
SOUTH COAST...STRONG TO GALE FORCE SOUTHEAST EXCEPT STRONG EASTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG TO GALE FORCE SOUTHEAST.
OFFSHORE...GALE FORCE WEST TO SOUTHWQEST WINDS.

END

SYNOPSIS
A SURFACE TROUGH EXTENDING ALONG THE COAST TODAY WILL MOVE EASTWARD AS A WEAK RIDGE OF HIGH PRESSURE BUILDS OVER THE COAST TONIGHT. ANOTHER PACIFIC FRONTAL WAVE WILL APPROACH THE SOUTH COAST FRIDAY. MODERATE TO FRESH WINDS OVER MOST WATERS WILL GRADUALLY INCREASE AHEAD OF THE NEXT WAVE. FRESH TO STRONG SOUTHEASTERLY WINDS WILL DEVELOP IN THE SOUTH AND STRONG GALE FORCE WINDS OVER THE NORTH COAST AND OFFSHORE AREAS.

PGM:MSCHK --- CIRCUIT 220 TIME RCVD: 142Z

WWCN1 CWVR 120200
GALE WARNING FOR ALL SOUTH COAST WATERS EXCEPT JUAN DE FUCA STRAIT
ISSUED BY ENVIRONMENT CANADA AT 7 PM PDT THURSDAY OCTOBER 11 1984

A FRONTAL SYSTEM NEAR 45N 139W WILL CONTINUE EASTWARD AND REACH
VANCOUVER ISLAND FRIDAY AFTERNOON. WINDS ARE EXPECTED TO INCREASE
TO SOUTHEASTERLIES 30 TO 40 KNOTS AHEAD OF THE SYSTEM FRIDAY
MORNING AND ABATE TO STRONG SOUTHWESTERLIES IN THE EVENING.

END

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 1472

FPCN20 CWVR 120215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

GEORGIA STRAIT
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS RISING AT TIMES TO 25.
WINDS INCREASING TO SOUTHEAST 25 TO 35 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES LOWERING TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS WESTERLY 10 TO 20 KNOTS SHIFTING TO EASTERLY 10 TO 20 OVERNIGHT AND INCREASING TO 20 TO 30 KNOTS FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

WEST COAST VANCOUVER ISLAND.
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS TONIGHT INCREASING TO 30 TO 40 FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES 2 TO 4 MILES IN PRECIPITATION AND NEAR ZERO IN FOG.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS. WINDS INCREASING SOUTHEAST 25 TO 35 BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE AFTERNOON. VISIBILITIES LOWERING TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING CONTINUED.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS INCREASING TO SOUTHEAST 15 TO 25 OVERNIGHT AND TO SOUTHEAST 30 TO 35 KNOTS BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES REDUCED TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING CONTINUED.
WINDS SOUTHWEST 10 TO 15 KNOTS BECOMING SOUTHEAST 10 TO 25 KNOTS OVERNIGHT AND INCREASING TO SOUTHEAST 30 TO 35 KNOTS FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

END PART 1

PCM:MSCHK --- CIRCUIT: 220 TIME RCVD: 149Z

FPCN20 CWVR 120215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

BOWIE
GALE WARNING CONTINUED.
WINDS SOUTHERLY 10 TO 20 KNOTS INCREASING TO 15 TO 25 OVERNIGHT.
WINDS INCREASING TO SOUTHEAST 30 TO 40 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 2 TO 4 MILES IN SHOWERS AND NEAR ZERO IN FOG.

EXPLORER
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 25 KNOTS INCREASING TO SOUTH TO SOUTHWEST 25 TO 35 OVERNIGHT AND RISING AT TIMES TO 40 FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE MORNING.
VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM FRIDAY.
SOUTH COAST...FRESH TO STRONG SOUTHWEST WINDS EXCEPT WESTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG TO GALE SOUTHWESTERLY.
OFFSHORE...STRONG TO GALE FORCE WEST TO SOUTHWEST WINDS.

END

SYNOPSIS
A WEAK RIDGE OF HIGH PRESSURE WILL MOVE ONTO THE COAST TONIGHT. ANOTHER PACIFIC FRONTAL WAVE NEAR 45N 139W WILL CONTINUE EASTWARD TO REACH VANCOUVER ISLAND FRIDAY AFTERNOON. MODERATE TO FRESH WINDS OVER MOST WATERS TONIGHT WILL GRADUALLY INCREASE AHEAD OF THE NEXT WAVE. SOUTHERLY GALES WILL DEVELOP OVER THE OFFSHORE AREAS BY FRIDAY MORNING AND WILL SPREAD TO ALL COASTAL WATERS BY FRIDAY AFTERNOON EXCEPT FOR JUAN DE FUCA STRAIT. JUAN DE FUCA WINDS WILL BE MODERATE TO FRESH WESTERLY AHEAD OF THE RIDGE AND WILL SHIFT TO EASTERLY OVERNIGHT AND RISE TO STRONG EASTERLY BY FRIDAY AFTERNOON.

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 6 7Z

WWCN1 CWVR 120600
STORM WARNING FOR WEST COAST VANCOUVER ISLAND QUEEN CHARLOTTE AND JOHNSTONE STRAITS AND ALL NORTH COAST WATERS
ISSUED BY ENVIRONMENT CANADA AT 11 PM PDT THURSDAY OCTOBER 11 1984

A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY. AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING. WINDS ARE EXPECTED TO INCREASE TO SOUTHEASTERLY 45 TO 55 KNOTS WITH HIGHER GUSTS AHEAD OF THE FRONT AND ABATE TO STRONG TO GALE FORCE WESTERLIES IN THE AFTERNOON AND EVENING BEHIND THE SYSTEM.

END

PGM:MSCHK --- CIRCU. . 220 TIME RCVD: 641Z

FPCN20 CWVR 120630 AMD
PART 1 OF 2
REVISED MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY
ENVIRONMENT CANADA AT 11.30PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

GEORGIA STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEAST 10 TO 20 KNOTS RISING AT TIMES TO 25.
WINDS INCREASING TO SOUTHEAST 30 TO 40 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES AT TIMES 1 TO 4 MILES IN RAIN AND MIST.

JUAN DE FUCA STRAIT
GALE WARNING ISSUED.
WINDS EASTERLY 10 TO 20 KNOTS INCREASING TO 20 TO 30 FRIDAY MORNING.
WINDS INCREASING OVER EASTERN AND WESTERN ENTRANCES AT TIMES TO
SOUTHEAST GALES 35 TO 40. WINDS SHIFTING TO WESTERLY 15 TO 25
FRIDAY AFTERNOON. CLOUDY. RAIN BEGINNING BY FRIDAY AFTERNOON.
VISIBILITIES AT TIMES 1 TO 4 IN RAIN AND MIST.

WEST COAST VANCOUVER ISLAND.
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS INCREASING TO 40 TO 50 WITH HIGHER
GUSTS FRIDAY MORNING. WINDS BECOMING SOUTHWEST 25 TO 35 FRIDAY
AFTERNOON. MOSTLY CLOUDY TONIGHT. RAIN FRIDAY.
VISIBILITIES 1 TO 4 MILES IN RAIN AND MIST.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS. WINDS INCREASING SOUTHEAST 35 TO
50 BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH
RAIN BEGINNING IN THE MORNING. VISIBILITIES LOWERING TO 2 TO 4
MILES IN RAIN AND MIST.

END PART 1

PGM:MSCHR --- CIRCUIT 220 TIME RCVD: 7112

FPCN20 CWVR 120630 AMD
PART 2 OF 2
REVISED MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY
ENVIRONMENT CANADA AT 11.30PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING UPGRADED TO STORM WARNING.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS INCREASING TO SOUTHEAST 25 TO 35 OVERNIGHT AND TO SOUTHEAST 40 TO 55 KNOTS BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES REDUCED TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS INCREASING TO 25 TO 35 OVERNIGHT AND 40 TO 55 FRIDAY MORNING. WINDS SHIFTING TO SOUTHWEST 35 FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 1 TO 4 MILES IN RAIN AND MIST.

REMAINDER FORECASTS UNCHANGED FROM 7PM ISSUE.

END

REVISED SYNOPSIS
A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY. AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING AND INLAND LATE FRIDAY. WINDS ARE EXPECTED TO INCREASE TO GALE TO STORM FORCE SOUTHEASTERLIES AHEAD OF THE FRONT AND ABATE TO STRONG TO GALE FORCE WESTERLIES BEHIND THE DISTURBANCE.

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 6532

WWCN1 CWVR 120630
GALE WARNING FOR JUAN DE FUCA STRAIT ISSUED
BY ENVIRONMENT CANADA AT 11.30 PM PDT THURSDAY OCTOBER 11 1984

A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY. AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING. STRONG EASTERLY WINDS ARE EXPECTED AHEAD OF THE FRONT WITH GALES OVER THE EASTERN AND WESTERN ENTRANCES. WINDS WILL SHIFT TO STRONG WESTERLIES BEHIND THE FRONT FRIDAY AFTERNOON.

END

WWCN1 CWVR 121215
STORM WARNING FOR BOW ISSUED BY ENVIRONMENT CANADA AT
5.15 AM PDT FRIDAY OCTOBER 12 1984

A LOW PRESSURE CENTRE OF 970 MILLIBARS NEAR 51N 130O THIS MORNING WILL DEEPEN AND MOVE NORTH INTO THE GULF OF ALASKA. A FAST MOVING FRONT ASSOCIATED WITH THE LOW FROM JUST WEST OF THE CHARLOTTES TO 46N 127W THIS MORNING WILL MOVE ON TO THE COAST BY MIDDAY. STORM FORCE SOUTHEAST WINDS ARE EXPECTED ALL WATERS AND EXCEPT GEORGIA AND JUAN DE FUCA STRAITS AND EXPLORER WHERE GALES ARE EXPECTED. STORM FORCE WEST TO NORTHWESTERLIES ARE EXPECTED IN BOWIE. WINDS WILL DIMINISH AS THE FRONT AND LOW MOVE AWAY.

FPCN20 CWVR 121215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15AM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM SATURDAY.

GEORGIA STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEAST 25 TO 35 KNOTS RISING TO 35 TO 45 WITH HIGHER GUSTS THIS MORNING. WINDS DIMINISHING TO 20 TO 30 DURING THE AFTERNOON AND BECOMING SOUTH TO SOUTHEAST 15 TO 20 DURING THE NIGHT.
INTERMITTENT RAIN TODAY. SHOWERS TONIGHT. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

JUAN DE FUCA STRAIT
GALE WARNING CONTINUED.
WINDS EASTERLY 15 TO 25 KNOTS INCREASING TO 20 TO 30 THIS MORNING. WINDS INCREASING OVER EASTERN AND WESTERN ENTRANCES AT TIMES TO SOUTHEAST GALES 35 TO 45. WINDS SHIFTING TO WESTERLY 20 TO 30 THIS AFTERNOON. CLOUDY. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITIES LOWERING TO 1 TO 3 MILES IN RAIN.

WEST COAST VANCOUVER ISLAND.
STORM WARNING CONTINUED.
WINDS SOUTHEAST 45 TO 65 KNOTS WITH HIGHER GUSTS SHIFTING TO SOUTHWEST 30 TO 40 THIS AFTERNOON. WINDS DIMINISHING TO 20 TO 25 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
STORM WARNING CONTINUED.
WINDS SOUTHEAST 50 TO 60 KNOTS WITH HIGHER GUSTS DIMINISHING TO 30 TO 40 THIS AFTERNOON. WINDS DIMINISHING FURTHER TO 20 TO 30 TONIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
STORM WARNING CONTINUED.
WINDS EAST TO SOUTHEASTERLY 45 TO 65 KNOTS WITH HIGHER GUSTS. WINDS DIMINISHING TO SOUTHEAST 35 TO 45 DURING THE AFTERNOON AND TO 20 TO 30 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

WEST COAST CHARLOTTES.
STORM WARNING CONTIUED.
WINDS EAST TO SOUTHEAST 45 TO 65 WITH HIGHER GUSTS. WINDS SHIFTING TO WEST TO NORTHWEST 40 TO 50 THIS AFTERNOON AND DIMINISHING TO SOUTHWEST 20 TO 30 OVERNIGHT. RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITIES LOWERING TO 1 TO 3 MILES IN RAIN.

END PART 1

PGM:MSCHK --- CIRCU : 220 TIME RCVD: 1247Z

FPCN20 CWVR 121215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15AM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM SATURDAY.

BOWIE
GALE WARNING UPGRADED TO STORM WARNING.
WINDS NORTHWESTERLY 45 TO 55 KNOTS BECOMING WESTERLY 40 TO 50 THIS AFTERNOON. WINDS DIMINISHING TO SOUTHWESTERLY 20 TO 30 OVERNIGHT.
RAIN CHANGING TO SHOWERS THIS AFTERNOON. VISIBILITY LOWERING TO 1 TO 3 MILES IN RAIN.

EXPLORER
GALE WARNING CONTINUED.
WINDS SOUTHWEST 35 TO 45 KNOTS DIMINISHING TO 20 TO 30 THIS AFTERNOON. WINDS DIMINISHING FURTHER TO 15 TO 20 OVERNIGHT.
FREQUENT SHOWERS TODAY LOWERING VISIBILITY TO 1 TO 3 MILES.
DECREASING SHOWERS TONIGHT.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM FRIDAY.
SOUTH COAST...MODERATE TO STRONG SOUTHERLIES EXCEPT WESTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG SOUTHERLIES.
OFFSHORE...STRONG SOUTHWEST WINDS.

END

SYNOPSIS
A LOW PRESSURE CENTRE OF 970 MILLIBARS NEAR 51N 130W THIS MORNING WILL DEEPEN AND MOVE NORTH INTO THE GULF OF ALASKA. A FAST MOVING FRONT ASSOCIATED WITH THE LOW FROM JUST WEST OF THE CHARLOTTES TO 46N 127W THIS MORNING WILL MOVE ON TO THE COAST BY MIDDAY. STORM FORCE SOUTHEAST WINDS ARE EXPECTED OVER MOST WATERS AND EXCEPT GEORGIA AND JUAN DE FUCA STRAIT WHERE GALES ARE EXPECTED.
WINDS WILL DIMINISH AS THE FRONT AND LOW MOVE AWAY.

FPCN20 CWVR 121815
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.15AM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON SATURDAY.

GEORGIA STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEASTERLY 40 TO 45 WITH HIGHER GUSTS DECREASING TO 25 TO 35 THIS AFTERNOON AND EVENING. WINDS DECREASING TO SOUTHEASTERLY 15 TO25 SATURDAY AFTERNOON. OCCASIONAL SHOWERS. VISIBILITIES AT TIMES LOWERING TO NEAR 3 MILES IN SHOWERS.

JUAN DE FUCA STRAIT
GALE WARNING CONTINUED.
WINDS EASTERLY 25 TO 35 KNOTS EXCEPT 45 KNOTS WITH HIGHER GUSTS EASTERN ENTRANCE. WINDS SHIFTING TO WESTERLY 25 TO 35 KNOTS THIS AFTERNOON AND BECOMING WESTERLY 15 TO 20 OVERNIGHT. MOSTLY CLOUDY WITH OCCASIONAL SHOWERS. VISIBILITIES AT TIMES LOWERING TO NEAR 3 MILES IN SHOWERS.

WEST COAST VANCOUVER ISLAND.
STORM WARNING CONTINUED.
WINDS SOUTHEAST 30 TO 45 KNOTS EXCEPT 60 WITH HIGHER GUSTS NORTHERN SECTIONS. WINDS DECREASING TO SOUTHEASTERLY 30 TO 40 THIS AFTERNOON BECOMING SOUTHWESTERLY 30 OVERNIGHT. MOSTLY CLOUDY WITH OCCASIONAL SHOWERS. VISIBILITIES AT TIMES LOWERING TO NEAR 3 MILES IN SHOWERS.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
STORM WARNING CONTINUED.
WINDS SOUTHEASTERLY 35 TO 55 KNOTS WITH HIGHER GUSTS DECREASING TO 30 TO 40 THIS AFTERNOON. WINDS DECREASING TO SOUTHEASTERLY 30 NEAR NOON SATURDAY. SHOWERS BECOMING LESS FREQUENT OVERNIGHT. VISIBILITIES AT TIMES LOWERING TO NEAR 3 MILES IN SHOWERS.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
STORM WARNING CONTINUED.
WINDS SOUTHEASTERLY 45 TO 65 KNOTS WITH HIGHER GUSTS EXCEPT NORTHEASTERLY 35 TO 50 NEAR MANY MAINLAND INLETS TODAY. WINDS DECREASING TO SOUTHEASTERLY 35 TO 45 THIS EVENING AND TO 35 OVERNIGHT. SHOWERS BECOMING LESS FREQUENT OVERNIGHT. VISIBILITIES AT TIMES LOWERING TO NEAR 3 MILES IN SHOWERS.

WEST COAST CHARLOTTES.
STORM WARNING CONTINUED.
WINDS EASTERLY 40 TO 60 KNOTS WITH HIGHER GUSTS BECOMING NORTHEASTERLY 30 TO 45 TOWARDS EVENING AND WEST TO SOUTHWEST 35 TO 45 OVERNIGHT. SHOWERS BECOMING LESS FREQUENT OVERNIGHT. VISIBILITIES AT TIMES LOWERING TO 1 TO 3 MILES IN SHOWERS.

END PART 1

PQM:MSCHK --- CIRCU 220 TIME RCVD: 18332

FPCN20 CWVR 121815
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.15AM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON SATURDAY.

BOWIE
STORM WARNING CONTINUED.
WINDS NORTHWESTERLY 45 TO 55 KNOTS BECOMING WESTERLY 40 TO 55 SOUTHERN HALF THIS AFTERNOON AND NORTHERN HALF TONIGHT. WINDS DECREASING TO WESTERLY 30 TO 45 SATURDAY MORNING. OCCASIONAL SHOWERS AT TIMES LOWERING VISIBILITIES TO NEAR 3 MILES.

EXPLORER
GALE WARNING CONTINUED.
WINDS WEST TO SOUTHWEST 45 KNOTS WITH HIGHER GUSTS DECREASING THIS AFTERNOON TO 35 TO 45. WINDS FURTHER DECREASING TO WESTERLY 25 TO 35 OVERNIGHT. SHOWERS BECOMING LESS FREQUENT TONIGHT. VISIBILITIES AT TIMES LOWERING TO NEAR 3 MILES IN SHOWERS.

FURTHER OUTLOOK FOR 24 HOURS BEYOND NOON SATURDAY.
SOUTH COAST...MODERATE TO STRONG SOUTHERLIES EXCEPT WESTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG SOUTHERLIES.
OFFSHORE...STRONG WEST TO NORTHWEST WINDS.

END

SYNOPSIS
AN INTENSE LOW PRESSURE CENTER OF 958MB NEAR 50N 135W EARLY THIS MORNING IS EXPECTED TO MOVE NORTHWARDS AND WEAKEN. THE LOW SHOULD MOVE WEST OF THE CHARLOTTES TODAY AND DRIFT TO THE GULF OF ALASKA BY MORNING. A RAPIDLY MOVING FRONTAL SYSTEM AHEAD OF THE LOW WILL REACH THE MAINLAND BY EARLY AFTERNOON. STORM FORCE WINDS ARE ASSOCIATED WITH THE LOW OVER MOST ALL BUT THE SOUTHERNMOST INNER WATERS. WINDS SHOULD DIMINISH SOMEWHAT TONIGHT AS THE LOW FILLS AND CONTINUES NORTHWARDS.

WWCN1 CWVR 121900
WIND WARNING CONTINUED FOR NORTH AND WEST VANCOUVER ISLAND AND FOR THE QUEEN CHARLOTTE ISLAND AND NORTHERN MAINLAND REGIONS OF BRITISH COLUMBIA ISSUED BY ENVIRONMENT CANADA AT 12 NOON PDT FRIDAY OCTOBER 12 1984.

AN INTENSE AND VERY DEEP LOW OFF THE NORTH COAST WILL CONTINUE TO MOVE NORTHWARDS TODAY. STRONG SOUTHERLY WINDS OF 70 TO 100 KMH ARE EXPECTED OVER EXPOSED AREAS TODAY. THE WINDS SHOULD ABATE OVER THE SOUTHERN REGIONS LATER TODAY AS THE LOW PULLS TO THE NORTH.

..THIS WARNING WILL BE UPDATED AT 6 PM TODAY...

END

WWCN1 CWVF 121925
STORM WARNING FOR EXPLORER ISSUED BY ENVIRONMENT CANADA AT
12.25 PM PDT FRIDAY OCTOBER 12 1984.

AN INTENSE LOW PRESSURE CENTRE OF 958 MILLIBARS LOCATED NEAR
51N 132W LATE THIS MORNING WILL MOVE NORTHWARDS OVER THE CHARLOTTES
TODAY AND WILL REACH THE GULF OF ALASKA BY MORNING. THE LOW SHOULD
BEGIN FILLING TODAY. STORM FORCE WINDS CAN BE EXPECTED WITHIN 300
MILES OF THE LOW. STORM FORCE WESTERLIES OF 45 TO 65 KNOTS OVER
THE EXPLORER REGION ARE FORECAST TO SLOWLY DIMINISH OVERNIGHT.

FPCN10 CWVR 121935 AMD (
REVISED FORECASTS FOR B.C. COASTAL WATERS ISSUED BY
ENVIRONMENT CANADA AT 12:35 PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON SATURDAY.

EXPLORER.
STORM WARNING ISSUED.
WINDS WEST TO SOUTHWEST 45 TO 65 KNOTS DECREASING TO WESTERLY
35 TO 45 OVERNIGHT AND TO WESTERLY 25 TO 35 SATURDAY MORNING.
SHOWERS BECOMING LESS FREQUENT TONIGHT. VISIBILITIES AT TIMES
LOWERING TO NEAR 3 MILES IN SHOWERS.

REVISED SYNOPSIS.
AN INTENSE LOW PRESSURE CENTER OF 958MB LOCATED NEAR 51N 132W
LATE THIS MORNING WILL MOVE NORTHWARDS AND FILL. STORM FORCE
WINDS CAN BE EXPECTED WITHIN 300 MILES OF THE LOW.

END

*PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 217Z

FPCN20 CWVR 130215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM SATURDAY.

GEORGIA STRAIT
GALE WARNING LOWERED TO SMALL CRAFT WARNING.
WINDS SOUTHEASTERLY 20 TO 30 KNOTS DECREASING TO 20 OVERNIGHT AND TO 10 TO 20 SATURDAY AFTERNOON. OCCASIONAL SHOWERS AND ISOLATED THUNDERSHOWERS LOWERING VISIBILITIES AT TIMES TO NEAR 3 MILES.

JUAN DE FUCA STRAIT
GALE WARNING IN EFFECT.
WINDS WEST 20 TO 30 KNOTS OCCASIONALLY RISING TO 35 THIS EVENING.
WINDS DECREASING TO WESTERLY 15 OVERNIGHT. MOSTLY CLOUDY. OCCASIONAL SHOWERS AND ISOLATED THUNDERSHOWERS LOWERING VISIBILITIES AT TIMES TO NEAR 3 MILES.

WEST COAST VANCOUVER ISLAND.
STORM WARNING CONTINUED.
WINDS SOUTHWESTERLY 30 TO 40 KNOTS EXCEPT SOUTHERLY 45 TO 60 NORTHERN SECTIONS TIL NEAR MIDNIGHT. WINDS DECREASING TOWARDS MORNING TO SOUTHWESTERLY 25 TO 35 KNOTS AND FURTHER DECREASING SATURDAY AFTERNOON TO WESTERLY 25. SHOWERS AND ISOLATED THUNDERSHOWERS LOWERING VISIBILITIES AT TIMES TO NEAR 3 MILES.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
STORM WARNING DOWNGRADED TO GALE WARNING.
WINDS SOUTHEASTERLY 20 TO 25 KNOTS EXCEPT 30 TO 35 NORTHERN SECTIONS THIS EVENING. WINDS DECREASING OVERNIGHT TO SOUTHEASTERLY 15 TO 20. MOSTLY CLOUDY. OCCASIONAL SHOWERS AND ISOLATED THUNDERSHOWERS LOWERING VISIBILITIES AT TIMES TO NEAR 3 MILES.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
STORM WARNING CONTINUED.
WINDS SOUTHERLY 40 TO 60 KNOTS EXCEPT NORTHEASTERLY 45 WITH GUSTS MAINLAND INLETS THIS EVENING. WINDS BECOMING SOUTH TO SOUTHWEST 40 TO 55 OVERNIGHT AND DECREASING TO SOUTHWEST 35 SATURDAY MORNING. RAIN CHANGING TO SHOWERS TONIGHT. VISIBILITIES AT TIMES LOWERING TO NEAR 3 MILES IN PRECIPITATION.

END PART 1

-PGMTMSCHK --- CIRCU..: 220 TIME RCVD: 218Z

FPCN20 CWVR 130215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM SATURDAY.

WEST COAST CHARLOTTES.
STORM WARNING CONTINUED.
WINDS NORTHERLY 40 TO 60 KNOTS WITH HIGHER GUSTS BECOMING NORTHWESTERLY 35 TO 45 OVERNIGHT AND WESTERLY 35 SATURDAY MORNING. SHOWERS LOWERING VISIBILITIES AT TIMES TO NEAR 3 MILES.

BOWIE
STORM WARNING CONTINUED.
WINDS NORTHWESTERLY 40 TO 55 KNOTS EXCEPT NORTHWESTERLY 35 TO 40 WESTERN SECTIONS. WINDS DECREASING TO WESTERLY 30 TO 40 EARLY SATURDAY MORNING. SHOWERS LOWERING VISIBILITIES AT TIMES TO NEAR 3 MILES.

EXPLORER
STORM WARNING CONTINUED.
WINDS WESTERLY 45 TO 65 KNOTS EXCEPT WESTERLY 35 TO 50 SOUTHERN SECTIONS. WINDS DECREASING OVERNIGHT TO WESTERLY 30 TO 40 AND AND FURTHER DECREASING SATURDAY MORNING TO WESTERLY 25. SHOWERS AND ISOLATED THUNDERSHOWERS LOWERING VISIBILITIES AT TIMES TO NEAR 3 MILES.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM SATURDAY.
SOUTH COAST...STRONG SOUTHERLIES OR SOUTHWESTERLIES.
NORTH COAST...STRONG SOUTHERLIES.
OFFSHORE...STRONG TO GALE WEST TO WESTERLIES.

END

SYNOPSIS
AN INTENSE LOW PRESSURE CENTER OF 958MB LOCATED OVER THE CHARLOTTES THIS AFTERNOON IS EXPECTED TO MOVE NORTHWARDS AND WEAKEN. THE LOW WILL REACH THE GULF OF ALASKA BY MORNING. STORM FORCE WINDS CAN BE EXPECTED WITHIN NEARLY 300 MILES OF THE LOW. WINDS OVER NORTHERN WATERS SHOULD SHIFT TO WEST TO SOUTHWEST TONIGHT AS THE LOW MOVES NORTH OF THE DISTRICT. SOUTH TO SOUTHWEST WINDS OVER MOST SOUTHERN WATERS SHOULD DECREASE TO FRESH TO STRONG WINDS TONIGHT.

PGM:MSCHK --- CIRCUIT . 220 TIME RCVD: 330Z

FPCN20 CWVR 130315 COR
CORRECTED MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY
ENVIRONMENT CANADA AT 8.15 PM PDT FRIDAY 12 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM SATURDAY.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM SATURDAY.
SOUTH COAST...STRONG SOUTHERLIES OR SOUTHWESTERLIES.
NORTH COAST...STRONG SOUTHERLIES.
OFFSHORE...STRONG TO GALE FORCE WESTERLIES.

REMAINDER FORECASTS UNCHANGED FROM 7PM ISSUE.

Appendix 7.

Coast Guard Radio Station Broadcasts.

Canadian Coast Guard Garde Côtière Canadienne

224 West Esplanade
North Vancouver, B.C.
V7M 3J7

Your file Votre référence

Our File Notre référence 8050-111

October 30, 1984

Dr. K.B. Dawson
Regional Director
Atomospheric Environment Service
Sute 700 - 1200 W. 73rd. Avenue
Vancouver, B.C.
V6P 6H9

Dear Dr. Dawson:

Coast Guard Radio Station Broadcasts - 11th October 1984

This is in reference to the broadcast of meterological information by Tofino and Alert Bay Coast Guard Radio Stations on 11th October 1984.

The attached documents include a breakdown of the broadcast material for the period 1700-0017 on 11/12 October 1984, showing times of issue, receipt and actual on-air broadcasts by the above-named stations.

I trust the attached information is of assistance.

Yours truly,

R.S. Bryant
A/Regional Director General
Canadian Coast Guard
Western Region

SM/rg

Attachment

Canada

TOFINO COAST GUARD RADIO

SOURCE	TYPE	ISSUED	RECEIVED	BROADCAST	FREQUENCY
		(All times PDT)			
SFO	GALE WARNING	111700	111529	111530 111536 112120	4125 kHz CMB 478 kHz
AES	GALE WARNING	111900	111853	111905 111902	CMB.22A.2054 kH 478 kHz
AES	FORECAST	111915	111902	111909 112050 112120	CMB 2054 kHz 478 kHz
SEA	GALE WARNING	111930	112200	112202 112230	4125 kHz CMB
AES	STORM WARNING	112300	112316	112318 112332	CMB,22A,2054 kH 478 kHz
AES	REVISED FORECAST	112330	112343	120040	CMB
AES	GALE WARNING	112330	112354	120007	CMB.22A.2054 k
AES	REVISED FORECAST	112330	120017	120040	CMB.22A.2054 k

(1)

Tofino CGRS

FZPN KSFO 112300
NATIONAL WEATHER SERVICE SAN FRANCISCO. HIGH SEAS WEATHER 0000 GMT OCTOBER 12 1984. FORECASTS VALID 0000 GMT OCTOBER 13 1984.

WARNINGS.

TROPICAL DEPRESSION RACHEL 13.7N 110.3W AT 1300 GMT MOVING 280 DEG 9 KT. WIND 30 KT WITHIN 45 MI OF CENTER. FORECAST DISSIPATION.

COMPLEX GALE 986 MB 47N 140W MOVING NORTHEAST 40 KT. SECOND CENTER 986 MB NEAR 46N 146W MOVING NORTHEAST 45 KT. FORECAST COMBINED CENTER 984 MB 54N 134W. WIND 45 KT SEAS 22 FT 450 MI OF CENTERS MAINLY SOUTH SEMICIRCLE.

