

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.
- 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 or 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.

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THE CHITTER LITERIUM.

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WHICH CHVR 171815

GALE MARNING FOR JOHNSTONE STUAIT DUEEN CHANLOTTE STRAIT
WEST CHAST VANCOUVER ISLAND AND GEORGIA STRAIT
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THE GALES OVER THE WEST CHAST CHANLOTTES AND OUTEN CHANLOTTE
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A COLD FRONT DROPPING SOUTHWAND OVER A TELEMBOR AND EVENTURE BENTOD
A COLD FRONT DROPPING SOUTHWAND OVER SINTHERN VANCOUVER ISLAND.
WINDS ARE EFFECTED TO INCREASE IN OR KNOTS OVER NORTH AND MEST
VANCOUVER ISLAND AND 35 KNOTS IN GEORGIA STRAIT. MINDS WILL

DIMINISH LATE MONDAY MORNING.
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RPCNICAVE 172300AMU

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WITH AN OUTLOOK FOR TUESDAY.
THE NEXT SCHEDULED FORECAST WILL HE ISSUED AI
5 AM HOMBAY HA AUGUST 1980.
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OUTPY CHARLOTTE STRAIT.
GALE MARNING ISSUED.
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HOWS HESTRAIT IN TO 25 KNOTS EXCEPT LIGHT IN JOHNSTONE STRAIT.
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HIST CUAST CHARLOTTES,
GATE MANNING CONTINUED.
HOWS HOMITHESTS TO TO 40 KNOTS DIMINISHING THIS EVENING TO 20 TO
10 AND HOMERS, VISIBILITY AT TIMES 3 MILES IN SHOWERS.
DIXON ENTRANCE
HETALE STRAIT.
HOMS HOSTRANCE TO TO TO KNOTS DIMINISHING THIS EVENING TO 25 KNOTS.
A FEM SHOWERS, VISIBILITY AT TIMES 3 MILES IN SHOWERS.

CALE STRAIT.
HOMS HOSTRANCE AND THE STRAIT SHOWERS THE EVENING TO 15 TO
25. A FEM SHOWERS, VISIBILITY AT TIMES A MILES IN SHOWERS.
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JUAN DE FILO STRAIT.

GALE AARNING ISSUED.

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MINDS DIMINISHING OVERNIGHT IO MEST IS 10 25. A FEN BMORERS.

VISIBILITY AT 11HES 2 MILES IN SHORERS.
            MECALE STRAIT.

ATTOM SCREEN Y 20 TO 30 KNOTS DIMINISHING THIS EVENING TO 15 TO
25. A FEM SHOKERS, VISIBILITY AT TIMES 3 MILES IN SHOWERS.

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MORTH CLUSTS. STROME SOUTHRLIES BEFORENT FRESH TO STRONG MESTERLIES.
      NORTH COAST, STRONG SOUTHRELES RECOMING FRESH TO STRONG WESTER
STRONG A
COLD FRONT IS BUDDEPING SOUTHREAD THROUGH SUITHERN VANCOUVER
ISLAND WITH A BUTGE IS BUILDING MORTHESTRAND OVER THE MORTH
COAST MORTHESTER CALES MILE SPREAD TO MOST COASTAL WATERS
AND THE EROPITAL SYSTEM IS EXPECTED TO REACH THE NORTH COAST
AND THE EROPITAL SYSTEM IS EXPECTED TO REACH THE NORTH COAST
HOROGAT AFTERMOON.
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END

FRONTAL STEERNOON.

END

FRANT 1 OF 2

FOWECASTS FOR SWITTISH COLLUMBIA 155HED BY ENVIRONMENT CAHADA AT 4.00 MM POT SIMINAT 17 AUGUST 1980 FOR TONIGHT AND MONDAY MITH AN OUTLON FOR TUESDAY.

HIT MILE SCHEDULED FORECAST MILL BE ISSUED AT F5 AM MONDAY 18 AUGUST 1980.

GRISTER VANCOUVER LOFE FORECAST MILL BE ISSUED AT F5 AM MONDAY 18 AUGUST 1980.

GRISTER VANCOUVER LOFE SOUNDAY. MAINLY CLOUDY, A FEW SHOWERS OVERNIGHT AND MONDAY MONDAY. AND INDIGHT 12 TO 14. HIGHS MONDAY 18 TO 20. OUTLOUR FOR THESDAY. MOSTLY CLOUDY.

