Wenatchee River Tributary near Monitor, Washington

(Miscellaneous ungaged site in the Columbia River basin,
USGS Washington Water Science Center)

Review of peak discharge for the flood of August 25, 1956

Location: This flood was located about 5.9 mi northwest of Wenatchee, Wash., at 47.4772N and 120.4081W.

Published peak discharge: The published discharge for this flood is 903 ft^3/s and is rated fair. A second slope-area measurement of the same storm was made in a nearby basin (Wenatchee River Tributary No. 2; State of Washington, 1964) and produced a discharge of 1,950 ft^3/s. The unit discharges for these two basins are 6,020 and 1,480 $(ft^3/s)/mi^2$, respectively. The two drainages are only a few miles apart.

Drainage area: The drainage area is 0.15 mi^2 and was planimetered from the 1:24,000-scale quadrangle map for Monitor, Wash. The basin is a small, very steep canyon that heads in a maze of smaller drainages emanating from a fairly flat mesa. The exact basin limits are difficult to define at this scale.

Data for storm causing flood: Monitor, Wash., is located about 10 mi northeast of Wenatchee. A localized, intense rainstorm hit the area at about 5 p.m. on August 25, 1956. The storm is reported to have dropped 2.5 in. of rain on the basin. No timeframe is reported, but the duration probably could be retrieved from the local newspaper or from weather records. Several small drainage basins experienced severe flooding. Flow estimates were made for two miscellaneous sites in the Monitor area—this one and Wenatchee River Tributary No. 2. These small, steep canyons empty onto the Wenatchee River flood plain, and the flood damaged fruit orchards that dominate the sandy valley floor. The smaller of these two basins (Wenatchee River tributary near Monitor, Wash., produced record-breaking unit discharge. According to local residents, this was the worst flood in at least 66 years. Historical photographs taken after the August 25, 1956, flood and during the 2003 review and described herein are provided in figures A233-A239.

Method of peak discharge determination: Two slope-area measurements were made in this basin in two short reaches near the canyon mouth. The reaches were selected about 3 weeks after the storm. The two reaches are separated horizontally by about 200 ft, a stretch where no high-water marks could be found. The slope areas were surveyed to different arbitrary datums and were not referenced to each other. The upstream reach is at the mouth of the canyon and extends upstream about 74 ft. The downstream reach is in an area where the bottom of the channel had been filled to provide an area to plant fruit trees. This reach is about 70 ft long. Three cross sections were surveyed in the upstream reach, and two cross sections were surveyed in the downstream reach. Only sections A and B were used in the upstream reach because of 37-percent expansion from section B to section C. The resulting discharges are:

Upstream reach sections A and B	1,010 ft^3/s
Downstream	796 ft^3/s

Both reaches were considered poor even though the high-water profiles were defined by good to excellent high-water marks. It was decided that the best result could be obtained by averaging the two discharges.

The upstream portion of the basin is extremely steep. The elevation change from the slope-area reach to the top of the drainage is more than 1,150 ft. The drainage is only about 1 mi long; thus, the average slope is about 22 percent. There were cloud-seeding operations going on in the area, so the area was probably in a drought when the storm hit. The basin is so steep and the storm was so intense that infiltration was minimal.

Manning's "*n*" values selected for the upstream reach are in the range 0.055 to 0.060 and probably are low for a reach this steep. Roughness coefficients for the downstream reach were in the range of 0.030 to 0.040 and probably are reasonable. Froude numbers ranged from 1.13 to 2.42, so flow was supercritical and probably very unstable.

Possible sources of error: The downstream slope-area measurement was made in a reach that had been filled in to create a level planting area for an orchard. The fill was eroded, and it is impossible to know the channel geometry at the time of the peak discharge. The cross-section geometry could have developed after the peak discharge when flow duration was long enough to cause extensive erosion. Roughness coefficients and hydraulic computations for extremely steep basins like this one are always questionable.

The drainage area is so small that any error would have a significant effect on the unit discharge. The downstream reach may have included runoff from a left-bank tributary, but it is hard to believe the field crew would not have noticed this if it occurred.

The field review team looked for evidence of a debris flow but nothing definite was found. The flow carried a lot of sediment and could have been hyperconcentrated.

Recommendations of what could have been done differently: There is not much that could have been done differently in this basin. Local residents could have been interviewed to try to determine when erosion occurred. The upstream basin could have been investigated for debris-flow evidence or remnants of temporary dams from landslides. The contributing area may have been more accurately delineated on aerial photographs.

Site visit and review: The site was visited on April 24, 2003, by John Costa (USGS Office of Surface Water), Bob Jarrett (USGS National Research Program), Mike Nolan (USGS Western Region Surface-Water Specialist), Glenn Hess and Jim O'Conner (USGS Oregon Water Science Center), John England (Bureau of Reclamation), Joe Weber (Federal Emergency Management Agency), Gary Gallino (USGS retired), and Bill Taylor (USGS Washington Water Science Center).

The review team looked for evidence of debris flows and landslide dams in the basin, and none were identified. The team also tried to determine if inflow from a left bank side channel contributed to flow in the downstream reach, but evidence was inconclusive.

Recommendations: The original peak discharge of 903 ft^3/s should be accepted as published (rounded to 900 ft^3/s) and the rating should be downgraded to "poor."

There is a temptation to discount the discharge computed for the downstream reach, but there are no new data to justify ignoring this computation. There is no way of knowing if the after flood channel geometry is the same as the geometry at peak discharge. This is a common problem with indirect discharge measurements.

Figure A233. View upstream of lower reach of Wenatchee River tributary near Monitor, Washington, 1956. Section B at top of falls. Section A upstream of large rock.

Figure A234. View upstream of sections A and B of lower reach of Wenatchee River tributary near Monitor, Washington, 1956.

Figure A235. View upstream of sections A and C of upper reach of Wenatchee River tributary near Monitor, Washington, 1956. Section C at blue bucket.

Figure A236. View upstream of sections A and B of lower reach of Wenatchee River tributary near Monitor, Washington, 1956.

Figure A237. View downstream of headwaters, Wenatchee River tributary near Monitor, Washington, May 2003.

Figure A238. View upstream toward headwaters, Wenatchee River tributary near Monitor, Washington, May 2003.

Figure A239. View downstream toward damaged house at mouth of basin, Wenatchee River tributary near Monitor, Washington, May 2003.