CMBR 112236Z/ET.

SYNOPSIS.

COLD FRONT 32N 117W 25N 125W MOVING EAST 20 KT AND WEAKENING. WIND GUSTS 25 KT SEAS 12 FT AND SHOWERS VICINITY OF FRONT.

LOW 984 MB 59N 142W MOVING NORTH. FORECAST INLAND. WIND 30 KT SEAS 16 FT WITHIN 350 MI OF CENTER MAINLY SOUTH SEMICIRCLE.

LOW 988 MB 53N 156W MOVING SOUTHEAST AND WEAKENING. FORECAST DISSIPATION. WIND 30 KT SEAS 15 FT 400 MI SOUTHWEST SEMICIRCLE.

LOW 1006 MB 34N 178W. FORECAST 1002 MB 36N 165W. WIND 30 KT SEAS 14 FT WITHIN 400 MI OF CENTER.

HIGH 1024 MB 28N 144W. FORECAST 1022 MB 30N 144W. RIDGES 40N 125W AND 20N 115W.

HIGH 1034 MB 43N 163E. FORECAST 1034 MB 41N 165E. RIDGES 45N 175W AND 28N 157E.

INTERTROPICAL CONVERGENCE ZONE..5N78W 5N90W 11N123W 9N140W.
CONVECTION...SCATTERED MODERATE 120 MI WIDE 78W TO 103W AND 150MI WIDE 113W TO 130W AND 75MI WIDE 130W TO 140W.
ELSEWHERE ISOLATED WEAK.

TOFINO CG RADIO
OCT 12 1984

(2)

Best 480 02022
22/21/054 0205 KD

12 OCT 84
CG
TOFINO

VTS

WWCN1 CWVR 120200
GALE WARNING FOR ALL SOUTH COAST WATERS EXCEPT JUAN DE FUCA STRAIT
ISSUED BY ENVIRONMENT CANADA AT 7 PM PDT THURSDAY OCTOBER 11 1984

A FRONTAL SYSTEM NEAR 45N 139W WILL CONTINUE EASTWARD AND REACH
VANCOUVER ISLAND FRIDAY AFTERNOON. WINDS ARE EXPECTED TO INCREASE
TO SOUTHEASTERLIES 30 TO 40 KNOTS AHEAD OF THE SYSTEM FRIDAY
MORNING AND ABATE TO STRONG SOUTHWESTERLIES IN THE EVENING.

END

(3)

FPCN20 CWVR 120215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT
CANADA AT 7.15PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

CMB 0209 V.O

GEORGIA STRAIT
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS RISING AT TIMES TO 25.
WINDS INCREASING TO SOUTHEAST 25 TO 35 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES LOWERING TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS WESTERLY 10 TO 20 KNOTS SHIFTING TO EASTERLY 10 TO 20
OVERNIGHT AND INCREASING TO 20 TO 30 KNOTS FRIDAY AFTERNOON. MOSTLY
CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

VTS

WEST COAST VANCOUVER ISLAND.
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS TONIGHT INCREASING TO 30 TO 40
FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN
BEGINNING NEAR NOON. VISIBILITIES 2 TO 4 MILES IN PRECIPITATION
AND NEAR ZERO IN FOG.

120CT84 01 58Z

CG [illegible]

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS. WINDS INCREASING SOUTHEAST 25 TO
35 BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH
RAIN BEGINNING IN THE AFTERNOON. VISIBILITIES LOWERING TO 2 TO 4
MILES IN RAIN AND NEAR ZERO IN FOG.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING CONTINUED.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS
INCREASING TO SOUTHEAST 15 TO 25 OVERNIGHT AND TO SOUTHEAST 30 TO
35 KNOTS BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY
WITH RAIN BEGINNING NEAR NOON. VISIBILITIES REDUCED TO 2 TO 4 MILES
IN RAIN AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING CONTINUED.
WINDS SOUTHWEST 10 TO 15 KNOTS BECOMING SOUTHEAST 10 TO 25 KNOTS
OVERNIGHT AND INCREASING TO SOUTHEAST 30 TO 35 KNOTS FRIDAY
AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING
IN THE MORNING. VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO
IN FOG.

FPCN20 CWVR 120215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT
CANADA AT 7.15PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

BOWIE
GALE WARNING CONTINUED.
WINDS SOUTHERLY 10 TO 20 KNOTS INCREASING TO 15 TO 25 OVERNIGHT.
WINDS INCREASING TO SOUTHEAST 30 TO 40 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE
MORNING. VISIBILITIES 2 TO 4 MILES IN SHOWERS AND NEAR ZERO IN FOG.

EXPLORER
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 25 KNOTS INCREASING TO SOUTH TO SOUTHWEST
25 TO 35 OVERNIGHT AND RISING AT TIMES TO 40 FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE MORNING.
VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM FRIDAY.
SOUTH COAST...FRESH TO STRONG SOUTHWEST WINDS EXCEPT WESTERLY IN
JUAN DE FUCA.
NORTH COAST...STRONG TO GALE SOUTHWESTERLY.
OFFSHORE...STRONG TO GALE FORCE WEST TO SOUTHWEST WINDS.

END

SYNOPSIS
A WEAK RIDGE OF HIGH PRESSURE WILL MOVE ONTO THE COAST TONIGHT.
ANOTHER PACIFIC FRONTAL WAVE NEAR 45N 139W WILL CONTINUE EASTWARD
TO REACH VANCOUVER ISLAND FRIDAY AFTERNOON. MODERATE TO FRESH
WINDS OVER MOST WATERS TONIGHT WILL GRADUALLY INCREASE AHEAD OF
THE NEXT WAVE. SOUTHERLY GALES WILL DEVELOP OVER THE OFFSHORE
AREAS BY FRIDAY MORNING AND WILL SPREAD TO ALL COASTAL WATERS
BY FRIDAY AFTERNOON EXCEPT FOR JUAN DE FUCA STRAIT. JUAN DE FUCA
WINDS WILL BE MODERATE TO FRESH WESTERLY AHEAD OF THE RIDGE
AND WILL SHIFT TO EASTERLY OVERNIGHT AND RISE TO STRONG EASTERLY
BY FRIDAY AFTERNOON.

12 Oct 84 0220 0222z
RADIO

(4)

FZUS6 KSEA 120500
MARINE FORECAST
NATIONAL WEATHER SERVICE SEATTLE WA
930 PM PDT THU OCT 11 1984

CMRL 12043

CAPE FLATTERY TO MOUTH OF COLUMBIA OUT 60 MILES
...GALE WARNING...
WINDS SOUTHEASTERLY AND INCREASING TO 20 TO 35 KNOTS BY FRIDAY MORNING. WINDS BECOMING SOUTHWESTERLY 15 TO 30 KNOTS FRIDAY NIGHT. WINDS WAVES 2 TO 4 FEET TONIGHT INCREASING TO 4 TO 7 FRIDAY. SWELL SOUTHWEST 10 FEET INCREASING TO 15 FEET FRIDAY NIGHT. INCREASING CLOUDS WITH RAIN BY FRIDAY MORNING AND CONTINUING THROUGH FRIDAY. SHOWERS FRIDAY NIGHT.
OUTLOOK FOR SATURDAY...MODERATE SOUTHWEST WINDS.

STRAIT OF JUAN DE FUCA
...SMALL CRAFT ADVISORY..
WINDS EASTERLY INCREASING TO 20 TO 30 KNOTS LATER TONIGHT AND FRIDAY. WINDS SWTICHING TO WESTERLY 15 TO 25 KNOTS FRIDAY NIGHT. CLOUDY TONIGHT WITH RAIN LATER TONIGHT AND FRIDAY. SHOWERS FRDAY NIGHT.

INLAND WATERS OF WESTERN WASHINGTON
...SMALL CRAFT ADVISORY...
WINDS BECMONG SOUTHEASTERLY 15 TO 25 KNOTS NORTH OF EVERETT LATE TONIGHT AND FRIDAY. WINDS SOUTH OF EVERETT SOUTH TO SOUTHEAST 5 TO 15 KNOTS. WINDS FRIDAY NIGHT SOUTHWESTERLY 15 TO 25 KNOTS ALL AREAS. CLOUDY WITH RAIN DEVELOPING LATER TONIGHT AND FRIDAY. SHOWERS FRIDAY NIGHT.
LSC

TTTRT/BCRT[?] 06 18Z/[?]
CW/ Best - Duplex position /KD

WWCN1 CWVR 120600
STORM WARNING FOR WEST COAST VANCOUVER ISLAND QUEEN CHARLOTTE AND
JOHNSTONE STRAITS AND ALL NORTH COAST WATERS
ISSUED BY ENVIRONMENT CANADA AT 11 PM PDT THURSDAY OCTOBER 11 1984

A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL
DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY.
AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING.
WINDS ARE EXPECTED TO INCREASE TO SOUTHEASTERLY 45 TO 55 KNOTS
WITH HIGHER GUSTS AHEAD OF THE FRONT AND ABATE TO STRONG TO
GALE FORCE WESTERLIES IN THE AFTERNOON AND EVENING BEHIND THE
SYSTEM.

END

TOFINO CG RADIO
12 OCT 84 06 16 Z
Rec'd [?]

6

TOFINO
CG RADIO

120CT84 06 45Z

CHVR 120630 AMD
1 OF 2

REVISED MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.30PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

GEORGIA STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEAST 10 TO 20 KNOTS RISING AT TIMES TO 25.
WINDS INCREASING TO SOUTHEAST 30 TO 40 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES AT TIMES 1 TO 4 MILES IN RAIN AND MIST.

JUAN DE FUCA STRAIT
GALE WARNING ISSUED.
WINDS EASTERLY 10 TO 20 KNOTS INCREASING TO 20 TO 30 FRIDAY MORNING.
WINDS INCREASING OVER EASTERN AND WESTERN ENTRANCES AT TIMES TO SOUTHEAST GALES 35 TO 40. WINDS SHIFTING TO WESTERLY 15 TO 25 FRIDAY AFTERNOON. CLOUDY. RAIN BEGINNING BY FRIDAY AFTERNOON.
VISIBILITIES AT TIMES 1 TO 4 IN RAIN AND MIST.

WEST COAST VANCOUVER ISLAND.
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS INCREASING TO 40 TO 50 WITH HIGHER GUSTS FRIDAY MORNING. WINDS BECOMING SOUTHWEST 25 TO 35 FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. RAIN FRIDAY.
VISIBILITIES 1 TO 4 MILES IN RAIN AND MIST.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS. WINDS INCREASING SOUTHEAST 35 TO 50 BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES LOWERING TO 2 TO 4 MILES IN RAIN AND MIST.

CMB / 120740Z / ow

END PART 1

TOFINO
CG RADIO
12 OCT 84 06 54
PCST
120702

WWCN1 CWUR 120630
GALE WARNING FOR JUAN DE FUCA STRAIT ISSUED
BY ENVIRONMENT CANADA AT 11.30 PM PDT THURSDAY OCTOBER 11 1984

A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY. AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING. STRONG EASTERLY WINDS ARE EXPECTED AHEAD OF THE FRONT WITH GALES OVER THE EASTERN AND WESTERN ENTRANCES. WINDS WILL SHIFT TO STRONG WESTERLIES BEHIND THE FRONT FRIDAY AFTERNOON.

END

S/

TORINO
CG RADIO
12Oct84 07 17z
CMB/1207402/c

FPCN20 CWVR 120630 AMD
PART 2 OF 2
REVISED MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.30PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING UPGRADED TO STORM WARNING.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS INCREASING TO SOUTHEAST 25 TO 35 OVERNIGHT AND TO SOUTHEAST 40 TO 55 KNOTS BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES REDUCED TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS INCREASING TO 25 TO 35 OVERNIGHT AND 40 TO 55 FRIDAY MORNING. WINDS SHIFTING TO SOUTHWEST 35 FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 1 TO 4 MILES IN RAIN AND MIST.

REMAINDER FORECASTS UNCHANGED FROM 7PM ISSUE.

END

REVISED SYNOPSIS
A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY. AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING AND INLAND LATE FRIDAY. WINDS ARE EXPECTED TO INCREASE TO GALE TO STORM FORCE SOUTHEASTERLIES AHEAD OF THE FRONT AND ABATE TO STRONG TO GALE FORCE WESTERLIES BEHIND THE DISTURBANCE.

ALERT BAY COAST GUARD RADIO

SOURCE	TYPE	ISSUED	RECEIVED	BROADCAST	FREQUENCY
		(All times PDT)			
AES	GALE WARNING	111900	111855	111857 111859	2054 kHz CMB
AES	FORECAST	111915	111900	111907 112120	CMB 2054 kHz
AES	STORM WARNING	112300	112310	112312 112314	2054 kHz CMB
AES	REVISED FORECAST	112330	112343	112345 112355	CMB 2054 kHz

ALERT BAY CGRS

WWCN1 CWVR 120200
GALE WARNING FOR ALL SOUTH COAST WATERS EXCEPT JUAN DE FUCA STRAIT
ISSUED BY ENVIRONMENT CANADA AT 7 PM PDT THURSDAY OCTOBER 11 1984

A FRONTAL SYSTEM NEAR 45N 139W WILL CONTINUE EASTWARD AND REACH VANCOUVER ISLAND FRIDAY AFTERNOON. WINDS ARE EXPECTED TO INCREASE TO SOUTHEASTERLIES 30 TO 40 KNOTS AHEAD OF THE SYSTEM FRIDAY MORNING AND ABATE TO STRONG SOUTHWESTERLIES IN THE EVENING.

END

Appendix 8.

The forecasting process (prepared by G. Wells, Pacific Weather Centre).

THE FORECASTING PROCESS

Introduction

The following documentation briefly attempts to describe the forecasting process in three basic steps. But, it must be remembered that forecasting is not simply a three-stage process.

Weather forecasting is a continuous process, carried on and evolving from observation to observation, from meteorologist to meteorologist. It is an osmosis of time and space that integrates the past, present and future and the large scale with the small scale.

Out of this continuum must come products fixed in format, fixed with deadlines and fixed to previous forecasts. There are thus constraints into which decisions must be made on a continual basis and at critical times.

How are Forecasts Produced

The forecasting process can be viewed, in its simplest terms, as a three-stage process: analysis, prognosis, and forecast production.

1. Analysis of Data

This step involves the synthesis of basic data and the derivation of certain fields to describe the current state of the atmosphere.

1.1 The synthesis of data involves the collection and processing of data on various scales, of both current and past information. The primary purpose is to obtain an understanding of why the weather is occurring - i.e. what processes are at work within the atmosphere in creating the weather that is occurring. The fields being analysed include:

- Surface and Upper Air Data (Conventional Data)

  - surface data from manned observation stations, automatic reporting stations, ocean buoys, ships, etc. Includes surface pressure, temperature, moisture, precipitation, wind velocity, cloud types/amounts, weather.
  - upper air data from radiosonde ascents and pilot reports. Data includes temperature, moisture, and wind velocities at various levels in the atmosphere and the height of certain pressure levels.

. Non-Conventional Data

- satellite imagery. Provides data on the main upper level air streams, atmospheric pressure ridges and troughs, jet streams, cloud top temperatures and associated expansion/compression, motion speed and wind speeds.

- lightning location data provides information on the location, speeds, and tracks of severe convection and lightning.

1.2 From these data, certain fields are derived to provide a detailed description of the current dynamics of the atmosphere. Some of derived fields include:

. vorticity fields - an analysis of the rotational components of the atmosphere.
. stability - an analysis of the stability of the atmosphere i.e. its readiness for change from the current state.
. longwave and shortwave troughs and ridges.
. airmasses - location of fronts and their motion.
. jet streams - strength and relative motions.
. moisture throughout the atmosphere.
. the thickness of airmasses within the atmosphere and the varying height of the troposphere.
. cloud types/bases/tops/extent.

2. Prognosis

The next step in the process is the production of a prognosis up to 24 to 36 hours into the future. Using the analysis at hand (which is continuously updated both physically and mentally as new data comes in), one must then predict the evolution of the atmosphere. This process must relate the broad-scale predictions at various levels of the atmosphere to the prediction of surface weather elements.

This is done using the following general applications:

. Energetics. the assessment of probable changes by examination of the thermodynamics of the atmosphere (e.g. latent heat releases, increasing baroclinicity, etc.).
. Assessment of Numerical Weather Prediction (NWP) guidance. This is basically an analysis of the NWP models with regard to their immediate past performance and the relative validity of the initial analysis of the model. The forecaster then makes subjective changes to the prognoses.
. Satellite data applications. short-range prediction of cloud motions and development based on satellite imagery.
. Production of a surface pressure prognosis 24 to 36 hours into the future.

- Application of broad-scale estimates of precipitation and clouds to the surface pressure prognoses..

3. Production of Forecasts

There are two basic activities involved in this step. One is the actual formatting into a product tailored for a specific user group (e.g. marine, aviation, etc.). This aspect, although time-consuming, is the easiest.

The other process is the actual decision that must be made with respect to determining the value of the weather element to be forecast (e.g. the wind velocity over a specific time period).

Having made the analyses and general prognoses, and considering the latest information available, the forecaster applies his/her scientific knowledge and years of experience to the problem to make decisions on the type of weather to be experienced over the valid period of the forecast.

When decisions on the weather elements have been made, these are put into final form, in a format and time frame required by the user of that product.

Appendix 9.

Report of J. Knox

John L. Knox
285 Deloraine Ave.
Toronto, Ontario
M5M 2B2
October 15, 1984
Tel: Res: 488-4356
AES: 667-4829

rcvd
Nov 16

Prof. Paul H. LeBlond
University of British Columbia
Department of Oceanography
2075 Westbrook Place
Vancouver, B.C.
V6T 1W5

Dear Paul:

Re: Pacific Coast Storm
Oct. 12th, 1984

I have reviewed the documentation sent to me by Gary Wells, Chief, Forecast Operations, Pacific Region.

First, I think it would be appropriate to preface the reply with a quote from an article "Weather and Climate of the B.C. Coast" written by D. Strachan, former Officer-in-Charge of the Pacific Weather Centre.

"Winds in excess of 39 mph (34 kts) occur quite frequently in winter. The duration of these individual storms is about 1-2 days while the interval between storms varies from 1-5 days as a rule. ..... Fall sees a transition between the quiet summer circulation and the vigorous winter one. The duration and frequency of the gales increases".

My point is that since a gale warning is issued when sustained winds greater than 35 knots are expected to develop, it should be clear that, as a rule, such warnings are issued several times during the course of the late fall and winter seasons. Even more important than the fact of the warning, is the statement, in the text, of the predicted maximum sustained wind, because it is that number which distinguishes between the relatively frequent storms of moderate intensity and those of unusual severity.

In the case under consideration, gale warnings for northern B.C. coastal and off-shore areas were issued Thursday at 5 a.m. October 11th predicting winds of up to 40 knots for Friday morning. In view of the nature of the information available over

.../2

the NE Pacific at the time, this forecast was remarkably good. It was based on the Pacific Weather Centre surface prognosis which predicted a 970 MB low to be centred near 50N 140W at 12/1200Z. (Fig. 1). It is difficult to understand why subsequent prognoses and associated marine forecasts, with later observations available, not only failed to predict stronger winds but actually reduced the maximum wind speed to 35 knots and delayed the occurrence of the maxima over inland waters until Friday afternoon! Indeed, it was not until 11 p.m. Thursday that a revision was issued, providing barely 4 hours notice of whole gale and storm force winds.

In the attached Assessment, I present reasons why the Pacific Weather Centre should have recognized much sooner than they did, the fact of the rapid development of the storm which was already underway based on an analysis of the surface chart dated 11/1800Z (10 a.m. PST), and therefore why, as Thursday progressed, instead of "backing off", subsequent forecasts should have recognized not only stronger wind maxima but also their earlier arrival on the coast.

With regard to observational data, I am sure you are well aware of my views concerning the termination of Ocean Station "P". They were expressed during the 1980 public meeting (which you chaired) and to CMOS and DOE. From a perusal of the attached charts it is clear that ground truth data from Station "P" would have reinforced confidence in the analyses, and probably would have lessened the possibility (because of more accurate initialization) of the confusion caused by disparate NWP prognoses. Moreover, the inoperative GOES Satellite has severely compounded the data problem. In summary, my views concerning the premature termination of Station "P" have not changed.

On the positive side, the drifting buoys provide valuable surface pressure and tendency information. A glance at 1200Z surface analyses, usually devoid of reports from commercial ships, shows how valuable the buoys are. But they seem to drift 'in-line' and their distribution is far from homogeneous. There should be more of them.

Next, how good is the liaison between the commercial fishing fraternity and those who provide and communicate weather information (AES and MOT respectively)? Do the parties concerned have on-going meetings to discuss weather services and the important question of feedback of real-time weather reports from on-site fishing vessels?

Our main result is that the data on the 11/1800Z Surface Analysis strongly indicated the ultimate severity of the storm.

.../3

In our judgment, a skilled prognostician should have been able, at this stage, to accurately predict the evolution of the storm centre motion and intensity. We therefore conclude that the Pacific Weather Centre had the information required to justify the issue of revised Marine Forecasts and of revised Warnings at least as early as 5 p.m.(local time) Thursday, October 11th, i.e., 6 hours earlier than was the case.

Yours truly,

John L. Knox

John L. Knox

Attachments

JLK/lm

36 hr ?

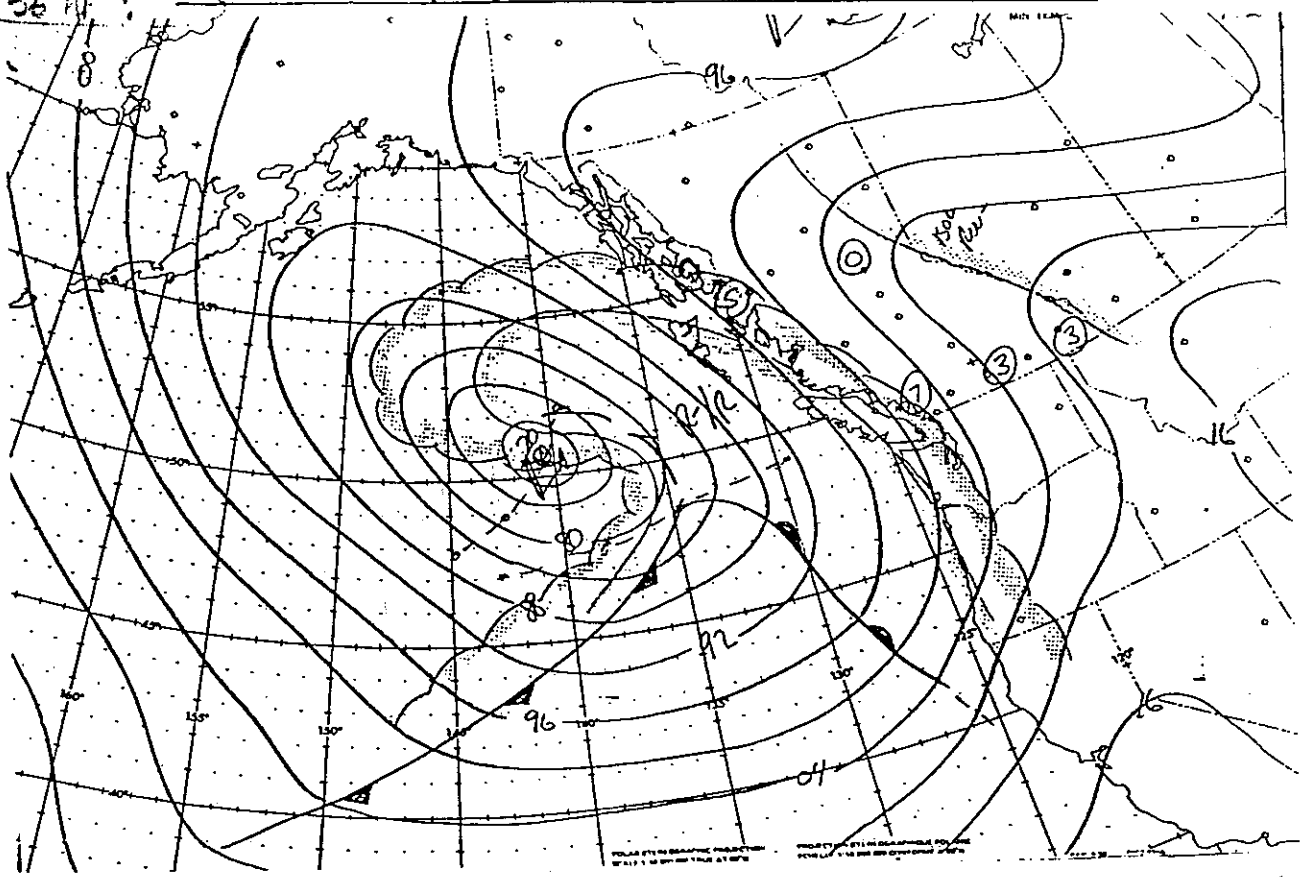


Fig. 1

36-hour prediction of the SURFACE (i.e. Sea Level) pressure field valid for Fri. Oct 12 1200Z (= 0500 PST), issued by the Pacific Weather Centre.

On the strength of this prediction (which was very good considering the 36-hour period between initial data and time of verification) gale warnings were in effect by 0500 PDT Thur. Oct 11th for northern BC coastal areas as per attached Marine Forecast.

FPCN20 CWVR 111215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15 AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM FRIDAY.

GEORGIA STRAIT
SMALL CRAFT WARNING.
WINDS VARIABLE 5 TO 15 KNOTS BECOMING SOUTHEAST 10 TO 20 KNOTS THIS EVENING INCREASING TO SOUTHEAST 20 TO 30 FRIDAY MORNING.
MOSTLY CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG PATCHES.
VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS VARIABLE 5 TO 15 KNOTS OCCASIONALLY WEST 15 TO 25 TODAY.
WINDS BECOMING EASTERLY 10 TO 15 TONIGHT INCREASING TO 15 TO 25 FRIDAY MORNING. CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG PATCHES. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

WEST COAST VANCOUVER ISLAND.
WINDS VARIABLE 5 TO 15 KNOTS BECOMING WESTERLY 10 TO 20 THIS MORNING. WINDS BECOMING SOUTHEAST 10 TO 20 TONIGHT INCREASING TO SOUTHEAST 20 TO 30 FRIDAY MORNING. MOSTLY CLOUDY WITH OCCASIONAL SHOWERS. CHANCE OF A THUNDERSHOWER. RAIN FRIDAY MORNING. A FEW MORNING FOG PATCHES. VISIBILITIES 3 IN SHOWERS AND NEAR ZERO IN FOG.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
SMALL CRAFT WARNING.
WINDS LIGHT OCCASIONALLY SOUTHEAST 10 TO 15 KNOTS. WINDS INCREASING TO SOUTHEAST 15 TO 20 TONIGHT RISING TO SOUTHEAST 20 TO 30 FRIDAY MORNING. CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER. A FEW MORNING FOG PATCHES. VISIBILITIES LOWERING AT TIMES TO 3 MILES IN SHOWERS AND TO NEAR ZERO IN FOG.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING CONTINUED.
WINDS SOUTHERLY 10 TO 20 KNOTS WITH A FEW HIGHER GUSTS THIS MORNING.
WINDS INCREASING TO SOUTHEAST 20 TO 30 KNOTS TONIGHT RISING TO SOUTHEAST 25 TO 40 FRIDAY MORNING. CLOUDY WITH SHOWERS. RAIN BEGINNING FRIDAY MORNING. A FEW MORNING FOG PATCHES. VISIBILITIES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING CONTINUED.
WINDS SOUTHWEST 10 TO 15 KNOTS BECOMING SOUTHEAST 15 TO 25 THIS EVENING. WINDS INCREASING TO SOUTHEAST 20 TO 40 KNOTS OVERNIGHT.
MOSTLY CLOUDY WITH A FEW SHOWERS. RAIN BEGINNING AFTER MIDNIGHT.
VISIBILITIES 2 TO 4 MILES IN SHOWERS AN TO 1 MILE IN RAIN.

END PART 1

FPCN20 CWVR 111215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 5.15 AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 6 AM FRIDAY.

BOWIE
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 20 KNOTS BECOMING SOUTHEAST 15 TO 25 BY EVENING. WINDS BECOMING SOUTHEAST 30 TO 40 KNOTS TONIGHT. MOSTLY CLOUDY WITH ISOLATED SHOWERS. RAIN BEGINNING TONIGHT. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

EXPLORER
GALE WARNING CONTINUED.
WINDS BECOMING SOUTHWEST 15 TO 20 KNOTS THIS MORNING THEN SOUTHEAST 15 TO 25 THIS EVENING. WINDS INCREASING TO SOUTHEAST 30 TO 40 TONIGHT. MOSTLY CLOUDY WITH A FEW SHOWERS AND THE CHANCE OF A THUNDERSHOWER TODAY. RAIN BEGINNING TONIGHT. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 6 AM FRIDAY.
SOUTH COAST...STRONG TO GALE FORCE SOUTHEST.
NORTH COAST...STRONG TO GALE FORCE SOUTHEAST.
OFFSHORE...GALE FORCE SOUTHEAST BECOMING STRONG WESTERLY IN THE AFTERNOON.

END

SYNOPSIS
A 982 MB SURFACE LOW AT 59N 142W EARLY THIS MORNING WILL DRIFT NORTHWEST TO THE SOUTH CENTRAL COAST OF ALASKA BY THIS EVENING AND WEAKEN TO 986 MB. A SURFACE TROUGH EXTENDING FROM THE LOW TO TO THE WASHINGTON STATE COAST WILL DISSIPATE TODAY AS A WEAK RIDGE OF HIGH PRESSURE BUILDS OVER THE COAST. A 980 MB LOW CENTRE NEAR 46N 155W EARLY THIS MORNING WILL MOVE NORTHEAST TODAY TO LIE NEAR 51N 140W BY EARLY FRIDAY MORNING AND DEEPEN TO 970 MB.

END PART 2 OF 2

Assessment of Synoptic Charts and Marine Forecasts related to the Pacific Coast Storm - Oct. 12, 1984

In Gary Wells' summation for Thursday morning (Attachment 1) he states "On the 11/1800Z surface analysis there were 5 ships within a 300nmi radius of the low centre. 3 of the ships were east of the low. 2 of these ships reported strong falling pressures as follows: KLHZ falling 50 (i.e. 5 mbs/3 hrs) and UZUA falling 70".

