



# **PACIFIC REGION TECHNICAL NOTES**

80-028

August 28, 1980

## GALE FORCE WINDS AND HEAVY THUNDERSTORM ACTIVITY OVER SOUTHWESTERN B.C. ON SUNDAY, AUGUST 17, 1980

(Forecast Investigation #5)

Peter Haering, Chief Meteorologist  
Pacific Weather Centre, Vancouver

### INTRODUCTION

On Sunday, afternoon and evening, August 17, 1980, many parts of southwestern B.C. received considerable damage due to strong winds and rather severe thunderstorm activity. Power outages were quite general over a large part of Greater Vancouver. Being Sunday, many recreational boaters were having problems with gusty gale force winds over Georgia Strait and the Juan de Fuca Strait. Unconfirmed reports indicated that a water sprout was sighted over English Bay. An examination of the meteorological events that led to these conditions revealed a number of interesting points both from a forecasting and operational point of view. The forecasts that were issued that day were generally quite good, although the thunderstorm activity was not anticipated early enough and the wind speeds over the water were forecast a bit too low.

### DOCUMENTATION

- Figure 1 - Forecasts issued/both public and marine
- Figure 2 - Port Hardy, Upper Air Sounding August 17, 1200Z
- Figure 3 - Port Hardy, Upper Air Sounding August 18, 0000Z
- Figure 4 - Top Half - 250mb analyses for August 17, 1200Z  
and August 18, 0000Z  
Bottom Half - 500mb analyses for August 17, 1200Z  
and August 18, 0000Z
- Figure 5 - Surface analyses for August 17, 1200Z  
August 17, 1800Z  
and August 18, 0000Z
- Figure 6 - Top part - 12hr LFM 500mb prognoses valid August 18, 0000Z  
and 12hr CMC 500mb spectral prognoses valid  
August 18, 0000Z  
Bottom part - 500mb lifted index (LFM) analysis valid  
August 18, 0000Z and 12hr forecast lifted  
index valid 18 August, 0000Z.
- Figures 7 - Various lighthouse reports near 0000Z of August 18, 1980.  
& 8
- Figure 9 - CMC surface analysis for August 18, 0000Z.  
Unfortunately, the satellite pictures for the appropriate  
time did not reproduce well and have been omitted.

## DISCUSSION

1. Comparison of the 12hr 500mb progs (Both spectral and LFM) top half of figure 6 with the actual 500mb analysis (Bottom, right hand side of figure 4) show that the 12hr prognoses were excellent. Furthermore, the intense digging that had occurred was quite well forecast for the first time some 24hrs before the event occurred. The strong jet maxima shown on the 250mb chart valid 17 August, 1200Z over Southern Alaska (About 150kts.) (See figure 4, top left side) was an indication that the progs would likely verify well. Also, to the southwest of Alaska (not on chart) a storm (remnant of a typhoon) was moving towards western Alaska and intensifying rapidly, assuring ample ridging to the east of its path. The MSL surface prognoses of all computer progs showed relatively weak pressure gradients over Georgia Strait (in a northwest to southeast direction) and a 1000-500mb thickness drop of about 6dam.
2. The marine forecasts for southwestern B.C. were generally good - gales of 35 knots were expected over Georgia Strait and gales of 40 knots along the west coast of Vancouver Island. This may have been an underestimate of about 5 knots. Also during this time period, the winds were quite gusty.
3. The severity or the onset of the thunderstorms was not forecast well. The change from rain to showery conditions, however, was anticipated.
4. In this particular case consideration of strict MSL pressure gradients along the Georgia Strait would have led to a forecast of light to moderate winds. No doubt the gale force winds were caused by a channeled wind maxima that moved over the region. In such cases isotherms, height contours, and thickness lines are generally parallel to the axis of maximum wind. These areas of channeled flow are vertically deep and there is usually little change in wind direction with height (See winds figure 3 of 0000Z Port Hardy sounding). In such cases, the strongest winds will be associated with the wind maxima and are located immediately below it. Where then is the wind maxima located? (For detailed discussion, see Pacific Region Technical Note 79-004, Model 3).
5. The upper air soundings for Port Hardy indicated very strong cooling near the 500mb level while the surface temperature remained relatively constant. This indicates rapid destabilization of a moist airmass, and in part explains the occurrence of the thunderstorms. No doubt this explanation is too simplistic. The satellite imagery indicated a rather complex evolution to the system that was carried on the PWC surface analyses for August 17, 12Z, August 17, 18Z and August 18, 00Z (See figure 5). In this case, there are also many similarities to what Roger Weldon refers to as "baroclinic leaf cloud systems" (Part IV Satellite Training Course Notes, Cloud Patterns and the Upper Air Wind Fields, March, 1979. Certainly, the lifted index prognostic charts (Figure 6) were no help.

