PACIFIC REGION TECHNICAL NOTES

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THE EFFECT OF MOUNT ST. HELEN'S VOLCANIC ERUPTION MAY 18, 1980 ON CEILINGS AND VISIBILITIES OVER SOUTHEASTERN B.C.

Mert Horita
Senior Development Meteorologist
Pacific Weather Centre, Vancouver

INTRODUCTION

At 1531Z Sunday May 18, 1980 Mt. St. Helens situated at 46.12N, 122.12W erupted. The uppermost 1200 feet of Mt. St. Helens was decimated and pulverized volcanic rock was thrown over 60,000 feet into the atmosphere. The maximum amount of ash fallout, outside the immediate vicinity of Mt. St. Helens, was located approximately 300 kms to the east-northeast. Southern Vancouver Island is within this distance of Mt. St. Helens.

Due to the prevailing winds below 500mbs, the effects of the ash fallout extended into southeastern B.C. Reduced ceiling and visibilities were recorded for up to 2 days.

SATELLITE IMAGES OF THE VOLCANIC ASH

Figure 1 shows the infra-red satellite picture for 1445Z and 1545Z. These occurred 46 minutes before and 14 minutes after the eruption. By 1665Z a high resolution infra-red image with an MB enhancement was being received at the Pacific Weather Centre via the GOES-W tap through Seattle. The MB enhancement sharpens up the IR image temperatures between -30 and -80 (temperatures associated with the atmosphere between 500 and 150mbs). Figures 2 and 3 show the rapid growth and progression of the ash cloud eastward into eastern Washington/Idaho and then southward. The speed and direction of the ash cloud closely follows the 250mb wind field for that morning, May 18, 1200Z. Wind analyses above the 250mb level were not available at the PWC.

METEOROLOGICAL CONDITIONS

At the time of the eruption the mean 200mb wind was southwesterly 10-15 knots over Washington and southern B.C. The 500mb wind was west-southwest 10-15 knots becoming northwesterly 10 over eastern Washington and Idaho. The 250mb wind was westerly 45 knots changing to northwesterly 45-55 over eastern Washington and Idaho. Figures 4 and 5 show the May 18, 1200Z, and May 19, 0000Z analyses for 700, 500 and 250mbs.

The most significant effects of the ash fallout were directed to the east-northeast of Mt. St. Helens. Figure 6 depicts roughly the areas with ground accumulations of ash fallout greater than ¼ inch. This distribution is

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consistent with the assumption that the ash was advected by the prevailing high level winds and ash falling to each subsequent lower level would be redirected in the direction of the wind of that level. Therefore, the largest accumulations world be expected over an area with prevailing winds at all levels coming from a direction with a significant amount of ash fallout from upper levels.

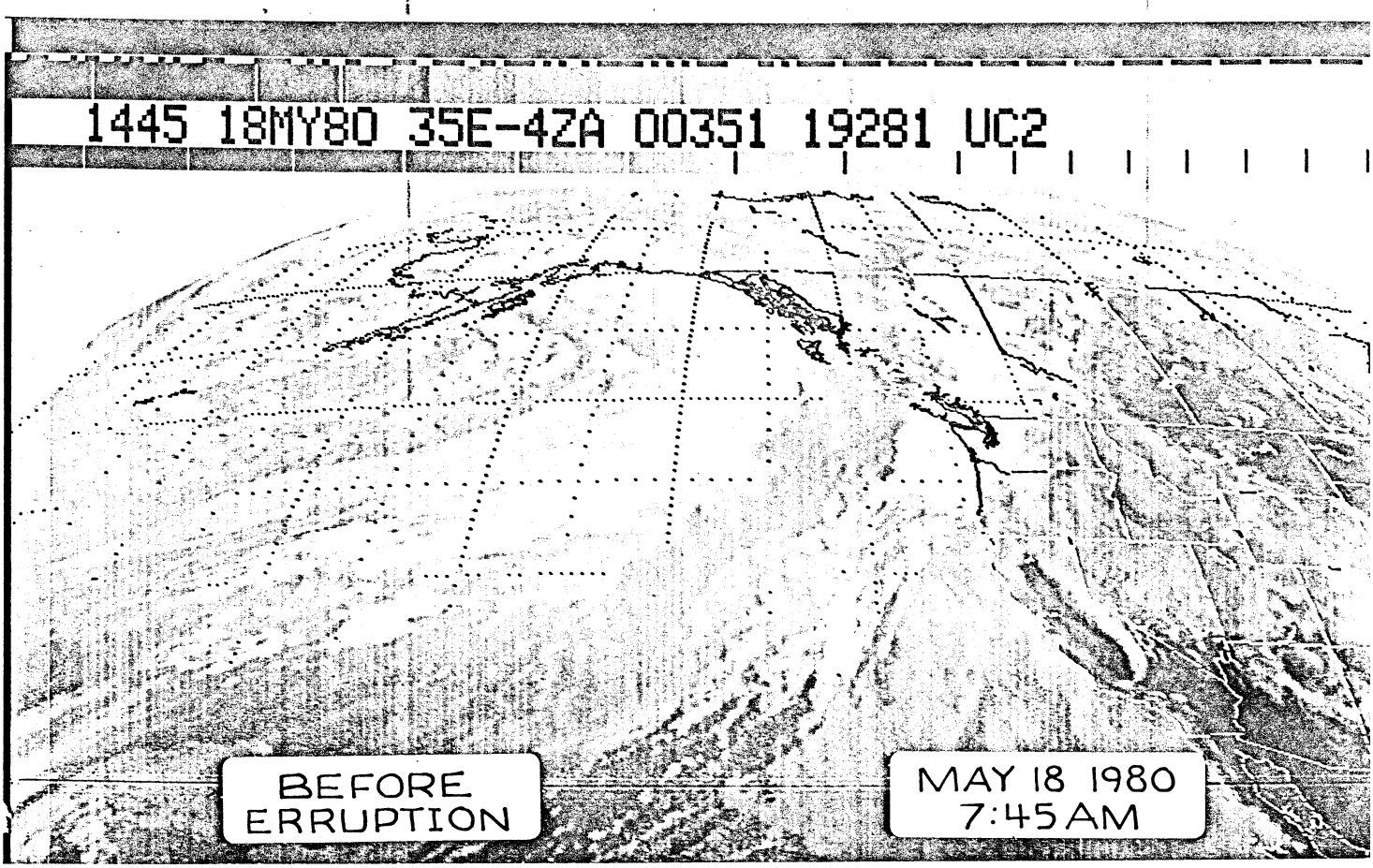
Figures 7a, 7b and 7c show the chronological spread of reduced visibilities of less than 1, 2 and 3 miles at 8 hour intervals up to 32 hours after the eruption. Ceilings of -XE100 OVC and visibilities of 3-8 miles were observed at Penticton Airport approximately 15 hours after the eruption and persisted for 17 hours (191000Z-200200Z). Kelowna Airport reported approximately 12 hours (191200Z-192300Z) of reduced visibilities between 3-6 miles. At Castlegar Airport, ceilings of -XE100 BKN to OVC and visibilities of 3 to 8 miles were reported for 45 hours (191700Z-211300Z). Cranbrook Airport recorded ceilings of -XE50 BKN to OVC and visibilities of 2 to 5 miles for 44 hours (191600Z-211100Z). Sparwood observed ceilings of -XE45 BKN to OVC and visibilities of 2 to 4 miles between 191800Z and 210400Z.