The 11/1800Z analysis (Att. 2) is enclosed and I have sketched an estimate of the isallobaric $\left(\frac{\partial p}{\partial t}\right)$ field (broken blue lines). Clearly, this is a rapidly deepening cyclone (5.0mbs per 3 hrs at its centre). Also, wind speeds reported by 2 ships immediately south of the low centre are force 8 and 7 respectively. (37 kts and 30 kts). Pure extrapolation predicts a central pressure for 12/1200Z of 954mbs, and consideration of past motion, recurving and deceleration due to deepening indicates a NE wd motion of 25-30 kts. This would have placed the low centre near 50N 134W by 12/1200Z, which in fact was its observed location, and which was also the location predicted by earlier 36- and 48-hour prognoses received from CMC.

On the other hand, the 18-hour prognosis for 12/1200Z issued by the Pacific Weather Centre about noon Thursday (Att. 3) moved the centre almost due northward and filled it by 4mbs! The Marine Forecasts based on this prognosis, reduced the predicted maximum wind speed from 40 to 35 kts for some coastal areas (Att. 4).

The rationale, again to quote Gary Wells, (Att. 1), "The PWC prog for 12/1200Z based on this model run (i.e. the LFM NWP 24-hr. prog. based on 11/1200Z initial data) showed a 988mb centre near 53N 141W. The forecasters had also backed off."

My point is that the PWC prognostician was unduly influenced by the 24-hr. NWP, which was initialized from earlier data (1200Z). Some prognosticians seem to have lost sight of the fact that, for short range forecasts (<18 hours) careful analysis of the latest data and extrapolation of motion and development by well known kinematic techniques can often improve on NWP prognoses of the surface pressure field. This is particularly the case in explosive situations when later data is available.

.../2

NWP = Numerical Weather Prediction

PHL.

The Pacific Weather Centre did not seem to recognize the intensity and implications of the development as late as Thursday evening (i.e. after the 12/0000Z surface analysis had been completed). See Gary Wells' write up (Atts. 5 & 6). This is evident on reading the text of the Marine Forecasts issued 7.15 p.m. Thursday, October 11 (Att. 7) in which maximum winds were still forecast at 35 kts. (the lower threshold for a gale warning) and their development over the inner passages was postponed from Friday morning to Friday afternoon! The storm is referred to in the Synopsis as "another Pacific Frontal Wave"!

It was not until 11 p.m. Thursday that the Marine Forecasts were revised to indicate time of onset and maximum wind speeds more accurately (Att. 8). It was at this time that Gale Warnings were upgraded to Storm Warnings for some areas.

In summary, we estimate there was an avoidable delay of at least 6 hours in providing notice of the exceptional severity of this storm.

John L. Knox

John L. Knox

Attachments: 8

Late

2.5 Thursday Morning (October 11)

Att. 1

On the 11/1800Z surface analysis there were 5 ships within a 300 nmi. radius of the low centre. 3 of the ships were east of the low. 2 of these ships reported strong falling pressures as follows: KLHZ falling 50 (i.e. 5 mbs/3 hrs) and UZUA falling 70.

On the satellite imagery the cirrus with the system had pushed northward about 3° in the last 6 hours, indicating building of the ridge ahead of the system. The ridge line was moving east at about 30 knots. The dry "slot" was now evident. Farther to the west, cold convective clouds could be seen. The flow into the system was becoming slightly more meridional indicating sharpening of the following trough. The southern warmer valued stream however seemed to be breaking through to the south which would lead to a split in the system if it continued.

The model run based on 11/1200Z data proved very interesting. The CMC spectral 24 hour prog for 12/1200Z backed off on development showing a 987 mb low at 53 N 141 W. Did the bogus data entered on the 11/0000Z analysis affect the way the model handled the low? Was the lack of data on the communications system a factor? or both?

The U.S. Spectral continued to back off on development showing a 995 mb low at 50 N 140 W.

The LFM was similar to the previous run showing a 982 mb low near 54 N 141 W.

The communications disk was repaired and operating at 11/1232Z although the backlog on the circuit lasted for several hours.

The PWC prog for 12/1200Z, based on this model run, showed a 988 mb centre near 53 N 141 W. The forecasters had also backed-off.

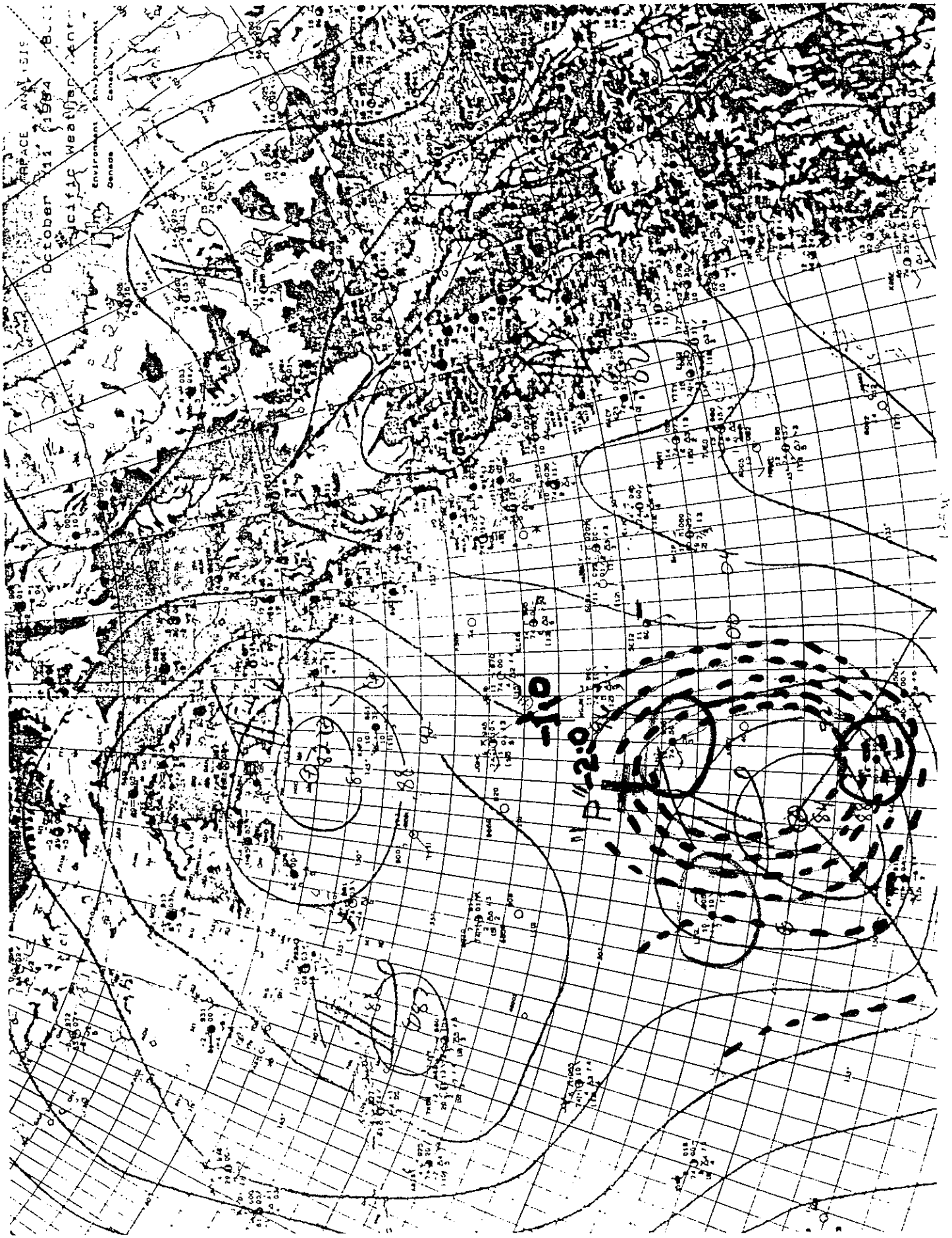
2.6 Thursday Afternoon (October 11)

Gale Warnings were extended to southern coastal areas at 7 p.m. (12/0200Z). The 7:15 p.m. forecast for West Coast Vancouver Island called for winds increasing to southeast 30 to 40 knots Friday afternoon.

Attachments:

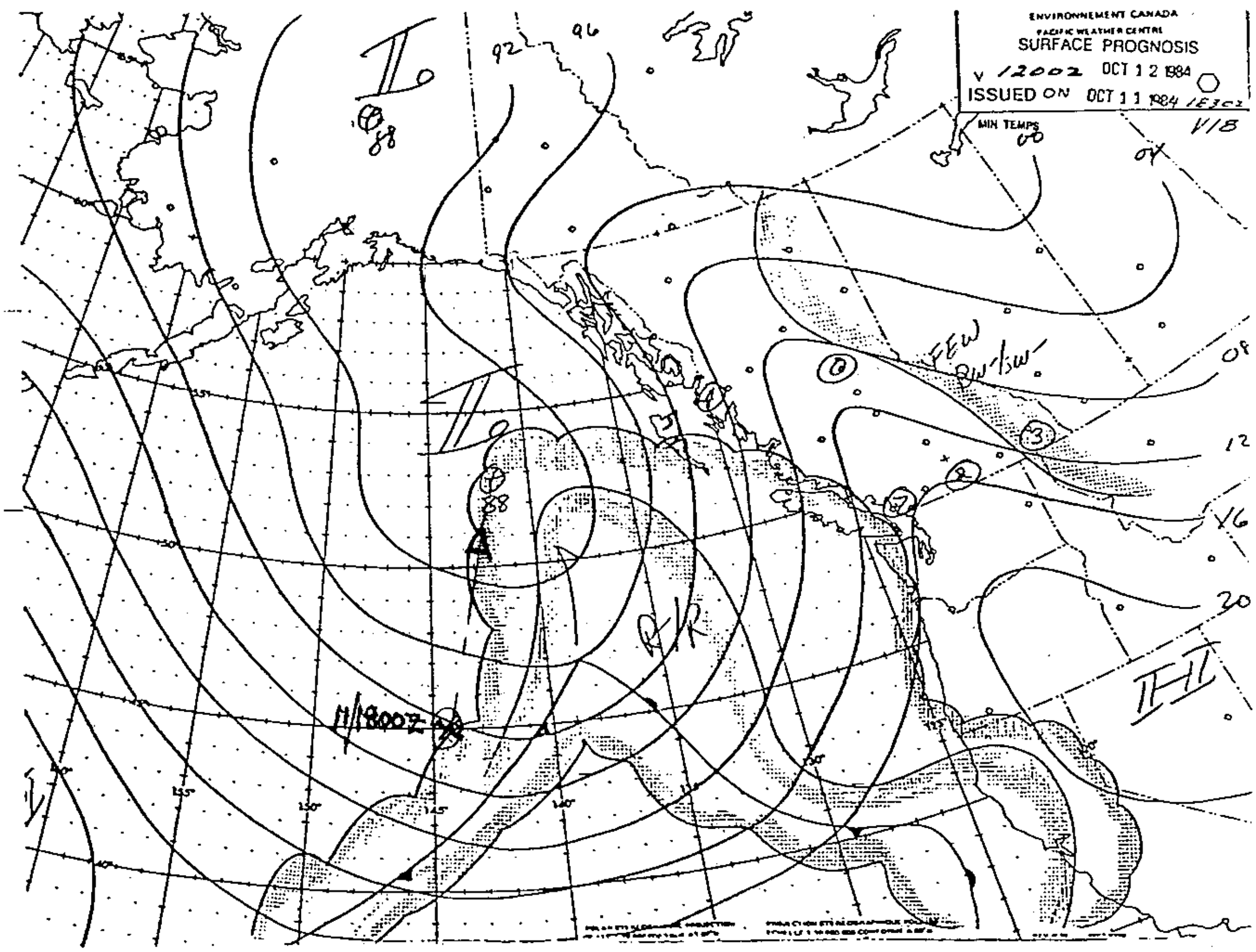
FXCN 1 CWAO 11/1715Z
FXCN 1 CWAO 11/2245Z
FXCN 1 CWVR 11/1900Z
FXCN 1 CWVR 11/2200Z
FPUS 3 KSFO 11/1558Z
FPUS 3 KSEA 11/1600Z
FPUS 3 KSEA 11/2200Z
FPUS 3 KSFO 11/2158Z
TBXX 6 KSFO 11/1815Z
TBXX 6 PANC 11/2159Z
FPCN 20 CWVR 11/1815Z
WWCN 1 CWVR 12/0200Z
FPCN 20 CWVR 12/0215Z
PWC Surface Analysis 11/1800Z
U.S. Spectral 24 Hour Surface Prog Valid 12/1200Z
CMC 24 Hour Surface Prog Valid 12/1200Z
LFM 24 Hour Surface Prog Valid 12/1200Z
PWC 18 Hour Prog Valid 12/1200Z

Att. 2


PWC SURFACE ANALYSIS 111800Z
October 11, 1994
Pacific Weather Centre
Environment Canada
Environnement Canada
1012.0
1012.0

Att. 3

PWC 18 HOUR SURFACE PROGNOSIS VALID 121200Z



Note [illegible] prog [illegible]
widence available [illegible] !!
111800Z PWC analysis [illegible]
The central pressure [illegible] 84 mb
to [illegible] !!

Att. 4

PGM:MSCHI --- CIRCL #: 220 TIME RCVD: 1816Z

FPCN20 CWVR 111815
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT
CANADA AT 11.15AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON FRIDAY.

GEORGIA STRAIT
SMALL CRAFT WARNING.
WINDS SOUTHEAST 5 TO 15 KNOTS RISING AT TIMES TO 20 KNOTS.
WINDS INCREASING TO SOUTHEAST 15 TO 25 KNOTS FRIDAY MORNING.
MOSTLY CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG PATCHES.
VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS VARIABLE 5 TO 15 KNOTS OCCASIONALLY WEST 15 TO 20 TODAY.
WINDS BECOMING EASTERLY 10 TO 15 KNOTS TONIGHT INCREASING TO 15
TO 25 FRIDAY MORNING. CLOUDY WITH A FEW SHOWERS. A FEW MORNING FOG
PATCHES. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND NEAR ZERO
IN FOG.

WEST COAST VANCOUVER ISLAND.
WINDS SOUTHEAST 10 TO 20 KNOTS TODAY INCREASING TO 20 TO 30 FRIDAY
MORNING. MOSTLY CLOUDY WITH SHOWERS. CHANCE OF A THUNDERSHOWER
TODAY. A FEW MORNING FOG PATCHES. RAIN BEGINNING FRIDAY NEAR NOON.
VISIBILITIES AT TIMES 3 MILES IN PRECIPITATION AND NEAR ZERO IN FOG.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
SMALL CRAFT WARNING.
WINDS LIGHT OCCASIONALLY SOUTHEAST 10 TO 15 KNOTS. WINDS INCREASING
TO SOUTHEAST 15 TO 25 FRIDAY MORNING. CLOUDY WITH SHOWERS. CHANCE
OF A THUNDERSHOWER TODAY. A FEW MORNING FOG PATCHES. VISIBILITIES
LOWERING AT TIMES TO 3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING CONTINUED.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS
INCREASING TO SOUTHEAST 25 TO 35 KNOTS BY FRIDAY MORNING. CLOUDY
WITH SHOWERS. A FEW MORNING FOG PATCHES. VISIBILITIES AT TIMES
3 MILES IN SHOWERS AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING CONTINUED.
WINDS SOUTHWEST 10 TO 15 KNOTS BECOMING SOUTHEAST 10 TO 20 KNOTS
TONIGHT AND INCREASING TO SOUTHEAST 25 TO 35 KNOTS FRIDAY MORNING.
MOSTLY CLOUDY WITH A FEW SHOWERS. RAIN BEGINNING NEAR NOON FRIDAY
VISIBILITIES 2 TO 4 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

BOWIE
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 20 KNOTS BECOMING SOUTH TO SOUTHEAST 15 TO
25 TONIGHT AND INCREASING TO SOUTHEAST 25 TO 35 KNOTS OVERNIGHT.
MOSTLY CLOUDY WITH ISOLATED SHOWERS. RAIN BEGINNING FRIDAY MORNING.
VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

Att. 4 (Cont'd).

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 1817Z

FPCN20 CWVR 111815
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.15AM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL NOON FRIDAY.

EXPLORER
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 20 KNOTS INCREASING TO 15 TO 25 TONIGHT.
WINDS INCREASING SOUTH TO SOUTHWEST 25 TO 35 RISING AT TIMES TO 40 BY FRIDAY MORNING. MOSTLY CLOUDY WITH A FEW SHOWERS. RAIN BEGINNING FRIDAY MORNING. VISIBILITIES AT TIMES 3 MILES IN SHOWERS AND TO 1 MILE IN RAIN.

FURTHER OUTLOOK FOR 24 HOURS BEYOND NOON FRIDAY.
SOUTH COAST...STRONG TO GALE FORCE SOUTHEAST EXCEPT STRONG EASTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG TO GALE FORCE SOUTHEAST.
OFFSHORE...GALE FORCE WEST TO SOUTHWQEST WINDS.

END

SYNOPSIS
A SURFACE TROUGH EXTENDING ALONG THE COAST TODAY WILL MOVE EASTWARD AS A WEAK RIDGE OF HIGH PRESSURE BUILDS OVER THE COAST TONIGHT. ANOTHER PACIFIC FRONTAL WAVE WILL APPROACH THE SOUTH COAST FRIDAY. MODERATE TO FRESH WINDS OVER MOST WATERS WILL GRADUALLY INCREASE AHEAD OF THE NEXT WAVE. FRESH TO STRONG SOUTHEASTERLY WINDS WILL DEVELOP IN THE SOUTH AND STRONG GALE FORCE WINDS OVER THE NORTH COAST AND OFFSHORE AREAS.

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 142Z

WWCN1 CWVR 120200
GALE WARNING FOR ALL SOUTH COAST WATERS EXCEPT JUAN DE FUCA STRAIT ISSUED BY ENVIRONMENT CANADA AT 7 PM PDT THURSDAY OCTOBER 11 1984

A FRONTAL SYSTEM NEAR 45N 139W WILL CONTINUE EASTWARD AND REACH VANCOUVER ISLAND FRIDAY AFTERNOON. WINDS ARE EXPECTED TO INCREASE TO SOUTHEASTERLIES 30 TO 40 KNOTS AHEAD OF THE SYSTEM FRIDAY MORNING AND ABATE TO STRONG SOUTHWESTERLIES IN THE EVENING.

END

Att. 5

2.7 Thursday Evening (October 11)

The low was now into the developing stages. The 12/0000Z surface analysis showed a 980 mb centre at 47 N 142 W. Two ships in the southeast quadrant from the low reported pressure tendencies as follows: ELX3 falling - 40and HONF falling 90. The stationary buoys reported pressure tendencies as follows:

6004	50.9 N	135.9 W	falling 37
6005	46.1 N	131.0 W	falling 30
6002	42.5 N	130.0 W	falling 16

On the satellite imagery, the cirrus edge was now within 100 nmi. of the coast, a speed of about 35 knots in the past 6 hours. The following cold trough was more evident now. The structure of the system was not classical.

Another factor leading to strong pressure gradients over the coast was the rising pressures over British Columbia. These were due to cold air moving in over the province as the cold trough ahead of the system was forced inland.

The buoy reports for 12/0300Z (8 p.m. PDT) were as follows:

6004	50.9 N	135.9 W	falling 55
6005	46.1 N	131.0 W	falling 59
6002	42.5 N	130.0 W	falling 35

By this time it was apparent that rapid intensification was taking place. It was apparent from 1200Z analysis!

The satellite picture at 12/0300Z showed a possible vorticity centre forming at 48 N 134 W. This centre moved northeastward becoming absorbed in the frontal zone by 12/0600Z. The centre was probably a factor in the rapid deepening that took place in this time period.

The 12/0600Z surface analysis showed a 964 mb centre at 49 N 137 W. The buoys reported as follows:

6004	50.9 N	135.9 W	falling 84
6005	46.1 N	131.0 W	falling 83
6002	42.5 N	130.0 W	falling 32

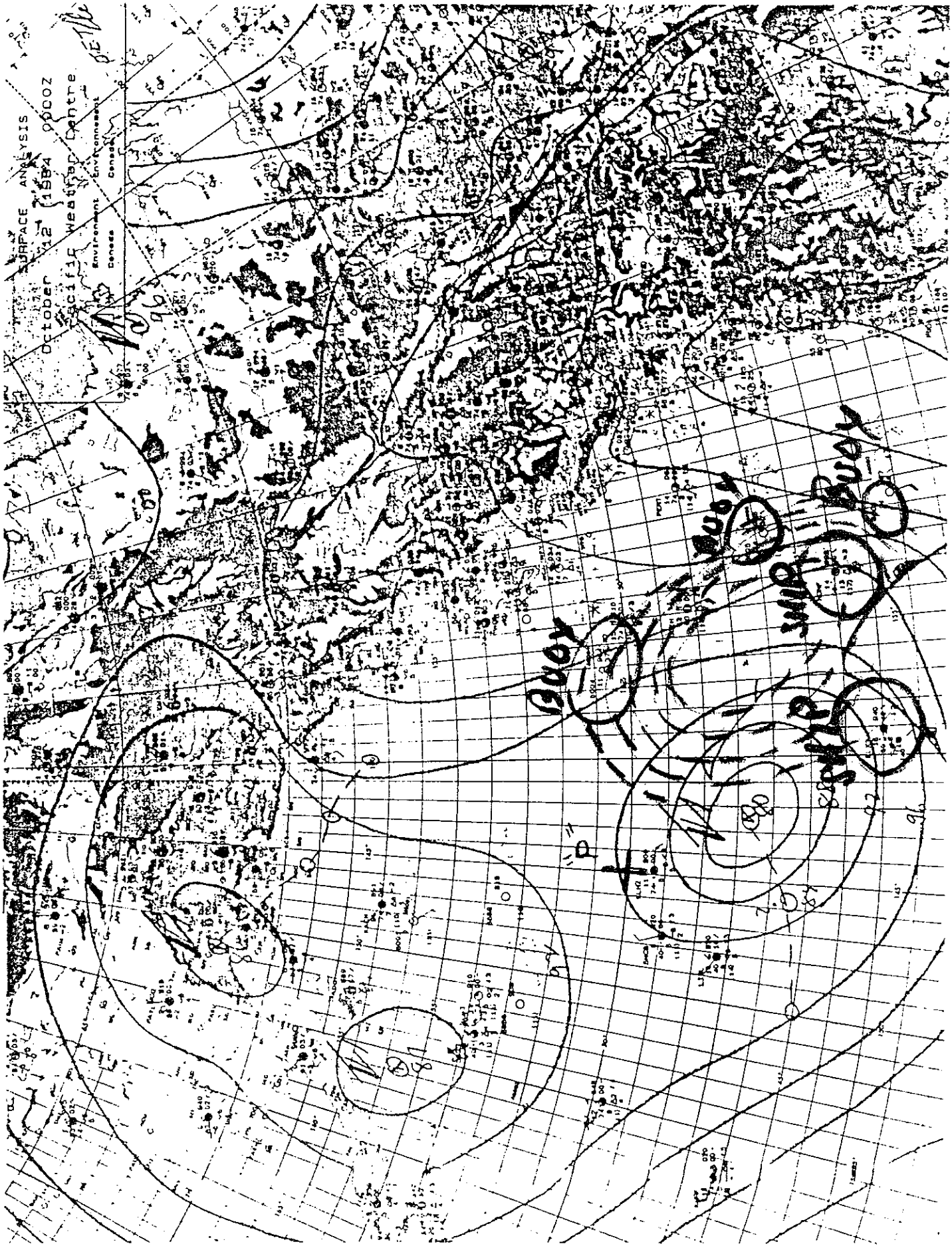
There was only one ship report within 360 nmi. of the centre at this time. On the satellite imagery the cirrus shield continued to be pushed northward. The cold air was now being pulled in behind the low.

at 1200 →

The CMC 12 hr prog valid 12/1200Z was similar to the previous 24 hr prog showing a 986 mb low centre near 52 N 139 W. The U.S. spectral 12 hr prog showed a 985 mb low centre near 52 N 137 W, 10 mb deeper and closer to the coast than the previous 24 hr prog.

The LFM had a 992 mb centre at 50 N 135 W.

Att. 6



PWC SURFACE ANALYSIS 120000Z

AH. 7.

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 1472

FPCN20 CWVR 120215
PART 1 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

GEORGIA STRAIT
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS RISING AT TIMES TO 25.
WINDS INCREASING TO SOUTHEAST 25 TO 35 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES LOWERING TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

JUAN DE FUCA STRAIT
SMALL CRAFT WARNING.
WINDS WESTERLY 10 TO 20 KNOTS SHIFTING TO EASTERLY 10 TO 20 OVERNIGHT AND INCREASING TO 20 TO 30 KNOTS FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

WEST COAST VANCOUVER ISLAND.
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS TONIGHT INCREASING TO 30 TO 40 FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES 2 TO 4 MILES IN PRECIPITATION AND NEAR ZERO IN FOG.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING ISSUED.
WINDS SOUTHEAST 10 TO 20 KNOTS. WINDS INCREASING SOUTHEAST 25 TO 35 BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE AFTERNOON. VISIBILITIES LOWERING TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING CONTINUED.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS INCREASING TO SOUTHEAST 15 TO 25 OVERNIGHT AND TO SOUTHEAST 30 TO 35 KNOTS BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES REDUCED TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

WEST COAST CHARLOTTES.
GALE WARNING CONTINUED.
WINDS SOUTHWEST 10 TO 15 KNOTS BECOMING SOUTHEAST 10 TO 25 KNOTS OVERNIGHT AND INCREASING TO SOUTHEAST 30 TO 35 KNOTS FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

-END PART 1

Att.7, (Cont'd).

PGM:MSCHK --- CIRCUIT: 220 TIME RCVD: 149Z

FPCN20 CWVR 120215
PART 2 OF 2
MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 7.15PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

BOWIE ..
GALE WARNING CONTINUED.
WINDS SOUTHERLY 10 TO 20 KNOTS INCREASING TO 15 TO 25 OVERNIGHT.
WINDS INCREASING TO SOUTHEAST 30 TO 40 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 2 TO 4 MILES IN SHOWERS AND NEAR ZERO IN FOG.

EXPLORER .
GALE WARNING CONTINUED.
WINDS SOUTHWEST 15 TO 25 KNOTS INCREASING TO SOUTH TO SOUTHWEST 25 TO 35 OVERNIGHT AND RISING AT TIMES TO 40 FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE MORNING.
VISIBILITIES 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

FURTHER OUTLOOK FOR 24 HOURS BEYOND 8 PM FRIDAY.
SOUTH COAST...FRESH TO STRONG SOUTHWEST WINDS EXCEPT WESTERLY IN JUAN DE FUCA.
NORTH COAST...STRONG TO GALE SOUTHWESTERLY.
OFFSHORE...STRONG TO GALE FORCE WEST TO SOUTHWEST WINDS.

END

SYNOPSIS
A WEAK RIDGE OF HIGH PRESSURE WILL MOVE ONTO THE COAST TONIGHT. ANOTHER PACIFIC FRONTAL WAVE NEAR 45N 139W WILL CONTINUE EASTWARD TO REACH VANCOUVER ISLAND FRIDAY AFTERNOON. MODERATE TO FRESH WINDS OVER MOST WATERS TONIGHT WILL GRADUALLY INCREASE AHEAD OF THE NEXT WAVE. SOUTHERLY GALES WILL DEVELOP OVER THE OFFSHORE AREAS BY FRIDAY MORNING AND WILL SPREAD TO ALL COASTAL WATERS BY FRIDAY AFTERNOON EXCEPT FOR JUAN DE FUCA STRAIT. JUAN DE FUCA WINDS WILL BE MODERATE TO FRESH WESTERLY AHEAD OF THE RIDGE AND WILL SHIFT TO EASTERLY OVERNIGHT AND RISE TO STRONG EASTERLY BY FRIDAY AFTERNOON.

"another frontal wave"! Surely by now the forecaster recognizes the existence of a rapidly developing cyclone. See 120200Z (4P.m. Thursday) analysis. (Att.6).

Att. 8

Att. 8

from the synoptic evidence available this revision was issued 6 hours too late!

PGM:MSCHK --- CIRCU: 220 TIME RCVD: 641Z

FPCN20 CWVR 120630 AMD
PART 1 OF 2
REVISED MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY
ENVIRONMENT CANADA AT 11.30PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

GEORGIA STRAIT
GALE WARNING CONTINUED.
WINDS SOUTHEAST 10 TO 20 KNOTS RISING AT TIMES TO 25.
WINDS INCREASING TO SOUTHEAST 30 TO 40 KNOTS FRIDAY AFTERNOON.
MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN IN THE AFTERNOON.
VISIBILITIES AT TIMES 1 TO 4 MILES IN RAIN AND MIST.

JUAN DE FUCA STRAIT
GALE WARNING ISSUED.
WINDS EASTERLY 10 TO 20 KNOTS INCREASING TO 20 TO 30 FRIDAY MORNING.
WINDS INCREASING OVER EASTERN AND WESTERN ENTRANCES AT TIMES TO
SOUTHEAST GALES 35 TO 40. WINDS SHIFTING TO WESTERLY 15 TO 25
FRIDAY AFTERNOON. CLOUDY. RAIN BEGINNING BY FRIDAY AFTERNOON.
VISIBILITIES AT TIMES 1 TO 4 IN RAIN AND MIST.

WEST COAST VANCOUVER ISLAND.
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS INCREASING TO 40 TO 50 WITH HIGHER
GUSTS FRIDAY MORNING. WINDS BECOMING SOUTHWEST 25 TO 35 FRIDAY
AFTERNOON. MOSTLY CLOUDY TONIGHT. RAIN FRIDAY.
VISIBILITIES 1 TO 4 MILES IN RAIN AND MIST.

JOHNSTONE STRAIT
QUEEN CHARLOTTE STRAIT
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS. WINDS INCREASING SOUTHEAST 35 TO
50 BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH
RAIN BEGINNING IN THE MORNING. VISIBILITIES LOWERING TO 2 TO 4
MILES IN RAIN AND MIST.

END PART 1

Att. 8 (Cont'd).

PGM:MSCHK --- CIRCUIT 220 TIME RCVD: 711Z

FPCN20 CWVR 120630 AMD
PART 2 OF 2
REVISED MARINE FORECASTS FOR B.C. COASTAL WATERS ISSUED BY ENVIRONMENT CANADA AT 11.30PM PDT THURSDAY 11 OCTOBER 1984
MARINE AREA FORECASTS VALID UNTIL 8 PM FRIDAY.

