



**Western Region Technical Attachment
No. 91-41
October 1, 1991**

**A HYDROMETEOROLOGICAL REVIEW
OF THE WENATCHEE RIVER FLOOD OF NOVEMBER 1990**

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November 1990 was one of the wettest months on record for many parts of Washington State, especially western Washington, the Cascades, and upper portions of the Wenatchee River Basin. Not surprisingly, there were several major floods. One such flood occurred in portions of the Wenatchee River Basin over the Thanksgiving holiday weekend.

Figure 1a outlines the Wenatchee River Basin as it is situated within the State of Washington. The Basin encompasses approximately 1,300 square miles. Figure 1b outlines the Basin in more detail showing the locations of the observing sites (by number) listed in Table 1 below. The Basin is bounded on the east by the Entiat Mountains, the west by the Wenatchee Mountains, and the north and northwest by the Glacier Peak Wilderness Area.

There are two river gage sites on the Wenatchee River: The USGS gage at Peshastin located at mile 21.5 and the USGS gage located at Monitor at mile 7.0. The gage at Peshastin was installed in 1929, and the gage at Monitor was installed in October 1962.

Rainfall, directly leading to the flooding over the holiday weekend occurred primarily during the period November 22-25 (Table 1). At several of the sites, nearly half of this rainfall occurred on November 23 and 24. For example, both Lake Wenatchee and Leavenworth recorded close to four inches of their totals during this time. Since most of the precipitation contributing to the flooding was in liquid form due to the unusually warm air mass, snowfall and snow melt were not considered in this review; however, it is likely they contributed to some extent.

Strong west-southwesterly flow from the east-central Pacific Ocean during the period forced significant moisture and warm air over the Pacific Northwest. Selected upper-air charts (Fig. 2) show the strong southwesterly flow at 850 mb and 300 mb. Figure 3 shows the surface analyses over the Northwest. These series of charts depict the period when the most intense precipitation occurred in the Basin.

The Wenatchee River responded relatively quickly to the heavy rains. Figure 4a depicts the changes in gage heights at the Peshastin and Monitor sites. The rapid rise at both gage locations can be seen beginning late on November 23 and continuing through November 24. The river was above flood stage (13 feet) at the Peshastin site from approximately 1200 LST on November 24 until approximately 1200 LST on November 26. The peak gage height at Peshastin reached 17.48 feet at approximately 0800 LST on November 25. The peak gage height downstream at Monitor reached 29.77 feet at approximately 0930 LST on November 25. A flood stage height has not been determined at Monitor.

Figure 4b depicts maximum instantaneous discharge in thousands of cubic feet per second (KCFS). Note that discharge amounts above 26.2 KCFS at Peshastin and 31 KCFS at Monitor are estimated (dashed lines) based on gage heights reached during this flood, since current maximum instantaneous discharge tables compute discharges only to these amounts. The rapid rise in discharges can be seen beginning the evening of November 23 and continuing into November 25, then receding.

The USGS in Spokane has completed a provisional analysis of this flooding using the actual gage heights reached. This review indicates the discharge at the Peshastin site (Fig. 4b Peshastin-Estimated) reached a maximum instantaneous discharge of about 40 KCFS. Analysis for the Monitor site indicated an estimated maximum instantaneous discharge of about 45.9 KCFS.

The previous record maximum instantaneous discharge recorded at the Peshastin site was 30.9 KCFS during the 1948 flood, and the previous record at the Monitor gage was 28.3 KCFS during the lesser 1980 flood. (Note that the Monitor gage was not installed until October 1962).

The USGS will be doing further study on this event in the future. However, with the data available, there is little doubt that this event, triggered by heavy rains over the Basin during a 4-day period, was the most significant in modern times.