CONCLUDING REMARKS

As would be expected the most significant factor in the distribution of the volcanic ash fallout and reduced visibilities and ceilings was the vertical and horizontal structure of the wind field. All significant meteorological effects resulting from the ash fallout were tightly contained within the upper and lower level wind fields. Washout due to rainfall was not a factor in this case however may be a significant factor if it should occur.

Enough ash was carried by high level winds that mountain barriers did not effectively contain the spread of reduced visibilities due to ash fallout. Under a wind field with a large southerly component, at all levels, eruptions of the magnitude of May 18 could cause significant fallout and reduced visibilities over large areas of southern B.C.

FIGURE 1.


1445 18MY80 35E-4ZA 00351 19281 UC2
BEFORE ERRUPTION
MAY 18 1980 7:45 AM

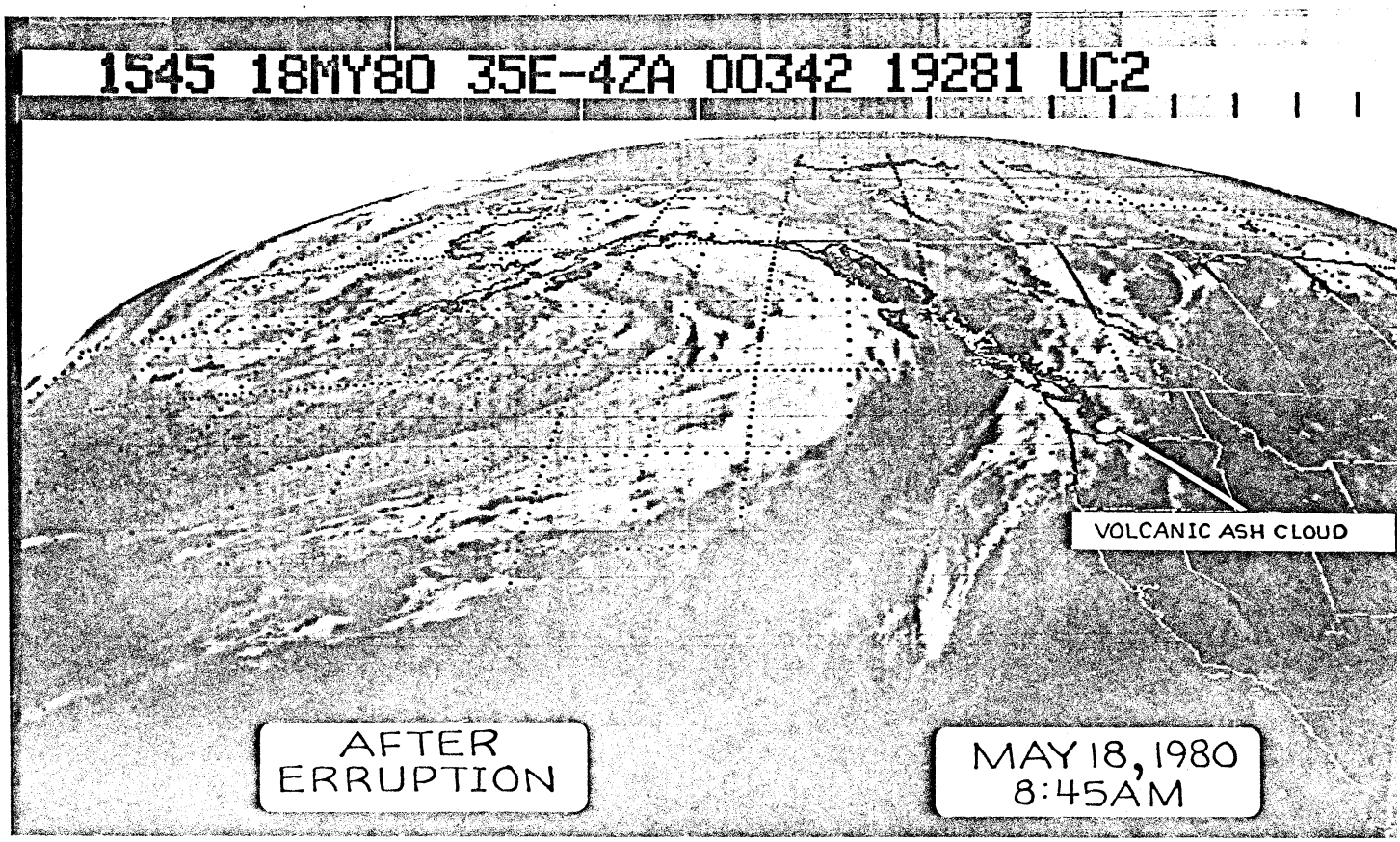
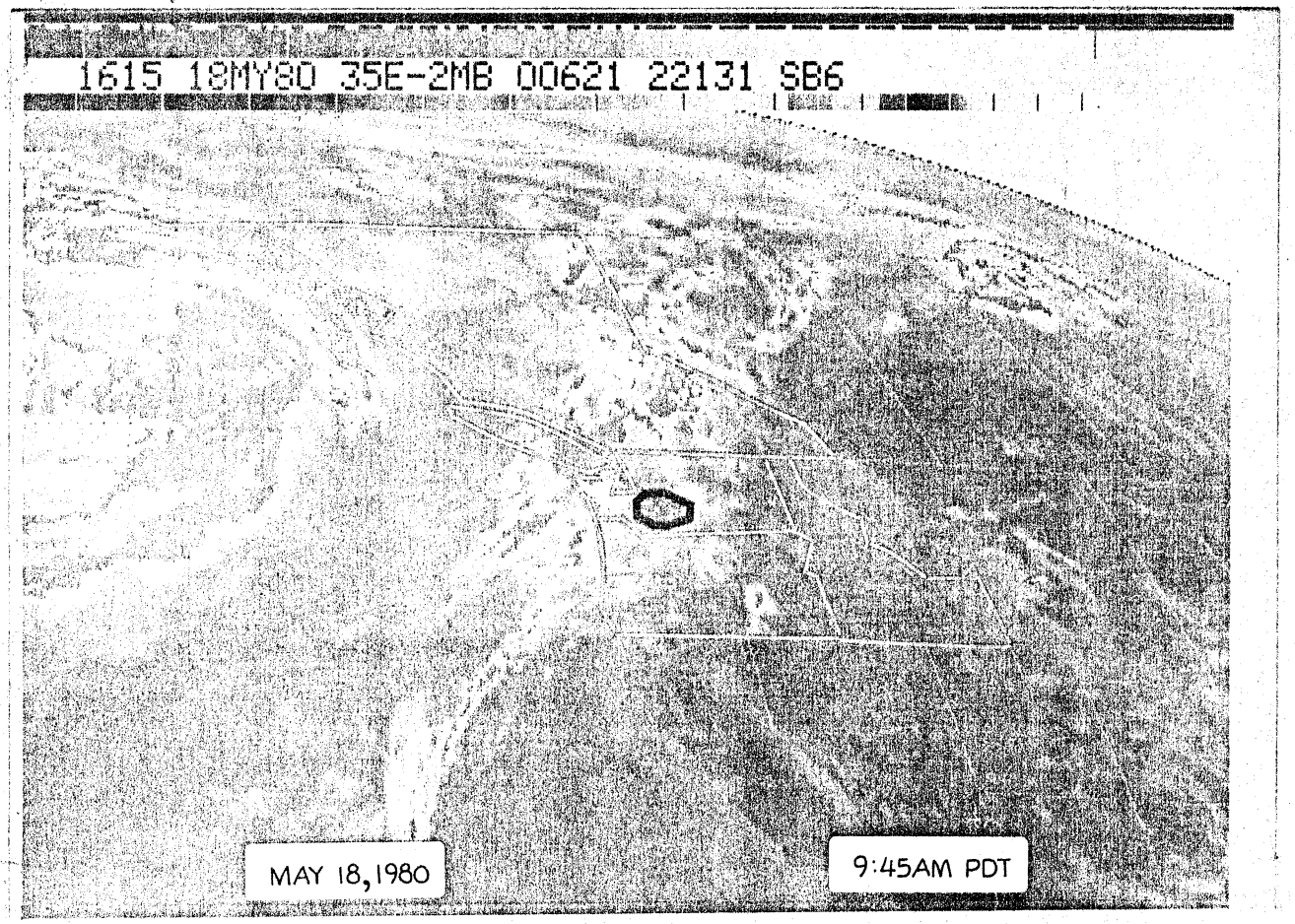