QUEEN CHARLOTTE SOUND
HECATE STRAIT
DIXON ENTRANCE
GALE WARNING UPGRADED TO STORM WARNING.
WINDS VARIABLE 5 TO 15 KNOTS RISING AT TIMES TO SOUTH 20. WINDS INCREASING TO SOUTHEAST 25 TO 35 OVERNIGHT AND TO SOUTHEAST 40 TO 55 KNOTS BY FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING NEAR NOON. VISIBILITIES REDUCED TO 2 TO 4 MILES IN RAIN AND NEAR ZERO IN FOG.

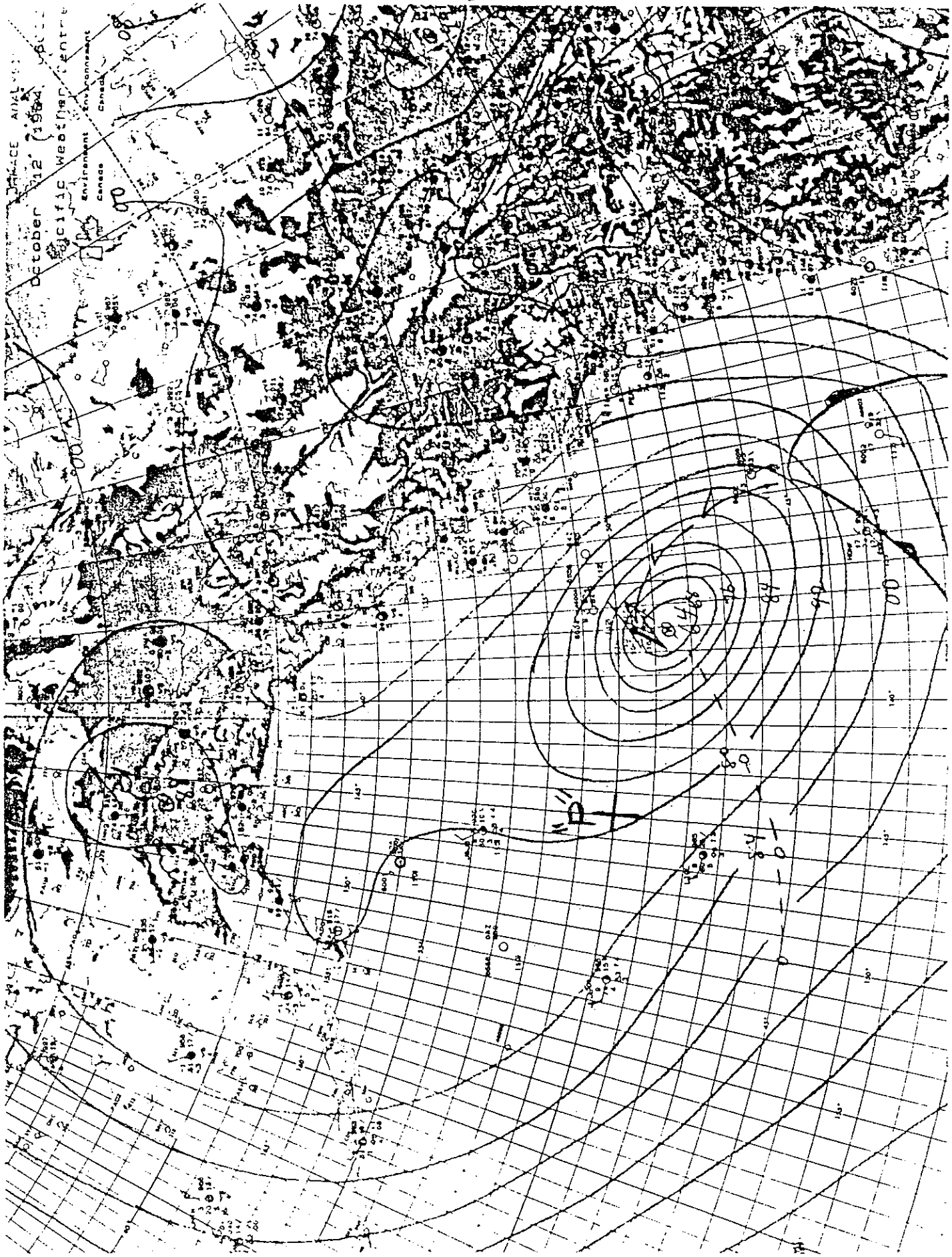
WEST COAST CHARLOTTES.
GALE WARNING UPGRADED TO STORM WARNING.
WINDS SOUTHEAST 15 TO 25 KNOTS INCREASING TO 25 TO 35 OVERNIGHT AND 40 TO 55 FRIDAY MORNING. WINDS SHIFTING TO SOUTHWEST 35 FRIDAY AFTERNOON. MOSTLY CLOUDY TONIGHT. CLOUDY FRIDAY WITH RAIN BEGINNING IN THE MORNING. VISIBILITIES 1 TO 4 MILES IN RAIN AND MIST.

REMAINDER FORECASTS UNCHANGED FROM 7PM ISSUE.

END

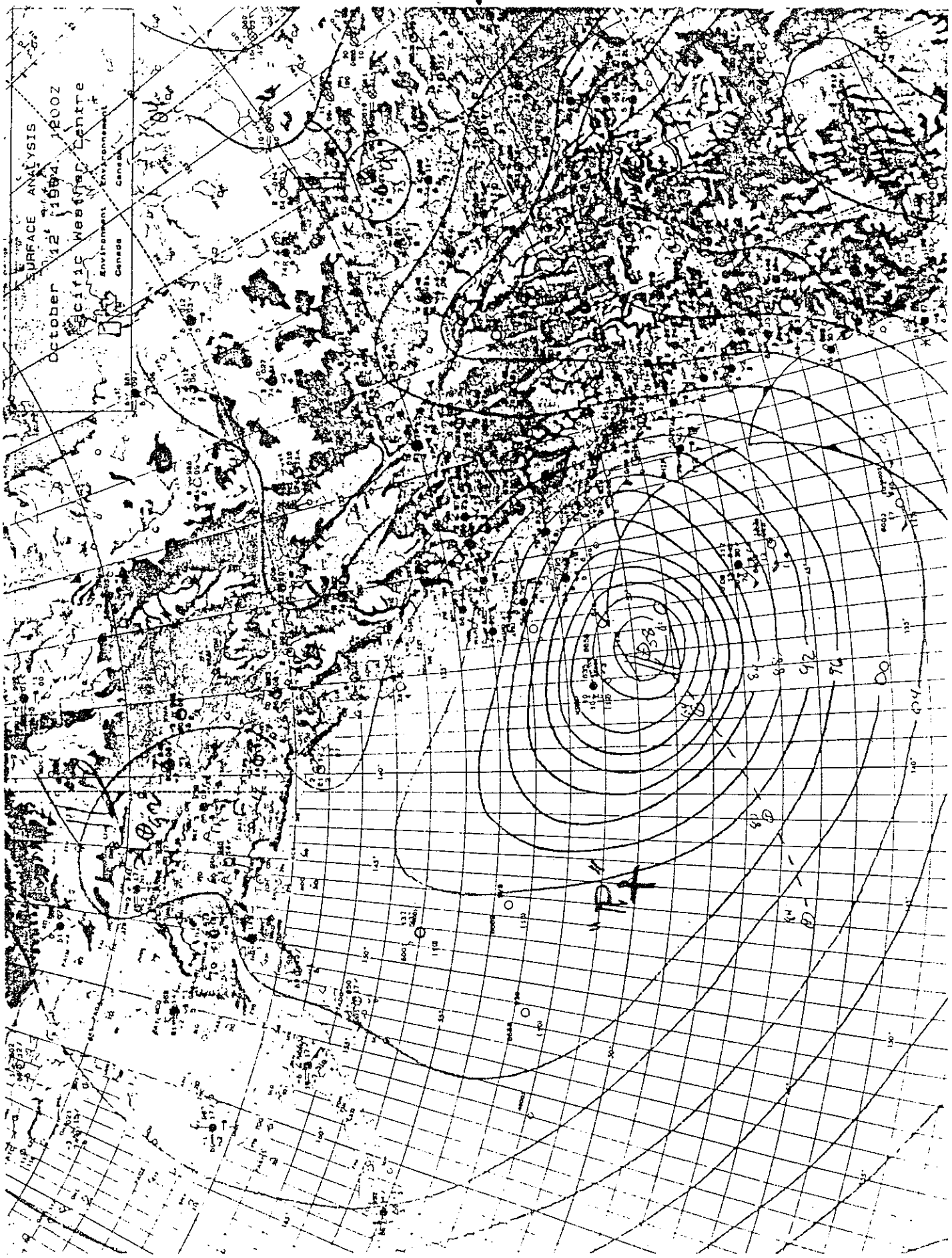
REVISED SYNOPSIS
A LOW PRESSURE CENTRE OF 980 MILLIBARS NEAR 47N 142W AT 5PM WILL DEEPEN TO 970 MILLIBARS AND MOVE TO NEAR 50N 137W BY 5AM FRIDAY. AN ASSOCIATED FRONTAL SYSTEM WILL MOVE TO THE COAST FRIDAY MORNING AND INLAND LATE FRIDAY. WINDS ARE EXPECTED TO INCREASE TO GALE TO STORM FORCE SOUTHEASTERLIES AHEAD OF THE FRONT AND ABATE TO STRONG TO GALE FORCE WESTERLIES BEHIND THE DISTURBANCE.

AH. 9



PWC SURFACE ANALYSIS 120600Z

Att. 10



PWC SURFACE ANALYSIS 12 1200Z

Appendix 10.

Report of P. Haering

NOV-21

MEMORANDUM/NOTE DE SERVICE

TO PAEM
A

FROM PAEMM
DE

CONFIDENTIAL

our file/notre reference
8001-132/V7

your file/notre reference

date NOVEMBER 15,1984

subject-- FORECAST INVESTIGATION OF OCTOBER 12, 1984 STORM.
objet

1. ATTACHED IS THE REPORT PERTAINING TO THE ABOVE FORECAST INVESTIGATION AS WELL AS A FEW ATTACHMENTS RELATING TO THE REPORT. .

2. ATTACHMENTS
   VARIOUS SATELLITE PICTURES
   PROGNOSTIC DISCUSSIONS BY MR. HOLMES
   PLAUSIBLE HISTORY OF EVENT

Peter Hamer

FORECAST INVESTIGATION

1. EVENT

A STORM WHICH INTENSIFIED QUICKLY SOME 300 MILES TO THE WEST OF CAPE SCOTT DURING THE EVENING OF THURSDAY, OCTOBER 11, 1984 AND THE EARLY MORNING OF FRIDAY, OCTOBER 12, 1984 BROUGHT STORM FORCE WINDS TO MOST B.C. COASTAL AREAS ON FRIDAY. THIS STORM RESULTED IN THE LOSS OF SEVERAL FISHING BOATS OFF THE NORTHERN TIP OF VANCOUVER ISLAND AND MORE IMPORTANTLY, FIVE FISHERMEN LOST THEIR LIVES DURING THE STORM.

2. SURFACE ANALYSES

2.1 FROM 101800Z TO 111200Z THE PRESSURE PATTERN ASSOCIATED TH THE SYSTEM WAS POORLY DEFINED NEAR ITS CENTRE. AT 110600Z SOME LATE SHIP DATA WAS NOT ANALYSED AND ON THE 111200Z CHART THE ONE PIECE OF DATA FROM BUOY 6659 (DRIFTER) WAS REJECTED. THE REPORTED DATA OF 1004.9 MBS APPEARS TO HAVE BEEN CORRECT AND CONSISTENT WITH THE PRESSURE BEHAVIOR OF THE REPORTS FROM THIS BUOY DURING THE PREVIOUS 24 HOURS. FROM 111800Z TO 121200Z THE PRESSURE PATTERN SURROUNDING THE SYSTEM WAS RELATIVELY WELL DEFINED ALTHOUGH THE CENTRAL PRESSURE VALUE IS NOT KNOWN. THE CENTRAL PRESSURE VALUES MAY WELL HAVE BEEN LOWER THAN ANALYSED.

2.2 THE FRONTAL ANALYSES FROM 101800Z TO 121200Z ASSOCIATED WITH THIS SYSTEM WERE INCONSISTENT DURING THE FIRST HALF OF THE PERIOD.

2.3 THE BEHAVIOR OF THE REPORTED PRESSURE AT BUOY 6659 BETWEEN 110019Z AND 110401Z (DROP OF 5.3 MBS) SUGGESTS A TIGHT PROBABLY SMALL PRESSURE SYSTEM.

3. UPPER AIR ANALYSES

3.1 UNTIL 111200Z ONLY CANADIAN AND ALASKA DATA WAS AVAILABLE FROM THE REGULAR UPPER AIR REPORTS.

3.2 AIRCRAFT REPORTS INDICATED THAT A VERY STRONG WIND FLOW WAS ASSOCIATED WITH THIS SYSTEM. AIRCRAFT REPORTS OF 140-170 KNOTS CONFIRMED THE INTENSITY OF THE JET STREAM.

3.4 FROM THE DATA AVAILABLE IT WAS NOT POSSIBLE TO IDENTIFY TWO DISTINCT WIND MAXIMA. HOWEVER, THE DISTORTION IN THE SATELLITE IMAGERY NORTH OF 45N WAS ASSOCIATED WITH THE WIND MAXIMUM THAT WAS MOVING RAPIDLY EASTWARD.

3.5 THE TUXN DATA SUPPORTED THE CMC THICKNESS ANALYSES.

ASSESSMENT OF COMPUTER PROGNOSIS

4.1 36 HOUR COMPUTER PROGNOSES BASED ON 110000Z DATA-VALID 121200Z

	DEPTH	POSITION
CMC	977MBS	52N 132W
LFM	983MBS	51N 141W
U.S.	984MBS	52N 140W
PWC (SUBJ)	970MBS	51N 141W
ACTUAL	950MBS (EST)	50N 134W

4.2 24 HOUR COMPUTER PROGNOSES BASED ON 111200Z DATA-VALID 121200Z

	DEPTH	POSITION
CMC	987MBS	53N 141W
LFM	982MBS	53N 141W
U.S.	995MBS	50N 140W
PWC (SUBJ)	988MBS	53N 141W
ACTUAL	950MBS (EST)	50N 134W

4.3 12 HOUR COMPUTER PROGNOSES BASED ON 120000Z DATA-VALID 121200Z

	DEPTH	POSITION
CMC	986MBS	52N 139W
LFM	993MBS	50N 134W
U.S.	985MBS	52N 137W
PWC (SUBJ)	NO PROGNOSES FOR THIS TIME PERIOD (12 HOURS)	
ACTUAL	950MBS (EST)	50N 134W

4.4 24 HOUR COMPUTER PROGNOSES BASED ON 120000Z DATA-VALID 130000Z

	DEPTH	POSITION
CMC	972MBS	55N 135W
LFM	988MBS	57N 137W
U.S.	977MBS	57N 135W
PWC (SUBJ)	966MBS	57N 135W
ACTUAL	960MBS (EST)	52N 132W

4.5 OF NOTE ALSO IS THE CMC 48 HOUR PROGNOSES BASED ON DATA FROM 101200Z. THIS PROGNOSES FORECAST A LOW OF 976 MBS AT 53N 133W FOR 121200Z WHEN THE ACTUAL DEPTH WAS 950MBS (EST) AT 50N 134W.

THE DEVELOPMENT OF THIS SYSTEM WAS AS FOLLOWS;

INITIAL ANALYSIS	998MBS	40N 180W (EST)
	993MBS	39N 180W (CMC HAND)
12 HOUR PROGNOSIS	994MBS	43N 165W
24 HOUR PROGNOSIS	989MBS	45N 150W
36 HOUR PROGNOSIS	986MBS	48N 140W
48 HOUR PROGNOSIS	976MBS	53N 133W

5. SELECTION OF CORRECT COMPUTER PROGNOSES

FROM THE DATA IN SECTION 4 IT APPEARS THAT;

5.1 THE PROGNOSTICIAN RESPONSIBLE FOR THE 36 HOUR PROGNOSES SELECTED THE CMC INDICATIONS FOR DEPTH AND THE LFM POSITION. ALSO THE LOW WAS INTENSIFIED SOMEWHAT.

5.2 THE PROGNOSTICIAN RESPONSIBLE FOR THE 24 HOUR PROGNOSIS BASICALLY USED THE CMC GUIDANCE. THE LFM BY THIS TIME SHOWED A MORE INTENSE CENTRAL PRESSURE THAN THE CMC.

5.3 THE PROGNOSTICIAN RESPONSIBLE FOR THE 24 HOUR PROGNOSIS VALID AT 130000Z BASICALLY ACCEPTED THE TREND OF THE CMC AND U.S. SPECTRAL PROGNOSES AND KEPT THE SYSTEM A LITTLE MORE INTENSE (IE. DID NOT FILL IT AS QUICKLY)

6. SATELLITE IMPLICATIONS AND INTERPRETATIONS

6.1 AS THE SYSTEM BECAME VISIBLE ON THE SATELLITE IMAGERY (150-160W)(NEAR 110000Z) THE FOLLOWING CHARACTERISTICS WERE OBSERVED:

6.11 A LARGE ILL-DEFINED CLOUD MASS

6.12 RELATIVELY WARM CLOUD TOP TEMPERATURES (AS COMPARED TO THOSE WITH THE PREVIOUS SYSTEM, NOW LOCATED ALONG THE B.C.-CALIFORNIA COAST.

6.13 NO CIRCULATION PATTERN WAS VISIBLE AT HIGH LEVELS (IE. CIRRUS LEVEL.

6.14 NO CIRCULATION PATTERN WAS VISIBLE AT LOW LEVELS (IE. LOW CLOUD FIELDS.

6.2 AS THE SYSTEM MOVED TO 150-140W (ABOUT 111200Z) THE FOLLOWING CHARACTERISTICS WERE NOTED;

6.21 TWO MOISTURE BOUNDARIES ON THE MOISTURE CHANNEL

6.22 COLDER CLOUD TOPS TO THE SOUTH OF THE SYSTEM'S CENTRE

6.23 THE COLDER CLOUD TOPS APPEAR TO BE CONVECTIVE

6.24 NO CLEAR FRONTAL STRUCTURE IS EVIDENT

6.3 AS THE SYSTEM MOVED TO 140-130W (ABOUT 120600Z) THE FOLLOWING CHARACTERISTICS WERE NOTED;

6.31 THE INTENSE WIND MAXIMUM HAS MOVED RAPIDLY EASTWARD

6.32 SOME STRUCTURE IS NOW EVIDENT IN THE HIGH LEVEL CIRCULATION

6.33 SOME STRUCTURE IS EVIDENT IN THE LOW CLOUDS

6.34 AT 120101Z ON THE VISIBLE IMAGERY A LARGE CIRCULAR CONVECTIVE COMPLEX IS EVIDENT AT 45N 134W

6.4 AS THE SYSTEM MOVED TO 130W AND THE COAST (ABOUT 121800Z) THE FOLLOWING CHARACTERISTICS WERE NOTED;

6.41 THE UPPER CIRCULATION IS LIKE THAT OF A DEEP,DEVELOPED MID-LATITUDE STORM WITH AN ESTIMATED DEPTH LOWER THAN 960 MBS

6.42 THE LOW LEVEL CLOUDS NOW INDICATE A DESTINCT BOUNDARY

6.43 THE COLD AIR WHICH WAS WELL TO THE WEST OF THE SYSTEM IS NOW MOVING EASTWARD TO THE SOUTH OF THE MAIN STORM CENTRE

WARNINGS ISSUED AND DISCUSSIONS INITIATED

7.1 GALE WARNINGS FOR THE NORTHERN COASTAL AREAS WERE "CONTINUED" ON THE 5 A.M. FORECAST ON OCTOBER 11,1984.

7.2 GALE WARNINGS WERE EXTENDED TO THE ALL SOUTH COAST WATERS EXCEPT JUAN DE FUCA STRAIT AT 7 P.M. OCTOBER 11, 1984. THIS WARNING IMPLIES WINDS OF 30-40 KNOTS FOR THE WEST COAST OF VANCOUVER ISLAND ON THE MORNING OF OCTOBER 12, 1984.

7.3 STORM WARNINGS WERE ISSUED FOR WEST COAST VANCOUVER ISLAND, QUEEN CHARLOTTE AND JOHNSTONE STRAITS AND ALL NORTH COAST WATERS FOR WINDS OF 45-55 KNOTS WITH HIGHER GUSTS AT 11 P.M. OF OCTOBER 11, 1984.

7.4 GALE WARNINGS WERE ISSUED FOR JUAN DE FUCA STRAIT AT 11:30 P.M. OCTOBER 11, 1984.

7.5 PHONE CALLS WERE INITIATED WITH SEATTLE WEATHER OFFICE ON THE NIGHT OF OCTOBER 10TH. (NIGHT SHIFT OF OCTOBER 11TH). THIS CALL DID NOT GIVE ANY ADDITIONAL INFORMATION.

7.6 A CALL WAS INITIATED TO VICTORIA W03 WITH REGARD TO STRATUS PROBLEM FOR PAT BAY TERMINAL.

8. MESOSCALE AND LOCAL EFFECTS

8.1 IT IS QUITE PLAUSIBLE THAT THE STRUCTURE OF TROPICAL STORM "OGDEN" WAS MAINTAINED FOR A LONGER TIME THAN INDICATED ON THE ANALYSES.

8.2 THE LARGE AREA OF CONVECTION ASSOCIATED WITH THIS SYSTEM AND VISIBLE ON THE SATELLITE IMAGERY TO THE SOUTH OF THE SYSTEMS CENTRE IS UNUSUAL.

8.3 THE EFFECT OF THE COAST RANGE ON SUCH A SYSTEM IS NOT CLEAR.

8.4 THE TRANSFORMATION OF A WARM CORE SYSTEM "HURRICANE, TROPICAL STORM) TO A COLD CORE MID-LATITUDE SYNOPTIC SYSTEM IS NOT FULLY UNDERSTOOD.

9. COMMENTS

SURFACE ANALYSES

1. ALTHOUGH THE ANALYSES WERE DIFFICULT BECAUSE OF LACK OF SURFACE DATA UNTIL 111800Z NO ATTEMPT APPEARS TO HAVE BEEN MADE TO OBTAIN A HISTORY OF THE PRESSURE SYSTEMS.
2. DATA WHICH APPEARS ACCURATE WAS REJECTED (BUOY DATA).
3. LATE DATA WAS NOT USED TO REANALIZE THE 110600Z CHART.
4. IT IS SUSPECTED THAT TROPICAL STORM "OGDEN" RETAINED ITS IDENTITY MUCH BEYOND THE TIME THAT THIS FEATURE WAS CARRIED ON THE SYNOPTIC CHARTS BOTH BY CMC AND PWC.
5. IT APPEARS THAT FRONTAL STRUCTURES WERE FORCED ON AN ANALYSIS WHEN IN EFFECT THERE WAS NO GOOD EVIDENCE THAT SUCH STRUCTURES EXISTED. THIS IN TURN CAN LEAD TO ASSUMPTIONS ON SUBSEQUENT DEVELOPMENT WHICH MAY IN FACT BE ERRONEOUS (IE. NO COLD AIR PRESENT; WIND MAX CUTTING ACROSS FRONT).
6. IT IS UNFORTUNATE THAT AES POLICY IS SUCH THAT THE AMERICAN PRODUCED PACIFIC SURFACE ANALYSES ARE NOT MADE AVAILABLE TO THE PWC METEOROLOGISTS. THERE IS NO GUARANTEE THAT THE DATA THAT REACHES PWC OR CMC IS UNIQUE AND IDENTICAL TO THAT USED IN THE U.S.

SATELLITE ANALYSES

1. THE SATELLITE IMAGERY SUGGESTS THAT THIS SYSTEM WAS NOT THE USUAL MID-LATITUDE FRONTAL SYSTEM.
2. THERE IS SOME EVIDENCE THAT THE TROPICAL CHARACTERISTICS OF "OGDEN" WERE MAINTAINED UNTIL 120000Z AFTER WHICH EXPLOSIVE DEEPENING TOOK PLACE.
3. THIS EVENT MAY WELL BE THE SIGNATURE FOR THE TRANSFORMATION OF A WARM CORE SYSTEM TO A COLD CORE SYSTEM. IN THIS REGARD A MR. HOLMES FROM THE SAN FRANCISCO SATELLITE OFFICE SEEMS TO HAVE PREDICTED THIS EVENT AS WELL AS ANYONE AND HIS PROGNOSTIC DISCUSSIONS IMPLY A CERTAIN SIGNATURE FOR SUCH AN EVENT.

COMPUTER PROGNOSES

1. ALL COMPUTER PROGNOSES FAILED TO PREDICT THE EXPLOSIVE DEEPENING OF THIS SYSTEM.
2. BOTH THE U.S. AND CMC SPECTRAL PROGNOSES PERFORMED POORER AT SHORTER TIME PERIODS (THE CLOSER TO THE DEVELOPMENT THE POORER THEY PERFORMED). THE LFM AT 48 HOURS WAS SO POOR THAT LATER IT COULD ONLY GET BETTER.
3. THE INTENSITY OF THE SYSTEM WAS MISSED BY MORE THAN 30MBS FOR A 24 HOUR PROGNOSES AND ABOUT 20-25 MBS FOR 36-48 HOUR PROGNOSES.

WARNINGS

1. THE WARNINGS AND FORECASTS WERE NOT WELL CO-ORDINATED ON THE DAY SHIFT OF THE 11TH AND THE NIGHT SHIFT OF THE 12TH. THE SYNOPSES OF THE MARINE FORECASTS ON THE DAY SHIFT OF THE 11TH WERE POORLY WRITTEN. ALSO, THE 5 A.M. OF OCTOBER 12TH MENTIONS A 970MB LOW AT 51N 130W WHEN THE 06Z SURFACE ANALYSES ALREADY SHOWED A CENTRE OF 964MBS AT 49N 137W.
2. THE LEAD TIME OF THE STORM WARNING WAS ABOUT 3 HOURS.

TECHNIQUES

1. THE GEORGE TECHNIQUE FOR DEEPENING OF STORMS WOULD HAVE GIVEN ABOUT 20MBS DEEPENING IN 24 HOURS OFF THE 1100Z, 1112Z AND 1200Z CHARTS. THIS WOULD HAVE PRODUCED A LOW OF ABOUT 960 MBS.

USE OF COMPUTER GUIDANCE

1. THIS EVENT INDICATES THAT FORECASTERS ARE HEAVILY INFLUENCED BY COMPUTER PROGNOSES.

DISSEMINATION OF FORECASTS AND WARNINGS

1. THE ONLY SIGNIFICANT DELAY OF ABOUT 1 HOUR OCCURRED WHEN A MARINE WARNING WAS ISSUED AT 120630 JUST AFTER THE RELEASE AFTER THE AMENDED FORECAST WHICH HAD ALSO BEEN ISSUED AT 120630. A SIMILAR SITUATION OCCURRED AT 121215.

WHAT PROMPTED THE ISSUING OF THE STORM WARNING?

1. IT APPEARS THAT THE MOST IMPORTANT INFORMATION THAT CAUSED THE STORM WARNING TO BE ISSUED WAS THE DATA FROM THE MOORED U.S. BUOYS LOCATED ABOUT 300 MILES OFF THE B.C. COAST.

RECOMMENDATIONS

1. THAT PWC EXPEND SOME RESOURCES TO INVESTIGATE THE CHARACTERISTICS OF EXPLOSIVE DEVELOPMENT AND TRY TO RELATE SUCH CHARACTERISTICS TO SATELLITE IMAGERY.
2. THAT MR. HOLMES FROM SN FRANCISCO BE APPROACHED IN ORDER TO DETERMINE IF INDEED THERE ARE CERTAIN SATELLITE SIGNATURES THAT ALLOW FOR THE PREDICTION OF SUCH SYSTEMS 12-24 HOURS IN ADVANCE OF THE EVENT.

Appendix 11.

Submission by M. Miyake

GOVERNMENT OF CANADA
Fisheries and Oceans

GOUVERNEMENT du CANADA
Pêches et Océans

INSTITUTE OF OCEAN SCIENCES
P.O. BOX 6000
9860 WEST SAANICH ROAD
SIDNEY, BRITISH COLUMBIA
CANADA V8L 4B2

Your file Votre référence

Our file Notre référence

Professor Paul LeBlond
Deptartment of Oceanography
University of British Columbia

Nov,15,1984

Dear Paul,

As I mentioned over the telephone the other day, I would like to submit the following brief to the Commission you are chairing for the Department of Environment. This submission is made strictly as a single research scientist, not in any way representing a government service.

During September of this year I have been trying to obtain upper ocean information directly from the ships operating off the west coast of Vancouver Island. They were the Parisau, of the Ocean Science Survey of the Dept. of Fisheries and Oceans, and the Tanu, the Fisheries patrol vessel of the Fisheries management service.

These two ships, if it has not come to your attention already, were operating off the west coast at the time of the storm. The Tanu was located around the Brooks penisula. The Parisau was also conducting a CTD survey and current meter recovery and redeployment for the Tide and Current section and Dr. Thompson's project off the southern tip of the Queen Charlottes.

As you know, there are only a few vessels that exceed a hundred feet in the west coast of Canada and all of them belong to the Canadian government services. I would like to call your attention to the fact that these vessels may have meteorological sensors that can measure some relevant parameters of the weather, but their information rarely gets through communication channels into the hands of the AES and much less to the forecasting activities.

The reason for the difficulty is almost entirely technological. It is essential that such ship information get into the forecasting scheme.

The up grading of the communication system is one of the key activities needed. I believe the Pacific weather center must have a computer capable of digesting up to date local weather factors. Also required is a high resolution forecasting model to be operated locally to make" now casting". I believe inclusion of topography is an important element of such a forecasting model.

Also important is how to get such information into the hands of the fishing community. Fisheries management services has tried to upgrade the shortwave broadcasting scheme so that the fishermen would have up to date information of the fishing grounds. But this broadcasting system has not been used to broadcast meteorological information in a routine manner.

During storm conditions every means to reach the fisherman would, I think, be an important consideration. Therefore, the communication method must be reexamined.

I have presented here some topics you may not have considered ,hoping that you may look into some of them.

I hope your Commission will have a successful survey of the situation and that the remedy recommended through your Commission will make our West Coast maritime activity a much safer one.

Sincerely yours,

Mike Miyake

Appendix 12.

Submission by A. Bennett

Not received in time for submission of report.

Appendix 13.

Submission from the Pacific Trollers Association.

