# G473 Environmental Geology
# Lab 2 – Introduction to Flood Hazard Analysis

## Part 1. Buffalo Creek, WV Case Study

On February 26, 1972, the most destructive flood in West Virginia's history swept through the Buffalo Creek valley in the southwestern Corner of the State, 40 miles south of Charleston (Figure 1). Shortly before 8:00 AM, a coal-waste dam collapsed on the Buffalo Creek tributary, releasing 17.6 million cubic feet (132 million gallons) of water. A 10 to 20 ft flood wave rapidly passed down the valley, killing 118 people, destroying 500 homes, leaving 4000 people homeless, and creating $50 million dollars in damage to public infrastructure. The towns most directly affected by the flooding include Saunders, WV; Stowe, WV; Accoville, WV; and Man, WV (Figure 2).

Table 1 is a record of stream discharge data collected along Buffalo Creek on the day of February 26, 1972. Your task is to use the attached graph paper to plot a hydrograph (Discharge vs. Time) for Buffalo Creek. This data is also available as a Microsoft Excel worksheet file on the class website. Students are encouraged to use Excel to compute the results of this exercise. Complete the following tasks:

(1) Using the answer sheet in Table 2, convert the discharges from cfs to cu. m/sec for each gauge station.
(2) Using the answer sheet in Table 2, convert the "clock time" to time in minutes from the start of the observation period for each gauge station (e.g. the start time is 7:50 AM for each station, consider this as "0 min" since start, 7:55 AM = 5 min, 8:00 AM = 10 min, 8:05 = 15 min…. and so on).
(3) Using the blank graph in Figure 3, plot a flood hydrograph for each station, using a different colored line for each (e.g. Saunders station = red, Stowe station = blue, etc.). Plot all four hydrographs on the same graph paper. Format your hydrographs with time (min) on the x-axis, and discharge (cu. ft /sec) on the y-axis.
(4) On Table 3, compute the travel velocity of the peak flood wave as it progressed downstream.
   A. Determine the distance along the stream course, in miles, between each of the stations (use Fig. 2),
   B. Determine the travel time of the peak flood wave (in hours) between each station, by using your hydrograph,
   C. Calculate the velocity of the peak flood wave between each station (in mi / hr using V=d/t),
   D. Calculate the total distance, travel time, and average velocity between Saunders and Man, and
   E. Convert the flood-wave velocity from mi/hr to ft/sec.
(5) On Table 4, compute the cross-sectional area of peak flood flow at the Stowe, Accoville, and Man stations using the continuity equation: Q = VA, where Q = flood peak discharge, V = velocity of flood wave, and A = cross-sectional area of channel flow in the valley.
   A. List the peak flood wave velocity in ft/sec, as calculated on Table 3.
   B. From your hydrograph / discharge data, list the peak flood-wave discharge for each of the stations listed on Table 4.
   C. Re-arrange the continuity equation and solve for cross-sectional area of flow in square feet.

Answer the following questions on a separate sheet of paper, or with a word processor:

1. Describe what happens to the overall peak flood-wave discharge as the dam-burst event progresses downstream.
2. Describe what happens to the velocity of the peak flood-wave as it passes downstream.
3. Provide several hypotheses as to why you think the peak flood-wave discharge decreases so dramatically from Saunders (near the dam break) to the other stations? (think about what is happening to the river channel and the water in the channel).
4. Based on Table 3 and Table 4, why does the flood-wave travel velocity diminish so significantly between Accoville and Man? (look at the data and think about the continuity equation and valley geometry).
5. Which town along Buffalo Creek do you think sustained the most death and destruction? Explain your answer in detail (why?).

6. What would be the best way to save lives in Man, WV, compared to Saunders… again look at the data in Table 3.
7. Discuss what you know about flood hazards and how this catastrophe could have been avoided or otherwise mitigated.

**Part 2. Flood Recurrence Interval Calculations**

Table 5 lists 25 years (1971-1995) peak annual discharge data for Mission Creek, near Santa Barbara, CA. The stream is gauged and monitored for discharge. At the end of each water year, the highest discharge is selected and designated as the "peak annual". Peak annual discharge analysis forms the framework for delineating Recurrence Intervals of maximum flood flow along streams and rivers. Your job is to calculate the "100 year Flood Discharge", so that a flood hazards map can be prepared for home owners along Mission Creek. Since there is only 25 years of data, we will have to do a statistical analysis to project the magnitude of the "100-year flood". We will use a technique developed by the U.S. Geological Survey referred to as the "Pearson Type III Distribution". Complete the following steps.

(1) Sort and rank the data in Table 5 according to discharge magnitude (M) from highest to lowest, e.g. for the highest discharge M = 1, for the lowest discharge M=25 (since there are only 25 years worth of data). Place your data in the appropriate position on Table 6 (fill in columns 1 and 3).