EAST VANCOUVER SILAND

GRISTER VANCOUVER SILAND

TOWNING, CLOUDY WITH A FEW CLEAR SHEAKS, ISOLATED SHOWERS, LOWS 11 TO 13. MONDAY. CLUUDY WITH SUNNY PERIODS. ISOLATED MONNING SHORES, HIGHS 16 TO 20. OUTLOUR FOR TUESDAY. MOSTLY CLOUDY.

NORTH AND MEST VANCOUVER ISLAND.

TONIGHT, CLOUDY HITH A FEW CLEAR SHEAKS, ISOLATED SHOWERS, LOWS 11 TO 13. MONDAY. CLOUDY WITH A FEW CLEAR SHEAKS, ISOLATED SHOWERS, LOWS NORTHER MAINLAND.

OUTLOUR FOR TUESDAY. MOSTLY CLOUDY.

MONTHER MAINLAND

OUTLOUR FOR TUESDAY. MOSTLY CLOUDY.

HOMPON DEAT COUDT, PERIODS OF HAIN, HIGHS MFAR 15.

OUTLOUR FOR TUESDAY. MOSTLY CLOUDY.

HOMPON DEATH AND THE SHORE MEST CHANCE OF A THUNDERSHOWER THIS EVENING, LOWS TONIGHT 12 TO 14. MONDAY. MAINLY CLOUDY WITH A FEW SCHOOLS.

HIT SEVENING, LOWS TONIGHT 12 TO 14. MONDAY. MAINLY CLOUDY WITH A FEW SCHOOLS.
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GALE MANNING FOR LIAN DE FILLA STRAIT
ISSUED HY FREYPROMENT CANADA AT 3.45 PM PDT SUNDAY AUGUST 17 1980
THE GALE WARMING OVER MIST COASTAL WATERS 15 EXTENDED TO JUAN DE
FUCA STRAIT. WINDS WILL INCRESSE TO WESTERLY 30 TO 40 KNOTS
BY EVENING AND DIMINISH OVERNIGHT TO WEST 15 TO 25.
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BY EVERING AND DIMINISM OVERNICHT TO WEST 15 TO 25.

FPONILOWN 172365AD

AT 4,30 PM PORT SUIDAY 17 AUGUST 1940 FOR TONIGHT AND MONDAY

MITH AN INCHIONE FOR INCESDAY.

THE NEXT SCHEDILED FORECAST WILL HE ISSUED AT

5 AM MONDAY IN AUGUST 1980.

GREATER VARICHUSEN

HOSE STUMM-PHISTLER

SONSHIT CARRY VALLEY

MORE STUMM-PHISTLER

SONSHIT CARRY VALLEY

MINDY WEAR GEORGIA STRAIT, LOWS TONIGHT 12 TO 14, MONDAY.

MINDY WEAR GEORGIA STRAIT, LOWS TONIGHT 12 TO 14, MONDAY.

MINDY WEAR GEORGIA STRAIT, LOWS TONIGHT 12 TO 14, MONDAY.

MINDY WEAR GEORGIA STRAIT, LOWS TONIGHT 12 TO 14, MONDAY.

MINDY WEAR GEORGIA STRAIT, LOWS TONIGHT 12 TO 14, MONDAY.

TONIGHT, CLUMDY ATTH A FEW CLEAR HEREKS, A FEW SHOWERS, CHANCE OF

A THUMBERSHOWER, LOWS 11 TO 13, MONDAY, CLUMDY WITH SUNNY PERIODS,

ISOLATED MORNING SHOWERS, HIGHS 18 TO 20.