Acknowledgements

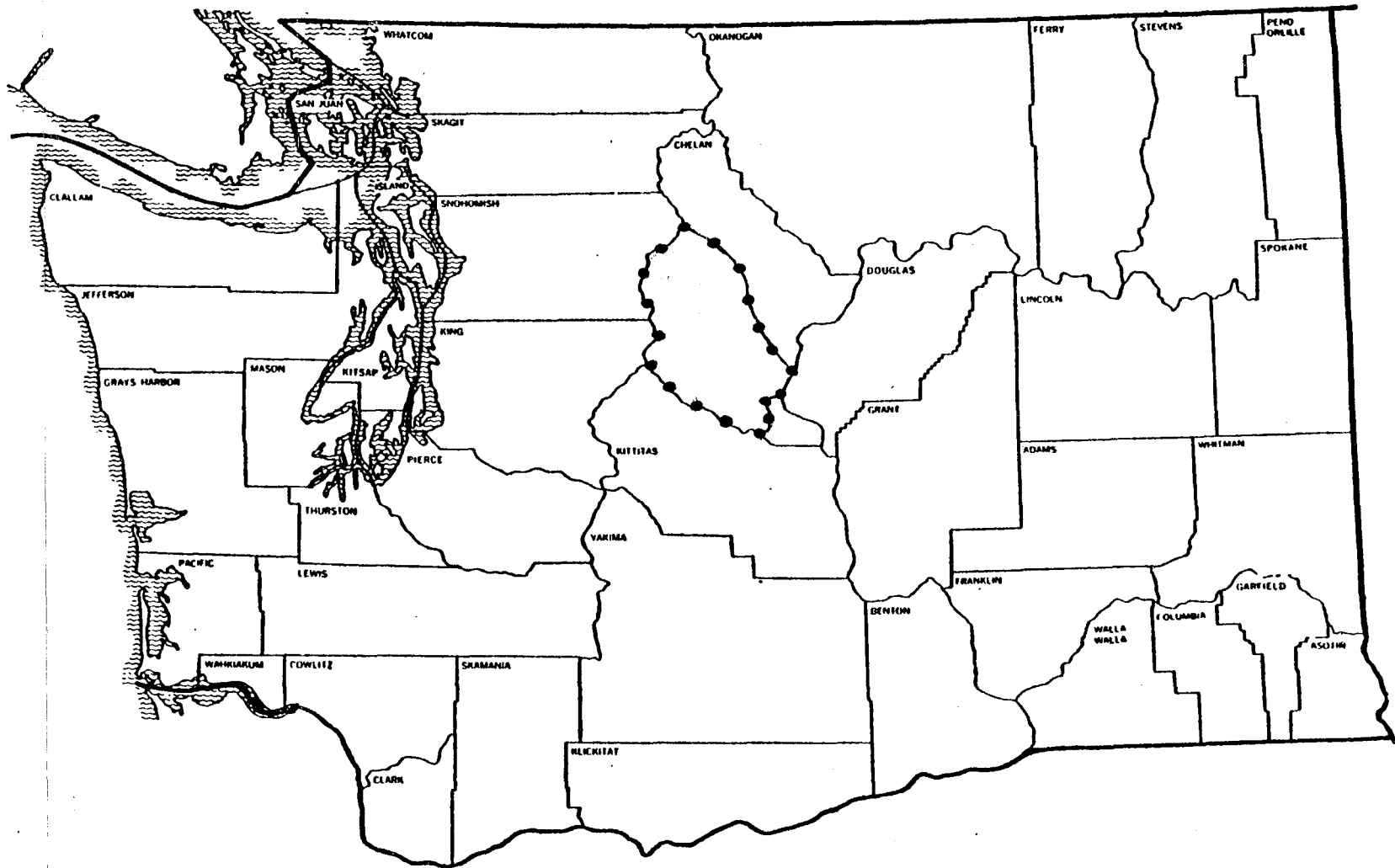
Chelan County PUD, USGS Spokane, WA., and the River Forecast Center - Portland, OR.