**NOTE:** Tables 5 and 6 are available for download from the web site as Microsoft Excel Files. You are encouraged to use Microsoft Excel to work this problem, especially since I have the formulas for Table 6 already set up. If you use the Excel version, all you have to do is enter the data into Table 6, and it will automatically calculate all of the 100 year flood discharge parameters. Otherwise, you can use the paper version of Table 6 and calculate by hand with a traditional calculator.

(2) Calculate the recurrence interval for the listed floods by using the formula:

R.I. (years) = (N+1) / M

Where R.I. = recurrence interval, N = total no. of observations in the record, M = rank (1 = highest). Fill in column 4.

(3) In Table 6, Calculate Q' by taking the "log" (to the base 10) of the peak annual discharge (Qp – Column 3) for each year (fill in column 5).

(4) Calculate the average Q' (calculate the average of all values in column 5). Enter your result in the space provided in the calculation box at the bottom of the table.
(5) Systematically subtract the average Q' from each Q' and fill in column 6 (Q'-Qavg).
(6) In Column 7, calculate the square of (Q'-Qavg) (i.e. take the square of column 6).
(7) In Column 8, calculate the cube of (Q'-Qavg) (i.e. take the cube of column 6).
(8) Sum columns 6, 7 and 8, place in the appropriate box at the bottom of the columns.
(9) In the Calculation Box
    (A) Enter the total no. of observations.
    (B) Enter the average of Q' from all readings in Column 5.
    (C) Enter the standard deviation of Q'from all readings in Column 5.
    (D) Calculate "G" by using the following formula:

$$G = \left(\frac{n}{(N-1)(N-2)}\right)\left(\frac{\Sigma(Q-\overline{Q})^3}{\sigma^3}\right)$$

Enter your result in the calculation box.

(E) Use the G value and Table 5D to approximate a "K" value for the 100 year recurrence interval (i.e. find your G value in the first column by extrapolation, and look on Table 5D under the 100 R.I. column to find the value of "K"). Enter your result in the calculation box.

(F) Calculate the log of the discharge for the 100 year flood by using the following formula:

$LogQ_{100} = Q'_{avg} + K(Q'_{stdev})$

Where $Q_{100}$ = the discharge of the 100 year flood, $Q'_{avg}$ is from the calculation box, K is derived from part E above, and $Q'_{stdev}$ is from the calculation box.

(G) Now that you have the $LogQ_{100}$, all you have to do to calculate the actual discharge for the 100 year flood is to take the "INV" of $LogQ_{100}$ on a calculator to determine your value. Or alternatively, take the value derived in F above, and use that as a power of 10 to determine the actual 100 year flood discharge:

$$\text{100 year Flood Q} = 10^{\text{(the answer from "F")}}$$

Your answer should be in cubic feet per second, enter into the calculation box.

On a separate sheet of paper, or using a word processor, answer the following questions.

8. Based on Table 5, what climate conditions in Southern California are most commonly associated with the highest recorded flood events on Mission Creek.
9. What climate conditions are the lowest annual peak discharges associated with?
10. During the low peak-discharge years, the risk of flood hazard is minimized. Hypothesize what hazards you would face in coastal southern California during the low peak discharge years, other than flood.
11. What is the recurrence interval of the highest flood discharge recorded in the 25 year record? What is the R.I. of the lowest discharge recorded? Create a general statement regarding the magnitude of a flood event relative to it's frequency over time.
12. Based on the talk by Ann Beier from the State Dept. of Lands, discuss why the 100 year floodplain is important to the citizens of Oregon (What is the 100-yr floodplain and how is it delineated?).