END
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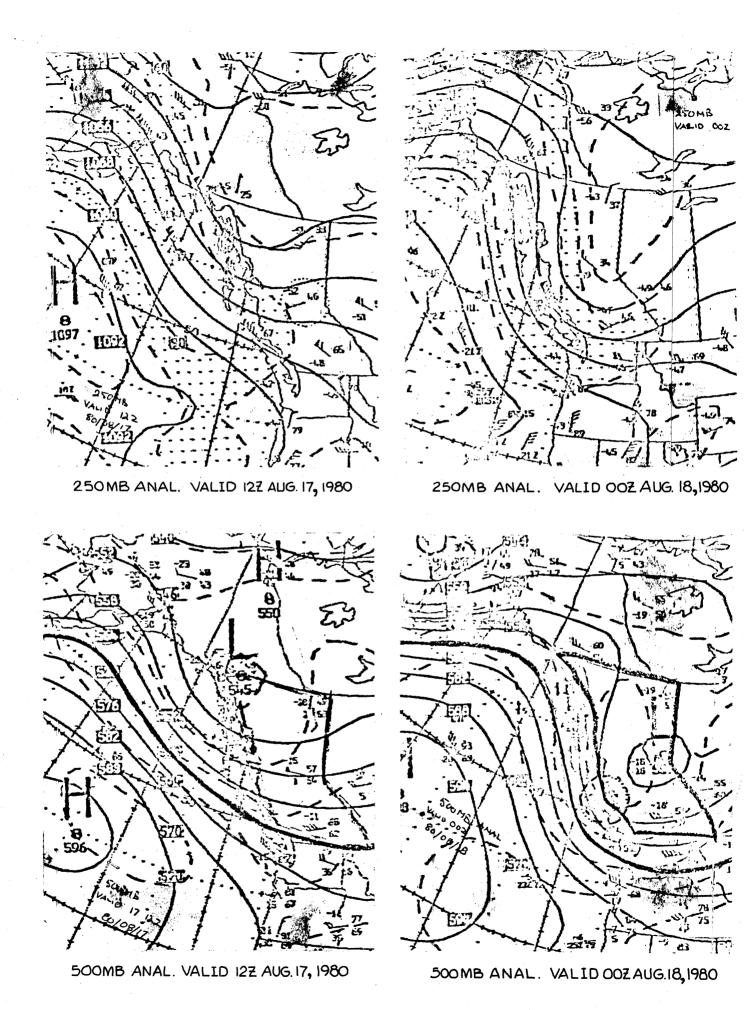
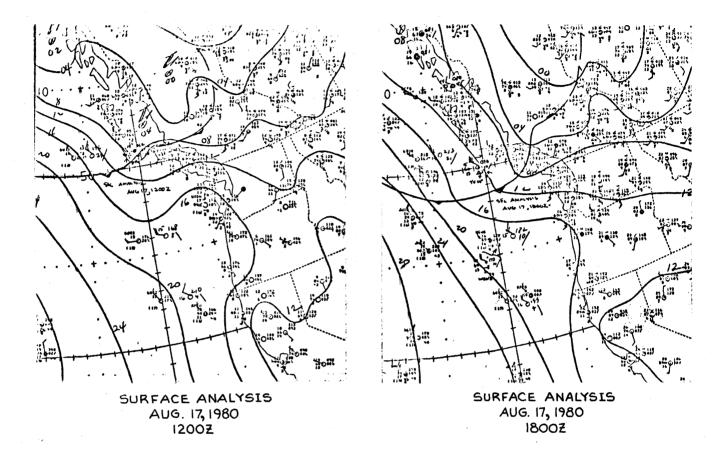


FIGURE 4.



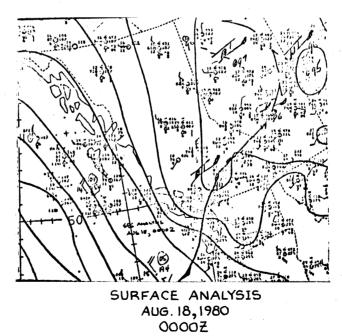
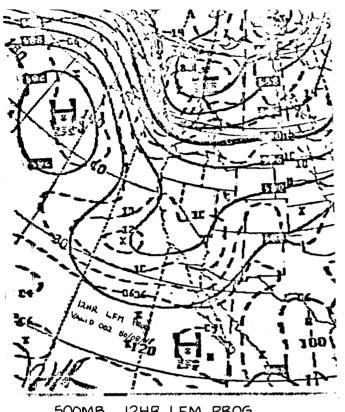
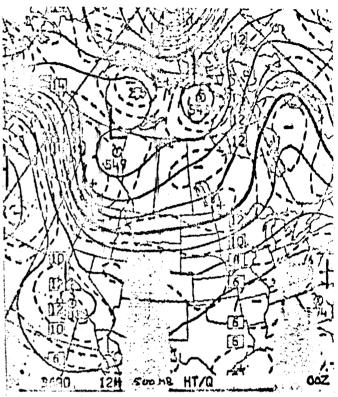


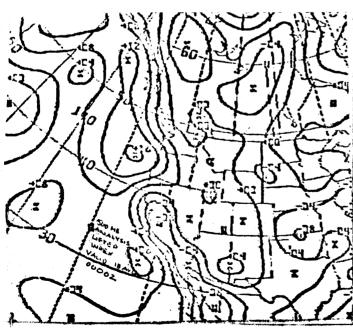
FIGURE 5.