1545 18MY80 35E-4ZA 00342 19281 UC2
VOLCANIC ASH CLOUD
AFTER ERRUPTION
MAY 18, 1980 8:45AM

FIGURE 2. SATELLITE IMAGES WITH ASH CLOUD BOUNDARY OUTLINED



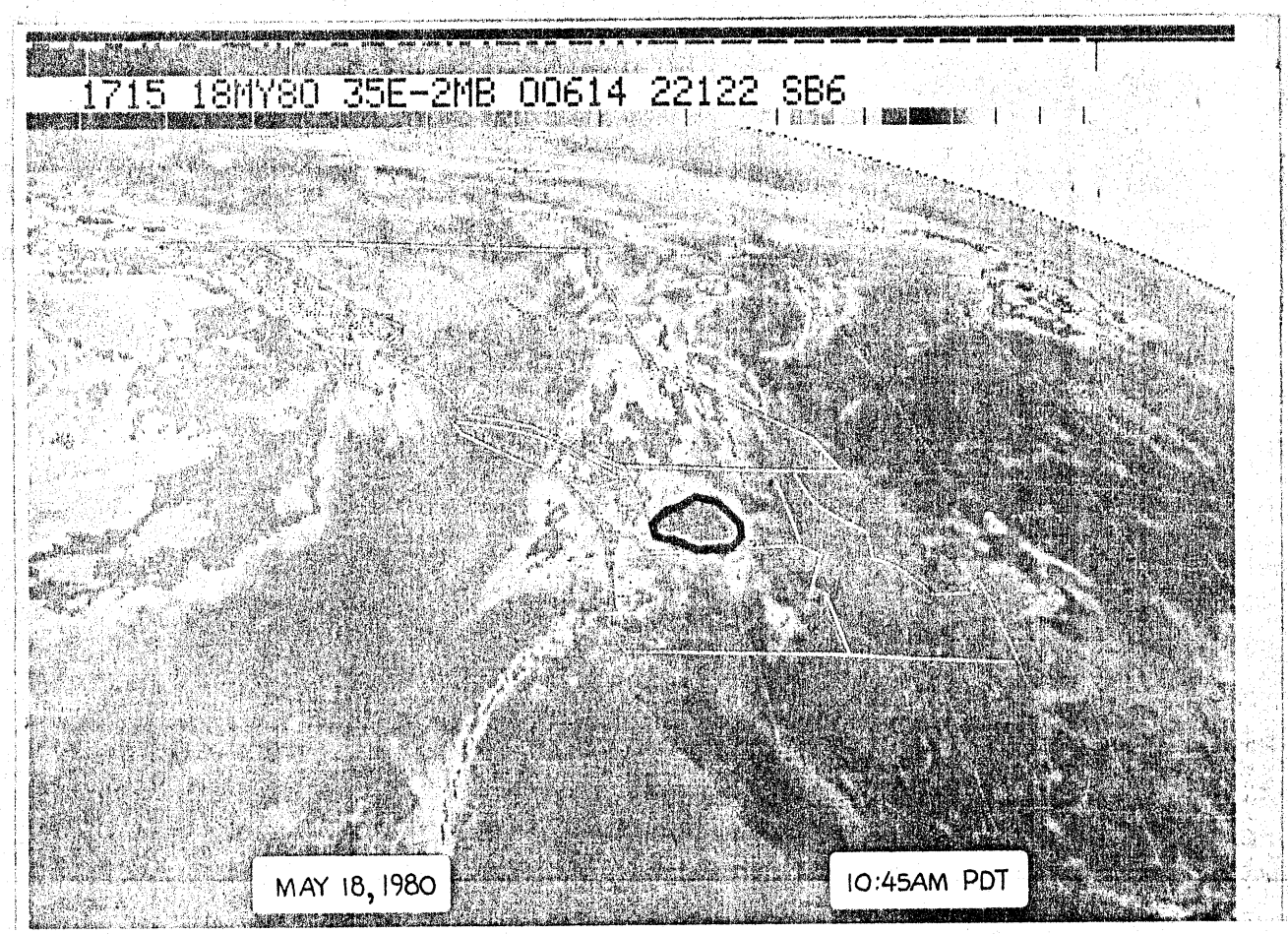
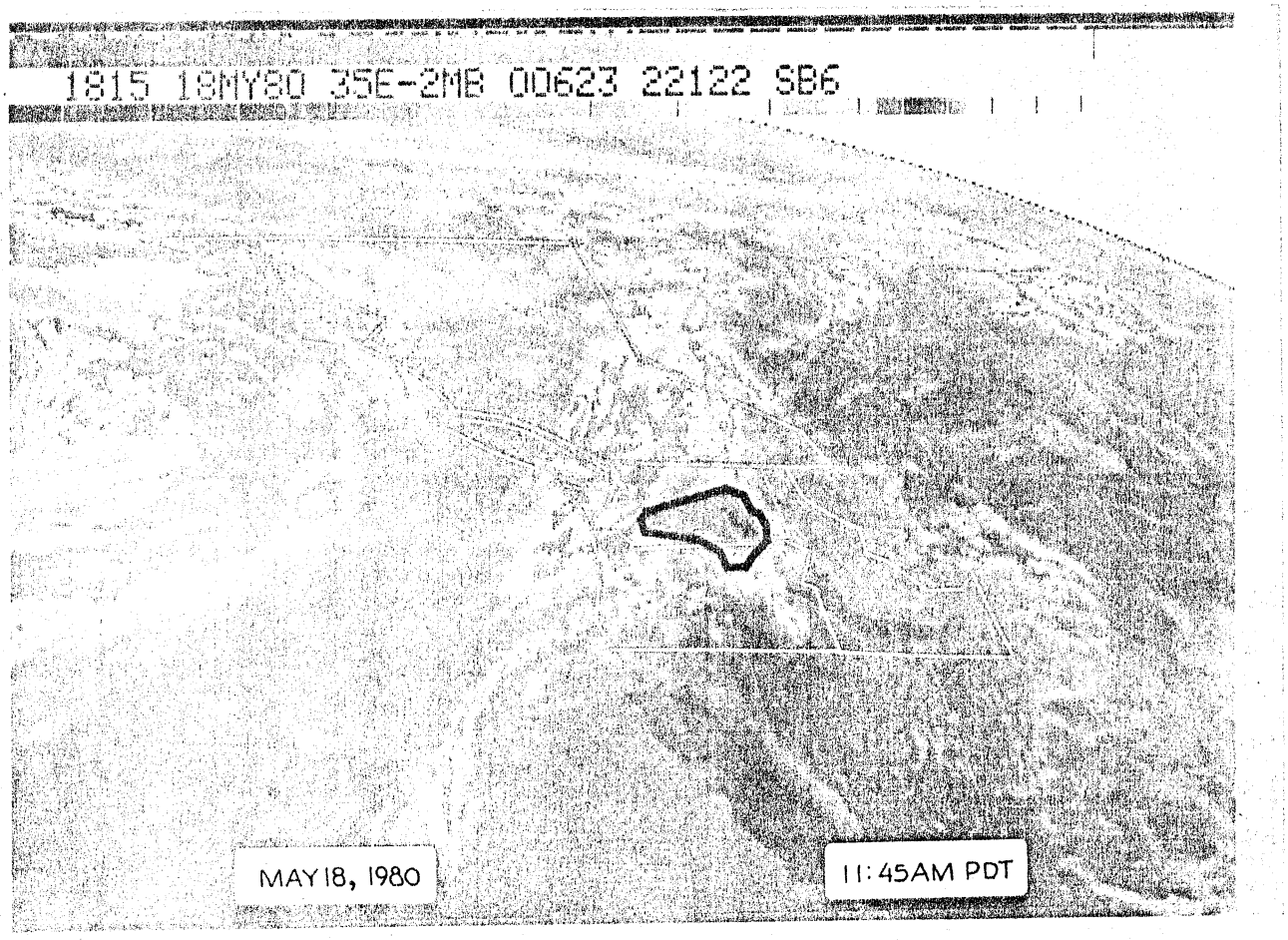