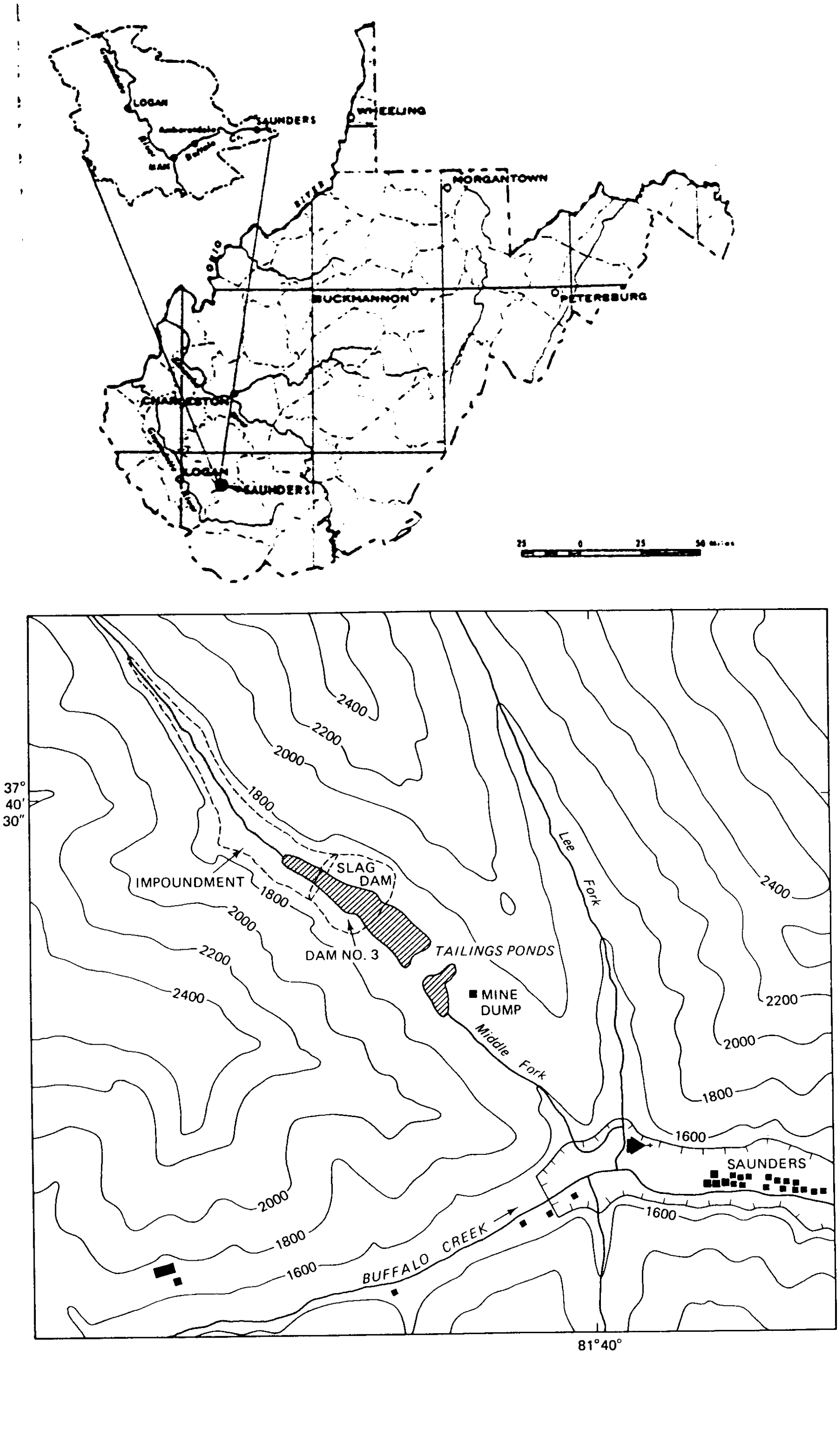



Figure 1. Location map of Buffalo Creek, WV.

