DW Module 3:
Surface Water Sources
Answer Key

Subsection Flow (CFS) = (1.0 Ft x 2.5 Ft) x 4 Ft/sec

Subsection Flow = 10 CFS

[During this sample exercise, flow was calculated for one subsection. Note that total streamflow is the total of all subsection measurements.]

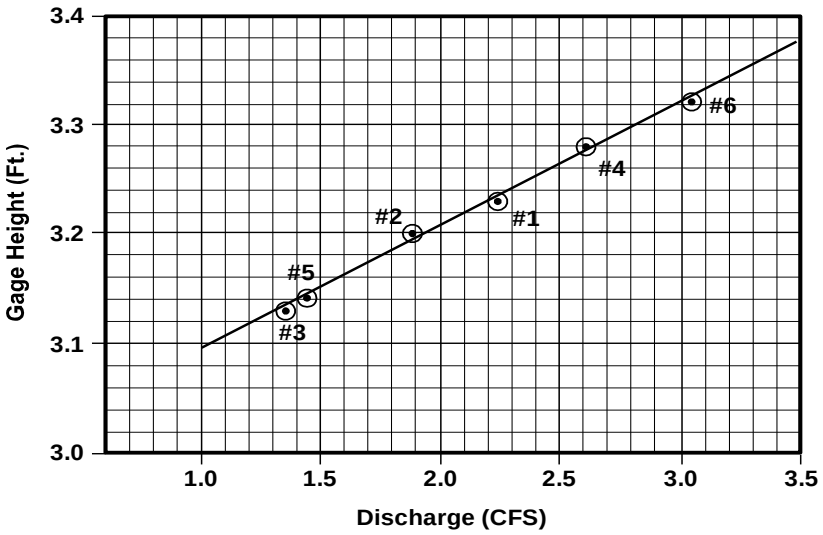
Ans: Subsection Flow (CFS) = (1.5 Ft x 3.0 Ft) x 2 Ft/sec

Subsection Flow (CFS) = 4.5 Ft^2 x 2 Ft/sec

Subsection Flow = 9 CFS

Rating Curves should look like the one shown

Streamflow Rating Curve



[Use the Streamflow Rating Curve provided in Figure 3.2 to estimate the streamflow for the two gage heights provided in Table 3.2..]

Ans:

Table 3.2

Gage Height (Ft.)	Estimated Streamflow (CFS)
3.10	1.00
3.17	**1.65**
3.22	**2.09**

[Calculate the average area for the three (3) remaining pairs of elevations.]

Ans: Average area between 748 Ft and 749 Ft = 3,450 Ft^2
Average area between 749 Ft and 750 Ft = 6,650 Ft^2
Average area between 750 Ft and 751 Ft = 11,500 Ft^2

Step 3: *[Calculation for estimating volume at a specific level, using data from Table 3.3.]*

Volume @ 746 Ft. = 0 Ft^3
Volume @ 747 Ft. = 0 Ft^3 + [(500 Ft^2) x (1 Ft] = 500 Ft^3
Volume @ 748 Ft = 500 Ft^3 + [(1,450 Ft^2) x (1 Ft)] = 1,950 Ft^3

[*Calculate the volume of water for the three (3) remaining elevations using Table 3.4.]*

Ans: Volume @ 749 Ft = 5,400 Ft^3
Volume @ 750 Ft = 12,050 Ft^3
Volume @ 751 Ft = 23,550 Ft^3

Step 5: *[In Step 5, the Water Level-Capacity Curve shown in Figure 3.4 is used to estimate volume at specific elevations, as shown in Table 3.4 in the workbook. Also in Step 5, volume is converted from FT^3 to gallons. The difference in volume between the elevations is also calculated. The volumes shown in Table 3.4 are from the curve, not from the individual volume calculations. The conversion from cubic feet to gallons is based on 1 $Foot^3$ = 7.481 Gallons.]*

Difference in volume between 746 Ft and 747 Ft is 2,990 Gal – 0 Gal = 2,990 Gal

Difference in volume between 747 Ft and 748 Ft is 14,960 Gal – 2,990 Gal = 11,970 Gal
Difference in volume between 748 Ft and 749 Ft is 41,890 Gal– 14,960 Gal = 26,930 Gal

[Calculate the difference in volume between the remaining two pairs of elevations.]

Ans: Difference in volume between 749 Ft and 750 Ft = 47,880 Gal
Difference in volume between 750 Ft and 751 Ft = 86,030 Gal

Step 6: *[By interpolating between elevations, the volume at any level can be estimated.]*

Estimated Volume at 750.85 Ft = 89,770 Gal+ (0.85 x 86,030 Gal)
= 89,770 Gal + 73,130 Gal
= 162,900 Gal

[Estimate volume at the levels shown in the workbook, using the water level-capacity table. Round the numbers off to the nearest ten (10) gallons.]

Ans: Estimated Volume at 749.50 Ft = 41,890 Gal + (0.50 x 47,880 Gal) = 65,830 Gal
Estimated Volume at 746.75 Ft = 0 Gal + (0.75 x 2,990 Gal) = 2,240 Gal

---

[How many drought indicators are required to signal a drought watch condition.]

Ans: Three or more.

[Name the five (5) drought indicators.]

Ans: Precipitation, Streamflow, Groundwater Levels, Palmer Drought Severity Index (Soil Moisture), and Reservoir Storage.

[How can you reduce water demand through conservation measures?]

Ans: *[Possible answers include:*

- *Reduce outside use of water, such as washing cars and watering yards,*

- *Check for leaks in pipes, faucets, and especially toilets,*
- *Take shorter showers,*
- *Install water-saving showerheads or flow restrictors,*
- *Turn off the faucet while brushing teeth or shaving,*
- *Use the dishwasher or washing machine only with full loads, and*
- *Keep a bottle of water in the refrigerator for drinking rather than running the faucet.]*

What are some examples of large users in this area?

Ans: Possible answers could include large service and health care organizations such as hotels, restaurants chains, and hospitals; specific industries such as the manufacturing industry; and business organizations that employ a significant number of employees.

What are some ways to reach customers in order to provide public education?

Ans: *[Possible answers could include bill stuffers, articles in local newspapers, news broadcasts, and presentations to local civic organizations.]*

A water supplier, located in a County experiencing a drought condition, is considering using water from an interconnected or neighboring system. What should the supplier consider?

Ans: *[Possible answers could include:]*

- *[Availability of surplus water at the neighboring system,]*
- *[Existence of a permanent interconnection point,]*
- *[Potential to develop a temporary interconnection point at a feasible location,]*
- *[Hydraulic capacity of the interconnection and adjacent distribution systems, and]*
- *[The cost of water.]*