FIGURE 3. SATELLITE IMAGES WITH ASH CLOUD BOUNDARY OUTLINED



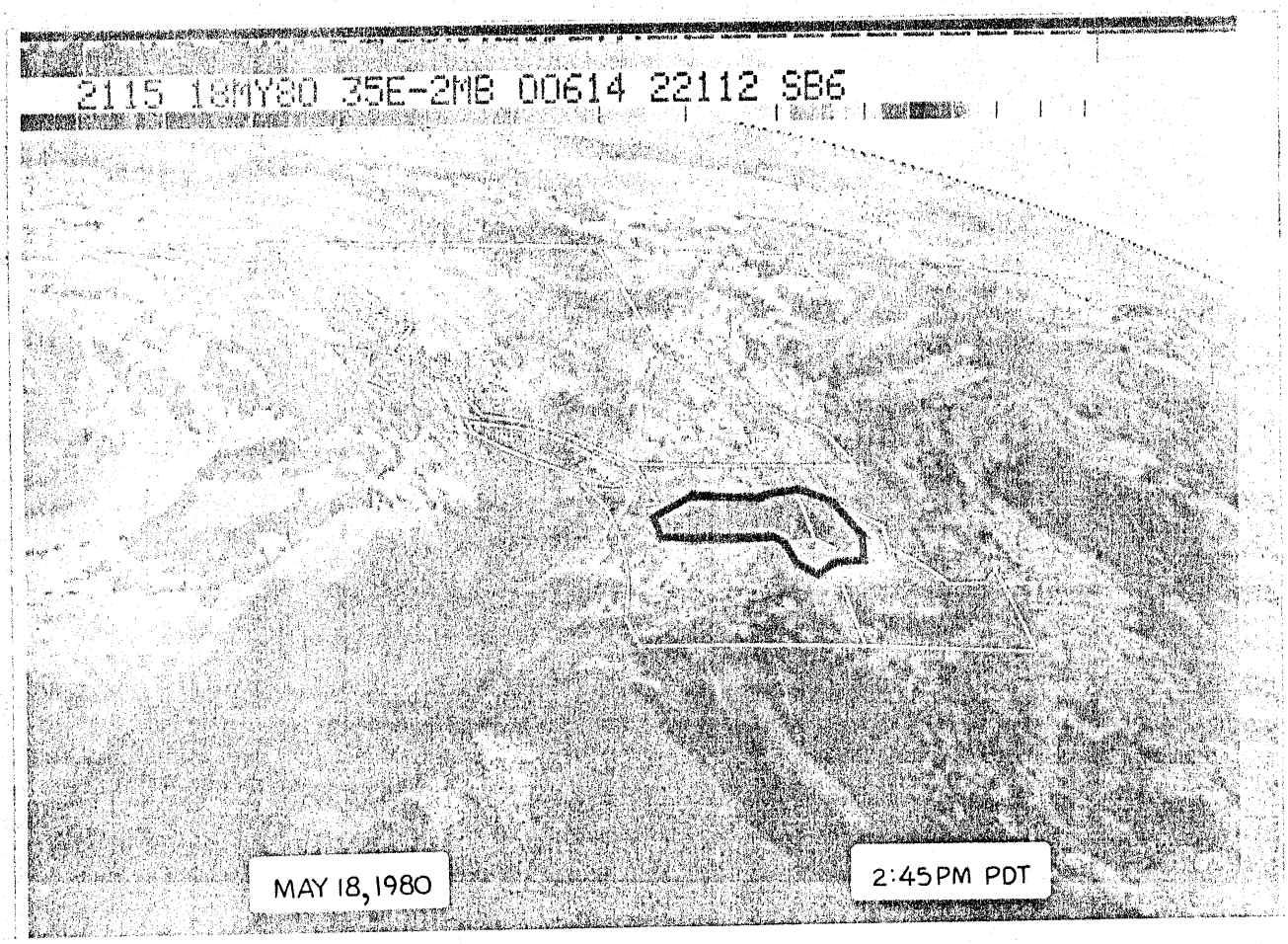


FIGURE 4.