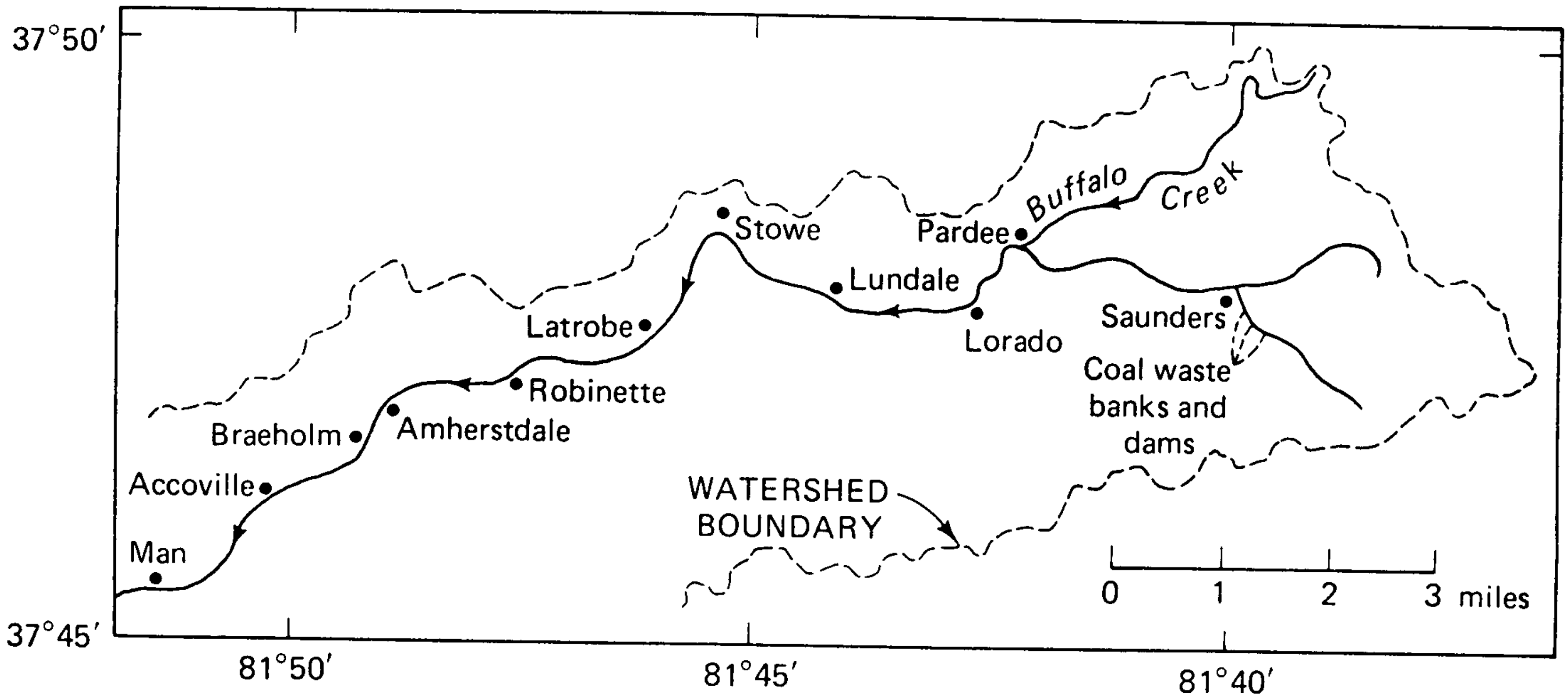



**Figure** 2. Map of the valley of Buffalo Creek, Latrobe County, West Virginia, showing locations cited