

Cimarron Creek Tributary near Cimarron, New Mexico

(Miscellaneous ungaged site in the Canadian River basin,
USGS New Mexico Water Science Center)

Review of peak discharge for the flood of June 5, 1958

Location: The flood occurred at a culvert on U.S. Highway 64, about 2 mi west of Cimarron, N.M. at 36.51919N and 104.95492W.

Published peak discharge: The published peak discharge determined from the indirect culvert measurement is 337 ft³/s on June 5, 1958. The measurement was rated fair.

Drainage area: The drainage area listed for the 1958 determination was “about 0.05 mi².” The area was determined by planimeter from the 1955 Cimarron quadrangle with a scale of 1:62,500 and a contour interval of 40 ft. Scott Waltemeyer (USGS New Mexico Water Science Center) used the 30-m NED and GIS to recompute a drainage area of 0.15 mi² as part of the 2003 review.

Data for storm causing flood: There is no information on the storm that caused the flood. The measurement summary notes only the location, type of computation, and result. The flooding undoubtedly was the result of a small, intense thunderstorm cell common in this part of New Mexico. A photograph taken during the 2003 review and described herein is provided in figure A156.

Method of peak discharge determination: The peak discharge is based on type I flow (inlet control) in a skewed concrete box culvert. The measurement was reviewed at headquarters by Harry Barnes, Jr. (USGS) on July 28, 1960.

The survey and computation were straightforward and were done correctly. The bed at the approach section had fresh sand fill (about 2 ft). This fill was assumed to have occurred after the peak discharge.

As part of the 2003 review, the computations were coded and run through the current USGS culvert analysis program (CAP). Those results confirm the original result of 337 ft³/s and type I flow.

Possible sources of error: The most likely sources of error in the measurement are: (1) the normal assumption that the culvert is free from debris and obstructions, (2) the assumption that the fill in the approach occurred after the peak discharge, and (3) the size of the basin that produced the flood.

Recommendations of what could have been done

differently: There should have been a discussion of the rainfall that produced the flood. Those details are nearly impossible to determine years after the fact for small-scale floods in sparsely populated areas. The erroneous drainage area is the other shortcoming of this measurement, and was nearly impossible to correct given the maps and technology available at the time. The only recourse would have been to define the perimeter of the basin with a field survey—a monumental undertaking in so rugged a basin.

Site visit and review: The site was visited on August 5, 2003, by John Costa (USGS Office of Surface Water), Scott Waltemeyer (USGS New Mexico Water Science Center), Mark Smith (USGS Central Region), and Kenneth Wahl (USGS retired). The highway has been widened since 1958, and the culvert entrances have been changed to accommodate the wider roadway. However, the skewed culvert barrel is still in place. There was no evidence that past flows had been other than water floods that carry large amounts of sediment as bed load.

Debris blocking the culvert entrance is unlikely given the lack of evidence of blockage in photographs taken during the survey. However, the fill observed in the approach at the time of the survey possibly existed during the flood given the high rates of sand transport. The cross-sectional area computed for the approach was about 200 ft², of which about 35–40 ft² was filled with sand. Even if the sand had been present at the peak discharge, flow would have been subcritical in the approach, and the culvert inlet would have been the control (type I flow). Therefore, the discharge would have been essentially as originally computed.

Recommendations: The original peak discharge of 337 ft³/s should be accepted as published, but rounded to 340 ft³/s. The drainage area should be corrected to 0.15 mi², and the numbers updated in future references to this flood.

There is no doubt that the rain and runoff from this small basin and from the surrounding area was exceptional. The computations are done correctly. The drainage area based on the 1:62,500-scale map was only one-third that determined by 2003 maps.



Figure A156. Site of culvert measurement, Cimarron Creek Tributary near Cimarron, New Mexico, August 5, 2003.