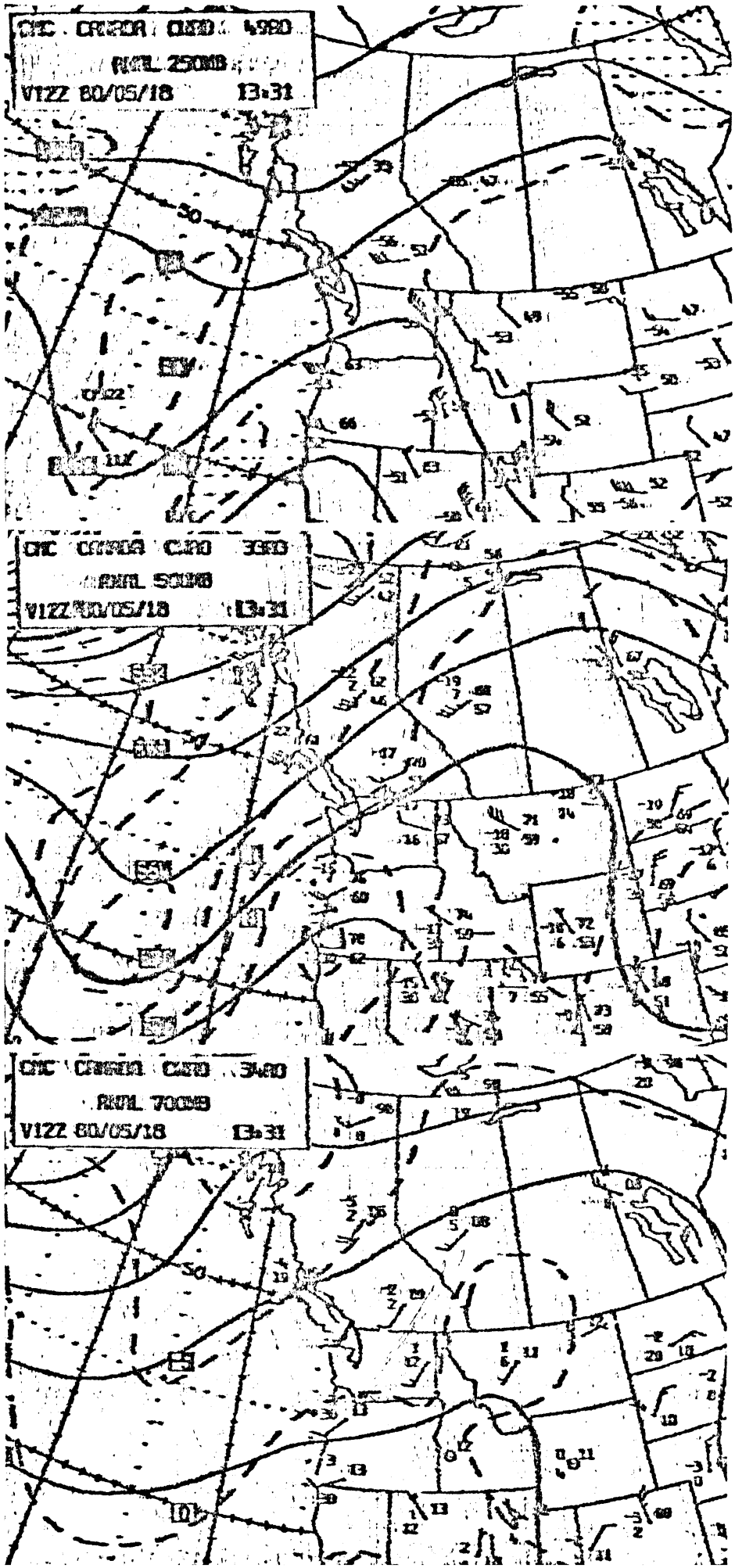


FIGURE 5.

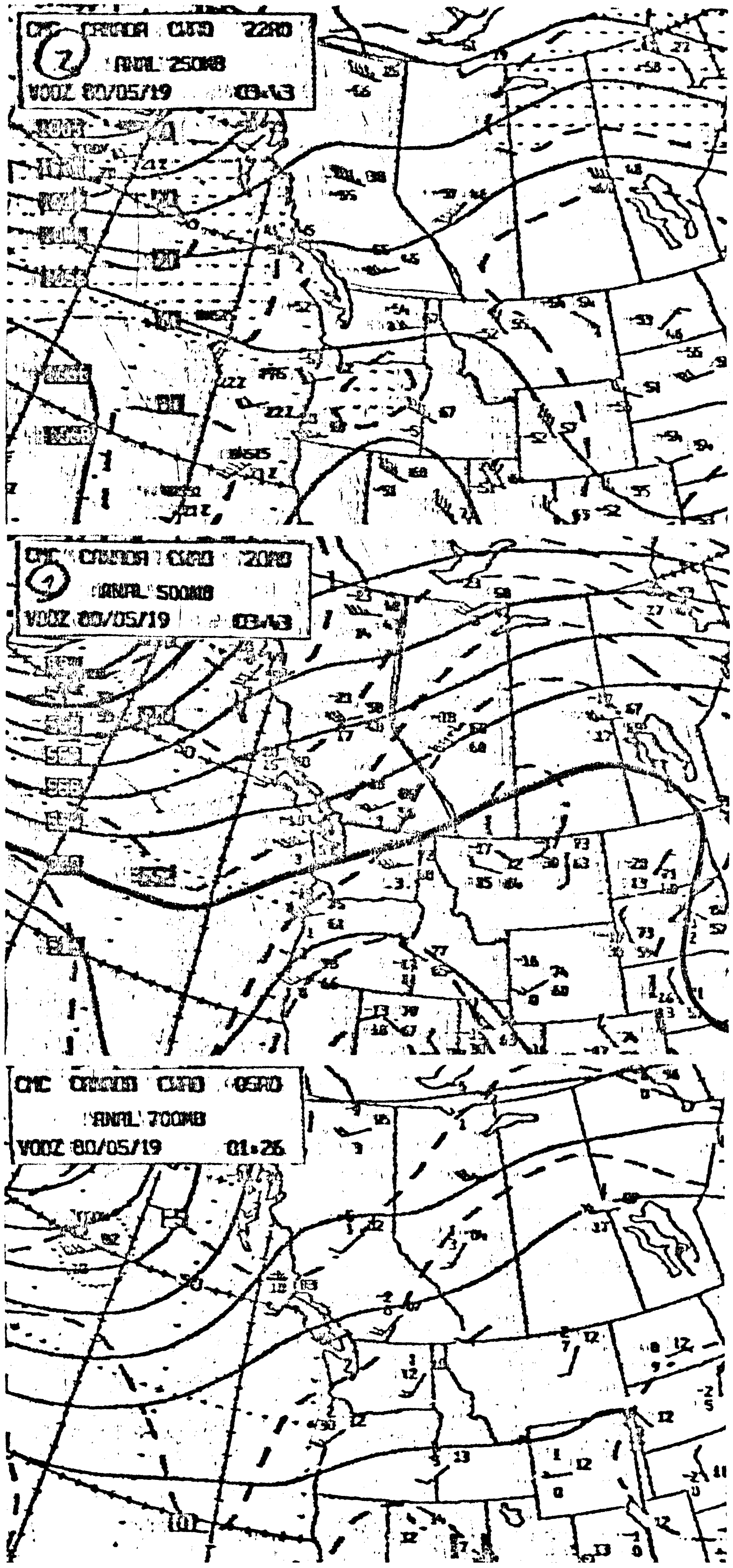

CMC CANADA CWAO 22AO
ANAL 250MB
VOOZ 80/05/19 03:43
CMC CANADA CWAO 20AO
ANAL 500MB
VOOZ 80/05/19 03:43
CMC CANADA CWAO 05AO
ANAL 700MB
VOOZ 80/05/19 01:26