in the text. (Davies, Bailey, and Kelly, 1972.)

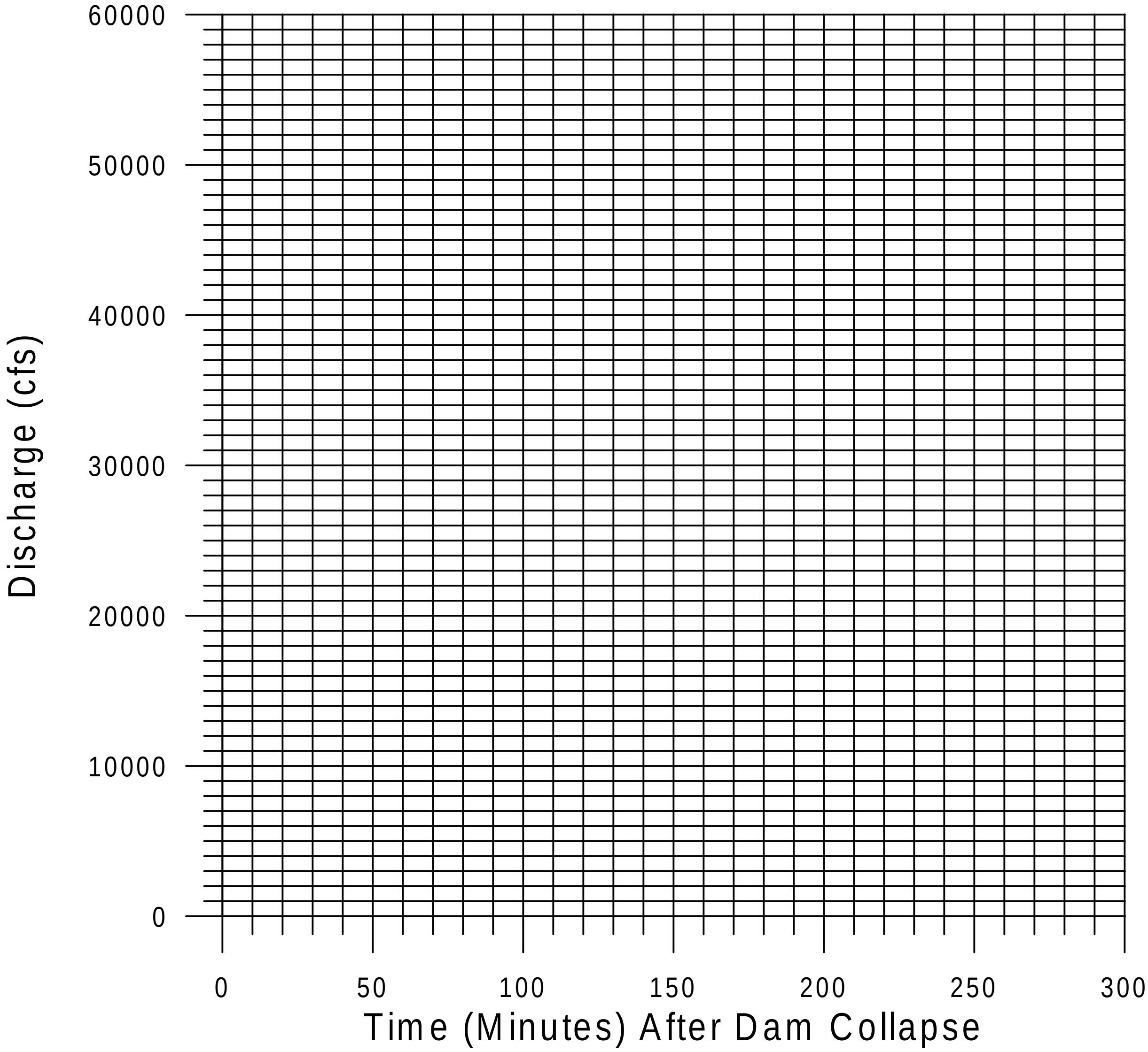
Table 1. February 26, 1972 Buffalo Creek, WV Discharge Data