6. An interesting point also is the difference in surface analyses between the CMC and PWC in this case (figures 9 and 5). No doubt the significant event (portrayed by some line on a chart) was captured better by the PWC analysis. However, what frontal slope is implied by the PWC analysis?

#### SUMMARY

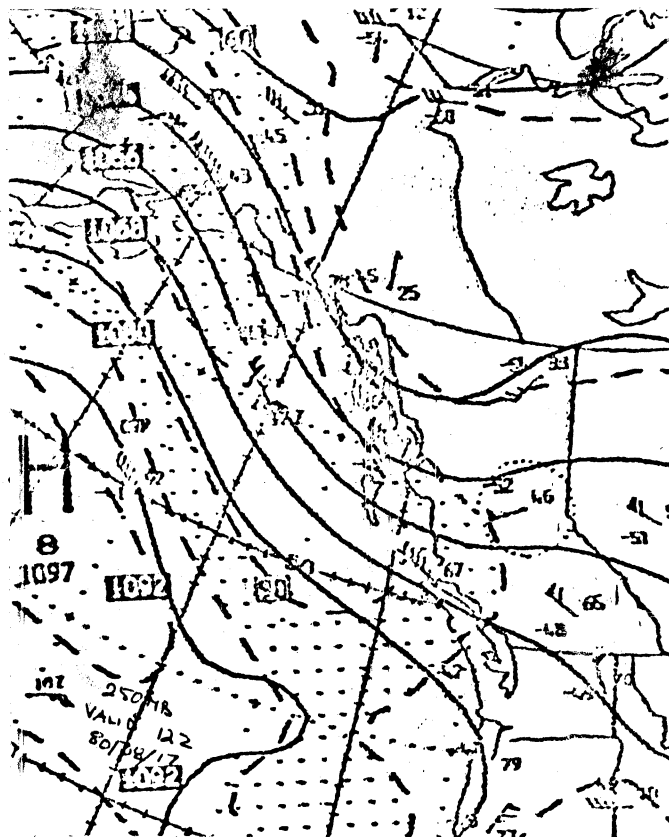
The following investigation has revealed that the forecasting of winds for southwestern B.C. is extremely complex. The factors to be considered are:

1. MSL pressure gradients for
  - Georgia Strait
  - Juan de Fuca Strait
  - Interior to coast
2. Wind direction and speeds at upper levels
3. Location and strength of upper wind maxima
4. Type of flow (advection, channel)
5. Stability of airmass over area and changes in stability
6. Direction of low level flow and influences of topography on direction and speed of flow
7. Assessment of day time heating and night time cooling
8. Stage of development of system under consideration.