FIGURE 6.
APPROXIMATE AREAS WITH GROUND ACCUMULATION
OF ASH GREATER THAN 1/4 INCH

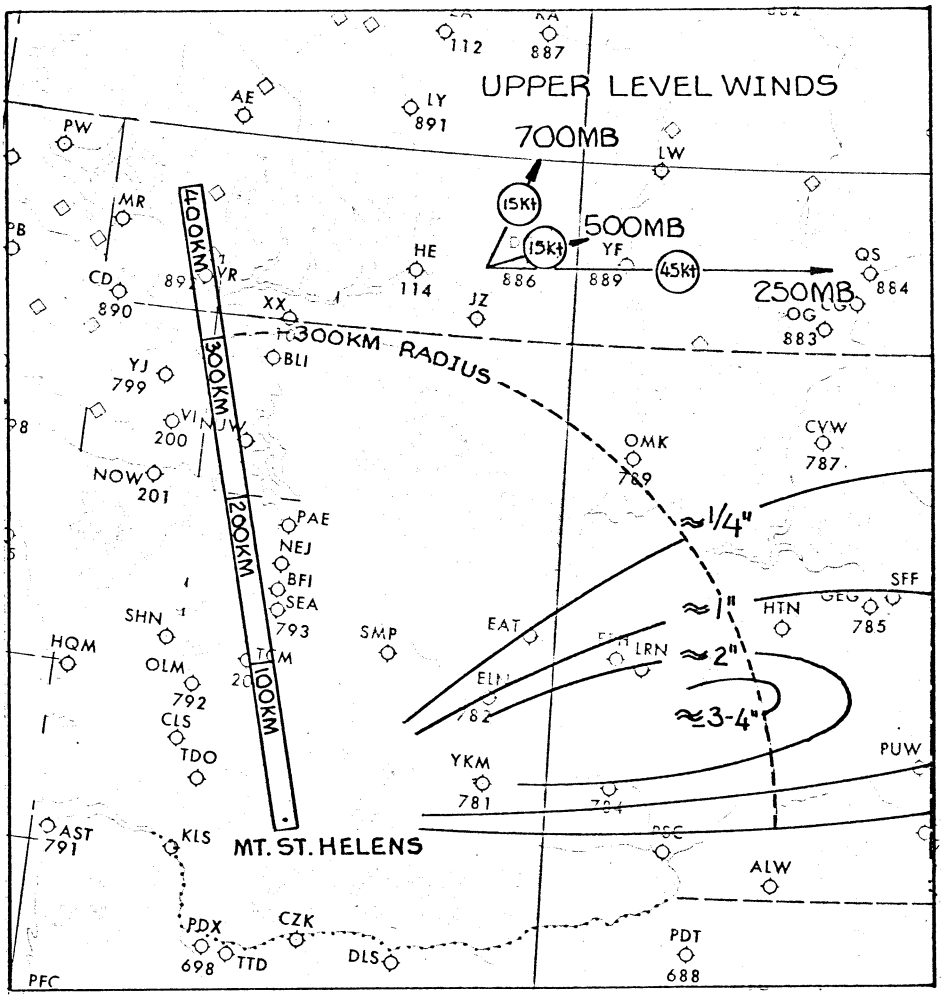


FIGURE 7a.
DISTRIBUTION OF 1 MILE VISIBILITY AT 8 HOUR INTERVALS

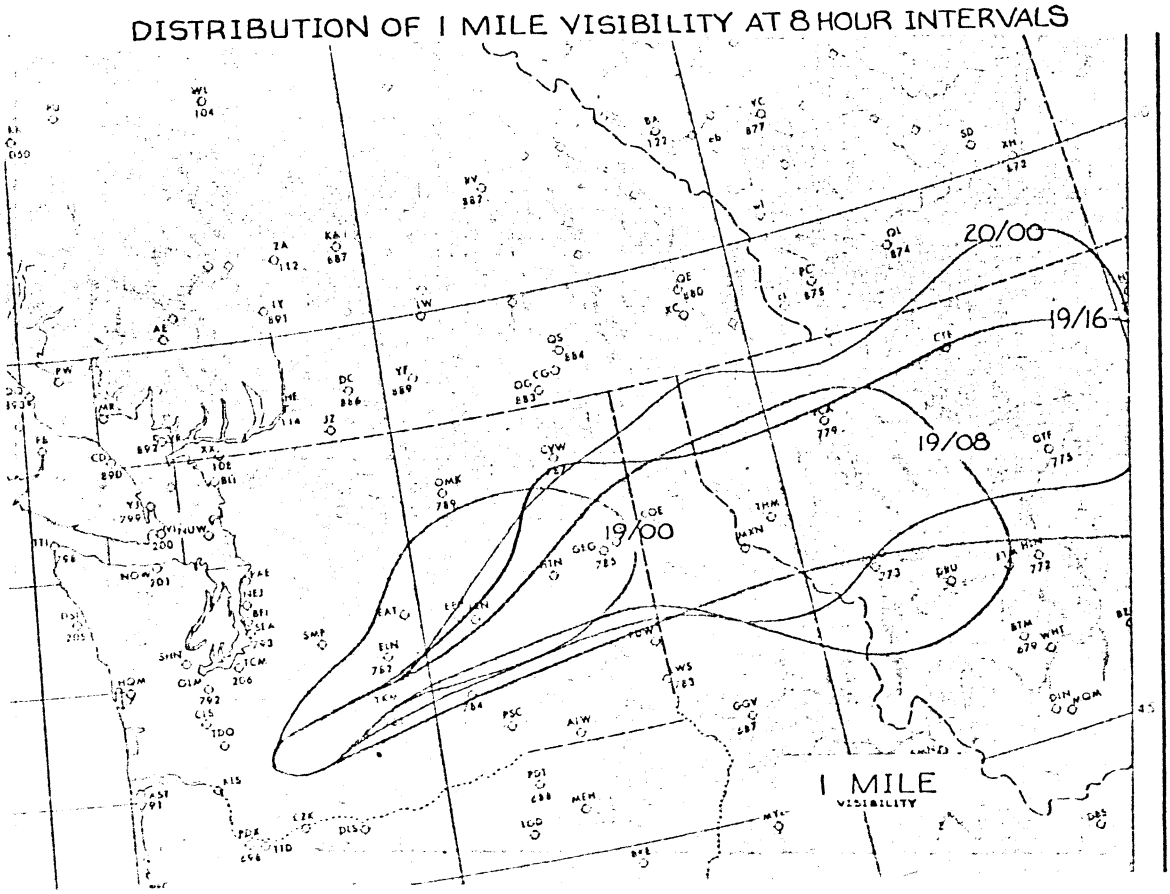


FIGURE 7b.

DISTRIBUTION OF 2 MILE VISIBILITY AT 8HOUR INTERVALS

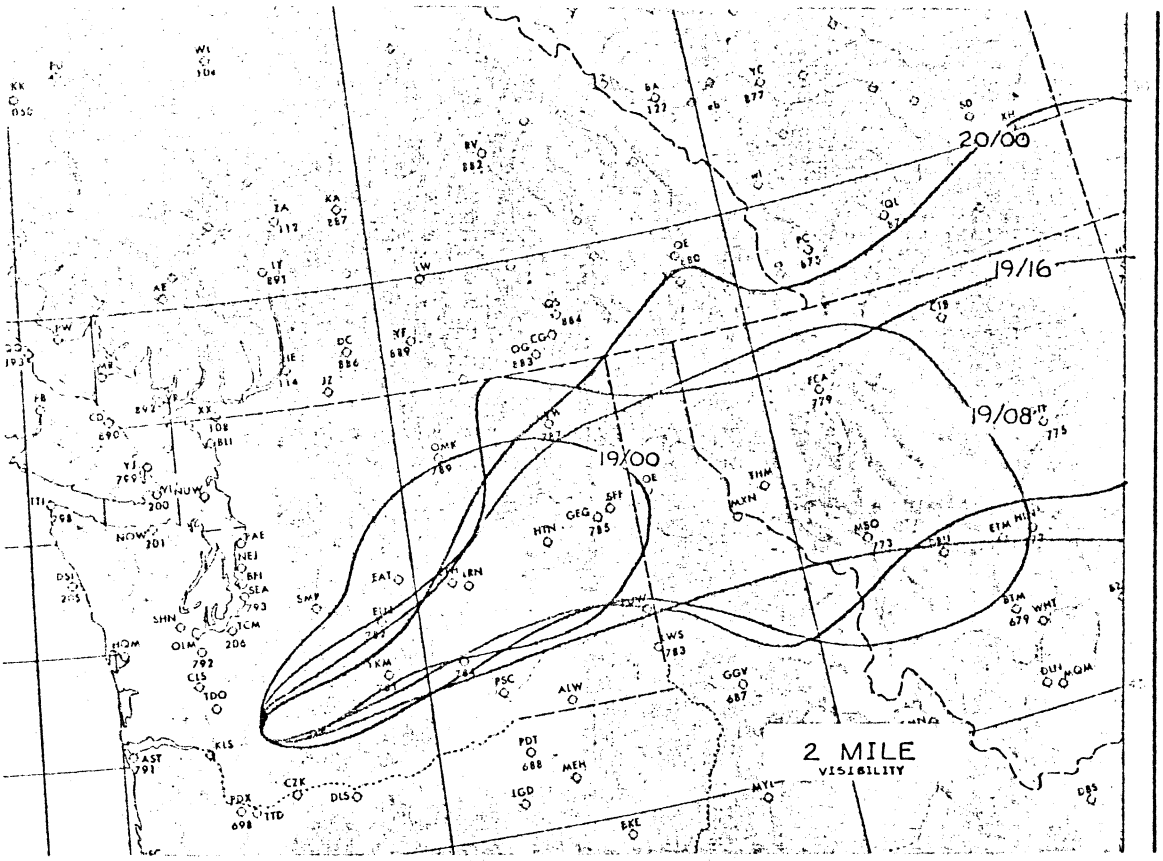


FIGURE 7c.

