

GO WITH THE FLOW

Solution Sheet

Question 1: Calculate the volume and detention time of Basin 1 at a flow rate of 9.5 MGD:

Volume is length*width * height (water level) = (64.5 ft)*(62.5 ft)* (14.75 ft) =59,461 cu. ft.

How many gallons can 59,461 cu. ft hold?

(7.48 gallons/cu. ft) x (59,461 cu. ft) = 444,768 gallons in Basin 1.

Flow rate is 9.5 million gallons/day = 9,500,000 gallons/day *day/24 hours*hour/60 minutes = 6,597 gallons per minute (hint: how many minutes are in a day?)

So 444,768 gallons ÷ 6,597 gallons per minute = **67.4 minutes**

This means that at a flow rate of 9.5 million gallons per day (which is equivalent to 6597 gallons per minute) all the water in Basin 1, which is 444,768 gallons, can get processed in 67.4 minutes

Question 2: Calculate the volume and detention time of the Basin 2 at a flow rate of 9.5 MGD:

Volume is length*width * height (water level) = (211.5 ft)*(67.0 ft)* (16.5 ft) =233,813 cu. ft.

How many gallons can 233,813 cu. ft hold?

(7.48 gallons/cu.ft) x (233,813 cu. ft) = 1,748,923 gallons in Basin 2

Flow rate is 9.5 million gallons/day = 9,500,000 gallons/day *day/24 hours*hour/60 minutes = 6,597 gallons per minute

So 1,748,923 gallons ÷ 6,597 gallons per minute = **265.1 minutes or 4.4 hours**

Question 3: Calculate the detention time from the beginning of Basin 1 to the end of Basin 2 at 9.5 MGD:

The detention time of Basin 1 at 9.5 MGD is 67.4 minutes.

The detention time of Basin 2 at 9.5 MGD is 265.1 minutes.

265.1 minutes + 67.4 minutes = 332.5 minutes or 5.5 hours

Question 4: Since the flow would increase from 9.5 MGD to 19 MGD the flow would double. Do you see why? The plant cannot decide to treat less water, they just have to reroute the water thorough the basins that are available.

Flow rate is 19.0 million gallons/day = 19,000,000 gallons/day *day/24 hours*hour/60 minutes = 13,194 gallons per minute

Basin 1 has been taken out of service.

Basin 2 detention time is:

1,748,923 gallons ÷ 13,194 gallons per minute = **132.6 minutes or 2.2 hours**

Consequently, the detention time through the basin would be half the time due to doubling the flow. (Compare answer to Question 2)