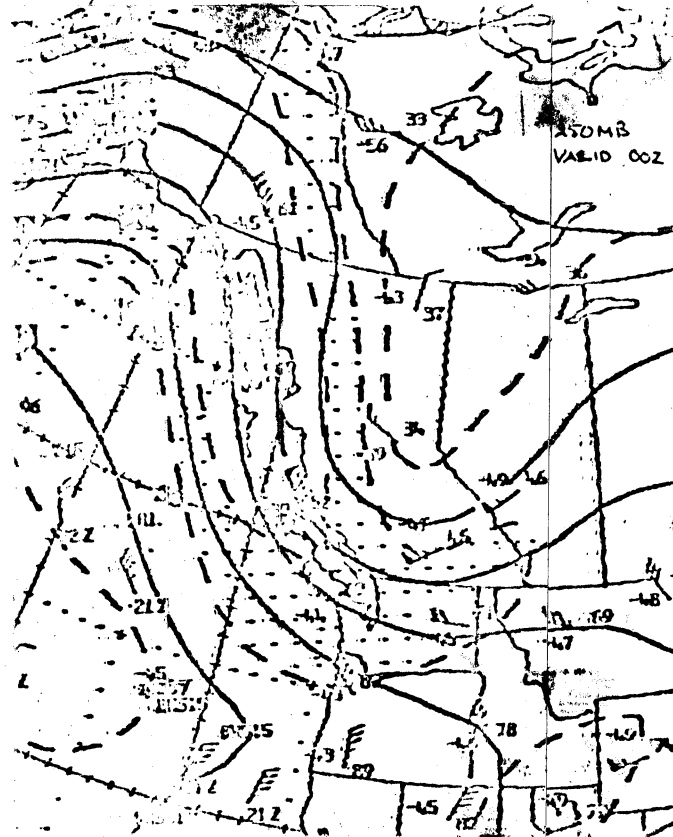
Many of these factors are now being assessed subjectively only. Perhaps what is needed is a systematic investigation of (initially) extreme cases with the view of developing objective techniques.