Pacific Trollers Association

Dr. Paul Le Blond
Chairman, Weather Reporting Inquiry
3555 Dunbar Street
Vancouver,B.C.
V6S 2C4

November 5, 1984

Dear Dr. Le Blond ;

The Pacific Trollers Association is concerned and upset at the recent tragic loss of life from the fishing vessels "Miss Robyn" and "Silver Triton" in the Brooks Bay - Cape Cook area. It should be remembered that prior to this latest incident an earlier storm in mid-April claimed three lives from the trawler "Cape Blanco" in the region of Cape Scott and two additional lives from American vessels that capsized in Queen Charlotte Sound.

Most people acknowledge that not one, but many factors, contribute to an incident at sea, not the least of which can be misjudgement by or inexperience on the part of the vessel operator. The latest tragedy is no exception. Nevertheless, the P.T.A. holds the view that had better weather information been available at the time, the vessels and crew might not have been travelling in the area at all - but rather might have found and taken shelter earlier.

A number of weather information gathering or transmitting deficiencies can be identified that specifically relate to the Estevan to Cape Scott area. This Association has brought attention to these deficiencies through our participation in a number of Maritime Safety Seminars sponsored by the Canadian Coast Guard. We are pleased that some action has been taken as a result of these representations, however more needs to be done.

At a Maritime Safety Seminar held September 28, 1982, our representatives noted the following:

a) that the Nootka light station was located in-shore at the mouth of Nootka Sound and of no benefit in determining accurate offshore wind speeds and direction.

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b) that the old loran "A" station at Spring Island was now gone leaving a serious gap in local weather reporting.

c) that Cape Cook (Solander Island) was a severe weather location throughout the entire year and a "pinch" location which all vessels transiting the coast both east and west must get around.

d) that the Lawn Pt. automatic wind speed indicator was inappropriately located inshore and useless in determining accurate offshore wind speeds and direction.

e) that the light station at Kains Island (Quatsino Sound) was situated somewhat inshore and often not an accurate indicator of offshore wind speeds and direction.

f) that the same applied concerning the Cape Scott light station. Keepers at both Cape Scott and Kains Island do supply "estimated winds offshore" which are included in the broadcast of local weathers from Coast Guard Stations. This is appreciated and of some help, but nevertheless only an "estimate" evaluated from some distance.

We are of the understanding that automatic wind speed indicators have recently been installed and are shortly to become operational on Solander Island and Sartine Island. These installations will help, however a serious gap will continue to exist in assessing accurate indications of offshore wind speeds between Estevan Point and Solander Island. As previously noted, the old Loran "A" station at Spring Island which used to cover this area is no more. We therefore recommend that an automatic wind speed indicator be installed at Ferrer Point (Esperanza Inlet). Perhaps the Lawn Point equipment could be moved there.

The P.T.A. recommends that Alert Bay Coast Guard Radio, broadcasting through the Holberg periferal, supply the Solander Island and Estevan Point local weathers on its broadcast of local weather and continuous marine broadcast (C.M.B.) This would give vessels travelling eastward from Cape Scott some indication of what offshore conditions to expect in the Kyuquot to Nootka region.

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The effective reliable range of transmission of weather information from Tofino Coast Guard Radio through the Eliza Dome periferal in poor weather conditions ends mid-way between Kyuquot Reef and Clerke Pt. (see attached map). The effective reliable range of transmission of weather information from Alert Bay Coast Guard Radio through the Holberg periferal under poor weather conditions ends mid-way through Brooks Bay. Under good weather conditions the transmissions from both Eliza Dome and Holberg collide and thus become garbled and unreadable between Clerk Pt. and Solander Island. Recent additions and improvements to the M.O.T. V.H.F. network on the coast has not resolved this local problem. The Brooks Peninsula headland (Cape Cook-Solander Island) is a "pinch" location that all vessels transiting the outer coast of Vancouver Island must round. It is also a location known for severe weather conditions.

Transmission of weather information in this vicinity must be clear and strongly received by vessels. We therefore recommend that M.O.T. investigate the possibilities of transmitting the C.M.B. from both Holberg and Eliza Dome periferals on separate and distinct V.H.F. frequencies. The power output of both perifieral transmitters should also be increased.

We wish to bring your attention to the West Coast of the Queen Charlotte Islands between Cape St. James and Langara Island. This distance of 170 miles is entirely without any capability to monitor local weather conditions. We therefore recommend that Marble Island at the southern entrance to Skidigate Narrows be seriously considered as a site for installation of an automatic wind speed indicator. One particular advantage to this would be to supply prior notice to vessels leaving Queen Charlotte City as to what conditions to expect on the outer coast before leaving the shelter of the Narrows.

Regarding the issuance of gale and storm warnings through Coast Guard Stations, we recommend that station operators broadcast such warnings to the fishing fleet as soon as is practically possible after receiving information from A.E.S. In practical terms this means broadcasting on 78A, 79A and all other V.H.F.

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frequencies known to be worked by the fishing fleet in the area; outside the framework of the CMB, scheduled weather broadcasts or recognized priority channels. While this approach may be viewed as unorthodox or "outside channels" it would nevertheless improve reaction time of the fishing fleet to approaching bad weather.

Concerning the adequacy of air-sea rescue capability on the coast, it has been the observation of many P.T.A. members that Coast Guard lighthouse-tending helicopters (of the Bell 212, Alouette and Jetranger types) are frequently on location ferrying supplies, rotating lightkeeping personnel and families, and transporting maintenance crews. These aircraft are by coincidence frequently in the vicinity of a marine incident yet are not equipped with even the most rudimentary lifesaving equipment in a secondary role.

We therefore recommend in the strongest possible terms that these aircraft be equipped where possible with liferafts capable of being dropped to a vessel or persons in the water; marking signals such as smoke flares; slings and/or winches to lift or pull persons to shore, liferafts or other vessels. We are not suggesting that these aircraft take on a new primary role - that obviously is the job of fully equipped and manned DND or Coast Guard air-sea rescue aircraft. Nevertheless, we do see a very important secondary role for lighthouse tending helicopters where it is practical to add lifesaving equipment.

This Association perceives a trend by government toward full automation of what are now manned major lighthouse stations on the coast. We protest this action by government and state emphatically that the majority of major lighthouse stations on the coast must continue to have a year round manned presence. The value of light keeping personnel as coast watchers, dispensers of emergency aid and sources of current and local knowledge regarding actual and probable conditions can never be accurately quantified because it is priceless. Countless occurrences have been documented where lightkeepers have spotted vessels in distress, resulting in timely rescues. Automated equipment will never substitute in this role and fishermen will react against any attempts to do away with the manning of major light stations.

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Pacific Trollers Association

In summation, the Pacific Trollers Association hopes this letter will provide constructive input for needed improvements in coastal weather reporting and rescue capability. This Association is prepared to supply whatever additional ongoing information or assistance may be required toward improving safety on the B.C. Coast.

Yours truly,

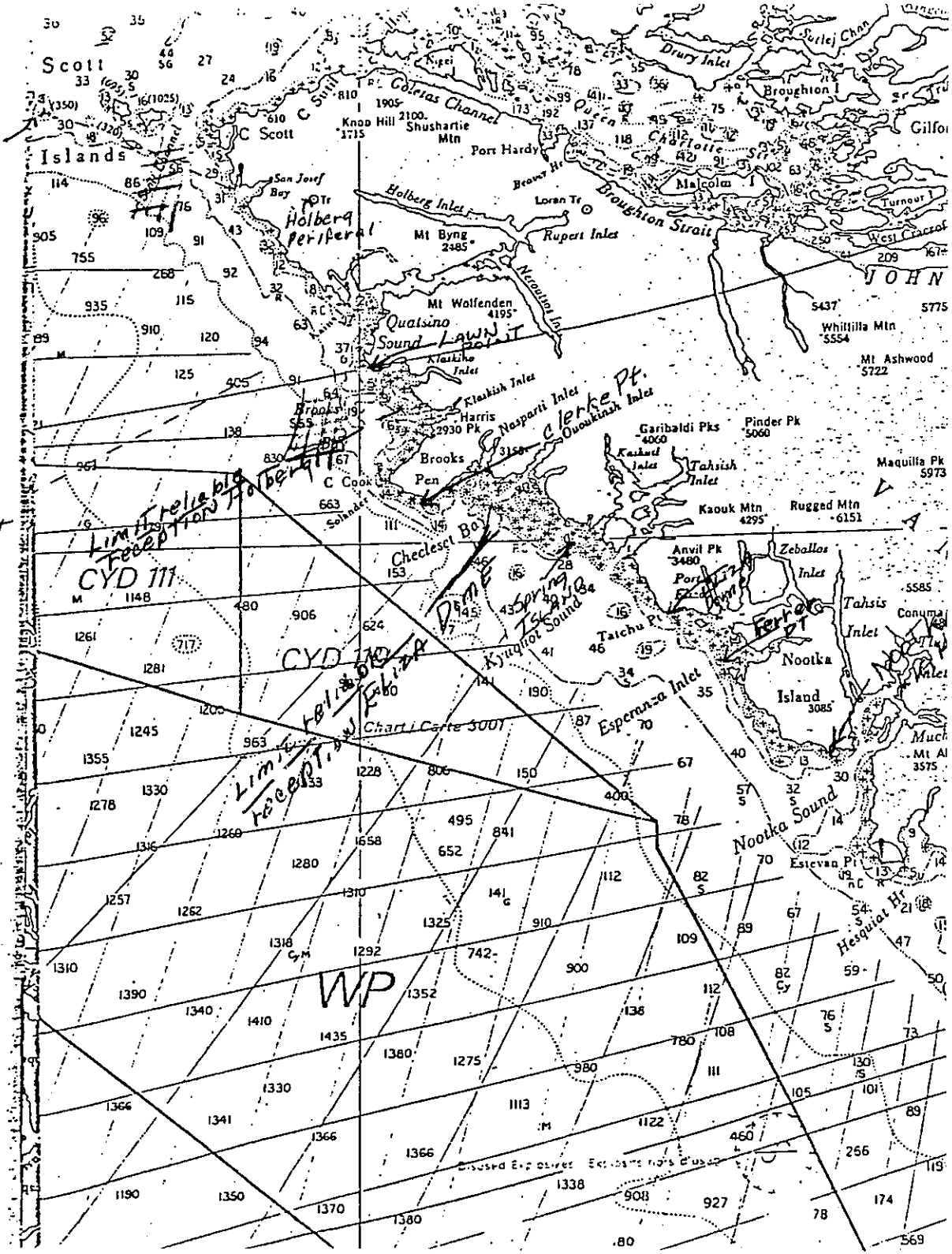
Alan H. Meadows
President

PACIFIC TROLLERS ASSOCIATION

cc:

Mr. Herb Buchanan, Director-General, Canadian Coast Guard
The Honourable Don Mazankowski, Minister of Transport
Mr. C. Wayne Shinners, Director-General, D.F.O.
The Honourable John Fraser, Minister of Fisheries & Oceans
Dr. D.R. Dawson, Regional Director, A.E.S.
The Honourable Suzanne Blais-Grenier, Minister of the Environment
Mr. Ron Rose, Vancouver Sun

Suite 625 - 5960 No. 6 Road, Richmond, B.C. V6V 1Z1 Phone: (604) 273-4213



Location of recent incident shown in red

Appendix 14.

Submission from the Canadian Merchant Service Guild.

received
Nov 13, 1984

Canadian Merchant Service Guild

A NATIONAL ASSOCIATION OF
MASTERS - MATES - PILOTS - ENGINEERS AND OTHER MARINE OFFICERS

AFFILIATED WITH
INTERNATIONAL MARITIME PILOTS' ASSOCIATION | CANADIAN LABOUR CONGRESS | INTERNATIONAL TRANSPORT WORKERS FEDERATION

WESTERN OFFICE
230 WEST BROADWAY
VANCOUVER, B.C. V5Y 1P7
TELEPHONE 872-7811
TELEX 04 55631

NATIONAL OFFICE
1150 MORRISON DRIVE
OTTAWA, ONTARIO K2H 8S9
TELEPHONE 829-9531
TELEX 05 34780

EASTERN OFFICE
3235 GRANBY AVENUE
MONTREAL, P.Q. H1N 2Z8
TELEPHONE 254-4571
TELEX 05 828754

Vancouver, B. C.,
9th November 1984.

Professor Paul LeBlond,
U.B.C. Chairman,
3555 Dunbar Street,
VANCOUVER, B.C. V6S 2C4

Dear Professor LeBlond:

SUBJECT - INVESTIGATION OF THE MARINE STORM OF OCTOBER 12th 1984

Not having the opportunity to review and analyse the Storm nor procedures used to prepare and issue forecasts, our recommendations will be based on past experience.

With regard to the Storm itself, it seems that most of the vessels were already in trouble or had sunk before a revised warning came out. This we learned in discussion with some of the fishermen involved.

I have personally experienced this situation a number of times myself where the forecast was for winds of 15-25 and suddenly you find yourself in winds of 45-50 and in two cases over 80, with no warning and some time later a revised forecast or wind warning comes out.

For early warning we recommend replacement of the Weather Ships or provide a suitable equivalent.

LOCAL WEATHERS

Many of the Lighthouse Stations such as Cape Scott, Kains Island and Nootka are of little value for local wind velocities and directions because of the position of their equipment. The wind velocity recording at Cape Scott is usually anywhere from 10 to 40 knots lower than actually experienced at sea. The estimated winds and wave heights are not very accurate and of course are not available after dark.

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Professor Paul LeBlond, 9th November 1984.

This is also true of Kains Island and Nootka and many times these two Stations will have outflow winds and the weather 2 miles at sea will be considerably different. This is true to a lessor extent of Lennard, Amphitrite and Beale, while Estevan and Carmanah are more reliable in velocities. It is a fact that the wind velocities are higher across the sea and none of the Stations have equipment for determining wave and sea heights.

In fact between Estevan and Cape Scott, the most reliable reports came from Spring Island which of course has been shut down.

We recommend the use of weather buoys off the Coast for local weathers.

We are concerned with the length of time between the actual time the Station Keeper records the weather until the time he communicates this to the collecting Station and they in turn transmit this to ships. We think that the total elapsed time could be considerable so we think the actual time the Station Keeper takes the weather should be stated in the broadcast.

We feel that the local weathers should be collected and transmitted more times than they are now and we wonder at the reliability of Rose Spit and Lawn Point when we often hear that they are "not available".

We think that the continuous tapes should be up-dated more often and as soon as possible after collection and that these tapes should be broadcast over a wider area, many areas are not covered. This would provide better voyage planning for Tugs and Fishing Vessels which often travel at 10 knots and so cover considerable distances between updates and forecasts.

SUMMARY OF RECOMMENDATION

1. Replace Weather Ships or provide a suitable equivalent.
2. Weather buoys along the Coast at strategic positions to provide wind force and direction, sea and wave height and directions, water and air temperature, current direction and velocity.
3. Broadcast the actual time the local weather is taken by the Station Keeper.

Professor Paul LeBlond, 9th November 1984.

4. Collect and transmit local weathers more times than they are now and immediately broadcast wind warning if wind velocity rises more than 10 knots over the forecast high.

5. Update continuous tapes more often and broadcast next update times.

6. Increase the area coverage of the tapes so that better voyage planning can be achieved.

7. Upgrade Rose Spit and Lawn Point to ensure reliability.

Respectfully submitted.

Capt. Griffiths S. Morris,
CANADIAN MERCHANT SERVICE GUILD,
Western Branch.

GSM:b

c.c. Archie Kario.

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Appendix 15.

Submission from the U.F.A.W.U.
(United Fishermen And Allied Workers' Union).

PRESIDENT: J. H. NICHOL • SECRETARY-TREASURER: GEORGE HEWISON • BUSINESS AGENT: WILLIAM PROCOPATION

UFAWU

UNITED FISHERMEN AND ALLIED WORKERS' UNION

HEADQUARTERS: THE FISHERMEN'S HALL, 138 EAST CORDOVA STREET, VANCOUVER, B.C. V6A 1K9

Telephone 684-3254

November 14, 1984

Honourable John Fraser
Minister of Fisheries & Oceans
House of Commons
Ottawa, Ontario
K1A 0A6

Dear Mr. Fraser,

The last meeting of our safety committee dealt with the west coast storms of April 15, 1984 (3 fishermen's lives lost) and of October 11th and 12th, 1984 (5 fishermen's lives lost as well as 7 fishing vessels). Our conclusions were that deficiences in A.E.S. weather forecasting as well as lack of adequate rescue facilities were reasons for the loss of life. The consensus was that if up-to-date technology were used to upgrade both services, such incidents need not happen. We, therefore, call for an inquiry under the Public Inquiries Act into the A.E.S. weather forecasting on the Pacific Coast, a responsibility of Environment Canada as well as S.A.R. marine capability on the west coast, a responsibility of Transport Canada and D.N.D. Our experience with previous internal inquiries into these matters has been that not much positive improvement takes place.

The Honourable Suzanne Blais-Grenier, Minister of Environment, has asked Paul LeBlonde, U.B.C. oceanographer, to conduct an investigation into the storm of October 11th and 12th. Notwithstanding our call for a full public inquiry, we are cooperating with him, hoping that the result will be a more trustworthy west coast weather service. Enclosed are recommendations that we have submitted to him.

The Minister of Transport has promised an inquiry into the October disaster. We know that Marine Casualty Investigations of Transport Canada provides a routine report of all incidents involving loss of life and ships in Canadian waters. If this is all the Minister intends, we are highly unsatisfied.

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In our experience, what happens is that the Western Regional personnel do the report and send it to Ottawa from where it finally becomes available. Fishermen who cooperate in the compilation of the report, are forbidden to get the original from the Western Region. The report from Ottawa is usually very concise and very seldom does it contain detailed recommendations to correct the causes of the incident. In any case, we suggest that you contact Captain B.C. Thorn, Chief Marine Casualty Investigations, 9th floor, Tower A, Place de Ville, Ottawa for the reports on the Hurricane I (C.A. Casey, owner, presumed drowned), Miss Robyn (crew: R. Cowlan and R. Malczewski lost at sea), Silver Triton (crew: J. Cartwright, T. Szezuka lost at sea) as well as for the abandoned fishing vessels Producer, Invercan IV, Scallywag and Lady Val II whose crews were rescued.

The B.C. Coroner's office will no doubt conduct an inquest into the deaths of Casey, Cowlan, Malczewski, Cartwright and Szezuka. The findings will most likely contain pertinent recommendations for the prevention of future incidents. However, application of Coroner's findings by the federal departments involved seldom takes place.

No doubt, you will agree that our call for a thorough investigation under the Federal Public Inquiries Act is a valid one. Positive results from internal inquiries and Coroner's inquests have not been satisfactory in the past and we have no reason to believe that the investigations into the October disaster, underway at present, will be any different.

Copies of this letter will be sent to the Ministers of Transport, Environment and Defence as well as the Minister of Science & Technology. Our hope is that you would convene your colleagues for a meeting that would arrive at forthright positive action to upgrade the west coast weather service and the S.A.R. marine capability.

Sincerely yours,

UNITED FISHERMEN AND ALLIED WORKERS' UNION

for Archie Kaario,
Standing Committee on
Navigational Aids &
Safety at Sea

AK/pm
encl.
cc: Jim Fulton
Paul LeBlonde
Griff Morris
Mr. Slaught

PRESIDENT: J. H. NICHOL • SECRETARY-TREASURER: GEORGE HEWISON • BUSINESS AGENT: WILLIAM PROCOPATION

UNITED FISHERMEN AND ALLIED WORKERS' UNION

HEADQUARTERS: THE FISHERMEN'S HALL, 138 EAST CORDOVA STREET, VANCOUVER, B.C. V6A 1K9
TELEPHONE 684-3264

October 24, 1984

PROPOSAL TO UPGRADE A.E.S. WEATHER FORECASTING

A. Cloud tracking radar to be located at:

1.) Langara or Masset DND Base.
2.) Cape St. James.
3.) Cape Scott.
4.) Amphitrite or Tofino.
5.) Cape Beale.
6.) Cape Flattery.

B. More automated weather buoys.

C. Land based automatic wind and barometric indicators at Solander Island (Cape Cook) and Triangle Island on site of the discontinued light house. Both to be continuously monitored by Cape Scott Station.

D. Recommission weather ships.

All above necessary to back up satellite system and information available from ships of opportunity and aircraft to avoid incidents such as occurred on April 15th/October 11th & 12th, 1984, where weather information did not give indication of the sudden storms which resulted in loss of life.

Submitted by: U.F.A.W.U. Standing Committee on Navigational Aids & Safety at Sea

Appendix 16.

Report from J. Scanlon.

"TOO LATE TO RETURN:
FISHERMEN AND WEATHER WARNINGS
ON CANADA'S WEST COAST"

BY

Joseph Scanlon and Angela Prawzick
with Jonathan Whitten and Suzanne Cote,
Emergency Communications Research Unit,
Carleton University,
Ottawa.

Prepared for:
Atmospheric Environment
Service,
Vancouver.

PART I:

THE SYSTEM

Late on October 11, 1984, the Atmospheric Environment Services (AES) of Environment Canada issued a storm warning for certain Pacific waters off British Columbia's west coast. The warning was more than justified for it was closely followed by a storm so severe that seven fishing vessels foundered, five fishermen lost their lives.

As soon as the warning decision was made, the elaborate warning system set up by AES and the Canadian Coast Guard went into place. The warning was pumped out over marine distress channels and over working channels used by ocean traffic and Coast Guard itself.

Unfortunately, the warning was not issued over 78A VHF radio channel most commonly used by fishermen and, for that reason, it was not always quickly heard. That may not have mattered. There is substantial evidence it was already too late. Most of the fishermen who later died or got into trouble had committed themselves. They were either already in trouble or the weather had deteriorated before the warning to the point they could no longer turn back.

But the real problem with weather warnings on the west coast is not with what happened specifically on October 11-12. It's with a system which the whole structure of the west coast fisheries, especially a salmon fishery which encourages fishermen to take risks. Any improvement in the system must involve not just a change in the way warnings are issued. It must involve a new approach to fisheries decision making on the west coast.

This report starts, therefore, not by reviewing the weather

system but by examining the way fisheries decisions are made. It then examines how the weather system works both at normal times and during gales and storms. Next it makes some recommendations. Finally, it examines how the system worked for the October 10-11 fishery and for the October 11-12 storm to see if the proposed changes would have altered what happened.

Essentially the recommendations call for two things:

1. For a closer relationship between Fisheries and Oceans, AES and the Canadian Coast Guard: and

2. For an adjustment in the warning system to make it fit the actual communications networks.

This report was prepared by the Emergency Communications Research Unit (ECRU) at Carleton University in Ottawa for the inquiry appointed by the Minister of the Environment. It was done under contract with AES. The statements in it are entirely the opinions of the authors.

Fisheries

The salmon population on the west coast in monitored continually by the federal department of Fisheries and Oceans. This is done to ensure that sufficient salmon reach inshore spawning grounds each year to guarantee the future of the fishery.

When a particular type of salmon has moved inshore in sufficient numbers in a particular area, Fisheries and Oceans decide that that area can be opened for fishermen. A statement is prepared announcing just that.

In recent years, in the case of salmon, most such announcements involve specific limited areas in protected coastal waters. These areas are usually opened for a specific time period and are monitored by Fisheries and Oceans vessels while they are open.

Once a decision to open is made, Fisheries and Oceans communicates it to the industry in various ways. Notices are posted in various locations including post offices. Telexes are sent to the major packing companies. The information is broadcast over the marine radio channel used by Fisheries, channel 78A VHF and the information is put on a recording which can be reached by a 24-hour phone.

One way or another - the grapevine is very efficient - fishermen learn about it. They then set out for the area in question.

Although fishermen try to anticipate any such announcement

(they try to scan fisheries radio traffic so they can guess future decisions) they usually can act only when an announcement is actually made. On hearing it, they must move immediately from where they are to the location.

Usually salmon fishing announcements are made 24 hours before an actual fishery, sometimes it is less. That means most fishing boats have little choice but to go as soon as they hear the announcement. Any delay and they would miss the fishery.

The fact is so little lead time is given, of course, is understandable. It is not possible to open an area until sufficient salmon have gone spawn. After that, further delay could mean most fish could be gone.

The decision to open a fishery, incidentally, is made by Fisheries and Oceans on its own. There is no consultation with any agency involved with the weather or ship safety. There is no formal attempt to communicate it to agencies such as AES or the Canadian Coast Guard.

The announcement of a specific fishery is, therefore, an independent decision by a federal government department, Fisheries and Oceans. It guarantees a number of fishermen will travel to a specific location and will be there for a pre-determined time period.

Fishermen

Who are these fishermen?

Two types of fishermen are involved in the salmon fisheries.

There are the gill netters, small (six or seven metres) one or two man boats. There are also the seiners (1 4 to 15 metres as large as 20 metres) with a five or six man crew.

The gill netters fish by dragging a net behind them so fish will be caught by the gills in the net. The seiners fish by putting out a net in a circle then using cable to close it underneath (a purse seine). Fish are caught in the net as if it were a basket: they are not trapped by the net itself.

Gill netters all carry some sort of radio equipment - usually a CB radio and a VHF. They usually travel in packs, sometimes as many as 20 or 30 travelling together. Seiners are likely to be far better equipped. They usually have CB, VHF radio, sidebank and several scanners. Quite often, they fish with "buddies" which means three, four, five or six of them will travel in reasonably close company.

Both types of boats are driven by the same basic compulsion: they make their living by catching fish. When a fisheries is opened both head from wherever they happen to be to that location. They then wait for the opening time - a fishery is opened from a specific hour to a specific hour - and start fishing. When time runs out they stop.

When a fishery ends - and sometimes before if the catch is not that good - most fishermen sell their catch to various

packing boats and cash bars on the fishing ground. This can sometimes lead to line-ups and as the various companies may not be offering the same price. A few larger boats (all seiners) may decide to carry their catch to a purchaser elsewhere.

Once a fishery ends and the catch has been sold, the fishermen usually try to move as quickly as possible to a location at or near the next fishery. Usually they either have picked up some information (most of them use scanners to monitor fisheries traffic) or some rumors about the next likely location. That information definitely affects what they do next.

What they do is also affected by the weather.

If it is apparent that weather conditions are changing (especially if they are becoming more severe) the fishermen will attempt to move as quickly as possible to avoid being trapped by increasingly severe weather. They do not want to get trapped in an area now closed. They may, in short, take immediate risks to avoid long-term economic consequences.

Not only that the direction in which they move may be affected by the weather. If conditions are such that wind and water will drive them north they will head in that direction.

What happens if there is a gale or, perhaps, storm warning in effect?

If it is a gale warning, fishermen will probably move anyway. They know gale warnings are not uncommon on the west coast and most of them are confident they can survive such weather.

If the gale warning suggests a gale will hit sometime in the future they are even more likely to move. Staying increases the changes of getting trapped. It is, in their view, best to move to beat the weather.

A storm warning is a different matter.

If a storm warning is issued, the fishermen will try, as quickly as possible, to reach a safe harbor. If they already are in protected waters they will stay there.

A storm is, in a sense, just a gale which has become more severe; for a storm starts (in terms of wind speed) where a gale stops. To a fishermen, however the two are perceived as quite different. Gales can be survived. Storms can not.

Communications

While they are travelling fishermen monitor and talk to each over either by CB or sideband. Sometimes they do this by using the main marine channel (78A). Sometimes they use other marine channels not otherwise occupied (channel 80).

Sometimes they and their buddies agree to use a specific VHF channel for their own private conversations.

No matter what channel they use for talking, most fishermen keep one radio tuned to 78A because that is where they expect to hear any further fisheries announcements.

On occasion fishermen will also tune in to one of several other channels. They will go to the VHF channel where weather information is issued (the channel number depends on location) or - if problems develop - they will go to one of the distress channels such as 21B VHF. (There are also distress channels on sideband.)

While fishing, most fishermen are too involved to monitor radio traffic over any channel except 78A, the key fisheries channel. It is the channel which will tell them if any new fisheries information is being given out; and it is the channel which will be used for any pronouncements by the Fisheries and Oceans vessel at a specific fishery.

When they leave a fishery, fishermen will probably check in on two radio channels. They will make a final check with the Fisheries and Oceans vessels to hear the latest fisheries information and to hear (from it) any current weather data. They

will also check the Continuous Marine Broadcast (CMB) which includes weather. Fisheries are usually in protected waters: fishermen need to know the weather again now they are heading back to open sea.

Weather

Weather information is available to fishermen in several ways.

First, marine forecasts are prepared by AES, passed on to the Coast Guard and broadcast continually 24 hours a say. They form part of the Continuous Marine Broadcast (CMB) which is available from all coast guard stations on the west coast.

These forecasts - they are only part of the total information on CMB - are updated three times each 24 hours. As soon as an update is issued it is recorded onto a cassette at each Coast Guard station and that casette is made part of the total package put on the CMB.

Forecasts for each station (this has been predetermined) include weather data not just for the area around that station but areas nearby. Boats travelling near the station can hear the forecast which covers where they are, where they have been and, more important, where they are going.

Coast Guard stations also put out another type of weather information. At set times they broadcast information about weather observations they have received from nearby lighthouse (the two are not identical in form). Those observations are broadcast at pre-announced times.

Such broadcasts can. to some extent, be misleading.

They are not the actual weather offshore at the time because the coast guard stations and lighthouses are onshore, often in protected waters. They are also not up-to-date because they are

collected before they are broadcast sometimes several hours before. They are also observations not forecasts. They contain the weather at the time it was recorded not the weather as it will be. A fishermen heading toward a coast guard station may be hearing local weather that is out-of-date, reflects protected water rather than offshore conditions and will have changed again by the time his boat nears the station.

Despite these limitations, most fishermen do monitor these broadcasts: they are quite familiar with their limitations.

Finally, fishermen acquire weather information through informal channels. They talk to and listen to each other. They listen to broadcasts made by other vessels. (If a Fisheries and Oceans vessel announces it has not been able to collect data for an area the fishermen know the weather must be bad though not necessarily why it is bad.) They sometimes radio ahead to ask other vessels about conditions in the direction they are heading. (This, too, can be misleading since conditions may have changed by the time they get there.) They sometimes chat (usually over CB) with lighthouse keepers and with Coast Guard, on an informal basis.

Warnings

When there is a significant change of weater expectations between regular forecasts, AES and Coast Guard co-operate in putting out special weather warnings. The system is the same for both gales and storms.

First, AES notifies all Coast Guard stations affected (that means all those who put out forecasts for an area) that a gale warning or storm warning is being issued.

Next, the Coast Guard puts out those warnings in a series of ways.