| At Saunders WV | | | At Stowe, WV | | | At Accoville, WV | | | At Man, WV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Q (cu. Ft/sec) | Clock Time | | Q (cu. Ft/sec) | Clock Time | | Q (cu. Ft/sec) | Clock Time | | Q (cu. Ft/sec) | Clock Time | |
| | Hours | Minutes | | Hours | Minutes | | Hours | Minutes | | Hours | Minutes |
| 500 | 7 | 50 | 500 | 7 | 50 | 500 | 7 | 50 | 500 | 7 | 50 |
| 500 | 7 | 55 | 500 | 7 | 55 | 500 | 7 | 55 | 500 | 7 | 55 |
| 500 | 8 | 0 | 500 | 8 | 0 | 500 | 8 | 0 | 500 | 8 | 0 |
| 32000 | 8 | 5 | 500 | 8 | 5 | 500 | 8 | 5 | 500 | 8 | 5 |
| 50000 | 8 | 7 | 500 | 8 | 10 | 500 | 8 | 10 | 500 | 8 | 10 |
| 25000 | 8 | 10 | 500 | 8 | 15 | 500 | 8 | 15 | 500 | 8 | 15 |
| 3000 | 8 | 15 | 500 | 8 | 20 | 500 | 8 | 20 | 500 | 8 | 20 |
| 500 | 8 | 20 | 500 | 8 | 25 | 500 | 8 | 25 | 500 | 8 | 25 |
| 500 | 8 | 25 | 500 | 8 | 30 | 500 | 8 | 30 | 500 | 8 | 30 |
| 500 | 8 | 30 | 500 | 8 | 35 | 500 | 8 | 35 | 500 | 8 | 35 |
| 500 | 8 | 35 | 2000 | 8 | 40 | 500 | 8 | 40 | 500 | 8 | 40 |
| 500 | 8 | 40 | 3000 | 8 | 45 | 500 | 8 | 45 | 500 | 8 | 45 |
| 500 | 8 | 45 | 6000 | 8 | 50 | 500 | 8 | 50 | 500 | 8 | 50 |
| 500 | 8 | 50 | 9000 | 8 | 55 | 500 | 8 | 55 | 500 | 8 | 55 |
| 500 | 8 | 55 | 12000 | 9 | 0 | 500 | 9 | 0 | 500 | 9 | 0 |
| 500 | 9 | 0 | 9000 | 9 | 5 | 500 | 9 | 5 | 500 | 9 | 5 |
| 500 | 9 | 5 | 8000 | 9 | 10 | 500 | 9 | 10 | 500 | 9 | 10 |
| 500 | 9 | 10 | 5000 | 9 | 15 | 500 | 9 | 15 | 500 | 9 | 15 |
| 500 | 9 | 15 | 2000 | 9 | 20 | 1000 | 9 | 20 | 500 | 9 | 20 |
| 500 | 9 | 20 | 500 | 9 | 25 | 2000 | 9 | 25 | 500 | 9 | 25 |
| 500 | 9 | 25 | 500 | 9 | 30 | 3000 | 9 | 30 | 500 | 9 | 30 |
| 500 | 9 | 30 | 500 | 9 | 35 | 5000 | 9 | 35 | 500 | 9 | 35 |
| 500 | 9 | 35 | 500 | 9 | 40 | 6000 | 9 | 40 | 500 | 9 | 40 |
| 500 | 9 | 40 | 500 | 9 | 45 | 7000 | 9 | 45 | 500 | 9 | 45 |
| 500 | 9 | 45 | 500 | 9 | 50 | 9000 | 9 | 50 | 500 | 9 | 50 |
| 500 | 9 | 50 | 500 | 9 | 55 | 8000 | 9 | 55 | 500 | 9 | 55 |
| 500 | 9 | 55 | 500 | 10 | 0 | 7000 | 10 | 0 | 500 | 10 | 0 |
| 500 | 10 | 0 | 500 | 10 | 5 | 5000 | 10 | 5 | 600 | 10 | 5 |
| 500 | 10 | 5 | 500 | 10 | 10 | 3000 | 10 | 10 | 700 | 10 | 10 |
| 500 | 10 | 10 | 500 | 10 | 15 | 2500 | 10 | 15 | 800 | 10 | 15 |
| 500 | 10 | 15 | 500 | 10 | 20 | 2000 | 10 | 20 | 900 | 10 | 20 |
| 500 | 10 | 20 | 500 | 10 | 25 | 1500 | 10 | 25 | 1000 | 10 | 25 |
| 500 | 10 | 25 | 500 | 10 | 30 | 850 | 10 | 30 | 1100 | 10 | 30 |
| 500 | 10 | 30 | 500 | 10 | 35 | 500 | 10 | 35 | 1500 | 10 | 35 |
| 500 | 10 | 35 | 500 | 10 | 40 | 500 | 10 | 40 | 2000 | 10 | 40 |
| 500 | 10 | 40 | 500 | 10 | 45 | 500 | 10 | 45 | 2500 | 10 | 45 |
| 500 | 10 | 45 | 500 | 10 | 50 | 500 | 10 | 50 | 3000 | 10 | 50 |
| 500 | 10 | 50 | 500 | 10 | 55 | 500 | 10 | 55 | 5000 | 10 | 55 |
| 500 | 10 | 55 | 500 | 11 | 0 | 500 | 11 | 0 | 8000 | 11 | 0 |
| 500 | 11 | 0 | 500 | 11 | 5 | 500 | 11 | 5 | 7500 | 11 | 5 |
| 500 | 11 | 5 | 500 | 11 | 10 | 500 | 11 | 10 | 5500 | 11 | 10 |
| 500 | 11 | 10 | 500 | 11 | 15 | 500 | 11 | 15 | 4500 | 11 | 15 |
| 500 | 11 | 15 | 500 | 11 | 20 | 500 | 11 | 20 | 4000 | 11 | 20 |
| 500 | 11 | 20 | 500 | 11 | 25 | 500 | 11 | 25 | 3000 | 11 | 25 |
| 500 | 11 | 25 | 500 | 11 | 30 | 500 | 11 | 30 | 2500 | 11 | 30 |
| 500 | 11 | 30 | 500 | 11 | 35 | 500 | 11 | 35 | 2000 | 11 | 35 |
| 500 | 11 | 35 | 500 | 11 | 40 | 500 | 11 | 40 | 1800 | 11 | 40 |
| 500 | 11 | 40 | 500 | 11 | 45 | 500 | 11 | 45 | 1000 | 11 | 45 |
| 500 | 11 | 45 | 500 | 11 | 50 | 500 | 11 | 50 | 800 | 11 | 50 |
| 500 | 11 | 50 | 500 | 11 | 55 | 500 | 11 | 55 | 650 | 11 | 55 |
| 500 | 11 | 55 | 500 | 12 | 0 | 500 | 12 | 0 | 500 | 12 | 0 |
| 500 | 12 | 0 | | | | | | | | | |