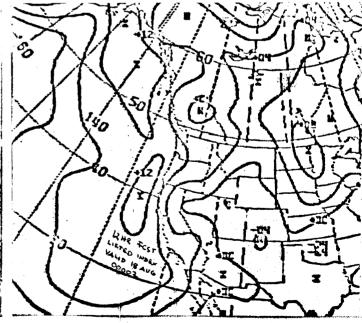
500MB 12HR LFM PROG VALID 0000Z AUG.08,1980



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

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TIPLE PC 15 MAI HVY CHP LO W
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LAMYER CLOY 15 MAI CHPY
BONILLA PC 12 NAZBG ROUGH HVY NW 2984R
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PINE CLOY 12 W25G CHPY MOD/HVY NEST
CAPE SCOTT PILTY CLUY 12 NW10 CHPY LOW/HOD SW 2987F EWOS NW25
QUANSIND CLUY 12 ALD CHPY LOW/HOD AEST EWOS W20G DCNL RW
SCARLEIT CLAY 15 NW25G MOD LOW/HOD NW LAZO CLUY 20 NWISG CHPY
MUDGE PTLY CLDY 15 NWIB CHPY
MUDGE PTLY CLDY 15 NWIB CHPY
STANDHEADS CLDY 15 SE24 WOD
CHROWE OVCST DR WISG CHPY
SISTERS OVCST 4R+ NEIBG WOD
MERRY CLDY 157 SE21 MOD MOD SE SWL THUNDER STORM NW HDNG NE=
BALLENAS CLDY 157 SE16 MOD MOD EAST SWL
ENTRANCE CLDY 10 NWIO CHPY LOW FAST SWL
ATKINSON CLDY 15 E14 LGT CHOP PC 15 NW20 CHPY
CLUY 15 W22 CHPY LOW #
PC 15 W22 MODT LOW/MODT W 2987
CLDY 15 NW206 MODT
PC 15 SW24G RUFF HVY NN 2986 R ADDENBRUKE CLOY 15 NW30G MOD/TROUGH MOD NW BULL HARBOUR CLDY 15 NW15G CHPY 2984S
804T BLUFF CLDY 15 NW10 LGT CHOP
FORNES CLDY 12 NW20G MUD LOW SX 2980R
IVORY CLDY 15 NW25G MUD LOW/MOD. SX
0RYAN OVCST 12 NW12 LGT CHOP ESTEVAN PTLY CLDY 15 NW35 MOD MGD WEST LENNARD CLDY 12 NW22G28 CHPY LOX SM CAPE BEALE OVCST 8 W25G CHPY LOM SW PACHEMA OVCST 8 NW10 CHPY LOW SN ALERT RAY CLOY 15 NM40G ROUGH 2977S SXCN4 CWVR 172300 FIRST NARROWS OVCST 10 UNAVBL3 RPLD BURRARD BHIDGE OVCST & NEZ RPLD JERICHO OVCST 6+ SE8 RPLD CARMANAH DVCST 61. - #20 MUD LOW SM EGG CLOY 12 NW30E HOUGH HOD NW DISCOVERY PTLY CLOY 10 WZO MOD ISAWWASSEN CLDY 15+ SSE18 CHPY SHERINGHAM OVCST 7R- W25G MOD RACE HOCKS CLDY 8 W25 MOD GRIEF PT. CLOY 12-15 NWS SMTH EAST POINT CLOY 15 SM14 MOD SXCN3 CMAR 172300 SXCN3 CYPR 172245 SXCN4 CWVR 172300 SXCN4 CWVR 172300 SXCN4 CMVR 172345 ROSESPIT TRIPLE LAWYER BONILLA ROSESPIT LUCY