First, the Coast Guard cuts in on the two major distress channels - 2182 MHF and 21B VHF - and makes an urgent announcement. The announcement - made simultaneously over both distress channels - both announces the warning (though in abbreviated fashion) and announces that further information will be broadcast immediately over two other channels - 2054 MHF and over the appropriate VHF channel. (This channel varies by location but, at all locations, is the same channel over which the Continuous Marine Broadcast including weather is being transmitted.)

Second, after putting out the urgent signal over the two distress channels, the Coast Guard repeats that signal and adds the detail weather on those second two channels.

Third, the Coast Guard operator records the new weather - the gale or storm warning - and uses that casette to replace the one which previously had carried the regular forecast.

The CMB now carries only the weather warning.

Once that it is done the operator turns to the morse code frequencies and repeats the process. First he puts out an urgent signal over the distress channel (500KH) then he repeats the urgent and adds the revised forecast over a working channel (478 KH).

Even as this process is going on, AES are putting together a revised forecast and, as quickly as possible, transmitting that forecast to the Coast Guard stations on the west coast.

When that forecast reaches the various stations the entire warning process is repeated:

1. An urgent is broadcast over the two main distress channels (this time announcing a revised forecast);
2. That announcement tells those listening to tune into the two working channels;
3. A complete revision is broadcast as an urgent message over the working channels;
4. That revised forecast is recorded and the casette is used to replace the one with warning;
6. The same urgent is broadcast in morse code in the same way.

Once this process is over, the urgent warning has been put out on all distress channels and over three working channels. In addition the CMB weather has been completely updated. A fully revised forecast has replaced the original one.

As is clear, the system is both somewhat complicated and

somewhat time consuming. It does not always work that efficiently.

First the system of getting warnings from AES to various Coast Guard stations sometimes is fairly slow. If the stations are already on the telex warnings may make a considerable time to get through.

Second, the fact that many stations have just one Coast Guard operator may mean that operator can not drop everything to put out the warning. This is especially true if ships are already in distress: weather warnings are a third priority on the major distress channels.

Third, when the initial warnings are given, they replace the existing weather. That means that, for a time, some parts of the original forecast may be dropped. If, for example, the warning covers just one area - say west coast Vancouver Island - the existing warnings for adjacent areas may no longer be heard. (That problem is not corrected until the revised forecast is issued and broadcast.)

Fourth, it takes time for AES to do a complete update of the forecast. That means the full revised forecast is not immediately available.

Fifth, and most important, the system assumes that those affected by the warning will be listening either to one of the distress frequencies and/or to the working channels including the one carrying the CMB. As must be already apparent, that is not necessarily the case.

The fact that fishermen do not hear weather warnings directly, may not always be a significant problem. The fact fishermen constantly talk to each other and listen to each other means that if any one fishermen in a pack or group hears (or overhears of) a warning, all others will hear it, too.

Sixth, the system does not make any attempt to locate important specific targets such as Fisheries and Oceans or its vessels or such as large fleets of boats which may be at one location (there are some places where regular marine broadcasts don't easily get picked up) it is possible warnings will be overlooked.

The system, over all, then has one major flaw.

It goes out according to a set of pre-determined procedures without regarding to any specific marine situation which may exist at that time. It is, in short, not in any way tailored to meet the needs of the fisheries.

PART II:

SUMMARY AND RECOMMENDATION

It must be apparent by now that what happens before, during and after a fishery is almost routine.

1. Fisheries and Oceans decides an area is suitable for fishing;

2. It announces that 24 hours before the opening.

3. Fishermen learn of the announcement and head to the fishery.

4. En route they talk to each other by radio and listen to the weather but they go unless the weather forecasts is so severe (storm). they dare not.

5. While the fishery is actually open fishermen listen almost exclusively to the fisheries channel, 78A, VHF.

6. Once a fishery ends fishermen sell their catch then leave, usually heading either home or to the next likely spot for a fisheries;

7. The way they leave is conditioned by several things: the next most likely location for a fishery; the weather (which direction is the easiest to go) the weather forecast (a gale warning some hours distant is likely to make them move so as to beat the worsening weather.)

8. During this entire process several government agencies are involved: Fisheries and Oceans; Atmospheric Environment Service (AES); the Canadian Coast Guard.

9. While the latter two, AES and Coast Guard, co-operate in putting weather forecasts and warnings there is no attempt to tie these forecasts or warnings to decisions about the fisheries.

10. There is also no attempt to tailor warnings to specific needs of fishermen, for example, to the presence of a great many fishing boats in one location.

11. No warnings are ever formally put out over the channel most listened to by all fishermen on the west coast, channel 78A VHF.

12. No warnings are ever formally passed to Fisheries and Oceans vessels at fishing grounds even though the vessels, at such times, are in continuous radio contact with all fishermen at a site.

Recommendations

All this leads to some obvious recommendations.

When Fisheries and Oceans are monitoring the fisheries and making decisions about opening areas for fishing they should maintain contact with AES and the Coast Guard. Any decision to open a fishery should be made only if it is clear it will not lead to a movement of fishing boats in weather conditions which are likely to be dangerous.

The 24-hour lead time may, for example, make no sense: if the lead time were longer fishermen would not feel compelled to move so quickly.

When AES are putting together marine weather forecasts and especially marine weather warnings, they should be kept aware of the presence of large numbers of fishing boats moving in one direction or in one place. Ther should be special concern that any severe weather which might affect those boats is brought to their immediate attention.

When weather warings are put out they should be broadcast not just over the various distress and working channels but also over the channel most listened to by fishermen, channel 78A VHF.

Such warnings ought also be passed directly to Fisheries and Oceans vessels at the fishery so they can pass the news onto fishermen. It would probably be extremely helpful if the marine forecaster talked directly (via sideband) to the Fisheries and Oceans vessel at each fishery so that an understanding of conditions at that site and the state of the weather can be

exchanged.

When warnings are issued they must be put out immediately - even if in very abbreviated form - over the distress channels. It may seem to make sense that actual distress calls take priority over weather warnings. It surely does not make sense when a delay in warning because one boat is in trouble will result in a number of other boats getting into trouble because they are unaware of the growing severity of the weather.

It is our understanding that the various agencies concerned with fisheries and weather and safety on the west coast - including Fisheries and Oceans, AES and the Coast Guard - do consult as a matter of course during the herring fishing season. It seems sensible to us that such consultation should take place at all times.

It is understandable that no system can ever be so personalized as to meet the needs of each individual, each individual boat. It surely is not understandable that such a system - designed as it is to get out warnings to those who need them - should not be designed to service large numbers of fishermen in one location and to do so through the channel they are already listening to, channel 78A VHF.

We are suggesting, in short, that the AES system must be adjusted to take into account the needs of fishermen and that to do that it must be tied into the decision making process and the communications systems of Fisheries and Oceans and the fishermen themselves. We are also saying that those making decisions about

fishing, decisions which affect the behavior of large number of boats, need to be sensitive to the possibility those decisions will expose fishermen to risk.

Fishermen trust AES: that trust must be honored.

There is one further point.

Gale warnings and storm warnings are seen by fishermen as quite different in character. The gale warning is usually ignored. The storm warning triggers specific action.

In one one way, this is understandable. A severe gale is far, far less of a weather situation than a severe storm. At the extreme, the two are an enormous distance apart.

The dilemna is, however, that a severe gale is in reality a mild storm. It is a weather situation which can not be handled effectively by many of the smaller craft involved in the fisheries, craft such as the average one or two member crew gill netter, craft which are no larger than the pleasure boats found all over west coast waters.

It seems to us that some thought needs to be given - when a gale warning is issued - to whether the date available suggest that gale will be relatively mild or relatively severe, in short as to whether it is likely to eventually end up as a storm. This may call for a more difficult form of forecasting. It may also eliminate one of the present problems in reactions to forecasts: fishermen apparently will take precautions when they hear a storm forecast; they will not do so for a gale.

Finally, it would appear that the precise wording of a

forecast especially information about the precise time winds will reach a specific force must be considered as being extremely important when a forecast is drafted. Fishermen react not just to the warning but to it implicit timing. They know their speed and the distance they have to travel. Even if a gale warning is issued, they will ignore it if the specific forecast does not indicate gale force winds will actually arrive until they have had time to complete their journey.

Any prediction of increasing wind must be as precise in time as is humanly possible.

What we are really saying is that fishermen listen to and believe what AES says. Not only that, they act on the basis of the exact information in a forecast.

In a sense that is reassuring.

But it is reassuring only if those making the forecast understand that when they say gale winds will arrive the following day fishermen will risk their lives on the assumption that information is precisely accurate.

PART III:

THE OCTOBER 11-12 STORM

On October 9-10-11-12, 1984, the system described in the first part of this report was put to the test. It functioned almost exactly as described. In other words, it failed.

In a period of roughly 12 hours on the night of October 11 and the morning of October 12, seven fishing vessels were lost at sea. (Four sank. Two capsized. One had to be abandoned.) Five fishermen died. Thirteen others had to be rescued.

Although the Atmospheric Environment Service (AES) forecast both the gale and the storm which caused these problems it did so too late for safety and in a way which encouraged fishermen to take chances. By the time it was clear a major storm was about to hit Vancouver Island, some fishermen were already in trouble. Others had gone too far to turn around. Many fishermen never heard the storm warning. By the time it was issued, that made little difference.

Events began on the afternoon of October 9 when Fisheries and Oceans decided chum salmon escapement requirements were being met in two areas along the west coast of Vancouver Island, Lower Nootka Sound and Kyuquot Sound (they are about 32 kilometres apart). A fishery was to be opened at both places from 10 a.m. October 10 until 10 a.m. October 11.

The announcement of the fishery was put out over the fishing channel, 78A VHF, at 3:49 p.m. on October 9, just more than 18 hours before the two sounds were to be open. Word of it spread immediately among fishermen along the coast. Some actually heard the broadcast on 78A VHF. Others got it when it was put on the

24-hour record line. Some were notified by the various packers which had received a telex. Most heard it by word of mouth from other fishermen.

Fishermen all along the coast began to head to the two fishing areas. Some had been standing by in that area waiting for a fisheries announcement. Others were in harbor some distance away. Some had left their boats nearby but had to fly to Vancouver Island to join them so they could take part in the fishery.

Before long an estimated 325 boats - about two-thirds of them gill netters - were in the two areas. They were joined there by about a dozen packers and cash bars and by two Fisheries and Oceans vessels (one in each sound). Travel to the fisheries was uneventful. The fishermen chatted with each other over their own private channels or over CB or sideband and, usually, monitored 78A VHF to see if there was any more news. Most had checked the weather before departure but had given it little thought otherwise.

Fishing had not been all that good all season and most fishermen could not afford to let another opportunity pass by.

> The fishery doesn't use weather...There's an opening you've got to go...That's the way it works out there.
>
> A lot of boats are travelling in this weather because they need money. They've got debts to pay. These 12 hour notices make us take chances we shouldn't have to...
>
> The worst thing is there is no correlation between Fisheries and weather and they dangle a carrot for fishermen...He can make a lot of money if he goes out in miserable weather.

Actually, en route the weather wasn't all that bad. There were gale warnings out for some areas further north (they had not been dropped since a previous gale); but none for the west coast of Vancouver Island.

Once the fishery began at 10 a.m., October 11, the fishermen had little time to pay attention to weather. Both fishing grounds were crowded and, for most, the fishing was not at all that good. Some found it so bad, in fact, that they decided to leave before the official ending. They sold their limited catch to the packers or cash bars and headed on their way.

Others didn't get away so quickly. The prices varied from packer to packer; so there were soon line-ups of boats at the packers with the better prices. Some boats had to wait several hours after the official closing time before they could leave. One or two seiners, in fact, deliberately delayed. They were somewhat worried about the weather; so they felt they should give the smaller gill netters a chance to sell their catch and go first.

As it turned out, the weather forecast was far from clear. What was being predicted depended on which direction the boats were going and when they actually left.

The marine forecast for 11:15 a.m. Thursday, October 11, for example, called for a continuing gale warning for Queens Charlotte Sound, Hecate Strait and Dixon Entrance (all to the north of Vancouver Island), for a small craft warning for Johnstone Strait and Queen Charlotte Strait between the island

and the mainland and for no warning of any kind for the west coast of Vancouver Island itself. Winds were forecast to be 25 to 35 knots Friday morning to the north, 15 to 25 Friday morning along the east coast and 20 to 30 Friday morning along the west coast.

That seemed to suggest the weather was deteriorating everywhere and that, in all probability, the warning would eventually apply to the west coast of Vancouver Island as well. It was a good time to go and - given the fact the winds were coming from the southeast - it was a good time to go north. Since there was also a rumor - some fishermen heard it, some did not - that the next fishery would be at Qualicum on the east coast of the Island, that encouraged a trip north as well.

Staying behind meant a chance at getting caught, a chance at missing the next fishery. Going immediately seemed a certain way to beat the weather. After all it was forecast to hit the next day.

> The gale warning wasn't for that night. It was for the next day...I would never have left if the gale warnings were for that afternoon.
>
> Everyone was in a hurry to do the travelling before the storm. The storm was forecast for the next day.
>
> I listened to the forecast at Nootka after the closing. The general warning wasn't supposed to come until the next morning.

Where did these fishermen get their weather information?

Most of them turned to the Continuous Marine Broadcast

ADDENDUM

By the time the storm warning was issued it made no difference.

Close to 90 per cent of the boats were no longer at sea when the warning came. Some had trucked their boats across the island. Some had made it to harbor according to plan. Quite a few had decided the weather was too severe and had turned in.

Of the rest, a few turned back (the weather convinced them it was too dangerous to go out), a few rode out the storm. Of those still at sea, only a few actually heard the storm warning and, if they did hear it, they almost always heard it from other fishermen.

The evidence available to date suggests that not a single fishermen made a decision on the basis of the storm warning itself. It had become irrelevant.

The gale warnings earlier did, however, affect behavior. A few took precautions. Most decided to move quickly because it was due the following day.

(CMB) where they could hear the gale warnings for other areas. Others talked by radio to the Fisheries and Oceans vessels and got much the same information. Still others radioed ahead to buddies who told them, at that point anyway, the weather was still holding. One boat found the weather so little threatening that he stopped to pick up some logs in order to try to make a little extra money.

Not all fishermen were so confident. The winds already blowing at 10 to 20 knots were stirring up waves as high as two metres. Some of the smaller boats decided to truck their boats across the island. Others decided to make a short run and then head into harbor. Eventually only 30 to 40 of the 325 boats were still at sea as the weather deteriorated.

As Thursday, October 11th, wore on, the weather information began to change and news of the change was rapidly passed along from fishing boat to fishing boat via 78A VHF.

The first major change occurred at 3:29 p.m. when a gale warning issued by the United States weather service was put on the CMB by the Coast Guard station at Tofino, seven minutes later. (It was not broadcast over the distress channels.)

The next change occurred at 6:53 p.m., just before the evening revised weather forecast. AES decided to issue a gale warning for most sout h coast wters. The forecast

called for the weather system to reach Vancouver Island Friday afternoon but it also mentioned the strongest winds - 30 to 40 knots - would come Friday morning ahead of that system.

The wording of that warning could have been confusing. At one point it was calling for a weather system to hit Friday afternoon. In the same warning it mentioned the heaviest winds would occur on Friday morning. Nevertheless it meant that the gale warning, previously issued just for northern waters, was now applicable to the west and east coasts of Vancouver Island.

Confusion about the precise timing of the gale must have increased a few minutes later when the revised forecast arrived with a changed prediction. The warning had called for winds of 30 to 40 knots Friday morning, presumably along both coasts of the island. The revised forecast - just nine minutes later - stated the winds would be 30 to 40 Friday afternoon along the west coast of the Island and 25 to 35 by Friday afternoon for Johnstone Strait and Queen Charlotte Strait along the Island's east coast. There were no mention of gale force winds for either place for Friday morning. In less than 10 minutes, it appeared the severe weather had been postponed.

The gale warnings was put out as required over the distress channels then repeated in detail over the various working channels including the CMB. The revised forecast

was not put out over the distress channels just the working channels.

That meant that fishermen who missed the warning either over the distress channels or over the working channels, and tuned in only in time to hear the revised forecast on the CMB, would never know that a warning had suggested gale force winds for Friday morning rather than Friday afternoon. It was about this time that some gill netters were debating going into Winter Harbor but - after reviewing the weather situation - had decided to go on. That was to be a fatal decision.

By now, the actual weather was steadily deteriorating and more of the remaining boats at sea had decided not to take chance. They had gone into harbor to ride out the storm. Others were already around the north tip of the island and heading south in comparatively sheltered water along the island's east coast. Still others, heading south, were approaching Victoria, another safe harbor.

Just a few hours later however the situation deteriorated still further. The gale was worsening and boats were starting to get into trouble.

9:12 a.m. The Producer (13 metres) began sinking off the west coast of Vancouver Island between Kyuquot and Quatsino sounds. (Two other boats were later to try to take shelter in the same area.)

11 p.m., AES issued a storm warning for west coast

Vancouver Island, Queen Charlotte and Johnstone Straits and for all northern waters. The storm was predicted for Friday morning with winds 45 to 55 knots and higher gusts ahead of the front. That met gusts of close to hurricane force would be hitting boats at sea during the next five or six hours.

11:13 p.m. The Invercam was in trouble and eventually had to be abandoned. Four fishermen had to be rescued.

11:16 p.m. The Coast Guard station at Tofino received the storm warning. It put it out over the distress channels two minutes later.

By this time those boats still at sea were hearing other boats in trouble. Most of the radio traffic was still on 78A VHF although some boats were starting to shift to the distress channel. The storm warning was <u>not</u> generally heard. (Very few boats were not at all interested in hearing weather over the CMB. It was obvious the weather was bad.)

11:30 p.m. AES issued a revised forecast for the west coast. It announced a gale warning upgraded to storm warning for west Vancouver Island, for the Johnstone and Queen Charlotte Straits and for waters further north. However the forecast was agin somewhat confusing. While the warning had suggested the severe weather would hit Friday morning, the forecast again differentiated between the west and east coasts of Vancouver Island.

The revised forecast said the winds would be 40 to 50

with higher gusts Friday morning along the west coast of the Island. It said that they would be 35 to 50 by Friday afternoon for Johnstone Strait and Queen Charlotte Strait. There was no mention there of earlier severe weather on Friday morning.

12:07 a.m. The Coast Guard station at Tofino got the revised weather forecast. It was some time before it was able to get it on the CMB because there were now enough problems at sea that other priorities had taken over.

12:40 a.m. Revised forecast put over Tofino CMB.

1:00 a.m. The Lady Val II was in difficulty.

2:27 a.m. Two more boats - the Miss Robyn and the Silver Triton - were attempted to shelter but had been driven out because of the severe weather.

These two boats had mad the earlier decision to continue around the tip of the island. They did not expect the weather to deteriorate so quickly. They had not been closely monitoring the changing weather doing most of their talking to each other over a tugboat channel, channel 80 VHF.

3:08 a.m. Both the Miss Robyn and the Silver Triton were in extreme distress. They went down in the next hour and a half. Four lives were lost.

4:30 a.m. The Lady Val II rolled over. It had been in difficulty since 1 a.m. and had been under escort by another boat. The one man aboard was rescued.

5:00 a.m. The storm is at its maximum intensity just six hours after the storm warning was issued.

Two other boats are yet to get in trouble. There was to be more fishermen killed.

The events of October 9-10-11-12 match the scenario described earlier. The origianl decision was by Fisheries and Oceans. Once they announced a fishery that inevitably led to many boats, gill netters and seiners, heading to the indicated spot.

While fishing, fishermen ignored the weather. Once they were finished they studied it once again. Even then, they often got their information not directly from official channels but often from others. Some did listen directly to the CMB. Others talked to the Fisheries and Oceans' vessels. Others chatted with their buddies.

Given the forecast - a gale was en route - some fishermen decided not to take chances. Others decided to do just that. They decided to head north with the wind and sea behind them, certain they could beat the storm. The precise timing of the forecast affected their decision.

As the weather deteriorated some were able to find a safe harbor. Others were able to ride it out. But some found it just too much to handle. They foundered, eventually went down. The weather had caught them unable to cope. While some got into trouble after the storm warning, others were in difficulty even before it was issued.

The reality is the warning made little difference. By the time the warning was issued - and by the time it got through - most boats were either stuck at sea or already safe. Some of them never did hear a storm warning. That mattered very little.

It seems quite clear that an earlier warning, especially one forecasting an earlier storm would have caused a different reaction. Fishermen believe they can ride out a gale, even a severe one. They are not convinced they can handle a storm. When they started out this time they thought they were going to beat a severe gale. They were wrong. Instead they got caught in a storm.

The events of October 9-10-11-12 indicate therefore that an earlier storm warning - if that had been possible - would have affected fishermen's behavior. That would have been especially true if that warning had come before boats had left the two fishing areas. They also indicate that the warning itself would have got through more effectively if it had come over channel 78A instead of the distress channels and the CMB.

It would also have helped a little if the two Fisheries and Oceans' vessels were even briefed. Although, in this case, the advice they gave out notched the AES forecast.

And they indicate that the exact timing of an expected weather situation, especially the timing of the strongest winds, may be extremely important. It seems clear that the

fishermen who took a chance October 11-12 - whether they thought they were doing so or not - did so because the weather system was to hit the next day. They thought they could make safe harbor in time. They were wrong, sometimes fatally so.

Appendix 16.A

Comments of investigating team on Scanlon's report.

Government of Canada / Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE

TO / À: PAED

FROM / DE: PAEM

SECURITY - CLASSIFICATION - DE SÉCURITÉ
CONFIDENTIAL
OUR FILE/NOTRE RÉFÉRENCE
8964-1---C(PAEM)
YOUR FILE/VOTRE RÉFÉRENCE
DATE
November 27, 1984

SUBJECT / OBJET: Comments on Scanlon Report by LeBlond Investigation Team

1. The preliminary draft of the Scanlon Report was tabled during the November 22/23 meeting of the LeBlond Investigation team. Following are some comments made by members of the team.

a) both Bill Forsythe and Archie Kaario supported the contention that the "whole structure of the west coast salmon fisheries encourages fishermen to take risks."

b) there was also considerable objection to the wording on page 4 that the announcement of a specific fishery "guarantees" that a number of fishermen will travel. There is a good possibility that fishermen will move, but depending on weather and other factors it is not a guarantee. This term implies almost reckless abandon to travel.

c) there was general agreement with all the items on pages 13 and 14.

d) page 17. With regard to passing information between DFO, fishermen, and AES there was general agreement this recommendation may help, but more importantly the opening of fishing grounds should be coordinated with the expected weather conditions.

e) page 19, last paragraph. There was discussion on the relative severity of gales and the potential for storms. The key phrase was "whether it (referring to gale) is likely to eventually end up as a storm". This premise addresses the whole system of worded forecasts and the difficulty in expressing the confidence of a forecaster in his/her prediction.

f) page 23, first paragraph. "None of the fishermen ---- no sense at all". The UFAWU strongly objected to this wording and its implications. Furthermore, the statement is simply not true in their opinion.

.../2

g) page - 23 -, 4th paragraph "By 6:23 p.m. ----- " there is something wrong with the time - we presume he meant 7:23 p.m.

2. Other than the above comments, the report was not analysed in further detail. For your information and discussion, as required.

G.E. Wells

cc: PAEW

w/p C419

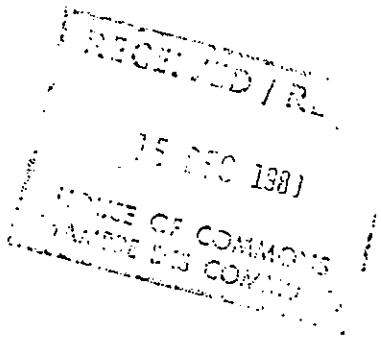
Appendix 17.

Letter from Mr. J. Roberts to Mr. J. Fulton.

READY AND TO BE RETURNED TO JOHN KNOX

Minister
Environment Canada

Ministre
Environnement Canada



DEC 10 1980

Mr. Jim Fulton, M.P.
House of Commons
Ottawa, Ontario
K1A 0A6

Dear Mr. Fulton:

I am replying to your October 10 letter to me and to your letter of November 13 addressed to the Prime Minister and to some of my Cabinet colleagues, about Ocean Station PAPA.

The primary reason for replacing the weatherships is financial. The attached report explains the reasons which led to the decision in 1978 to terminate the weathership program. Since April 1979, my Department has kept the program going with funds diverted from other programs within the Department, many of which are of major interest to your constituents. The alternative system already in place or planned for the immediate future is the best that will be available this decade. I cannot justify to myself the commitment of about $100 million during the 1980's to maintain the weathership program until another technological break-through arrives.

The alternative system will continue to permit reliable weather information for the West Coast and will have little impact on warnings and forecasts. Because I am convinced that the people of British Columbia are not being placed in danger by the removal of the weatherships and because I cannot continue diverting funds from other important programs, the time for the decision has arrived.

The loss of the ships as a platform for research, and as part of the fleet available for search and rescue, are separate matters. Both activities fall within the mandates of other Departments who have been unable to provide financial assistance for the weathership program.

In summary, it is not possible within the government's financial controls to reverse the decision to terminate the weathership program effective June 1981.

Yours sincerely,

John Roberts

Ottawa, Canada
K1A 0H3

Background Information

Responses to the LeBlond Report

Content

A. The Event

B. The Environment Canada Investigation

C. The Results of the LeBlond Report

D. Official Ministerial Responses

E. Internal Actions/Initiatives

F. Specific Responses to the Contents of the Report

Responses to the

LeBlond Recommendations

A. The Event

A violent storm struck the B.C. Coast the night of October 12 packing winds of 60 to 65 knots and accompanying seas of 10 to 15 metres. In its wake, the storm left 5 fishermen dead and 7 vessels lost.

Shortly thereafter numerous complaints arose about the quality of the weather forecasting for this tragic event.

B. The Investigation

In response to public concerns, the Minister of Environment commissioned an internal investigation into the event. The investigating team consisted of Professor Paul LeBlond from the University of British Columbia, Mr. Archie Kaario representing the United fishermen and Allied Workers Union, Mr. Bill Forsythe representing the fishing industry, Mr. Richard Nelis from AES Atlantic Region and Mr. Gary Wells of the AES Pacific Region.

To support the investigation, Pacific Weather Centre staff conducted a detailed analysis of the storm and the forecasts for the period of concern.

C. The Results

Professor LeBlond concluded that the "weather services provided by Environment Canada on that occasion were inadequate: the storm was forecast much too late to influence the movements of fishermen and wind speeds in it were seriously underestimated."

"The main problem seems to have been caused by unusual nature of the storm itself ---."

Professor LeBlond provided recommendations under two headings: those pertinent to the storm itself and those pertinent to the general level and quality of weather services.

D. Ministerial Responses to the LeBlond Report

Ottawa, December 13, 1984 ------ Federal Environment Minister Suzanne Blais-Grenier released a summary of the LeBlond Investigation Report. In her News Release, Mrs. Blais-Grenier advised that she was reviewing the report and would make a statement later about programs to improve weather forecasts on the West Coast.

Ottawa, January 29, 1985 ------ Mrs. Blais-Grenier announced programs that will begin immediately. These programs included:

. increasing weather observations from federal government vessels.

Action to Date: both CCG and DFO have recruited more ships for the observational program. All CCG vessels will also be taking special observations when the weather changes significantly; DFO vessels will be taking special observations during the major fisheries eg. Roe Herring.

. coordination of fisheries openings/closings.

Action to Date: effective with the 1985 Roe Herring fishery, a procedure has been established to have a daily conference call between major planners (DFO, DDG, DND/SAR and the Weather Centre Supervisor) to review the weather forecasts for the day. The feasibility of extending this procedure to other fisheries will be examined.

. expansion of the West Coast Roe Herring Marine Safety Committee to include the salmon fishery.

Action to Date: negotiations are proceeding between the various departments in this regard.

. research into the causes for severe Pacific storms.

Action to Date: an operational workshop is being planned for the fall of 1985 to examine the current state of knowledge and identify research requirements.

- the 1987 "Ocean Storms" project is being investigated as a vehicle for research into such storms.
- other research avenues are being examined, eg. an Australian high-resolution regional model.

. exchange of weather observations and forecasts directly with the fishing fleet.

Action to Date: the possibility of establishing MAREP-type programs is being examined in consultation with a number of West Coast fishing associations. Furthermore, programs utilizing CCG radio stations and DFO vessels are being looked at.

E. Internal Actions/Initiatives

1. Press Conference ---------- A press conference was held announcing the the release of the LeBlond Report. Professor LeBlond reviewed the investigation and the rationale for his recommendations. The report was distributed widely to media, other relevant federal government departments, and interested user groups.

2. Investigation into the Dissemination of Marine Warnings ---------- a contract was let to Professor J. Scanlon of Carlton University, Ottawa to examine the effectiveness of the weather warning dissemination system. This study was also used to assist Professor LeBlond in his investigation (a preliminary report was provided in early December).

   Professor Scanlon continued his investigation beyond the LeBlond Report. A more comprehensive report is forthcoming.

3. Analysis of the LeBlond Report ---------- AES Pacific Region staff reviewed Professor LeBlond's report, classifying the recommendations into two categories: A. those recommendations requiring additional resources; B. those recommendations readily implementable within current resources.

Action Plans including objectives and costs were formulated for the recommendations in each category. Detailed Implementation Plans were developed for the B. Category recommendations.

4. Interdepartmental Meetings --------- Professor LeBlond's recommendations addressed all aspects of the weather service system - that is, data acquisition, analysis and forecasting, and dissemination. His recommendations therefore had implications for the departments of Environment, Fisheries and Oceans, and Transport Canada.

   Negotiations were then initiated at both the Regional and National levels to examine LeBlond's proposals, their feasibility, and possible coordinated actions/funding for implementing approved recommendations.

   Meetings were held January 11th and January 29th in Ottawa for both national and regional representatives, and January 2nd and 3rd with regional representatives from the Departments concerned.

5. B.C. Coroner's Inquest ---------- A Coroner's Inquest into the deaths of four fishermen was held January 30 to February 01, and February 08. Dr. K. Dawson and G. Wells from AES were subpoenaed to testify. Legal assistance was seconded from the Department of Justice, Mr. John Haig. Considerable effort and time was expended in preparation for the Inquest.

   The Coroner's Jury concluded that the weather forecasts were "misleading" and recommended the early implementation of all Professor LeBlond's recommendations. Other recommendations were made relating to SAR activities, fishing boat inspections, and survival suits.

6. Liaison and Coordination Meetings ---------- a number of meetings were held through January and early February with various fisheries organizations and associations. A memo (attached) to PAED, February 11, summarizes those meetings and some results. Most of these groups are anxiously awaiting the official Ministerial response to the remainder of the LeBlond recommendations.