TABLE 1
 PRECIPITATION OBSERVING SITES
 Rainfall Amounts
 (for site locations in Fig. 1b)
 November 22-25

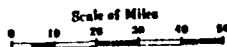
| Station | Elevation (feet) | Rainfall (inches) |
|--------------------------|---------------------|----------------------|
| 1 Stehekin | 1096 | 6.92 |
| 2 Winthrop Fish Hatchery | 1754 | 2.56 |
| 3 Chelan Boat Company | 1120 | 0.69 |
| 4 Viewpoint RAWS* | 4100 | 7.58 |
| 5 Lake Wenatchee | 1255 | 7.91 |
| 6 Dry Creek RAWS* | 3600 | 3.50 |
| 7 Entiat Fish Hatchery | 796 | 1.87 |
| 8 Leavenworth | 1163 | 5.56 |
| 9 Wenatchee WSO | 800 | 1.05 |
| 10 Swauk RAWS* | 3700 | 5.02 |

* RAWS (Remote Automated Weather Stations)
 U.S. Forest Service

WASHINGTON



NATIONAL WEATHER SERVICE
Western Region



Wenatchee River Basin

Figure 1a

Wenatchee River Basin
and
Precipitation Observing Sites
(See Table 1)
Basin Outline —●—●—●—
Scale: 1" ≈ 10 Miles