Table 2. Answer Sheet for Buffalo Creek Calculations. *1 cu. m = 35.31 cu. ft*

| At SaundersWV | | | At Stowe, WV | | | At Accoville, WV | | | At Man, WV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Q (cu. Ft/sec) | Q (cu m /sec) | Time (min) | Q (cu. Ft/sec) | Q (cu m /sec) | Time (min) | Q (cu. Ft/sec) | Q (cu m /sec) | Time (min) | Q (cu. Ft/sec) | Q (cu m /sec) | Time (min) |
| 500 | 14.16 | 0 | 500 | 14.16 | 0 | 500 | 14.16 | 0 | 500 | 14.16 | 0 |
| 500 | | | 500 | | | 500 | | | 500 | | |
| 500 | | | 500 | | | 500 | | | 500 | | |
| 32000 | | | 500 | | | 500 | | | 500 | | |
| 50000 | | | 500 | | | 500 | | | 500 | | |
| 25000 | | | 500 | | | 500 | | | 500 | | |
| 3000 | | | 500 | | | 500 | | | 500 | | |
| 500 | | | 500 | | | 500 | | | 500 | | |
| 500 | | | 500 | | | 500 | | | 500 | | |
| 500 | | | 500 | | | 500 | | | 500 | | |
| 500 | | | 2000 | | | 500 | | | 500 | | |
| 500 | | | 3000 | | | 500 | | | 500 | | |
| 500 | | | 6000 | | | 500 | | | 500 | | |
| 500 | | | 9000 | | | 500 | | | 500 | | |
| 500 | | | 12000 | | | 500 | | | 500 | | |
| 500 | | | 9000 | | | 500 | | | 500 | | |
| 500 | | | 8000 | | | 500 | | | 500 | | |
| 500 | | | 5000 | | | 500 | | | 500 | | |
| 500 | | | 2000 | | | 1000 | | | 500 | | |
| 500 | | | 500 | | | 2000 | | | 500 | | |
| 500 | | | 500 | | | 3000 | | | 500 | | |
| 500 | | | 500 | | | 5000 | | | 500 | | |
| 500 | | | 500 | | | 6000 | | | 500 | | |
| 500 | | | 500 | | | 7000 | | | 500 | | |
| 500 | | | 500 | | | 9000 | | | 500 | | |
| 500 | | | 500 | | | 8000 | | | 500 | | |
| 500 | | | 500 | | | 7000 | | | 500 | | |
| 500 | | | 500 | | | 5000 | | | 600 | | |
| 500 | | | 500 | | | 3000 | | | 700 | | |
| 500 | | | 500 | | | 2500 | | | 800 | | |
| 500 | | | 500 | | | 2000 | | | 900 | | |
| 500 | | | 500 | | | 1500 | | | 1000 | | |
| 500 | | | 500 | | | 850 | | | 1100 | | |
| 500 | | | 500 | | | 500 | | | 1500 | | |
| 500 | | | 500 | | | 500 | | | 2000 | | |
| 500 | | | 500 | | | 500 | | | 2500 | | |
| 500 | | | 500 | | | 500 | | | 3000 | | |
| 500 | | | 500 | | | 500 | | | 5000 | | |
| 500 | | | 500 | | | 500 | | | 8000 | | |
| 500 | | | 500 | | | 500 | | | 7500 | | |
| 500 | | | 500 | | | 500 | | | 5500 | | |
| 500 | | | 500 | | | 500 | | | 4500 | | |
| 500 | | | 500 | | | 500 | | | 4000 | | |
| 500 | | | 500 | | | 500 | | | 3000 | | |
| 500 | | | 500 | | | 500 | | | 2500 | | |
| 500 | | | 500 | | | 500 | | | 2000 | | |
| 500 | | | 500 | | | 500 | | | 1800 | | |
| 500 | | | 500 | | | 500 | | | 1000 | | |
| 500 | | | 500 | | | 500 | | | 800 | | |
| 500 | | | 500 | | | 500 | | | 650 | | |
| 500 | | | 500 | | | 500 | | | 500 | | |
| 500 | | | | | | | | | | | |

Figure 3. Flood Hydrograph for the February 26, 1972 Buffalo Creek, WV Dam Break




*c:wou:envgeo:lab:blank.grf (buffalo.xls)*

Table 3. Flood Wave Velocity Calculations

*conversion factors: 1hr = 60 min, 1 mi = 1609 m*

| Stream Segment | Distance (mi) | Time (min) | Time (hr) | Velocity (mi /hr) | Velocity (ft/sec) |
|---|---|---|---|---|---|
| | | | | | |
| Saunders-Stowe | | | | | |
| Stowe-Accoville | | | | | |
| Accoville-Man | | | | | |
| Total Average: Saunders-Man | | | | | |

Continuity Equation: Q = AV

Table 4. Cross-Sectional Flow Area Calculation.

| Station | Velocity (ft /sec) | Peak Floodwave Q (cfs) | Cross-Sectional Area of Flow (sq. ft) |
|---|---|---|---|
| Stowe | | | |
| Accoville | | | |
| Man | | | |

Table 5. Mission Creek at Santa Barbara, CA
Peak Annual Discharges (by year).

| Year | Peak Q (cfs) | Comment |
|---|---|---|
| 1971 | 360 | |
| 1972 | 1420 | |
| 1973 | 2580 | |
| 1974 | 519 | |
| 1975 | 1130 | |
| 1976 | 353 | |
| 1977 | 569 | |
| 1978 | 2500 | El Nino Year |
| 1979 | 667 | |
| 1980 | 1300 | |
| 1981 | 302 | |
| 1982 | 186 | |
| 1983 | 2300 | El Nino Year |
| 1984 | 681 | |
| 1985 | 128 | |
| 1986 | 626 | El Nino Year |
| 1987 | 625 | El Nino Year |
| 1988 | 139 | Drought Year |
| 1989 | 168 | Drought Year |
| 1990 | 115 | Drought Year |
| 1991 | 468 | El Nino Year |
| 1992 | 1129 | El Nino Year |
| 1993 | 838 | El Nino Year |
| 1994 | 207 | El Nino Year |
| 1995 | 3800 | El Nino Year |