7. Canadian Meteorological Centre ---------- CMC has advised that the NWP models will be re-run in February, utilizing data which was not available (due to a communications failure) prior to the storm.

F. Specific Responses to the Contents of the LeBlond Report

Professor LeBlond provided an accurate account of the forecasts and warnings leading up the explosive development of the October 12th storm. His conclusions that the weather services provided on that occasion were "inadequate" are valid insofar as the movement of fishing vessels is concerned near Brooks Peninsula during the evening of October 11th. The major problem was the unusual nature of this storm, its rapid development, and a general lack of scientific knowledge about these types of events.

The following are details on actions/initiatives to date regarding the recommendations in Professor LeBlond's Report.

1. Recommendations Specific to the Storm of October 11-12, 1984

1.1. A workshop should be held to explore the understanding and detection of explosive deepening of storms.

Response

It is planned to hold an operational workshop in the fall of 1985 involving meteorologists from the U.S. National Weather Service/National Ocean Service located at Anchorage, Seattle, Portland and San Francisco (also possibly from Hawaii), the Pacific and Atlantic Weather Centres, Training Branch, and Meteorological Services Research Branch. The purpose of this workshop would be to determine the present state of knowledge with regard to the development of synoptic, sub-synoptic and tropical systems that affect the mid-latitudes, and to recommend areas of required research.

1.2. Research should be encouraged into the physics of rapid deepening.

Response

It is planned to initiate or participate in a West Coast storm research project to examine the physics/dynamics of rapid deepening. The ultimate goal of this research will be to develop prediction techniques for application in a forecast office.

The Canadian Atlantic Storm Project (CASP) may contribute general knowledge to this project. Specific research requirements will include results of an operational West Coast workshop/seminar examining West Coast storm prediction problems.

The University of Washington is planning to undertake a similar project named "OCEAN STORMS". This project may provide a vehicle for cooperative international research.

1.3. The Canadian Meteorological Centre (CMC) should be requested to rerun their numerical prognoses for the period of interest with all the data which will have later become available.

Response

Most of the data which was not available prior to the storm has now been received. CMC intends to rerun the model with this additional data and review the prediction outputs during February and March. A report shuld be available by April.

2. General Recommendations on the Provision of Weather Services to Mariners on the B.C. Coast

2.1. Measures should be taken to obtain regular, including night time, weather reports from ships at sea.

Response

To obtain weather observations at night, a radio operator would need to be paid overtime (or some other form of incentive) or a shipboard automated system for transmitting weather observations - should be installed. The former action would be very costly and difficult to implement. It is our plan to pursue the latter action and investigate devices for automatic transmission of weather data. Such a system would provide:

a) increase in the number of observations from 20% during the day to 50% at night.
b) 4 surface observations per day (while at sea) from up to 10 vessels composing of:
   - air temperature
   - dew point
   - pressure
   - sky condition
   - weather
   - visibility
   - wind speed/direction
   - sea/swell condition
c) ship position and direction, confidentially if required.

2.2. Environment Canada should collaborate with NOAA in planning for continued maintenance and future deployment of moored buoys.

Response

In consultation with the U.S. National Oceanic and Atmospheric Administration, we are planning to install 3 buoys moored off the B.C. Coast.

Response (cont'd.)

A moored instrumented buoy will provide hourly data (24 hours/day) of:

- air temperature
- wind speed
- wind direction
- humidity
- pressure
- sea temperature

This program would contribute significantly to international cooperation of data networks on the high seas with the placement of buoys at strategic localities. We intend to commence building buoys early in 1986 and deploy 3 buoys over the next 3 years.

2.3. AES drifting buoys should contain wind sensors as the development of technology permits.

Response

It is planned to increase the deployment of drifting buoys in the North Pacific to from 6 to 9 per year.

Drifting buoys will provide:

- 16 observations per day of:

  . buoy position (latitude/longitude)
  . sea temperature
  . pressure

At this time, it is envisaged that drifting buoys with wind sensors will not be available until 1987. Efforts to accelerate this development will be pursued.

2.4. Federal government vessels should report weather conditions on a regular basis.

Response

Two actions have commenced in response to this recommendation.

Firstly, 4 DFO and CCG ships have been recruited to provide weather observations.

Secondly, special weather observations will be taken and transmitted by CCG and DFO vessels when significant changes in the weather/winds occur.

2.5. Canada should press the U.S. government to maintain an adequate back-up for the GOES satellite system.

Response

Negotiations on the U.S. satellite program are occurring on a regular basis. It is our understanding that the U.S. plans to launch 2 GOES satellites and early 1986. Further launches are planned for 1990. This should provide adequate back-up.

2.6. The Automated Shipboard Aerological Program should be continued.

Response

We plan to obtain and fit out 3 additional ASAP containers for placement aboard ships of opportunity, the objective being to have at least 5 ASAP containers at sea on the North Pacific at any one time, travelling between the West Coast of North America (Canada) and Japan.

Ships participating in the ASAP program will carry out two functions in support of forecast operations:

ASAP Program 1. - twice daily observations at 00.12 GMT of the atmosphere measuring:
temperature
humidity
pressure
wind speed
wind direction
- average 35 aerological observations per voyage (round trip North America to Japan and return)
- 12 voyages per year

2. Marine surface weather observations reports
- 4 reports per day at 00,06,12,18 GMT during each voyage.

These data will be available to regional forecast operations, national operations at CMC, and to the international meteorological community as a whole.

2.7. The installation of a weather radar at one or two locations on the West Coast has been suggested.

Response

AES is currently investivating jointly with the Canadian Coast Guard the possible meteorological applications of the current radar system. Furthermore, the scientific utility of coastal radar for forecasting purposes is being evaluated. Further action in this regard will depend on the results of these investigations.

2.8. With the plans to automate weather stations, care should be taken to ensure this data is made available to mariners.

Response

The Department of Transport intends to improve its Continuous Marine Broadcast System to provide up-to-date information. In addition, negotiations are proceeding between Transport Canada and AES on prodedures to upgrade the marine broadcast system as a whole, with an objective to providing automatic station reports and other data such as that from buoys.

These automatic weather stations will provide hourly data (24 hours per day) of:

- wind speed and direction
- air temperature
- pressure
- humidity
- precipitation

2.9. It was recommended that a MAREP-type program be installed similar to the one operated by Josie Dyas out of Wesport, Washington.

Response

AES will attempt to implement such a program off the coast of British Columbia ie. the West Coast of Vancouver Island and the North Coast including the Queen Charlotte Islands.

Such a program will provide:

1. current reports of weather, estimated wind speed and direction and sea state.
2. transmission of marine forecasts to fishermen on an individual basis.
3. interaction between the fisherman and marine forecaster, thus enabling the requesting of additional data from specific areas and generation of discussions on the marine forecasts and the general confidence level of the forecaster including alerts to possible changing situations.

Negotiations have commenced with a number of fishing associations, including the Pacific Trawlers Association and the Deep Sea Trawlers Association, who have publicly shown support for this program.

2.10. The AES should continue to upgrade and modernize its communications system and Coast Guard should keep up with developments.

Response

The AES will continue to implement the New Communications System over the next 2 years.

7 Coast Guard stations will be connected to this system per the following:

This action will facilitate selective formatting of weather information both for the input of weather observations and the dissemination of forecasts and warnings to the individual marine stations. This will reduce the time for communications of data and the number of error that may be introduced.

Work orders issued - August, 1985.
Victoria, Vancouver, Tofino connected - September.
Alert Bay, Prince Rupert - October.
Nanaimo - November.
Bull Harbour - January, 1986.

2.11. Specialist marine forecast positions should be established in coastal forecast offices.

Response

The major thrust is to establish a position that would concentrate solely on the marine forecast/warning problems of the day, similar to the dedication for aviation forecast products. Furthrmore, the establishment of a specialist marine forecast position at the Pacific Wether Centre, oeprateing 24 hours per day, would introduce new and improved forecast products, issued more frequently. Improved outputs would include:

- an increase in the frequency of forecast isues from 3 to 4 per day for 9 coastal and offshore areas.
- 4 issues per day of up to 5 new marine forecasts for coastal inlets.
- warnings and revisions for all forecasts as required.
- a continuous weather watch.
- a sea-state forecast program for two offshore areas 4 times per day.
- operational development for improving the marine forecasts on a continuing basis.

This position will be established by September 1985 and be fully operational by October 01.

2.12. The procedure for introducing 'bogus' data to the numerical model should be re-evaluated.

Response

Bogussing of data serves 2 purposes: one is to provide a better initial analysis of the current state of the atmosphere; the other, to influence the predictions produced by the numerical models.

The first purpose is a valuable one in that it provides a more accurate analysis of the current state of the atmosphere. This is particularly useful for briefing purposes and for references in providing consultation services.

The second, that is influencing the predictions, is more controversial. CMC will be evaluating the usefulness of this procedure in this regard. In addition, a project will be initiated between the Pacific Weather Centre and CMC to determine the type of data that the Weather Centre could usefully provide CMC for their operational model runs. This project will commence in the fall of 1985.

2.13. A wave forecasting service should gradually be introduced.

Response

With the establishment of a dedicated marine specialist position, an offshore (ie. within the 200 mi. economic conservation zone) wave forecasting service (twice a day) will be introduced March 01, 1985, for the BOWIE and EXPLORER marine forecast areas. This may be increased to 4 times per day October 01, 1985.

Coincidentally, research on sea-state forecasting for near coastal waters will be accelerated and, with the installation of up to 9 wave rider buoys over the next 2 years, a coastal wave forecasting serve may be introduced in 1987.

2.14. Taped weather broadcasts should be kept up-to-date.

Response

With the planned upgrades in the Coast Guard communications system and the continuous marine broadcast facilities, this problem should be eliminated.

2.15. Standard consultation between Environment Canada and Fisheries and Oceans should be broadened from the herring fishery to cover all fisheries.

Response

With the 1985 Roe Herring fishery, the Pacific Weather Centre will participate in daily conference calls related to the opening/ closing of fisheries.

Negotiations are proceeding with DFO to expand this procedure to other fisheries or to develop a modified plan to accommodate the need for standard consultation.

2.16. The coordination of marine activities and periodic non-confrontational reviews of the performance of government services is recommended.

Response

Environment Canada has been invited to participate fully in the Search and Rescue Advisory Group on the West Coast. This forum will facilitate discussions of marine weather safety problems and initiate possible solutions.

Furthermore, contacts have been made with a number of fishing associations to establish a liaison for meeting at regular intervals to discuss reciprocal exchange of data, provision of weather services, and modification of programs as appropriate.

DRAFT

Implementation Plan 1

Title

Marine Weather Forecast Specialist at Pacific Weather Centre.

Description of Plan

A dedicated marine forecast position will be established at the Pacific Weather Centre, operating 24 hours/day, 7 days/week.

Products/Outputs

- 4 marine weather forecasts per day for 9 offshore and coastal areas - issue times to be determined.
- initially one coastal inlet forecast, (4 times per day) gradually increasing to up to 5 inlet forecasts.
- wave height forecasts for the offshore marine areas of BOWIE and EXPLORER, 4 times per day.
- amendments, revisions and warnings for all forecasts as required.
- development and issue of products in support of marine operations (eg. sea surface temperatures).
- continuous weather watch and consultation with other government agencies (eg. DFO) and the fishing industry.
- provide training (including to user groups) and participates in the development and implementation of marine forecasting techniques.

Milestones

- Job descriptions and classification completed by April 30.
- Lateral transfer approvals and/or competition to staff positions completed by June 30, 1985.
- Marine forecast workstation installed by August, 1985.
- Marine forecasting manual prepared by August, 1985.
- Training for successful candidates completed by September.
- Position fully operational by October 01, 1985.

Implementation Considerations

1. This position will need to operate within the framework of the forecast operations within the Pacific Weather Centre. This includes a high degree of coordination and cooperation with the PWC Shift Supervisor. The Chief Meteorologist will be responsible for developing the working relationships and establishing procedures to ensure coordination and a smooth integration into the forecast operations.

2. Training. Appointed staff will require training in 2 major areas - oceanography and West Coast marine meteorology. Assistance from CF METOC Esquimalt and/or Halifax will be investigated, dependent on the results of the staffing procedure. A third area of training required will be the applications of satellite data to the marine forecasting program.

3. Workstation. A contract has been let to examine the space and ergonomic requirements for establishing an appropriate workstation. Procurement of materials and equipment (including EDP support) must begin early in the fiscal year (ie. April) to ensure that a workstation has been adequately established by September, at the latest.

4. Staffing considerations. It is conceivable that some staff at the Pacific Weather Centre may be successful in the competitive process (or in obtaining lateral transfers) which will then leave a shortfall in the operating personnel. Care should be taken to ensure, as much as possible, that these vacated positions can be readily filled.

5. Timeframes. The position must be fully operational, around-the-clock, by October 01 at the latest. Any slippage may result in concerns from the marine community as the fall/winter storm season arrives.

Resources

1. Level of staffing. In order to operate 24 hours per day, a minimum of 6 persons are required. The approved 3 P-Y allocation for 1985-86 will be adequate, but the FY 1986-87 allocations (4 P-Y) will not be sufficient. Negotiations on the transfer of P-Y from DFO will need to be effected and alternatives/options will need to be addressed.

2. Resource requirements for FY 1985-86 have been identified as follows:

P-Y	N-S O&M	Capital
3.0	100.0	200.0

Cooperation/Coordination With Other Government and External Agencies

Issue times of the weather and sea-state forecasts will require consultation with Transport Canada and major user groups eg. FISH Committee, Deep Sea Trollers, Canadian Merchants Services Guild.

Furthermore, consultation with the DND/CFWS will be required to establish cooperative programs and determine DND requirements for data.

Once the marine forecast desk has been established, consideration should be given to extending an invitation to media representatives to view the workstation, its operations, and products/services.

Activities

1. Negotiate with Coast Guard on best issue times of four forecasts at CMTA meetings.

2. Negotiate issue times of four inlet forecasts for Douglas Channel with Coast Guard and affected marine interests. Obtain appropriate headers for new forecasts.

3. Establish rating board and hold competitions for marine specialist positions; move personnel.

4. Let contract for workstations; procure material and hardware; develop software; up-grade lighting and electrical requirements in operations area.

5. Develop and write forecasting marine manual with input from staff and coordinated through marine focal point meteorologist.

6. Give on-the-job training to successful candidates and possibly hold some in-house workshops or seminars for this group. Will involve ODIT in some of the training. May also involve Data Acquisition and Scientific Services. Coordination through ODIT or PAEMM.

7. Implement coordination procedures with Seattle Marine Forecast unit initially and expand to include Anchorage and San Francisco.

DRAFT

Implementation Plan 2

Title

Sea-State Forecasting.

Description of Plan

This plan will gradually introduce sea-state (ie. wave height forecasts) over a period of 3 years. There will be 3 basic stages to the introduction of these services/products: a limited sea-state forecast for the offshore areas; implementation of a full sea-state forecast for the offshore areas, with amendments, coincident with the establishment of a marine weather forecast specialist position; and, accelerated research and development toward implementing a comprehensive coastal (ie. inshore) wave forecast service. (Note: a sub-Implementation Plan will be developed for the third stage, R & D).

Products/Outputs

1. Limited sea-state forecasts. Wave height forecasts will be issued twice per day for the offshore marine areas, BOWIE and EXPLORER. No amendments, revisions or sea-state warnings will be produced. Refer to attached "Guidelines for Sea-State Forecasts Issued by Pacific Weather Centre".

2. Full sea-state forecasts. This program will produce forecasts of up to 4 per day, with amendments and revisions when required, for the BOWIE and EXPLORER marine areas.

3. Comprehensive Coastal wave forecasts. Once R & D has been completed and an appropriate data base has been installed, this service will provide wave height forecasts for selected near coastal waters.

4. Additional services. As resources permit and development proceeds, additional products may be provided such as wave height analyses/prognoses charts and sea surface temperature analyses.

Milestones

1. Limited sea-state forecasts March 01, 1985.

2. Full sea-state forecasts for the offshore areas, effective October 01.

3. R & D to commence in fiscal year 1985-86. Wave rider/atmospheric sensing buoys to commence deployment in 1985-86 and continue for the next 3 years.

4. Coastal sea-state forecasts to commence in the fall of 1987.

Implementation Considerations

1. Arrangements have been made with CF METOC Esquimalt and CFWO Comox to provide guidance material to the Pacific Weather Centre for the limited wave forecast program, until October 01.

2. Effective October 01, the marine specialist forecaster will produce the necessary wave analyses/prognoses to serve as guidance for the forecasts and for distribution via facsimile broadcast as required.

3. The R & D required for the near coastal marine areas should include the data acquisition requirements as well as the forecast technique development.

4. As the sea-state program is developed, an increasing need for dissemination of actual and forecast information is probable.

Resources

1. The first two stages of this program (ie. the offshore forecasts) can be accommodated by the marine forecast specialist position, under the proposed reference level of 6 P-Y for a 24-hour shift, 7 days per week.

2. The R & D portion for FY 1985-86 has been allocated as: 2 P-Y and $400.0K O & M + Capital to be funded by DFO.

3. It is not yet clear what the resource requirements will be for implementing a coastal wave forecast service. This service may require additional P-Y depending on the level of automation and data available to the forecast desk.

Coordination with Other Government and External Agencies

1. The implementation, October 01, of the full offshore wave forecast program will require negotiations with DND/CFWS to establish coordination of programs and identify DND needs in the service programs for SAR and other operational activities.

2. Development of the coastal wave forecast program will require close coordination between AES and DFO/IOS in establishing requirements and negotiating effective and timely resource transfers, where appropriate. It should be noted that AES/Meteorological Services Research Branch (MSRB) has had significant experience in the development and application of wave height analysis and forecasting techniques - IOS, MSRB and AES Pacific Region will need to work closely together on the R & D. Furthermore, operating a coastal wave forecast service demands amendments and warnings, as required, 24 hours per day. As much as possible, the R & D should focus on data systems and forecast techniques that can be readily absorbed by the marine forecast specialist position at the Pacific Weather Centre, in order to reduce or eliminate the need for additional P-Y resources.

3. Cooperation will be required with Transport Canada/Canadian Coast Guard for broadcasts of real-time observations and forecasts of wave conditions. With the other announced improvements to marine weather services, it would appear that a significant workload increase may result in the dissemination system as a whole.

4. Consultation with the marine community will be a necessity in order to determine user needs/standards and establish feedback mechanisms.

Activities

1. See Implementation Plan 1 for selection of personnel.

2. Review literature on sea-state forecasting - Focal Point Marine.

3. Visit Esquimalt or Comox to observe operational program now in existence -- Focal Point and PAEMM.

4. Implement existing sea-state forecasting programs at Esquimalt and Comox into PWC operations. Establish appropriate procedures and working schedules to accomplish this -- PAEMM, Focal Point Marine, possibly one of successful candidates.

5. Run program in parallel with Comox and Esquimalt for about two weeks in late September.

6. Investigate expansion of program -- input from Scientific Services and Marine Specialty Unit, including Focal Point Marine.

DRAFT

Implementation Plan 2a

Title

Wave Rider Buoys (Sea State Sensing)

Description of Plan

This plan relates to the establishment of a wave forecasting service and the requirement for supporting wave data in real time. The DFO will be tasked to establish a R&D phase for the development of sea state forecasting techniques. In association with this, DFO will upgrade and expand its network of wave rider sensing buoys in 1985/86 and continue through 1988/89. It is further proposed that these wave sensing buoys, which will be reporting in real time, be equipped with atmospheric sensors (wind, pressure, air temperature).

Products/Outputs

1. Wave rider and atmospheric sensing buoys will provide hourly measurements (24 per day):

   - wave height
   - wave period
   - wind direction
   - wind speed
   - air temperature
   - atmospheric pressure

   This data will be transmitted via GOES satellite and distributed by AES communications to DFO/AES and to Coast Guard for broadcast to marine users.

Milestones

1. Coordination of DFO/AES data requirements and buoy sites - June, 1985.

2. Development of sensor specifications for measurement of wave height and period - December, 1985.

3. Finalization of procurement specifications for wave/atmospheric sensing moored buoys - March, 1986.

4. Procurement and deployment of 5 tethered buoys - June/July, 1986, to upgrade DFO network.

5. Procurement and deployment of 4 tethered buoys - May/July, 1987, to expand DFO/AES network.

Implementation Considerations

1. Selection of suitable buoy sites in consultation with DFO/Coast Guard.

2. Coordination of deployment and mooring with Canadian Coast Guard.

3. Coordination with AES HQ for assignment of GOES Channel.

4. Possible modification of CODCON to accommodate data messages from buoys and distribution to users.

5. Discussion with Coast Guard on dissemination of sea state data to marine users.

6. Consideration should be given to meeting his requirement with the use of NDBC's 'E' type buoys and DACT payloads - to capitalize on proven technology which is available 'off shelf'.

Resources (Component of DFO Funding)

	PY	CAP	O&M
1985/86			
1986/87	-	50.0	15.0
1987/88	-	40.0	27.0
1988/89		-	27.0

NOTE:

This level of resourcing is based on the assumption that this requirement for sea state sensing will be combined with that for automatic weather reporting stations (tethered buoys) such that a single platform will be reporting both atmospheric and oceanographic data.

DRAFT

Implementation Plan 3

Title

Establishment of Moored Buoys (NOMAD)

Description of Plan

To enhance the network of meteorological and oceanographic reporting stations in the Northeast Pacific by establishing a moored buoy reporting program. This program will consist of 3 moored buoys equipped with atmospheric and oceanographic sensors reporting hourly in real time (GOES) and deployed several hundred miles off the Coast of British Columbia.

Products/Outputs

These moored buoys will provide hourly measurements of meteorological and oceanographic parameters - 24 hours/day, and include:

- wind speed
- wind direction
- atmospheric pressure
- air temperature
- sea surface temperature
- wave height
- wave period
- wave direction*

Milestones

a) NDBC Lease/Operation

1. Formalize lease agreement with NDBC for NOMAD deployment late 1985 early 1986.

2. Agreement on deployment, location and timetable by July 1985.

b) AES Operations

1. Preparation of procurement specifications by December 1986 including buoy hull, payload (sensors).

2. Tendering and construction for delivery of one NOMAD buoy hull for April 1987.

3. Procurement of electronic payload (DACT system) for April 1987.

4. Acceptance/operational testing (in the water) for May 1987.

5. Deployment August/September 1987.

6. Buoy operational - October 1987.

7. Preceeding procurement/deployment cycle duplicated in 1988 and 1989.

Implementation Considerations

1. Assumptions

In considering the implementation of this plan, several factors have to be taken into account, these are:

- There is a degree of urgency in implementation - a commitment has been made for the first deployment in 1986.
- AES does not have any operational experience in a moored buoy program - it is estimated that AES will require 24-36 months to set up a buoy program.
- The current range of meteorological instrumentation used by AES is not compatible to buoy operation - not desigend for marine/buoy environment.
- The private sector in Canada does not have technical knowledge or experience in atmospheric sensing buoys (the technology that exists is in the field of oceanographic sensing and based on a mobile wave slope riding platform). Atmospheric sensing buoys require a stable platform as possible.
- The NOAA Data Buoy Centre is one of the world's leading authorities on moored buoy operations.
- NOAA NDBC would offer assistance to AES because of the resultant data benefits to NOAA, NWS.

2. Approach to Implementation

Based on the above assumptions, the logical and most cost effective approach for AES in implementing this program is to capitalize on the assistance offered by NOAA NDBC for the Northeast Pacific buoy program. This assistance is the leasing and operation of one NOMAD buoy for AES by NDBC - with deployment in late 1985.

Such an approach will allow AES to meet its commitment for a 1986 deployment and also provide AES with the opportunity to clearly monitor a deep sea moored program and gain experience which would be helpful in deciding AES future approach in operating a moored buoy program, whether to contract out, all or part of the operation, or maintain its operation "within house".

3. Costs

Based on preliminary estimates obtained from NDBC, the leasing of one NOMAD buoy will cost:

$U.S. 257.0K one time cost for lease of equipment (buoy/payload/mooring)

$U.S. 62.0K annual operating cost including data quality control.

These figures are based on deployment being carried out by Canadian Coast Guard vessels/equipment.

Resources

	PY	Cap.	O&M
1986/87	.5	350.0	50.0
1987/88	.5	350.0	90.0
1988/89	.5	350.0	130.0

NOTE:

If NDBC NOMAD is leased, there will be a decrease in requirement for Cap. with a corresponding increase in O&M funding.

Coordination Required with Other Agencies

Agreement with NOAA Data Buoy Center on leasing one NOMAD.

Agreement on NOMAD buoy location with NOAA/NWS.

Acquisition of appropriate communication (GOES) channels.

Coordination with Coast Guard for deployment and mooring at operational site with NDBC supervision.

Determination of standard reporting format.

Agreement with DFO on purchasing costs.

w/p C574

DRAFT

Implementation Plan 4

Title

Drifting Buoys - wind instrumented.

Description of Plan

To update the present drifting buoy program by augmenting the number of deployed drifting buoys with wind instrumented buoys.

Products/Outputs

Drifting buoys to provide measurements of atmosphere pressure, sea surface temperatures and non directional wind communicating through the orbitting TIROS satellite.

Milestones

1. Preparation of procurement specification, including wind sensor by January 1986.

2. Tendering and delivery of wind instrumented buoys (6 per year) for May 1986 and subsequent years till 1988.

3. Deployment commencing June/July 1986.

Resources

	PY	Cap.	O&M
1985/86	--		
1986/87	--	120.0	5.0
1987/88	--	120.0	5.0
1988/89	--	120.0	5.0

(Cost of wind instrumented drifting buoys estimated at $20.0K per buoy. The incremental cost of wind sensor and software changes (about $1.0 - 2.0K) could probably be absorbed by the discount of a bulk procurement.)

Implementation Consideration

1. Integration of the procuremenst of wind instrumented buoys within the existing drifting buoy program.

2. Determination of transmitted message format for wind information.

3. To deploy wind instrumented drifting buoys in the preferred deployment zone (see attached map) at a rate sufficient to ensure that of the 6 operating buoys within the deployment zone at least one is reporting wind information.

DRAFT

Implementation Plan 5

Title

Automatic weather reporting stations.

Description of Plan

The installation and operation of (10) additional automatic weather reporting stations located in major inlets and along the west coast of British Columbia. These stations will be a combination of land-based stations or tethered meteorologically instrumented buoys.

Products/Outputs

1. These stations will provide hourly measurements of meteorological parameters - 24 hours/day, such as:

   - wind speed
   - wind direction
   - air temperature
   - atmospheric pressure
   - humidity

   Transmitted, via the GOES satellite, these reports will be distributed over the AES communications network, and available at AES offices and Coast Guard marine radio

   Automatic weather reporting stations will be located along major deep water channels, along the coast and in open coastal waters, for example:

Location	No. of Stations	Installation Priority
Douglas Channel	2	1
Burke Channel	1	3
Bute Inlet	1	3
Hecate Strait	2	2
North Charlotte Sound	1	3
Dixon Entrance	1	2
West Coast Vancouver Island	1	3
Entrance to Juan de Fuca Strait	1	2
Total	10	

Milestones

1. Procurement of buoys to commence in April 1985 with deployment starting by August 1985.

2. Subsequent procurements will be made in the spring of 1986 and 1987 with deployments during the following summer - see Appendix 'A'.

Implementation Considerations

1. Selection of a suitable a NDBC 'E' type buoy and mooring for use as a meteorological sensing platform.

2. Use of NDBC's specifications for Data Acquisition Control and Telemetry (DACT) and sensors.

3. Allocation of appropriate GOES channel.

4. Dissemination of automatic station reports to user groups.

5. Determination of minimum time for repair for station failures (individual sensors), based on NDBC specifications.

6. Procurement action will need to commence in April 1985 - suppliers may require up to 120 days for delivery and to meet August/September deployment deadline for 1985.

7. Consideration should be given to including wave height and wave period sensors on buoys located in open coastal waters.

8. Location of buoys will have to be cleared with Coast Guard so that they do not constitute a hazard, are properly identified and marine groups are advised.

9. Site surveys for other than Douglas Channel will require discussion with local marine groups (fishermen, recreational boaters), Coast
1 Guard.

0. Technician training for installation, servicing of DACT systems to be arranged with NDBC - May, 1985.

Resources

1. Estimated costs of $50-55K per buoy include the buoy hull, mooring, atmospheric sensors (wind speed and direction, atmospheric pressure, air temperature) electronic processing and GOES Transmitter. The purchase of 2 buoys in 1985/86 - $100.0K.

2. 1 P/Y is require for procurement, testing, installation and maintenance of the operational system.

	PY	Cap.	O&M
1985/86	1	100.0	--
1986/87	1	160.0	30.0
1987/88	1	100.0	45.0
1988/89	.5		65.0

Coordination with Other Government and External Agencies

1. The identification of buoy requirements will need to be carried out in association with DFO to determine if there is a requirement for inclusion of wave sensors.

2. Coast Guard have made a commitment to deploy and maintain weather buoys, deployment will have to be coordinated with Coast Guard.

3. The inclusion of auto. station reports in routine broadcasts from Coast Guard marine radio facilities will require coordination.

Technology Considerations

1. NOAA NDBC has acquired considerable technological knowledge and experience with moored buoys - both for deep sea and coastal applications. This technology is available to AES.

2. NDBC's 'E' type buoy (cost $20.0K) which has been used in several years of coastal application is proven technology.

3. NDBC's electronic payload (DACT - Data Acquisition Control and Telemetry) is also well proven from operational applications both on 'E' type buoys and coastal automatic stations - (cost $35.0K).

4. NDBC is currently developing an advanced - value engineered electronic payload (VEEP) for its buoys. This new payload will be designed for the NOMAD and 'E' type hulls. AES if it adapts, these buoy hulls will be able to upgrade its payloads to the new VEEP when available without difficulty.

5. The procurement of 'E' type hulls and DACT payloads can be made through Canadian suppliers (hulls fabricated in Vancouver/Victoria.) NDBC's DACT payload available from Emhiser Research Limited, Parry Sound, Ontario. This equipment is available "off the shelf" - 120 day delivery but may require some software modification of message output.