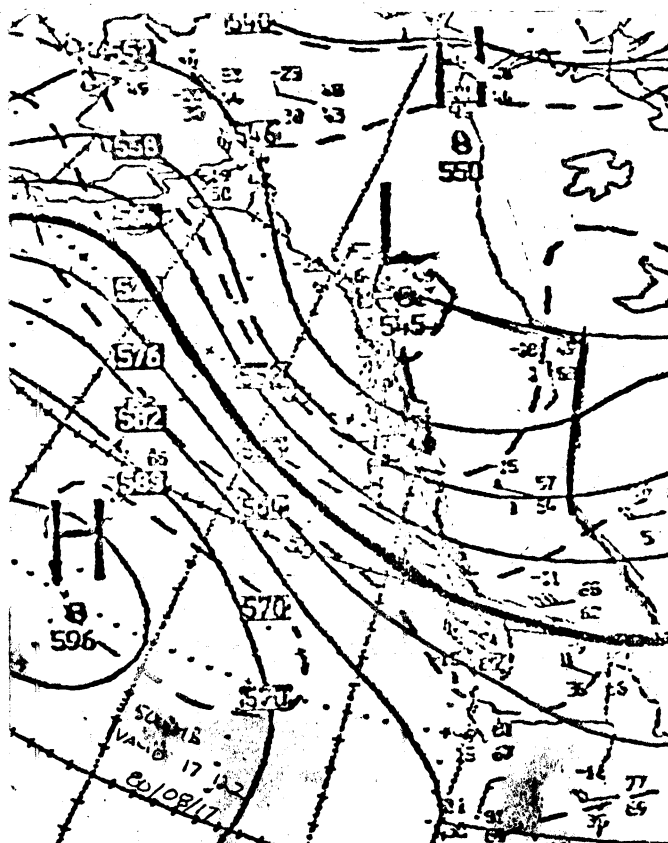




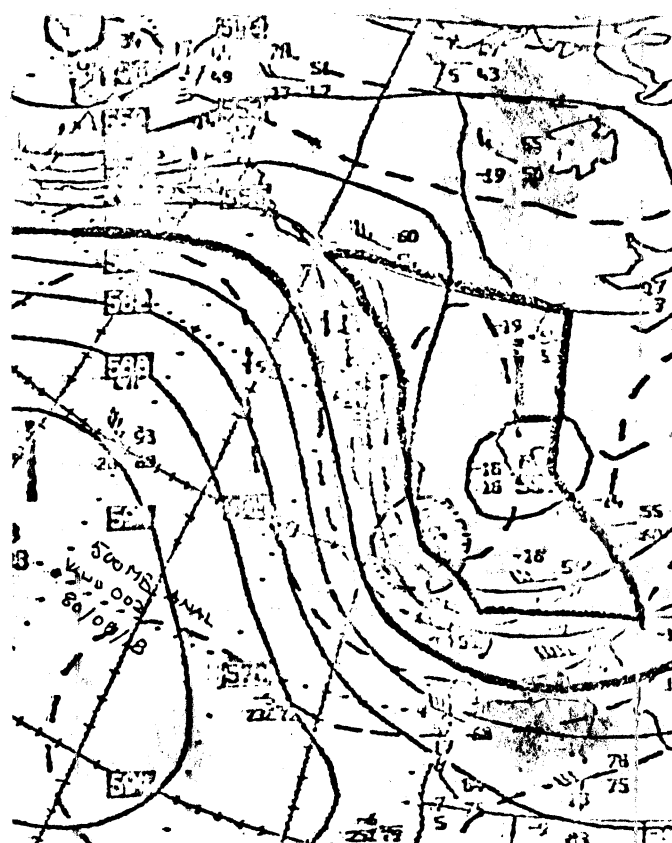
250MB ANAL. VALID 12Z AUG. 17, 1980



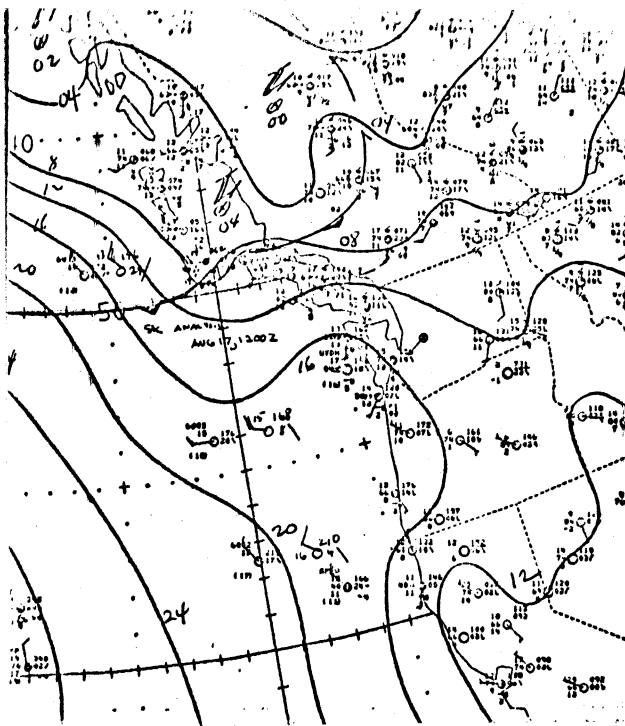
250MB ANAL. VALID 00Z AUG. 18, 1980



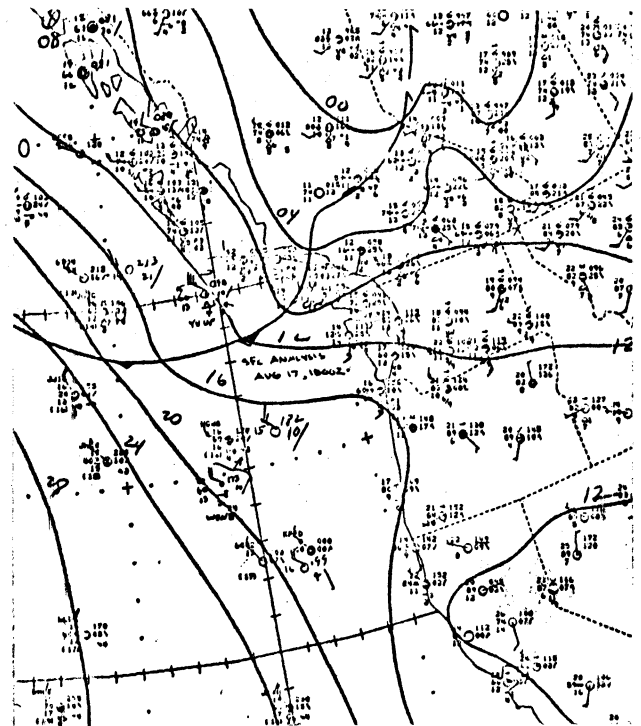
500MB ANAL. VALID 12Z AUG. 17, 1980