DISTRIBUTION OF 3 MILE VISIBILITY AT 8HOUR INTERVALS

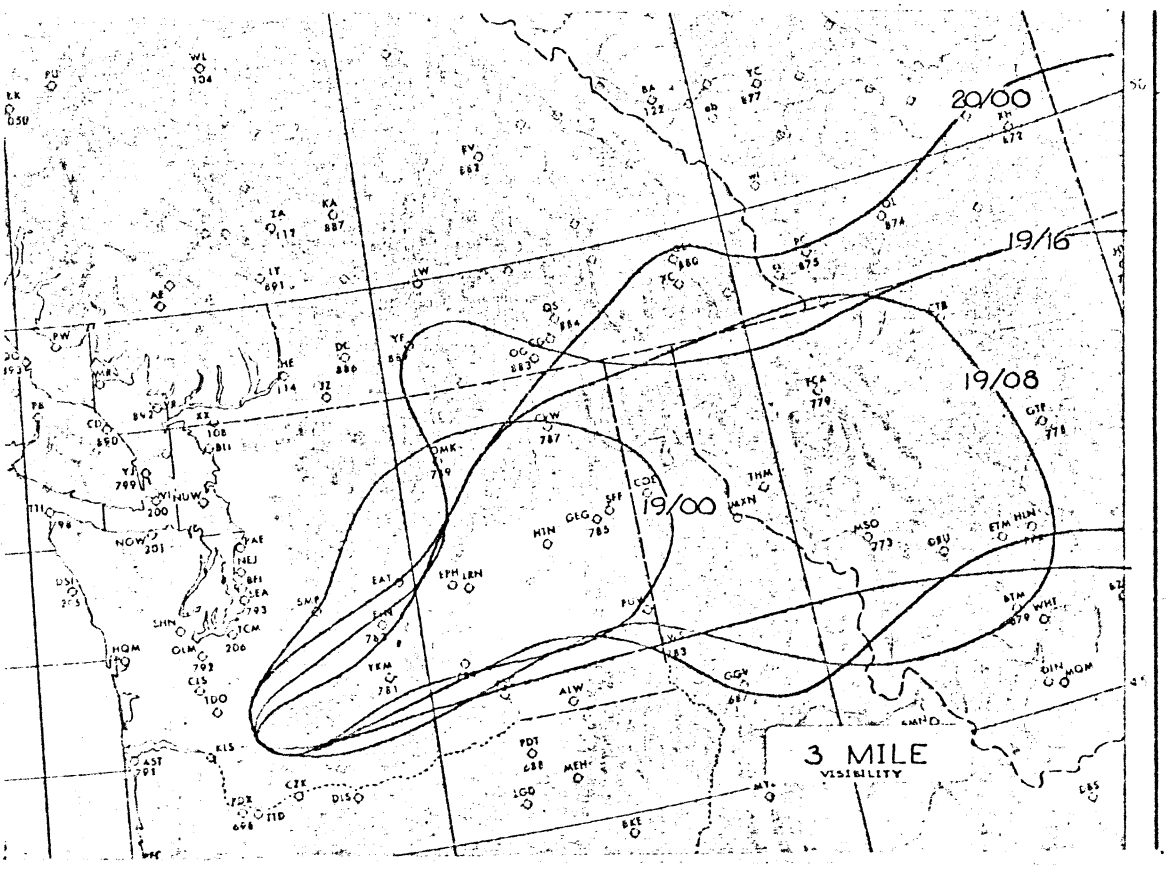


FIGURE 4.

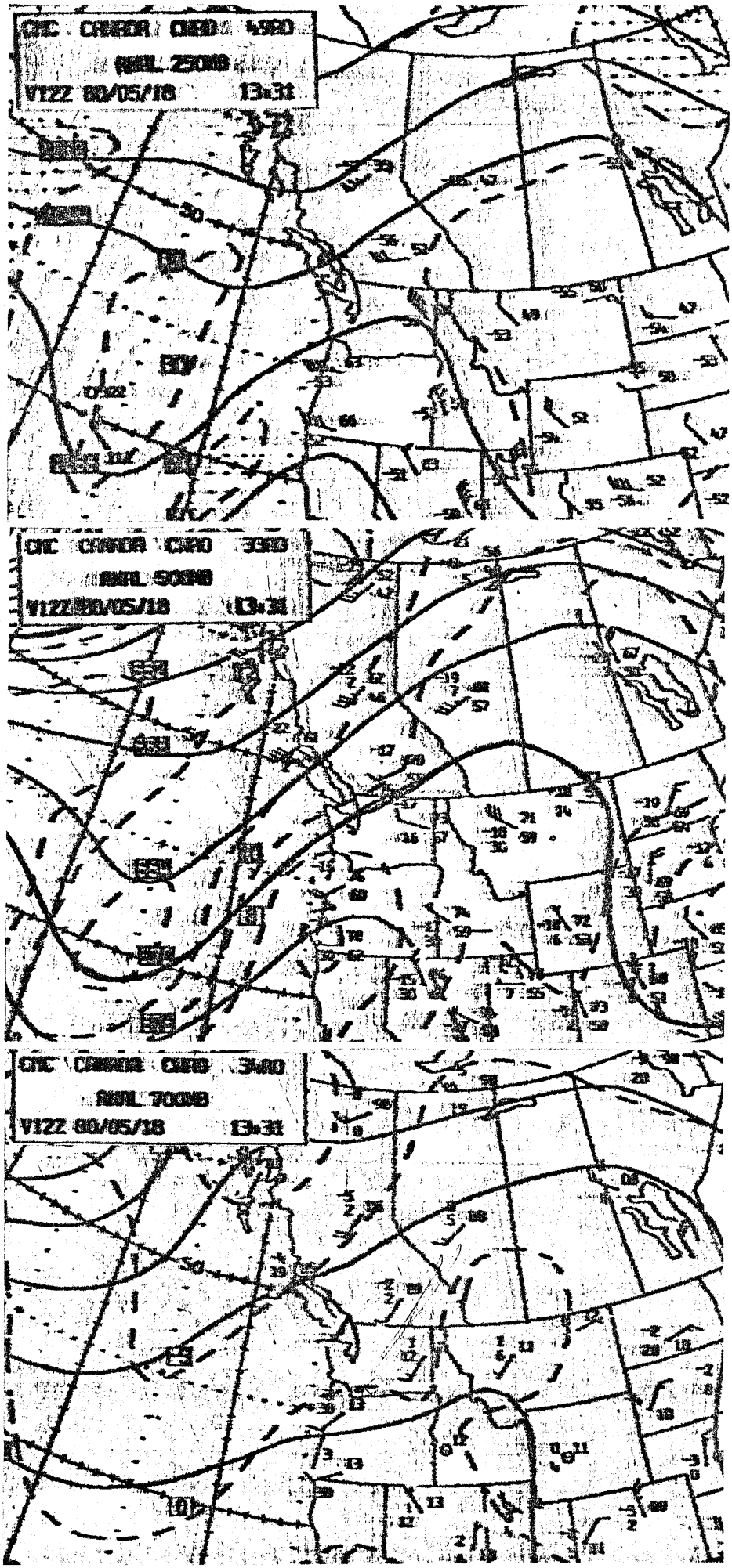

CMC CMAQA CMAQ 4980
ANAL 250MB
VT22 80/05/18 13:31
CMC CMAQA CMAQ 3980
ANAL 500MB
VT22 80/05/18 13:31
CMC CMAQA CMAQ 3480
ANAL 700MB
VT22 80/05/18 13:31

FIGURE 5.