	1985/86 A M J J A S O N D J F M	1986/87 A M J J A S O N D J F M	1987/88 A M J J A S O N D J F M	1988/89 A M J J A S O N D J F M
Douglas Channel (2)	P T I O			
Hecate Strait (2)	S	P T I O		
Dixon Entrance (1)	S	P T I O		
Juan de Fuan	S	P T I O		
West Vancouver Is.	S		P T I O	
N. Charlotte Sound	S			
Bute Inlet	S			
Burke Channel	S		P T I O	

Resources	PY	Cap.	O&M	PY	Cap.	O&M	PY	Cap.	O&M	PY	Cap.	O&M
	1	100.0		1	160.0	30.0	1	100.0	45.0	.5		65.0

Number of Installations	2	4	2	

Legend P - Procurement; I - Installation; T - Testing; O - Operational;
S - Site survey

1st PLAN

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Implementation Plan 6

Title

Install Automatic Weather Stations and Disseminate Weather Information.

Description of Plan

With the addition of automatic weather reporting stations and buoys, this action proposes the transmission of relevant weather data in near "real-time".

Upgrades of the communications system between AES and the Coast Guard radio stations and of the facilities for continuous marine broadcasts (CMB) are integral to accomplishing near "real-time" transmissions of weather data.

This action would result in a large increase in the number/frequency of observations being received at the station for marine broadcasts. This may have a significant impact on the workload of the staff of marine stations. Transport Canada will perform a workload analysis, after which options for implementation will be investigated.

Milestones

- Workload analysis completed - April, 1985.
- Options investigated - May, 1985.
- Further milestones may be contingent on the upgrades of the communications and CMB's.

Implementation Considerations

Consultation must be made with Transport Canada officials:

a) to ensure the installation of the automatic stations are logistically sound and consideration is given to future lighthouse automation plans;

b) to arrange procedures for the broadcast of the station data at regularly defined intervals.

Resources

Resources to be determined by Transport Canada/Canadian Coast Guard.

Update from G. Wells May 30/85.

DRAFT UPDATED MAY/85.

Implementation Plan 6

Title

Install Automatic Weather Stations and Improve Dissemination of Weather Information. (revised)

Description of Plan

With the addition of automatic weather reporting stations and buoys, this action proposes the transmission of relevant weather data in near "real-time".

Upgrades of the communications system between AES and the Coast Guard radio stations and of the facilities for continuous marine broadcasts (CMB) are integral to accomplishing near "real-time" transmissions of weather data.

This action would result in a large increase in the number/frequency of observations being received at the station for marine broadcasts. This may have a significant impact on the workload of the staff of marine stations. Transport Canada has implemented a program to provide new solid state CMB's.

Milestones

CMB Program

- Preliminary evaluation of new CMB unit - May 1985.
- Purchase of CMB unit for Operational evaluation of CMB unit at Vancouver CG Radio - September 1985.
- Define Operational Requirements and prepare specification for tendering - September 1986.
- Delivery of 3 units for West Coast Radio stations - March 1987.
- Delivery of 4 units for West Coast Radio stations - July 1987.

Implementation Considerations

Consultation must be made with Transport Canada officials:

(a) to ensure the installation of the automatic stations are logistically sound and consideration is given to future lighthouse automation plans;

(b) to arrange procedures for the broadcast of the station data at regularly defined intervals.

Resources

Resources for CMB program to be provided by Transport Canada/ Canadian Coast Guard as follows:

1985/86	-	100K
1986/87	-	150K
1987/88	-	200K

Implementation Plan #7

British Columbia West Coast Marine Reporting Program

(West Coast MAREP)

A. Description of Plan

The plan is to provide the west coast fishermen, and other mariners, with a relatively direct communications channel to the marine forecaster at the Pacific Weather Centre. This would be accomplished by a shore-based person, near the area of interest, to act as a liaison between the mariners at sea and the marine forecaster.

B. Products/Outputs

The purpose of the program would be to:

1. Encourage fishermen (and other mariners) to take marine weather observations and transmit them to the marine forecaster.

2. Enable fishermen to alert the marine forecaster if weather and sea-state conditions are significantly different from those in the marine forecast.

3. Enable the marine forecaster, through the shore-based person, to express subjectively the general confidence level of the marine predictions or alert fishermen to possible rapid deterioration in weather conditions.

4. Provide a better service to the fishermen (more accurate forecasts and more timely warnings) and improve understanding of the marine environment.

C. Milestones

1. Consultation with fishermen associations and other agencies to obtain a viable MAREP program, including site and person selection for the MAREP station, completed by June 30.

2. Draft contract with MAREP operator, specify equipment and purchase, by August 30.

3. Install equipment, test all communications circuits and prepare news/information bulletin for fishermen, by September 30.

4. Start program on October 1, 1985.

D. Implementation Considerations

1. Feasibility

The first step for a MAREP program would be to set-up a prototype or pilot MAREP program, consisting of one MAREP station located strategically near a large fishing community.

Once the pilot project is operating successfully, additional MAREP stations can be considered.

2. Location

A MAREP station would be preferred on the west coast of Vancouver Island, near Tofino or Ucluelet for example, because for this area fishermen are often exposed to the direct impact of the fierce pacific storms and offshore marine weather reports are generally scarce.

The best location would have to be decided in consultation with the fishermen and the Canadian Coast Guard (CCG).

3. MAREP Person

A critical consideration would be the selection of a person to operate a MAREP station. Such a person would essentially have to be on call 24 hrs/day.

For a successful program such a person should be:

(i) Friendly, out-going, and able to communicate well.

(ii) Be part of the fishing community, relatively well-known to fishermen and perhaps be a retired fisherman or the spouse of a fisherman - would be no difficulty in establishing liaison with fishermen.

(iii) Have a knowledge or background or interest in radio-communications, i.e. perhaps a ham radio or CB operator.

The selection would be critical and fishermen and the CCG should be surveyed for the best possible person.

4. Salary/Contract

It is difficult to estimate the number of hours a person would devote to contact fishermen. Initially a rough estimate would be 3 hrs/day, on average. At $8/hr this would imply approximately $700 per month.

Thus an annual contract in the range $7000 to $9000 might be reasonable.

5. Equipment

Tentatively the following equipment is suggested:

(i) A VHF line of sight transmitter (range 40-60 miles), cost $3000-$4000.

(Later a single side band transmitter could be added to extend range).

(ii) A telephone, communicate with the marine forecaster, all charges would be paid by the AES.

Estimating about $0.50/min for long distance charges and say 20 min/day, on average, for 365 days would yield a cost of $3,650 per year.

(iii) A telecopier, cost $1500 to purchase, to transmit a copy of the marine forecasts (and other relevant information) to the MAREP person.

These other options (considerably more costly) are:

- Electronic Mail, $12,000
  (HFD radio terminals)

- Modem & Printer, $1000-4000

- Teletype, $250 per month

6. Training

Initially the person selected would have to be acquainted with P.W.C. operations and acquire some basic meteorological knowledge.

This may be accomplished by an initial visit to P.W.C. and occasionally attending seminars.

Initial cost $1000 (rough estimate).

7. Miscellaneous

Also considered should be the format of the marine weather reports by the fishermen. These could be "plain language" reports.

Must also formalize contact with marine forecaster, schedules for transmitting marine forecasts.

Evaluation of MAREP program should be conducted on an on-going basis.

E. Resources

For first year of operation (estimated):

Item	O&M($)	Capital($)
Equipment Installation		2,000
Equipment Purchase		6,000
Telephone Charges	3,600	
Salary (Contract)	8,000	
Training	1,000	
Miscellaneous	500	
	13,100	8,000

F. Cooperation/Coordination

The site selection for a MAREP station and an operator, as well as the program details should be coordinated or done in consultation with:

- Fish Committee Trawlers
- Deep Sea Trollers Association
- Fisheries Association of B.C.
- Pacific Gillnetters Association
- Canadian Coast Guard
- Institute of Ocean Sciences
- Canadian Merchant Service Guild

These agencies (and others) may be interested in providing ideas and/or support for the proposed MAREP program.

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Implementation Plan 8

Title

Upgrade the Canadian Coast Guard Communications Facilities.

Description of Plan

Connect 7 Canadian Coast Guard marine radio stations to the AES New Communications System.

This action will facilitate selective formatting of weather information both for the input of weather observations and the dissemination of forecasts and warnings to the individual marine stations. This will reduce the time for communications of data and the number of errors that may be introduced.

Milestones

- Work orders issued - August, 1985.
- Victoria, Vancouver, Tofino connected - September.
- Alert Bay, Prince Rupert - October.
- Nanaimo - November.
- Bull Harbour - January, 1986.

Implementation Considerations

The plan will require coordination with Transport Canada and local carriers. Training will be required for the marine radio operators.

Resources

	1985-86			1986-87			1987-88		
	P/Y	Cap	O&M	P/Y	Cap	O&M	P/Y	Cap	O&M
Purchase, installation and maintenance of CRT/Printer/Modem	-	30.0	50.0	-	-	50.0	-	-	50.0

DRAFT

Implementation Plan 9

Title

Standard Consultation Between Environment Canada and Fisheries and Oceans on Fisheries Openings.

Description of Plan

This plan may be considered in two aspects:

a) The feasibility for regular consultation between DOE and DFO prior to fisheries openings will be discussed. Included in this discussion will be an extension of the ROE Herring Safety Advisory Committee to include the salmon fishery season and the practicality of cancelling announced fishery openings when there are forecasts of severe weather conditions.

b) Broadcast of the latest forecasts. At the closing of a salmon fishery prior to the movement of the fishing fleet (and, at times, for the Herring Roe Fishery), DFO vessels will broadcast the latest marine forecasts.

Milestones

a) Discussions have taken place on expanding the terms of reference for the ROE Herring Safety Advisory Committee to include the salmon fishery, January 28, 1985.

b) Broadcasts of marine forecasts to commence in the 1985 salmon fishery season.

Implementation Considerations

Implementation of regular consultations will require an adequate two-way communications system between DFO vessels and AES.

Severe weather criteria for closing fisheries will need to be negotiated from the viewpoint of both safety and economic considerations.

Resources

Resource implications are not known at this time. AES and DFO officials will discuss options for interactive, reciprocal communications facilities.

DRAFT

Implementation Plan 10

Title

Marine Operational Forecasting Workshop

Description of Plan

A marine operational forecasting workshop is to be held in the fall of 1985.

Objective/Outputs

To review our knowledge of marine forecasting and to determine the areas of research and development required to ensure adequate Canadian West Coast marine forecasts. The workshop will be held jointly with the NOAA/NWS at the University of Washington.

Milestones

- May, 1985 - Negotiate with NOAA/NWS to host a joint workshop at the University of Washington to be held in mid-September 1985.
- Finalize joint objectives/funding arrangements by June 30.
- Invitations to invited seminar lecturers, June 1985.
- Workshop - week of September 9-13, 1985.
- Summary and recommendations November, 1985.
- Recommendations for future R & D January, 1986.

Implementation Considerations

1. There will likely be a need to pay for travel and possible honorarium to some invited participants.

2. There will be no registration fee therefore no revenue generation.

3. AES Training Branch, and AES Atlantic Region participants should be in attendance. MSRB participants should also be considered.

4. Consideration should be given to extending an invitation to a European expert.

Resources

1. Person months for Workshop Chairman and Program Chairman/Secretary.

   a) workshop preparation/invitations/bookings — 2 months

   b) conduct workshop and prepare recommendations — 4 months

2. Capital and O&M

a)	workshop accommodations 4 days @ $200 U.S.	$ 800
b)	mailing, stationery and printing	$ 500
c)	travel, accommodations, etc.	$ 400

Coordination Required with External Agencies

Coordination will be required with NOAA/NWS to determine objectives and negotiate appropriate joint funding.

The University of Washington will need to be contacted to establish final attendance numbers and negotiate/confirm associated meal/accommodation expenses.

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Implementation Plan 11

Title

Marine Forecasting Research and Development

Description of Plan

To address the required actions to promote research and development into marine forecasting techniques.

Objective

To state the options and approximate resourcing needs for research and development into marine forecasting techniques. The ultimate goal should be for operationally oriented techniques using early warning signatures/danger signs for rapidly developing systems of synoptic and mesoscale nature and of ex-tropical systems moving in the mid-latitudes. Options should include original R&D, cooperative R&D, OCEAN STORMS, CASP results, and regional model development.

Milestones

- Initiate investigation into current applicable research April 1985.
- Participate at Marine Operational Forecasting Workshop in September, 1985.
- Review of Workshop recommendations by April 1986.
- Preparation of options and approximate resourcing by May 1986.

Implementation Considerations

1. This project is strongly coupled to the results and recommendation of the Marine Operational Forecasting Workshop. The recommendations from this Workshop will not be available until March 1986.

Resources

1. Person months for Project Manager and Project Assistant

   3 months

2. Capital and O&M

   Travel $2000

w/p C640

Implementation Plan #12

West Coast Mariner's Weather Manual

(Preliminary Draft)

A. Description of Plan

The plan is to produce a two volume mariner's weather manual (one for the B.C. south and north coast), under contract with a meteorological consulting company.

The manual envisaged will contain a wide variety of meteorological, and some oceanographic information for the west coast fishermen and other mariners.

B. Products/Outputs

Specifically the manual will contain (this is a preliminary list):

- Map of B.C. offshore and coastal marine forecast areas.
- Description of the Pacific Weather Centre's operation (how marine forecasts are produced).
- Number of issue times of marine forecasts.
- Type of marine warnings issued.
- Location of weather broadcast transmitters, broadcast times and frequency.
- Location of all coastal weather offices, including address and telephone number.
- Location of all lighthouses taking marine weather observations and their observing times.
- Description of coastal and offshore meteorological observing network (shore stations, ship reports, ASAP, drifting buoys,...).
- Discussion and list of past extreme weather and sea-state events (indicate magnitude of windspeeds and wave heights encountered).

- Discussion of nature, type, track and frequency of storms affecting B.C. coastal waters.

- Discussion of common (unusual) forecast problems encountered.

- Condensed cloud chart with an indication of weather conditions likely encountered.

- Discussion of meteorological hazards, such as outflow winds, sea spray icing, intensification of winds through narrow channels and so forth.

- Discussion of fishermen survey conducted to describe general marine weather and sea-state hazards encountered.

- General discussion on meteorological safety practices.

- Description of currents (done through consultation with IOS).

- Wind and sea-state frequency diagrams.

- Discussion of critical marine parameters (wind, waves and visibility) and their climatology, such as frequency of gale force winds, or near zero visibilities.

- Discussion of representativeness of the meteorological observations from lighthouses and weather offices.

C. Milestones

1. Draw up specifications for manual and contract work statement by August 30, 1985.

2. Request proposals through DSS and award contract by September 30, 1985.

3. Contract completed and manuals published by March 31, 1986.

D. Implementation Considerations

1. Must decide on number of pages of manual.

2. Revenue generation - would a charge be made for the manual?

3. Cost is an important item depending upon contents, paper quality (color diagrams, etc.) and number of copies required, the cost may vary significantly.

   A contract may cost anywhere from $5,000 to $50,000 depending upon the level of effort.

4. Careful consideration must be given to manual contents as it must be a practical and useful guide for mariners.

E. Resources

At this point it is not yet clear what resources are required. Some time must be allowed to draft initial specifications for the manual and from this more accurate cost estimates may be made.

F. Cooperation/Coordination

Suggestions for a mariner's weather guide should be solicited from fishermen associations, Canadian Coast Guard and DFO. In addition, some agencies may wish to contribute information for such a manual.

THE OCEAN WEATHER STATION "PAPA" ALTERNATIVE DATA SYSTEM

R.E. Vockeroth, Atmospheric Environment Service, Canada

ABSTRACT

Rising operating costs led the Canadian Government in 1978 to decide to terminate the use of weathership at Ocean Station PAPA and to develop and implement alternative means of obtaining meteorological observations from the north east Pacific Ocean. The alternative system under development, using geostationary and polar orbiting satellites, drifting data buoys and coastal automatic stations is described, and the operating costs of the two systems are compared.

INTRODUCTION

Due to steadily increasing operating costs, the government of Canada regretfully announced in the fall of 1978 the decision to terminate the operation of the observing ships at Ocean Station PAPA, at 50° N and 145° W in the north east Pacific Ocean, 1100 kilometers west of Vancouver Island. The station was established in 1950 with two refurbished navy frigates. Since 1967, on alternating six week cruises out of Victoria, B.C., two especially constructed Canadian Coast Guard ships, the CCGS QUARDRA and the CCGS VANCOUVER have maintained a continuous program of upper air, surface and special observations at that station. The upper air program consisted of four daily soundings, two with radiosondes and radar winds, and two with radar winds alone. Full ships synoptic reports were transmitted eight times daily. Precipitation radar, CO_2 and wave recorder observations were made routinely, and numerous research projects were supported. The ships also carried out an oceanographic program, and provided marine navigation and aid services.

In response to the numerous concerns over the effects of a sudden termination of the ship's observations and to permit initial alternatives to be developed, the Canadian Environment Department deferred a number of other programs in order to fund the operation of the ships for an additional two years.

THE ALTERNATIVE PACIFIC AREA DATA SYSTEM

In November 1978 the Canadian Atmospheric Environment Service (AES) initiated a project to develop and put into operation alternative meteorological observing systems for the north east Pacific. With a target operating budget of one fourth of that for the ships, no way was seen to duplicate their whole program. In consultation with the US National Weather Service and with other Canadian government departments, a plan was drawn up for an alternative Pacific Area Data System (PADS) providing meteorological information from west of station P eastward and northward to the Canadian and Alaskan coasts. The key component of this system is the meteorological satellite analysis program in the AES Pacific Weather Centre in Vancouver, which is soon to be equipped with a flexible interactive system for receiving and processing the GOES West Satellite imagery. These analysis are to be supplemented by coastal and ocean surface reports from several new sources. The possibility of instituting an international shipborne rawindsonde program is currently being studied. This is a progress report on the development of this Pacific Area Data System.

The Pacific Weather Centre Satellite Unit

Since February 1978, GOES West satellite imagery has been received regularily in the Pacific Weather Centre (PWC) on facsimile recorders by land-line from Seattle; Figures 1 and 2. This imagery has proven to be the most valuable single source of meteorological information for the north east Pacific. Using these images, a variety of operational applications were developed and instituted into the regular programs of the PWC. Analyses based primarily

Fig. 1. GOES-W VISSR Image of the N-E Pacific - Visual Band

Fig. 2. GOES-W VISSR Image - Infrared Band

on these images are routinely prepared and disseminated in the form of cloud analysis charts, Figure 3, a descriptive upper air analysis, and recently also in a "Satellite Analysis Chart" Figure 4. This latter chart shows the locations of jet stream axis, pressure centres, upper ridges and troughs, vorticity maxima and lobes, together with the motions of these features.

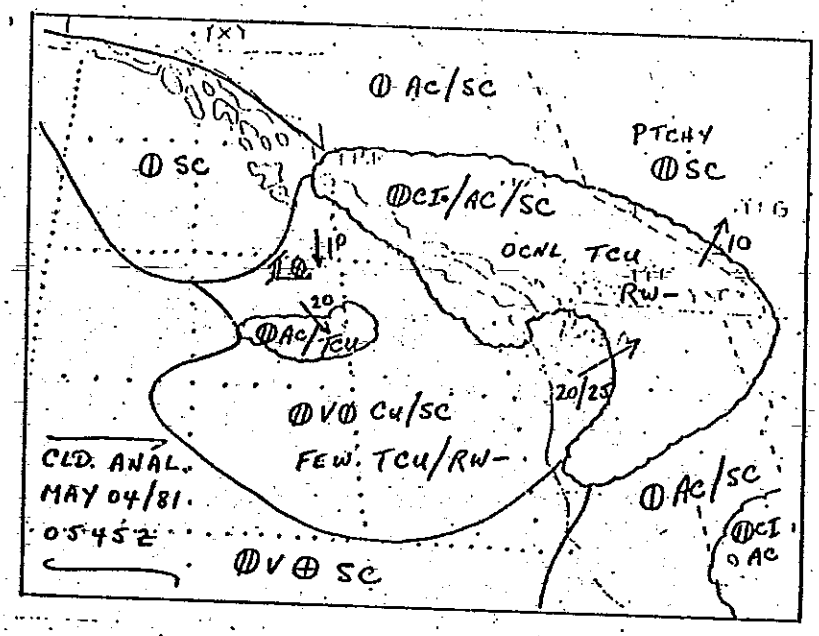


Fig. 3. Satellite Cloud Analysis

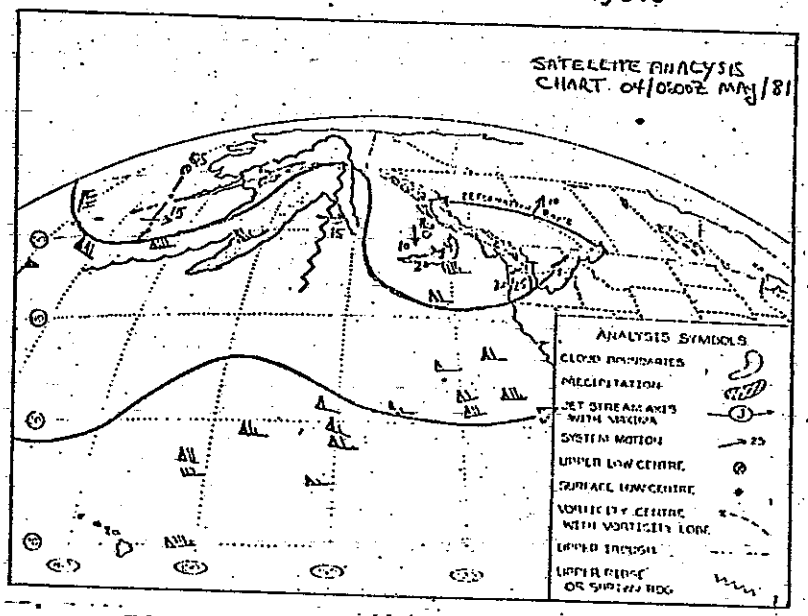


Fig. 4. Satellite Analysis Chart

A major augmentation of the current satellite analysis program will occur with the introduction of a GOES VISSR station in the PWC. The station, being developed under contract by MacDonald, Dettwiler and Associates, Ltd. (MDA) of Vancouver, will be implemented in two stages. In September 1981 the Weather Information Processing System (WIPS) component of the station is to be installed. Receiving time-stretched digital VISSR data directly from the GOES

West satellite, the station will provide half hourly visible and infrared images of the N.E. Pacific Ocean and western North America The whole image or selected sectors will be able to be produced and displayed on any of three local or remote facsimile circuits. To meet the needs of various users, the operator will have control of scaling of the sector, of image contrast enhancement, of background map contrast and of the gama corrections for the particular facsimile devices and circuits; all separately for each of the three output circuits.

In about March 1982 a Meteorological Data Analysis System (METDAS) is to be added to the Vancouver GOES station. With this system the PWC meteorologists will be able to display and process the images received by the WIPS on a high resolution screen, in grey scales or in colour. Interactive controls will allow them to:

- develop and display one or more animated image sequences for the study of cloud and system motions, dynamic developments, etc.;
- receive a wide variety of meteorological fields from the Canadian Meteorological Centre computer in Montreal, and display one or more of the fields as contours overlaid on chosen satellite images;
- differentiate cloud levels and other significant features by selectively varying grey scales or pseudocolour enhancements;
- store and recall archive images;
- record or transmit satellite images from the screen to facsimile recorders, with or without overlaid field contours;
- produce histograms or other derived statistical data of selected portions of satellite images.

As the PWC meteorologists gain experience with this versatile analysis system, a number of additional capabilities are expected to be added to the METDAS. Such potential additions include:

- the display of grid point or conventional data;
- the reception and display of vertical satellite soundings, such as TOVS data;
- the computer assisted computation of cloud winds, or other system velocities;
- the computer assisted preparation of bogus point data, and transmission of this data to the CMC in Montreal;
- The computation, contouring and display of sea surface temperatures.

The thorough probing analysis of the satellite imagery over the Pacific Ocean, when used in conjunction with related numerically generated upper air fields, and with the increasing use of TOVS soundings and aircraft reports, both objectively and subjectively will be the principle alternative to the upper air soundings heretofore provided by the weatherships for determining the structure of the atmosphere over the north east Pacific. The application of the procedures that have been developed in the PWC has already greatly improved their analyses of this important area, and time alone will tell to what extent the current and future techniques will offset the loss of the soundings from station P.

Mobile Ship Upper Air Soundings

Although the use of soundings from ships and aircraft were at first judged to be too costly, a thorough feasibility study of a new type of ship-borne rawindsonde sounding system in the North Pacific is currently being made. The proposal is based on the real time system potential of the OMEGA windsonde techniques used successfully during the Storm Response Experiment (STREX) in the north east Pacific in the fall of 1980, and on the scheduled operation of Japanese cargo vessels between North America and Japan. This system could possibly provide four to six soundings daily in the north Pacific, beginning in 1983, for an annual operating cost of about one million US dollars.

A ten month Canada-US sponsored feasibility study of this proposal was begun in June 1981, under the direction of Warren Keenan of NOAA and Vincent Lally of NCAR. It must be emphasized that at this time the future of this proposal is very dependant on the outcome of the feasibility study, the co-operation of the operators of suitable vessels, and on the support of participating governments.

AN AUGMENTED SURFACE OBSERVING PROGRAM

In addition to the regular reports from the weathership at station P, surface reports from the area are received from six moored US buoys, and from voluntary observing ships. To augment these sources, steps have been taken to increase the surface observations by using buoys, and coastal stations, and by increasing the recruiting of voluntary ships.

Meteorological Drifting Buoys

Initially consideration was given to mooring an instrumented 10 meter discus buoy at station P, similar to the six being maintained by the US National Data Buoy Program in an arc around station P. However the requirement for two such buoys and their periodic exchange in order to maintain one on station, together with the risk of capsizing or losing a buoy in this, one of the world's stormiest oceans, made this approach appear too costly. In view of the promising results being obtained with simple drifting buoys in FGGE, it was decided to introduce an operational system based on the further development of such buoys. Hermes Electronics Ltd. of Dartmouth, N.S. were contracted to provide a number of FGGE type buoys, and to add drogues and anemometers to such buoys so as to increase their effectiveness.

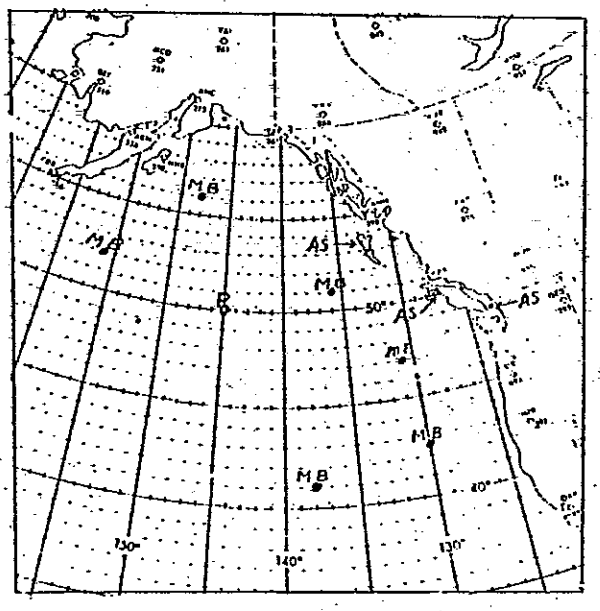
To provide timely receipt of buoy data from the north east Pacific, and incidentally also from the Arctic Ocean, an ARGOS local users terminal was established by adding suitable computing capability to the TIROS receiving station at Edmonton, Alberta.

The first four drogued FGGE type buoys, deployed near station P in January 1980 showed serious reliability problems. A buoy reliability program was then instituted by the supplier, and six new buoys deployed in October 1980 all operated without a failure until late April, a period of 185 days. One of these buoys experienced early battery failure in May. With some improvement in drogue durability, a useful operating life of a year or more in the north east Pacific appears achievable. The first buoys with anemometers were tested near Nova Scotia in June. The continuing development and field trial program is aimed at increasing the cost effectiveness of a drifting buoy network by increasing buoy life and reliability, improving station keeping drogues, providing wind reports, and possibly by providing a measure of sea state.

The effectiveness and the optimum distribution of drifting buoys in the north east Pacific, and the need for them in conjunction with surface data from voluntary vessels and moored buoys is under continuing review. Meanwhile it is planned to replenish the current network with four buoys to the south and west of station P this summer. More details on this buoy system and related developments will be presented in another paper in this conference.

Voluntary Observing Ships

While drifting buoys are most cost effective in ocean areas with little commercial ship traffic, an effective voluntary vessel observing program can potentially provide surface data most economically in much of the PADS area of the north east Pacific. To increase such observations, recruiting has been stepped up, with 98 ships recruited in the past 6 months, in Canadian Pacific ports, in comparison with 25 in the same time a year before. Studies have also been started recently on means of improving the timely receipt of the ships reports, including the possible use of satellite DCP's to transmit automatic or manual weather data from ships.



MB - Moored Buoy
AS - Automatic Station
P - Station PAPA

Fig. 5. Moored buoys and Coastal Automatic Stations

Coastal Automatic Meteorological Stations

To provide reports from key locations in support of coastal shipping three MAPS type automatic weather stations were obtained from Bristol Aerospace Ltd. of Winnipeg, Man. Since installation in 1980 these have been reporting winds, air pressure, temperature and precipitation from the three coastal points shown in fig. 5.

COMPARISON OF ESTIMATED ANNUAL OPERATING COSTS

Based on current 1981 costs for fuel, salaries, expendibles, etc.

Weathership Program

Annual Operating Costs:

Cost in 1978 for full program	$6.0 M
Projected 1981 full program operating cost (12% annual increase for fuel, salaries, etc.)	8.4 M
Actual operating cost in 1980 (a reduced staff and fuel saving program)	$6.6 M

New PADS System

The Satellite Station Program	
estimated annual operations	$0.5 M
estimated annual system development	0.5 M
The Surface Observing Program	
estimated annual operations	$0.2 M
estimated annual system development	0.2 M
Total estimated annual cost	$1.4 M

(System development and capital costs: $4.7 M)

Mobile Ship Upper Air Program

Annual operating cost, very approximately	$1.2 M

(System development and capital cost: $3.0 M)

CONCLUSION

This completes this status report on the meteorological data systems that Canada is developing and instituting in the north-east Pacific Ocean upon the termination of the weather ship program at station P. Using the rapidly developing satellite, buoy and automation technologies, these systems can be expected to develop and evolve over the next five years or more. Studies are planned in the AES of the potential for using the PWC subjective analyses of the north east Pacific area, and of introducing this information, possibly as "bogus" or adjustment points, into the objective numerical analysis. If effective techniques are developed, they could prove to be important in the search for economical alternative to at least a small number of the most costly conventional observing stations.