

Process Scenario #3: Lagoons

You must show your work to receive full credit even if the answer is correct.

A fertile muskrat family has caused damage to the levee between ponds #1 and #3, requiring that both ponds be removed from service during repairs. If the remaining ponds are in service and achieve the design BOD removal, will the plant meet the effluent permit requirement of 20 mg/l BOD? Assume plant influent is split 40% to pond #2 and 60% to pond #5 and that the ponds in service are performing as expected.

<input checked="" type="radio"/> A	Yes
<input type="radio"/> B	No

Pond 2

$$\text{In } 285 \times 8.34 \times 0.42 \times 40\%$$

$$399.4 \text{ lbs BOD}$$

$$\times 15\% \text{ remaining}$$

$$\underline{59.9 \text{ lbs BOD out}}$$

Pond 4

$$\begin{aligned} & 59.9 \text{ lbs BOD in} \\ & \times 35\% \text{ remaining} \\ & \underline{21 \text{ lbs BOD out}} \end{aligned}$$

total 42 lbs BOD out

$$\frac{42}{8.34 \times 0.42} = 12 \text{ mg/L effluent}$$

Pond 5

$$\text{In } 285 \times 8.34 \times 0.42 \times 60\%$$

$$599 \text{ lbs BOD}$$

$$\times 10\% \text{ remaining}$$

$$\underline{59.9 \text{ lbs BOD out}}$$

Pond 6 Same as 4

$$21 \text{ lbs BOD out}$$

3

Test page number: 29

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Points (60/120)	Proper answer

_____ A _____

Process Scenario #3: Lagoons

Test page number: 28

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Pond #2 was investigated by the operator, who found a sludge deposition of 5 feet at the front of the pond, 3 feet in the middle and one foot at the end. What is the most likely consequence of the deposition? Assume pond #2 is receiving 30% of the influent.



Solids average 3', depth of water 8-3'=5'

$$\text{Volume } 800 \times 200 \times 5 \times 7.48 = 6.24 \text{ MG}$$

$$Q = 0.42 \times 30\% = 0.126 \text{ MG/D}$$

$$DT = \frac{6.24}{0.126} = 49.5 \text{ days, OK}$$

BOD Load

$$998 \text{ lbs} \times 30\% = 299 \text{ lbs/day}$$

$$\text{Area} = \frac{800 \times 200}{43560} = 3.67 \text{ ac}$$

$$\text{Loading } \frac{299}{367} = 81 \text{ lbs/day/acre, OK}$$

A	Organic loading rate exceeded
B	Detention time too short
C	Both A and B
D	Neither A or B

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Points (60/120)	Proper answer

D

2

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Test page number: 27

Use the scenario information for all questions and circle the correct answer for each.

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0.42

The Soggy Bottom wastewater plant uses several lagoons for treatment. The dimensions and flow patterns are shown on the plant diagram page. The average annual influent flow is 0.35 MGD and the BOD is 285 mg/l. Ponds #1, #2, #3 and #4 were the original plant and ponds #5 and #6 were added as a plant expansion last year.

<p>Based on the current influent characteristics and design values in the table, was the expansion necessary?</p> <p><i>Loading</i></p> $0.42 \times 8.34 \times 285 = 998 \text{ lbs BOD/day}$ <p><i>Area</i></p> $\frac{800' \times 200' \times 2}{43560} = 7.35$ $\frac{998}{7.35} = 136 \text{ lbs/Acre/day, greater than design}$	<input checked="" type="radio"/> A	Yes
	<input type="radio"/> B	No

For grader's use only	
Points (60/120)	Proper answer

_____ A _____