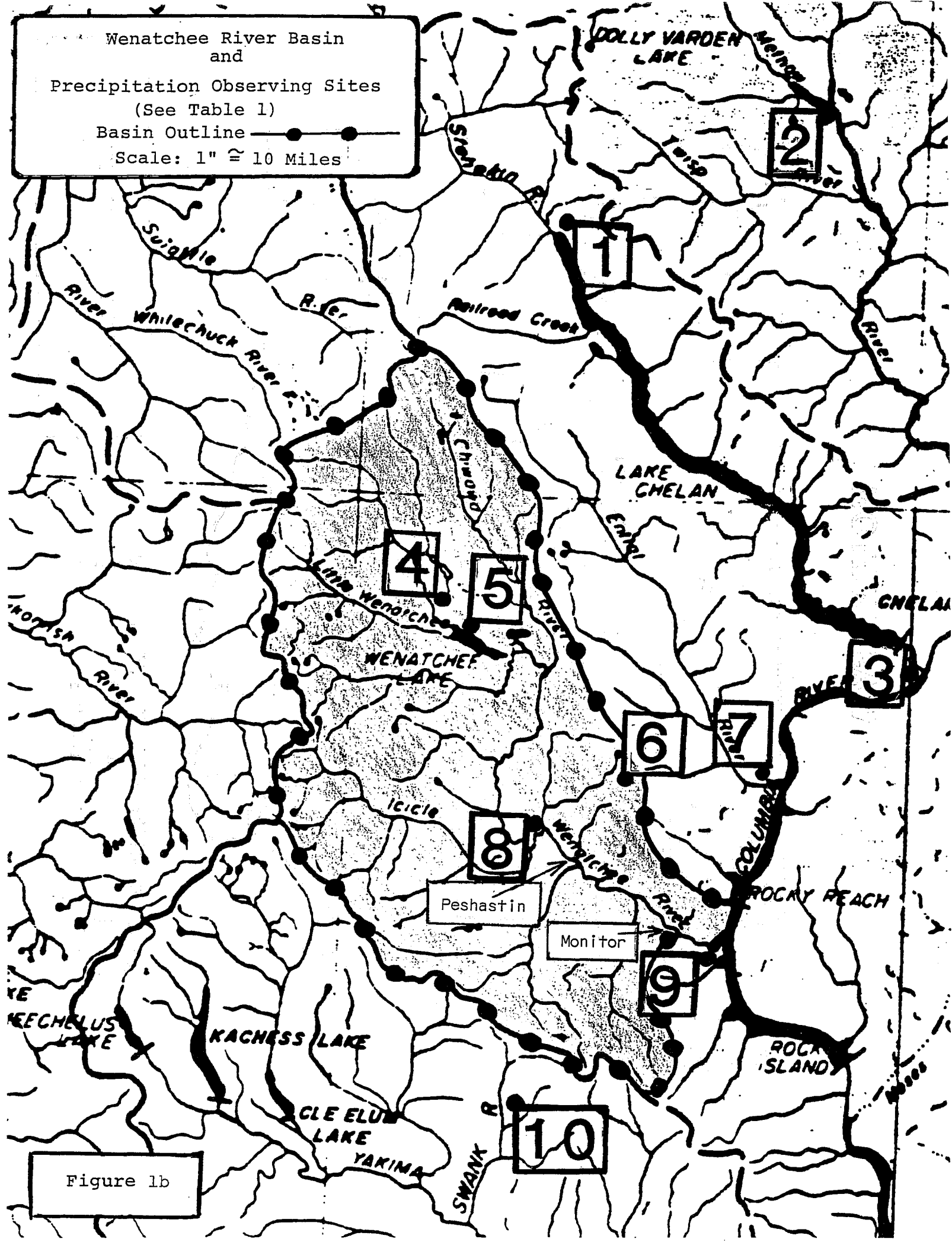
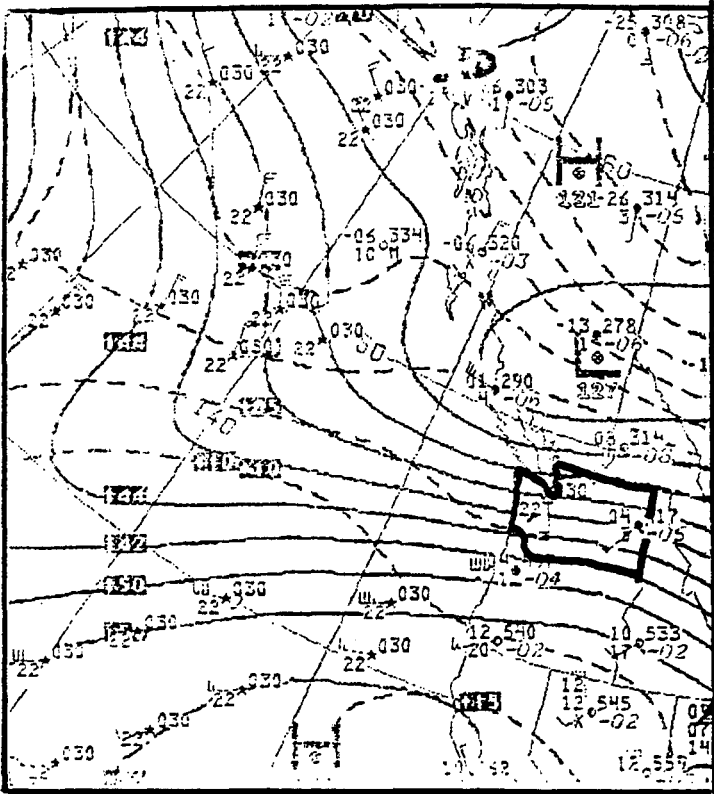
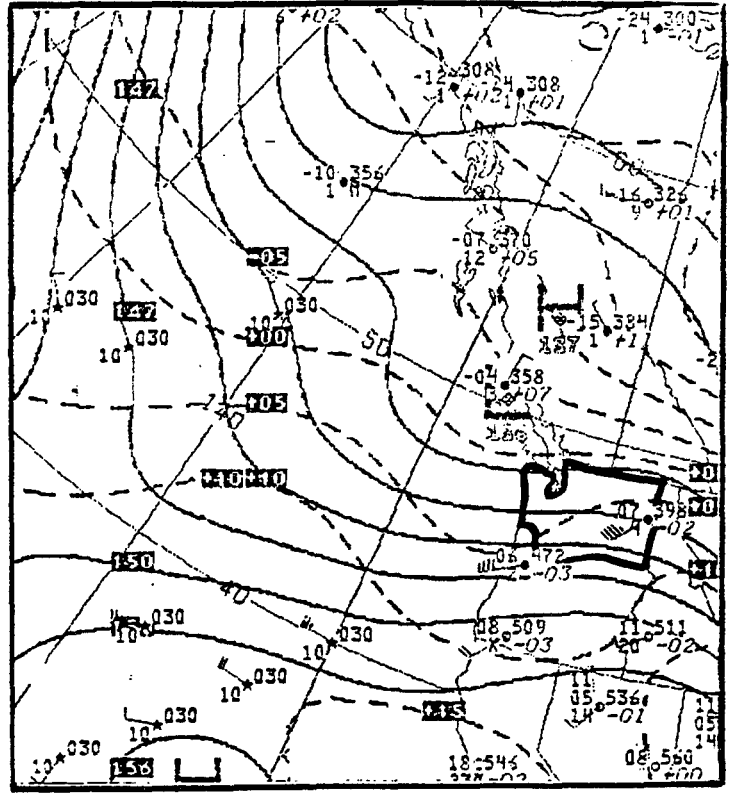