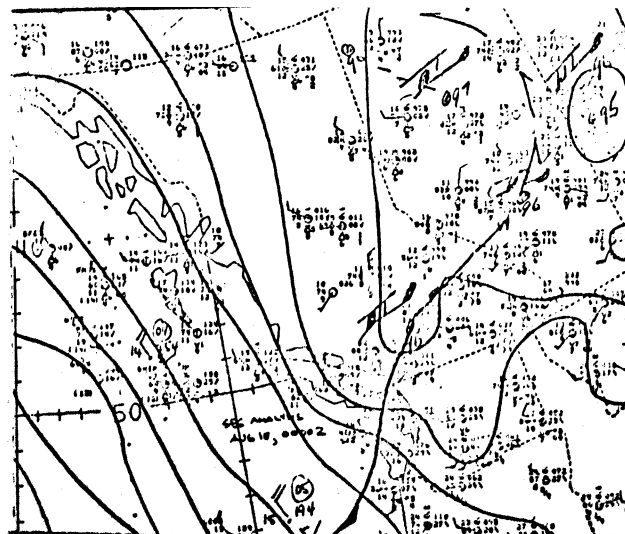
500MB ANAL. VALID 00Z AUG. 18, 1980



SURFACE ANALYSIS  
AUG. 17, 1980  
1200Z

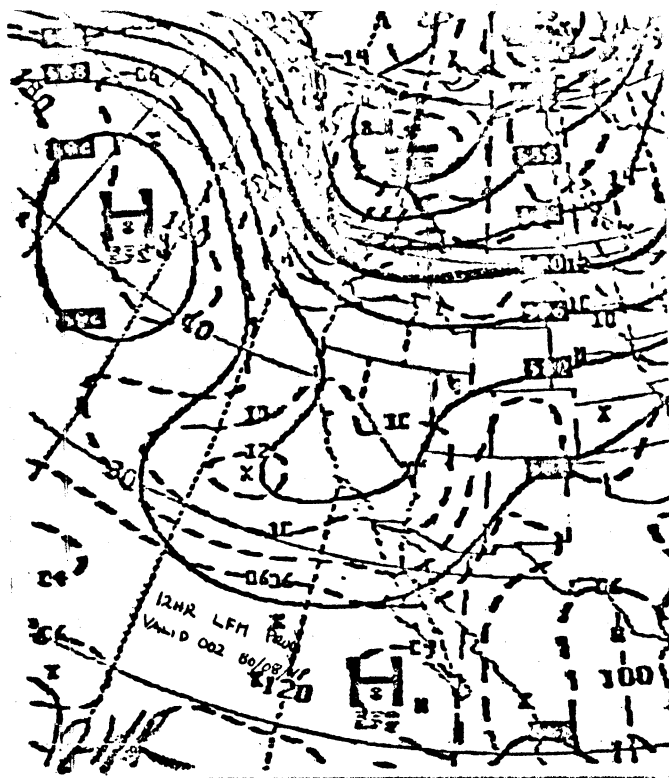


SURFACE ANALYSIS  
AUG. 17, 1980  
1800Z



SURFACE ANALYSIS  
AUG. 18, 1980  
0000Z

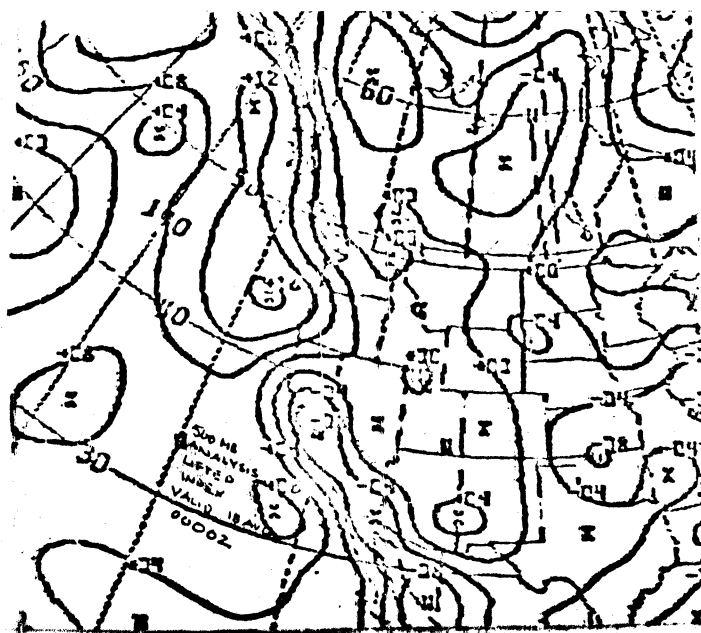
