

**CE 3372 – Water Systems Design**  
**Exercise Set 6**

**Purpose:** Demonstrate flow-equalization volume required for a storage tank to leverage some constant flow rate.

**Task(s):** Analyze daily water cumulative demand (from time varying outflows)  
Find equivalent constant draw rate  
Use double mass curve concept to find maximum deviations to size an equalization tank.

**Exercise**

1. Figure 1 is a plot of variable cumulative inflow volume versus time for a proposed flow-equalization tank location and the equivalent constant rate inflow for the same location.

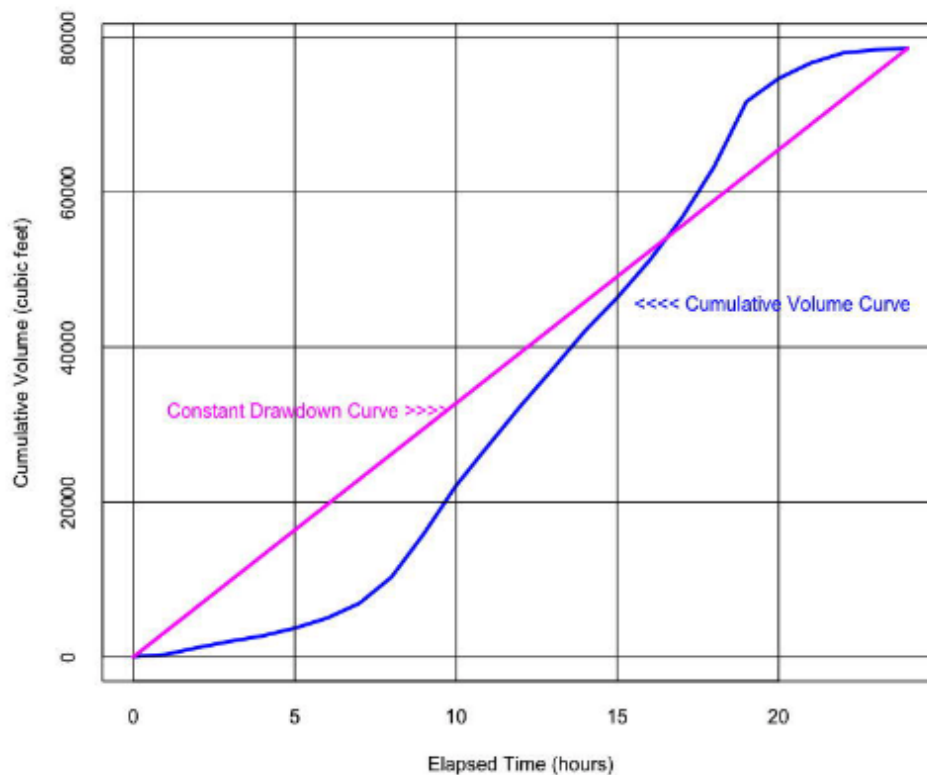


Figure 1: Time-varying water demand (cumulative) and constant-rate equivalent demand

Figure 2 is a list of time and cumulative volume inflow (same as the graph). A flow-equalization storage tank volume is to be determined.

Hour	Cum. Vol. (ft <sup>3</sup> )	Hour	Cum. Vol. (ft <sup>3</sup> )
0	0	–	–
1	300	13	37,200
2	1,200	14	42,100
3	2,000	15	46,400
4	2,700	16	51,200
5	3,700	17	56,700
6	5,000	18	63,300
7	6,900	19	71,700
8	10,300	20	74,700
9	15,900	21	76,700
10	22,100	22	78,000
11	27,300	23	78,400
12	32,400	24	78,600

Figure 2: Variable Draft Table for Flow Equalization

Determine:

- The cumulative volume of inflow (or draft) every 24 hours plotted on Figure 1 and tabulated in Figure 2.
- The constant flow rate (cubic feet per hour) from the constant drawdown curve plotted on Figure 1 and tabulated in Figure 2.
- The largest maximum absolute deviation between the constant drawdown line and the variable inflow curve indicated by Figure 1 and/or tabulated in Figure 2.
- The second largest maximum absolute deviation between the constant drawdown line and the variable inflow curve indicated by Figure 1 and/or tabulated in Figure 2.
- A recommended flow equalization storage volume indicated by Figure 1 and/or tabulated in Figure 2.

## References

Gupta, R. S. 2017. Hydrology and Hydraulic Systems. Waveland Press, Inc. pp. 548-552