Figure 1b

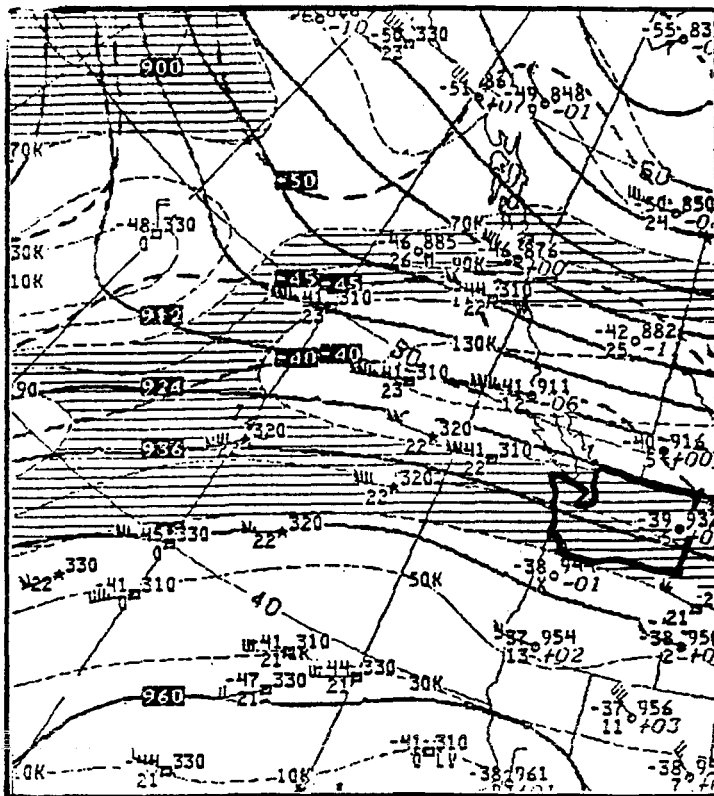
UPPER AIR CHARTS



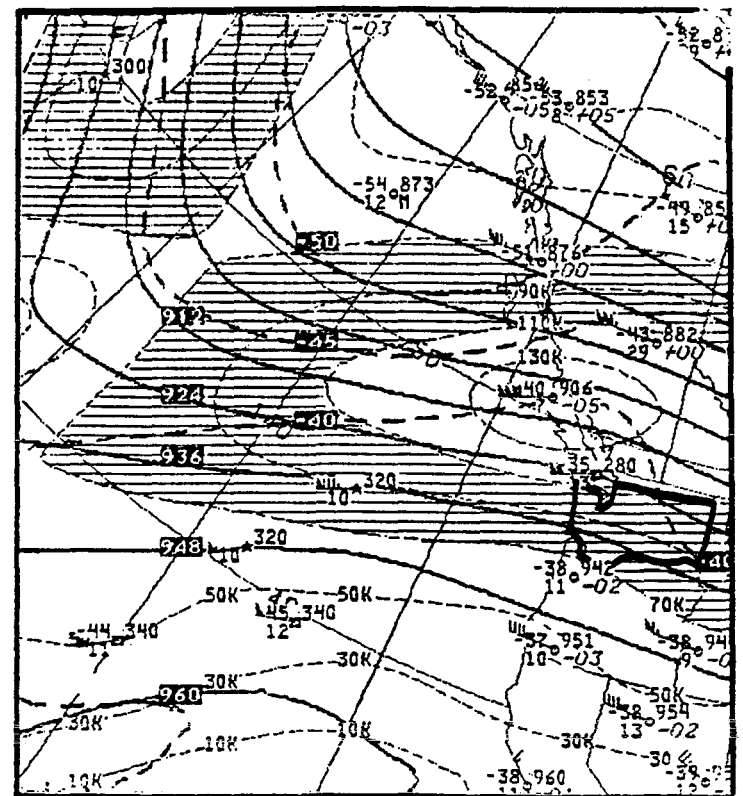