FIGURE 5.



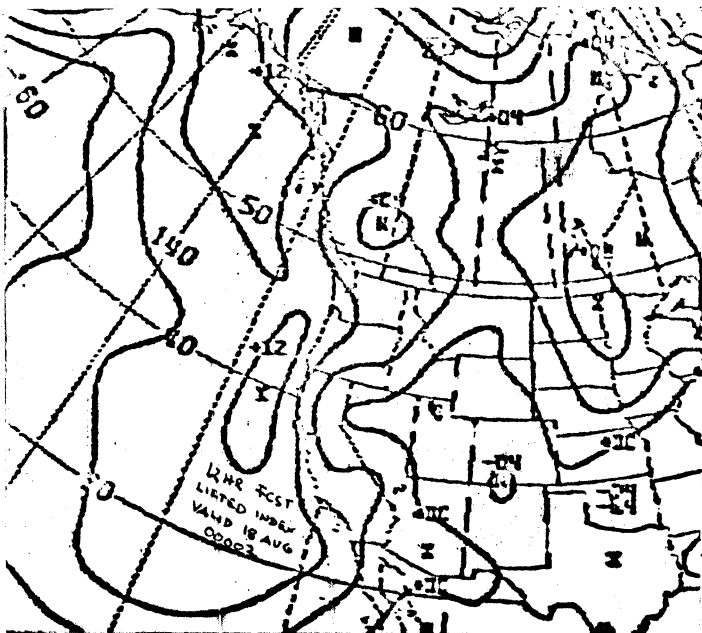
500MB 12HR LFM PROG  
VALID 0000Z AUG.08,1980



500MB 12HR SPECTRAL PROG  
VALID 0000Z AUG.08,1980



500 MB ANALYSIS  
LIFTED INDEX VALID AUG.18,1980  
0000Z



500MB 12HR PROG.  
LIFTED INDEX VALID AUG.18,1980  
0000Z

FIGURE 6.