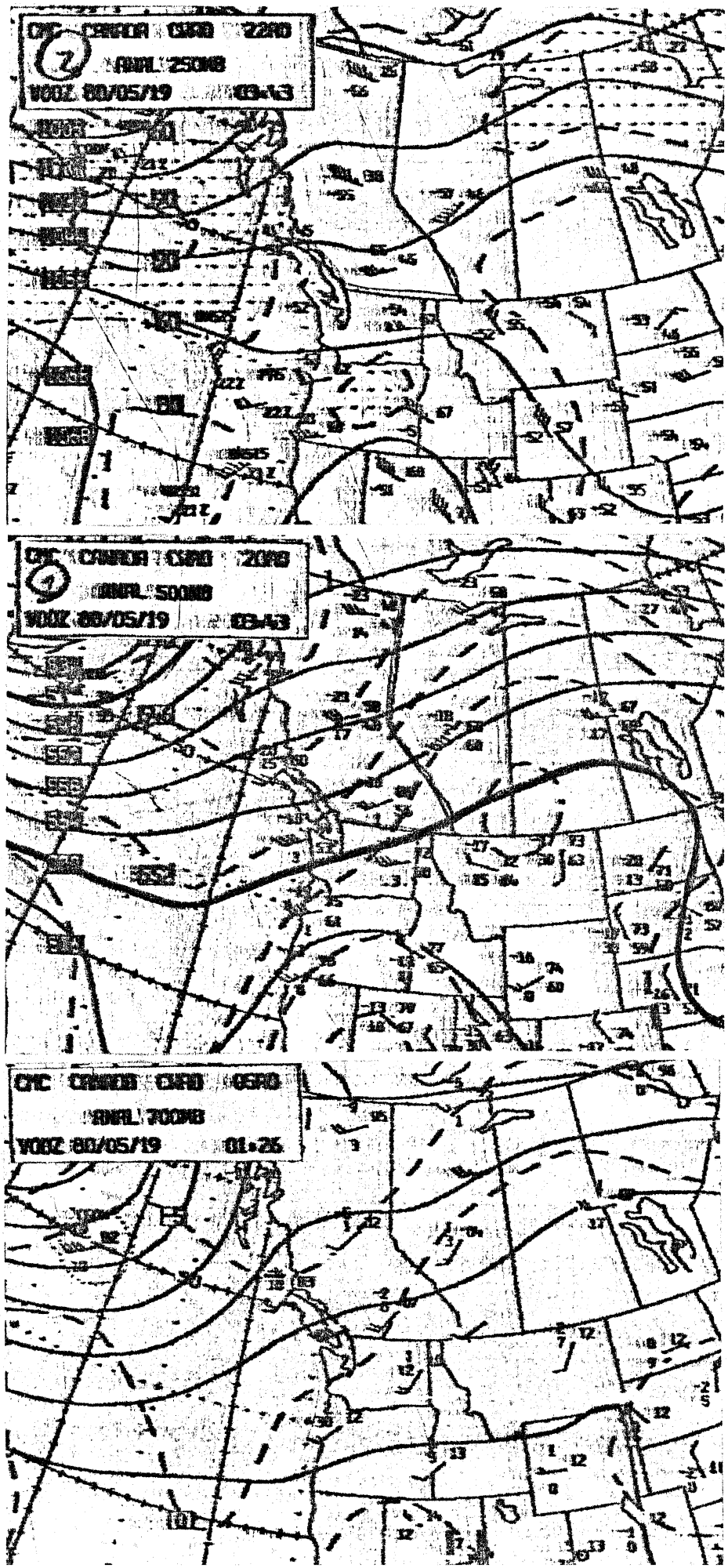


FIGURE 6.
APPROXIMATE AREAS WITH GROUND ACCUMULATION
OF ASH GREATER THAN 1/4 INCH

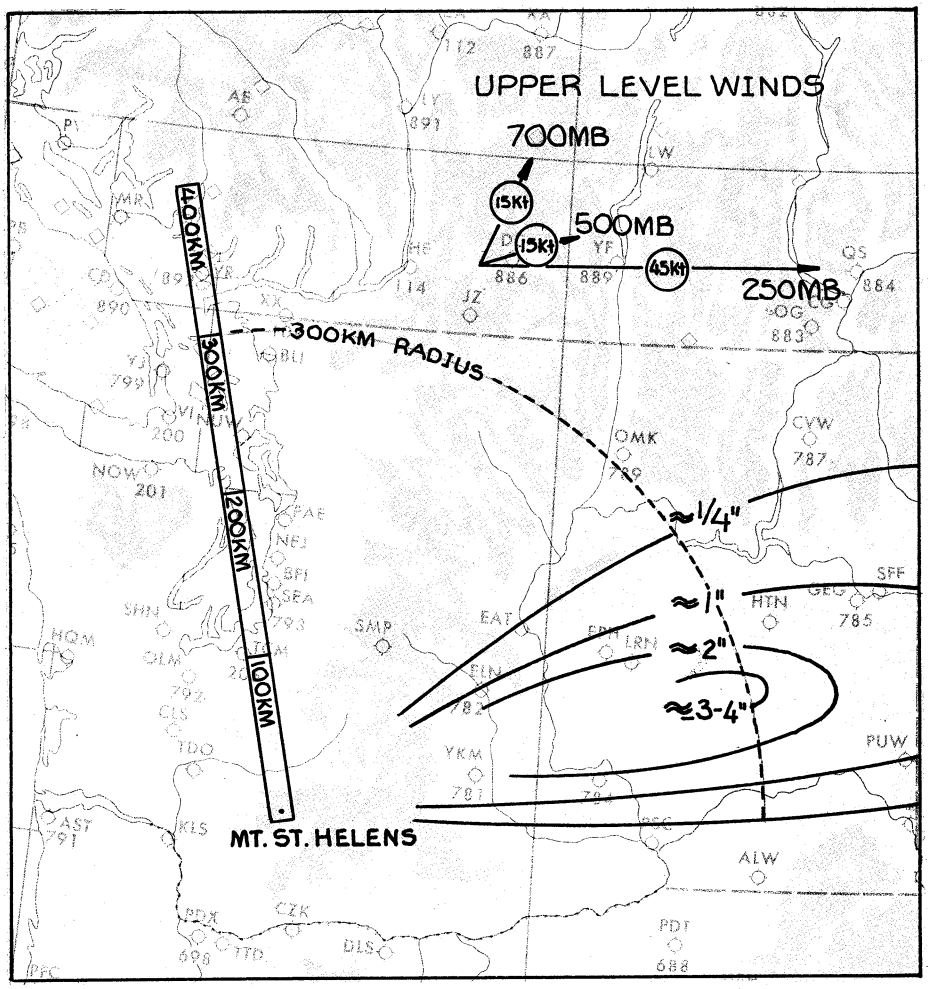


FIGURE 7a.
DISTRIBUTION OF 1 MILE VISIBILITY AT 8 HOUR INTERVALS