850 MB 00Z 24 Nov 90



850 MB 12Z 24 Nov 90



300 MB 00Z 24 Nov 90



300 MB 12Z 24 Nov 90

Figure 2

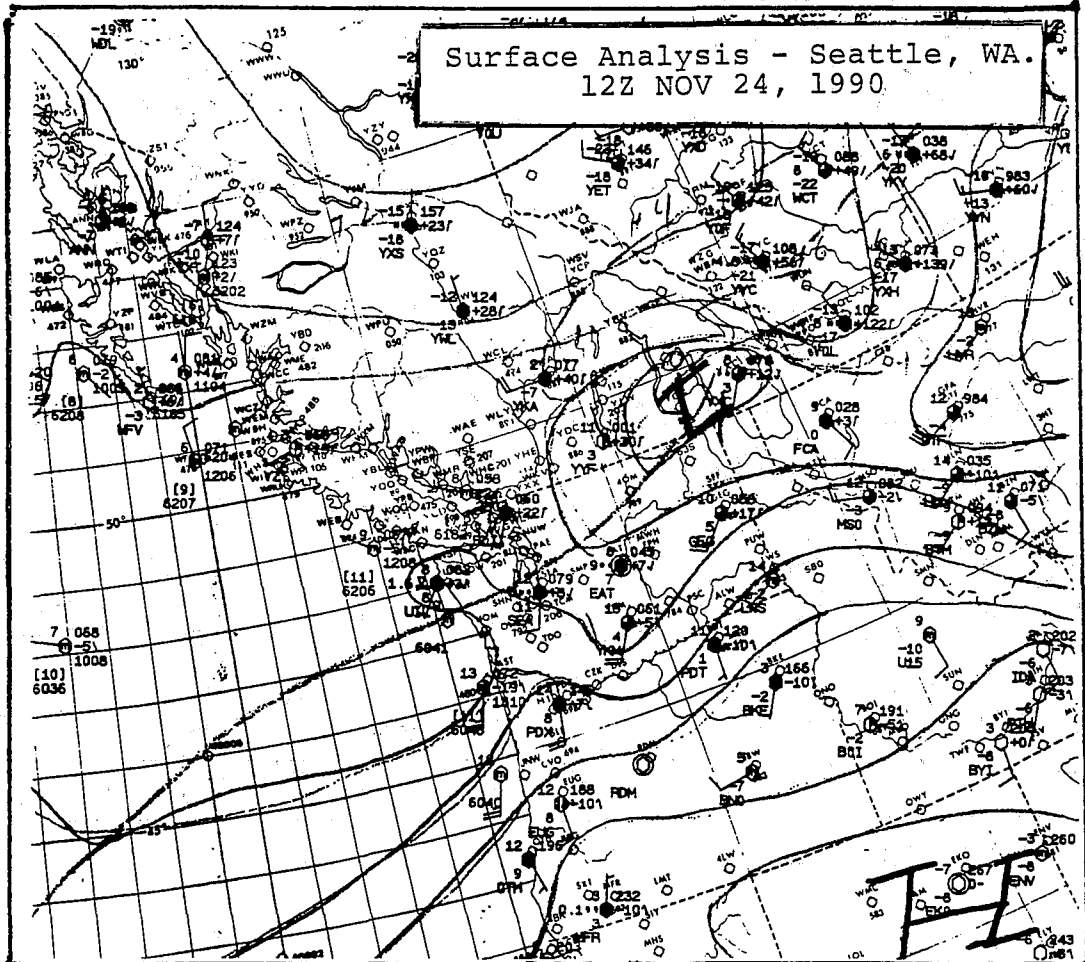
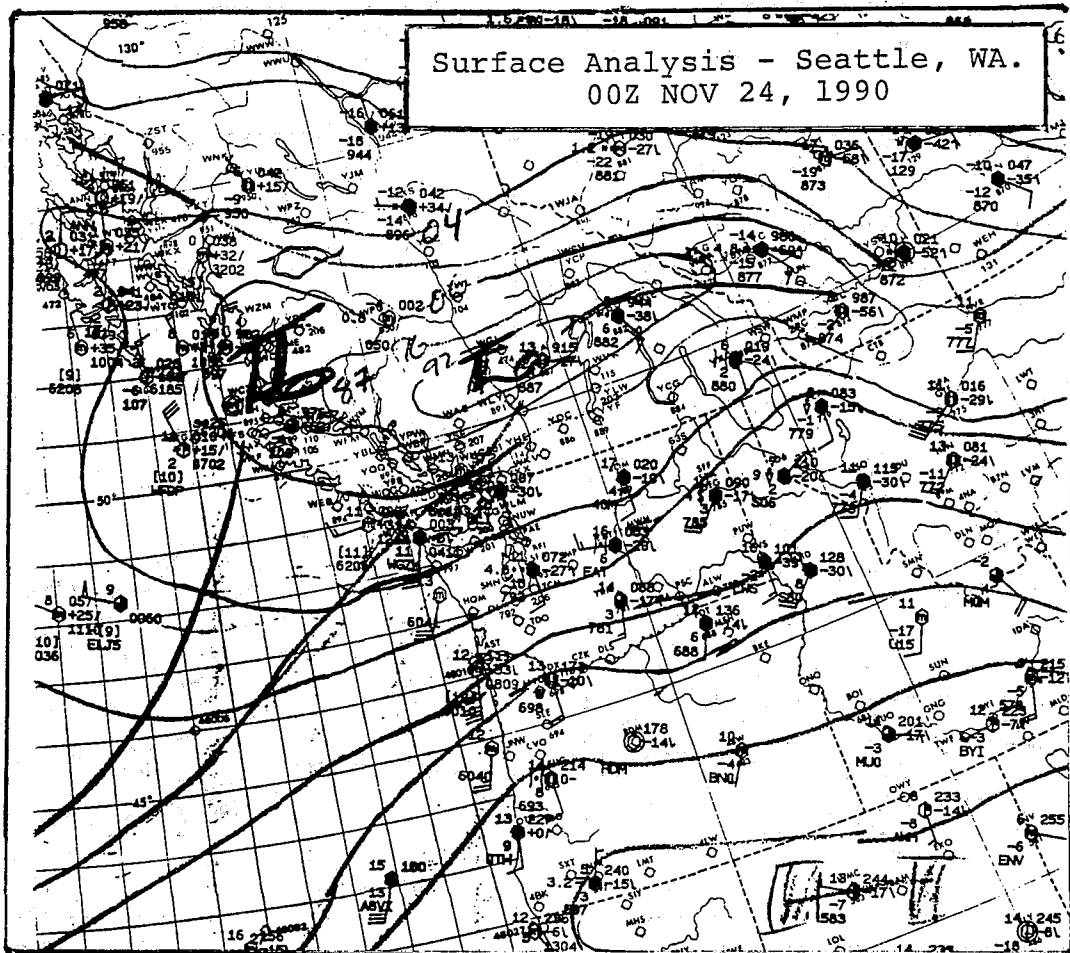
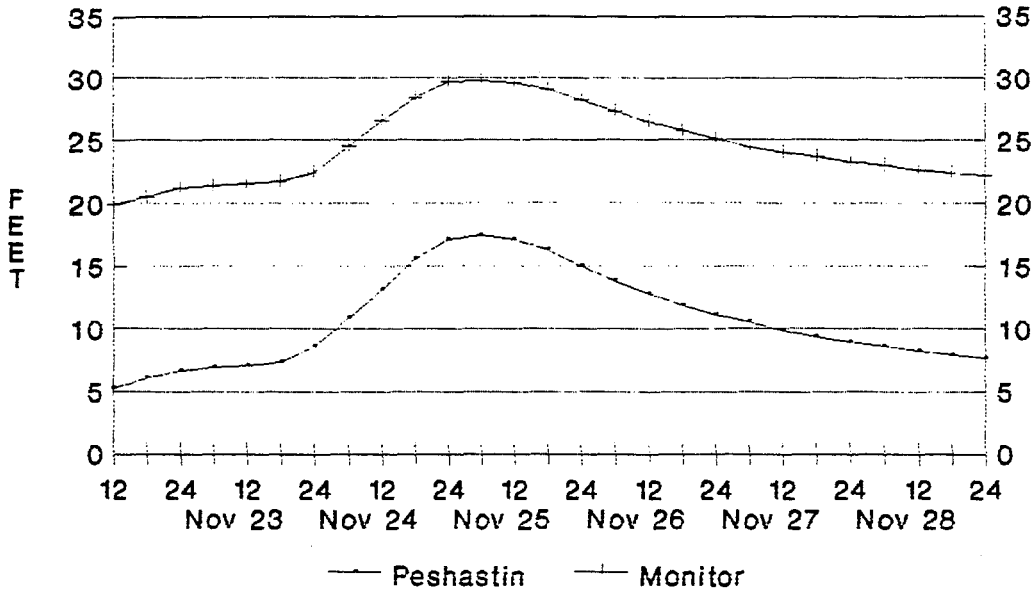