GREEN CLOY 15 NE15 CHPY  
LUCY CLOY 15 NW18 CHPY LO W  
TRIPLE PC 15+ W21 HVY CHP LO W 3014R  
LANGARA CLOY 12 W18 MOD MOD W 2990R WND OVER SEA E W25 OCCAS SQUA  
LAWYER CLOY 15 NW14 CHPY  
RONILLA PC 12 NW28G ROUGH HVY NW 2984R  
ROSESPIT W28

FIGURE 7

SXC4 CWVR 172345  
GRIEF PT. CLOY 12-15 NWS SMTH

SXC4 CWVR 172300  
FIRST NARROWS OVCST 10 UNAVBL3 RPLD  
BURRARD BRIDGE OVCST 8 NE2 RPLD  
JERICHO OVCST 6+ SE8 RPLD  
TSANWASSEN CLOY 15+ SSE18 CHPY

SXC3 CYPR 172245  
GREEN PC 15 NW20 CHPY  
LUCY CLOY 15 W22 CHPY LOW W  
TRIPLE PC 15 W25 MODT LOW/MODT W 2987 R  
LAWYER CLOY 15 NW20G MODT  
RONILLA PC 15 SW24G RUFF HVY NW 2986 R  
ROSESPIT W26

SXC4 CWVR 172300  
SHERINGHAM OVCST 7R- W25G MOD  
RACE ROCKS CLOY 8 W25 MOD  
DISCOVERY PTLY CLOY 10 W20 MOD

SXC4 CWVR 172300  
LAZO CLOY 20 NW15G CHPY  
MIDGE PTLY CLOY 15 NW18 CHPY  
SANDHEADS CLOY 15 SE24 MOD  
CHROME OVCST 6R W15G CHPY  
STIEVES OVCST 4R+ NE18G MOD  
MERRY CLOY 15T SE21 MOD SE SWL THUNDER STORM NW HDNG NE=

BALLENAS CLOY 5-15R E16G MOD MOD EAST SWL  
ENTRANCE CLOY 10 NW10 CHPY LOW EAST SWL  
ATKINSON CLOY 15 E14 LGT CHOP  
EAST POINT CLOY 15 SW14 MOD

SXC3 CMAQ 172300  
BULL HARBOUR CLOY 15 NW15G CHPY 294AS  
BOAT BLUFF CLOY 15 NW10 LGT CHOP  
MCINNES CLOY 12 NW20G MOD LOW SW 298UR  
IVORY CLOY 15 NW25G MOD LOW/MOD SW  
DRYAD OVCST 12 NW12 LGT CHOP  
POINTENK OVCST 10 NW8 LGT CHOP  
CAPE ST. JAMES CLOY 12 NW36G43 HECAETE MOD LOW NE PACIFIC ROUGH MOD  
WEST 2991R  
ADDENBROKE CLOY 15 NW30G MOD/TROUGH MOD NW  
EGG CLOY 12 NW30E ROUGH MOD NW  
PULTENEY CLOY 12 NE30G MOD MOD WEST  
PINE CLOY 12 W25G CHPY MOD/HVY WEST  
CAPE SCOTT PTLY CLOY 12 NW10 CHPY LOW/MOD SW 2987F EMOS NW25  
QUATSINO CLOY 12 W10 CHPY LOW/MOD AEST EMOS W20G UCNL RW  
SCARLETT CLOY 15 NW25G MOD LOW/MOD NW  
ALERT RAY CLOY 15 NW25G ROUGH 2977S  
NOOTKA MISC  
ESTEVAN PTLY CLOY 15 NW35 MOD MOD WEST  
LENNARD CLOY 12 NW22G28 CHPY LOW SW  
CAPE BEALE OVCST 8 W25G CHPY LOW SW  
PACHENA OVCST 8 NW10 CHPY LOW SW  
CARMANAH OVCST 6I- W20 MOD LOW SW

SXC4 CWVR 180245  
GRIEF PT. CLOY 8 NW 640 RUF

FIGURE 8

SXC3 CYPR 180145  
GREEN CLOY 15 NW12 CHPY  
LUCY CLOY 15 NW20 CHPY LOW W  
TRIPLE PC 15 W21 MODT LOW/MODT W 2991 W  
LANGARA PC 15 W14 MODT MODT W 2998 R WOS W25E SWT 11.7  
LAWYER CLOY 15 NW16G MODT  
RONILLA PC 15 NW26G RUFF HVY NW 2991 R  
ROSESPIT W26