**Table 5.D** Values of *K* for log-Pearson Type III Distribution

| | Return Period, Years | | | | | | |
|---|---|---|---|---|---|---|---|
| G | 2 | 5 | 10 | 25 | 50 | 100 | 200 |
| 3.0 | –0.396 | 0.420 | 1.180 | 2.278 | 3.152 | 4.051 | 4.970 |
| 2.8 | –0.384 | 0.460 | 1.210 | 2.275 | 3.114 | 3.973 | 4.847 |
| 2.6 | –0.368 | 0.499 | 1.238 | 2.267 | 3.071 | 3.889 | 4.718 |
| 2.4 | –0.351 | 0.537 | 1.262 | 2.256 | 3.023 | 3.800 | 4.584 |
| 2.2 | –0.330 | 0.574 | 1.284 | 2.240 | 2.970 | 3.705 | 4.444 |
| 2.0 | –0.307 | 0.609 | 1.302 | 2.219 | 2.912 | 3.605 | 4.298 |
| 1.8 | –0.282 | 0.643 | 1.318 | 2.193 | 2.848 | 3.499 | 4.147 |
| 1.6 | –0.254 | 0.675 | 1.329 | 2.163 | 2.780 | 3.388 | 3.990 |
| 1.4 | –0.225 | 0.705 | 1.337 | 2.128 | 2.706 | 3.271 | 3.828 |
| 1.2 | –0.195 | 0.732 | 1.340 | 2.087 | 2.626 | 3.149 | 3.661 |
| 1.0 | –0.164 | 0.758 | 1.340 | 2.043 | 2.542 | 3.022 | 3.489 |
| 0.8 | –0.132 | 0.780 | 1.336 | 1.993 | 2.453 | 2.891 | 3.312 |
| 0.6 | –0.099 | 0.800 | 1.328 | 1.939 | 2.359 | 2.755 | 3.132 |
| 0.4 | –0.066 | 0.816 | 1.317 | 1.880 | 2.261 | 2.615 | 2.949 |
| 0.2 | –0.033 | 0.830 | 1.301 | 1.818 | 2.159 | 2.472 | 2.763 |
| 0.0 | 0.0 | 0.842 | 1.282 | 1.751 | 2.054 | 2.326 | 2.576 |
| –0.2 | 0.033 | 0.850 | 1.258 | 1.680 | 1.945 | 2.178 | 2.388 |
| –0.4 | 0.066 | 0.855 | 1.231 | 1.606 | 1.834 | 2.029 | 2.201 |
| –0.6 | 0.099 | 0.857 | 1.200 | 1.528 | 1.720 | 1.880 | 2.016 |
| –0.8 | 0.132 | 0.856 | 1.166 | 1.448 | 1.606 | 1.733 | 1.837 |
| –1.0 | 0.164 | 0.852 | 1.128 | 1.366 | 1.492 | 1.588 | 1.664 |
| –1.2 | 0.195 | 0.844 | 1.086 | 1.282 | 1.379 | 1.449 | 1.501 |
| –1.4 | 0.225 | 0.832 | 1.041 | 1.198 | 1.270 | 1.318 | 1.351 |
| –1.6 | 0.254 | 0.817 | 0.994 | 1.116 | 1.166 | 1.197 | 1.216 |
| –1.8 | 0.282 | 0.799 | 0.945 | 1.035 | 1.069 | 1.087 | 1.097 |
| –2.0 | 0.307 | 0.777 | 0.895 | 0.959 | 0.980 | 0.990 | 0.995 |
| –2.2 | 0.330 | 0.752 | 0.844 | 0.888 | 0.900 | 0.905 | 0.907 |
| –2.4 | 0.351 | 0.725 | 0.795 | 0.823 | 0.830 | 0.832 | 0.833 |
| –2.6 | 0.368 | 0.696 | 0.747 | 0.764 | 0.768 | 0.769 | 0.769 |
| –2.8 | 0.384 | 0.666 | 0.702 | 0.712 | 0.714 | 0.714 | 0.714 |
| –3.0 | 0.396 | 0.636 | 0.660 | 0.666 | 0.666 | 0.667 | 0.667 |

Source: U.S. Soil Conservation Service

Table 6. Mission Creek - Log-Pearson Type III Distribution Answer Sheet.

| Column 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| Year | M | Qp (annual peak) | Reccurence Interval (years) | Q' = logQp | $(Q'-Q'_{avg})$ | $(Q'-Q'_{avg})^2$ | $(Q'-Q'_{avg})^3$ |
| | 1 | | | | | | |
| | 2 | | | | | | |
| | 3 | | | | | | |
| | 4 | | | | | | |
| | 5 | | | | | | |
| | 6 | | | | | | |
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| | 22 | | | | | | |
| | 23 | | | | | | |
| | 24 | | | | | | |
| | 25 | | | | | | |
| | | | **SUM Columns** | | | | |

**Calculation Box**

| | | |
|---|---|---|
| **No. Obs. Total** | | |
| **$Q'_{avg}$** | | |
| **$Q'_{stdev}$** | | |
| **G** | | |
| **$K_{100}$** | | (by linear extrapolation) |
| **$logQ_{100}$** | | |
| **$Q_{100}$ (cfs)** | | |