Figure 3

WENATCHEE RIVER

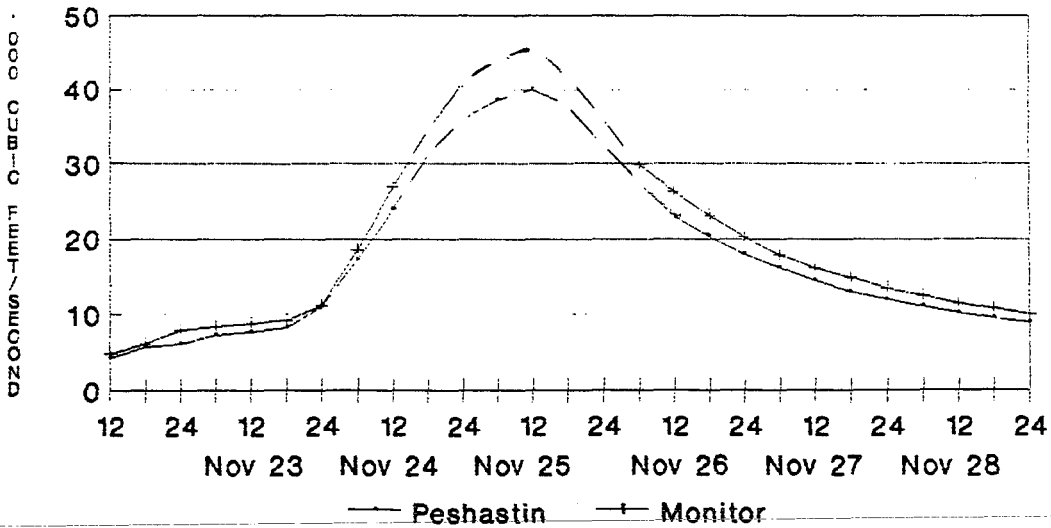
Peshastin and Monitor Gage Heights



Times LST. Peshastin flood stage 13'
Figure 4a

WENATCHEE RIVER

Peshastin and Monitor Maximum Instantaneous Discharge



Dashed portions - - estimated discharges
Times LST
Figure 4b