SXCN4 CWVR 180245 GRIEF PT. CLOY 8 NW G40 RUF SXCN3 CYPR 180145

GREEN CLDY 15 NW12 CHPY
TUCY CLDY 15 NW20 CHPY LOW W
TRIPLE PC 15 W21 MODT LOA/MODT W 2991 W
LANGARA PC 15 W14 MODT MODT W 2998 R WOS W25E SWT 11.7

LAWYER CLDY 15 NW16G MODT
BONILLA PC 15 NW26G RUFF HVY NW 2991 R

SXCN4 CWVR 180200
JERICHO CLDY & SW9 CHPY
SHERINGHAM OUCST 10 w25G MND
RACE ROCKS OUCST 8 W 30 MND
TRIAL ISLAND OUCST 8 W 30 MND
TRIAL ISLAND OUCST 8 W 30 MND
DISCOVERY CLDY 10R-W30 ROUGH
LAZO CLDY 20 NW20G30 ROUGH
MUDGE CLDY 15 NW26 MND MND NW SML
CHATHAM CLDY 15 W266 MND MOD WEST SML
CHROME CLDY 12 W266 MND MCST SML
CHROME CLDY 12 W266 MND MGST SML
CHROME CLDY 12 W266 MND SHWRS DSTNT NE-SE
BALLENAS CLDY 12 NW26 MND SHWRS DSTNT NE-SE
BALLENAS CLDY 12 NW26 MND SHWRS DSTNT NE-SE
ENTRANGE CLDY 12 W16 MND LOW NW SML
ATKINSON CLDY 15 W14 LGT CHOP LOW WEST SWL
EAST POINT OUCST 5-8RF SW6 CHPY

SXCN3 CWAG 180200
BULL HARBUUR PTLY CLOY 8 NW20G ROUGH 2987R EWOS NW30G
BOAT BLUFF PTLY CLOY 15 NW8 LGT CHOP
MCINNES PTLY CLOY 15 NW56 MOD LOW SW 2983R
IVORY PTLY CLOY 15 NW18G23 MOD LOW SW
DRYAD PTLY CLOY 15 NW8 LGT CHOP
POINTER PTLY CLOY 12 NW8 RPLD
POINTER PTLY CLOY 12 NW8 RPLD
POINTER PTLY CLOY 12 NW8 RPLD

DRYAD PTLY CLOY 15 NYB LGT CHOP
POINTER PILY CLOY 15 NYB RGT CHOP
POINTER PILY CLOY 12 NWB RPLO
CAPE 51, JAMES PILY CLOY 12 NW3646 HECATE MOD LOW NE PACIFIC ROUGH
MOD WEST 29938 12.8
ADDENBROKE CLOY 12 NW256 MOD MOD NW
EGG PILY CLOY 12 NW356 WO MOD NW
PINE PILY CLOY 12 NW356 WO MOD WEST 9.2
CAPE SCOTT PILY CLOY 12 NW10G16 CHPY LOW/MOD WEST 29958 EWOS SE25G
QUARTSINO CLOY 12 NW406 RIUGH 2981R
SCARLETT CLOY 12 NW406 MOD NW
PULTMEY CLOY 12 HW30G MOD NW

GLATSING CLOY 6F NW25G CHPY LOW/AND SW 12.2
ALERT BAY CLDY 12 NW40G ROUGH 2981R
SCARLETT CLOY 12 NW20G MOD MOD NW
PULTNEY CLDY-12 HW30G MOD MOD -4E8T
NOOTKA CLOY 12 W15 MOD LOW/MOD SW
ESTEVAN PTLY CLOY 15 NW38 MOD MOD MOD KEST
LENNARD PTLY CLOY 15 NW28 MOD LOW/MOD SW
CAPE BEALE PTLY CLDY 15 NW28 MOD LOW/MOD SW
CAPE BEALE PTLY CLDY 15 NW20 MOD MOD WEST
PACHENA CLDY 12 NW40655 ROUGH LOW/MOD SW
CAPMANAH PTLY CLDY 10 W25G MOD LOW SW

SXCN4 CNVR 180400
FIRST NARROWS CLDY 10 NW10G1SE CHPY
JERICHO CLDY 6R- E7 CHPY
SHERINGHAM OVCST 6 W20G MOD LOW SW SWL
RACE ROCKS OVCST 10 W2S MOD
UTSCOVERY OVCST 8R- SW23 MOD

SXCN3 CWAG 180400 BULL HARBOUR CLDY 7 NW18G ROUGH 2989R EWDS NW30G