SXC4 CWVR 180200  
JERICHO CLOY 6 SW9 CHPY  
SHERINGHAM OVCST 10 W25G MOD  
RACE ROCKS OVCST 8R- W30 MOD  
TRIAL ISLAND OVCST 8 W30 MOD  
DISCOVERY CLOY 10R- W30 ROUGH  
LAZO CLOY 20 NW20G30 ROUGH  
MUDGE CLOY 15 NW28 MOD MOD NW SWL  
CHATHAM CLOY 12 W26G MOD MOD WEST SWL  
SANDHEADS CLOY 15 W22 MOD LOW WEST SWL  
CHROME CLOY 12RW NW12 LGT CHOP LOW SE SWL  
SISTERS CLOY 10 NW30G ROUGH  
MERRY CLOY 15 NW26 MOD SHWRs DSTNT NE-SE  
BALLENAS CLOY 12 NW30G MOD  
ENTRANCE CLOY 10 W16 MOD LOW NW SWL  
ATKINSON CLOY 15 W14 LGT CHOP LOW WEST SWL  
EAST POINT OVCST 5-8RF SW6 CHPY

SXC3 CMAQ 180200  
BULL HARBOUR PTLY CLOY 8 NW20G ROUGH 2987R EMOS NW30G  
BOAT BLUFF PTLY CLOY 15 NW8 LGT CHOP  
MCINNES PTLY CLOY 15 NW25G MOD LOW SW 2983R  
IVORY PTLY CLOY 15 NW18G23 MOD LOW SW  
DRYAD PTLY CLOY 15 NW8 LGT CHOP  
POINTENK PTLY CLOY 12 NW6 RPLD  
CAPE ST. JAMES PTLY CLOY 15 NW36G46 HECAETE MOD LOW NE PACIFIC ROUGH  
MOD WEST 2993S 12.8  
ADDENBROKE CLOY 15 NW25G MOD MOD NW  
EGG PTLY CLOY 12 NW35E ROUGH MOD NW  
PINE PTLY CLOY 12 W30G MOD MOD WEST 9.2  
CAPE SCOTT PTLY CLOY 12 NW10G16 CHPY LOW/MOD WEST 2995S EMOS SE25G  
QUATSINO CLOY 6F NW25G CHPY LOW/MOD SW 12.2  
ALERT RAY CLOY 12 NW40G ROUGH 2981R  
SCARLETT CLOY 15 W20G MOD MOD NW  
PULTENEY CLOY 12 NW30G MOD MOD WEST  
NOOTKA CLOY 12 W15 MOD LOW/MOD SW  
ESTEVAN PTLY CLOY 15 NW38 MOD MOD WEST  
LENNARD PTLY CLOY 12 NW45 ROUGH LOW/MOD SW  
AMPHITRITE CLOY 15 NW28 MOD LOW/MOD SW  
CAPE BEALE PTLY CLOY 15 W35G45 MOD MOD WEST  
PACHENA CLOY 12 NW40G55 ROUGH LOW/MOD SW  
CARMANAH PTLY CLOY 10 W25G MOD LOW SW

SXC4 CWVR 180400  
FIRST NARROWS CLOY 10 NW10G15E CHPY  
JERICHO CLOY 6R- E7 CHPY  
SHERINGHAM OVCST 6 W20G MOD LOW SW SWL  
RACE ROCKS OVCST 10 W25 MOD  
TRIAL ISLAND OVCST 8R- SW23 MOD  
DISCOVERY OVCST 8R- W20 MOD  
SXC3 CMAQ 180400  
BULL HARBOUR CLOY 7 NW18G ROUGH 2989R EMOS NW30G

