

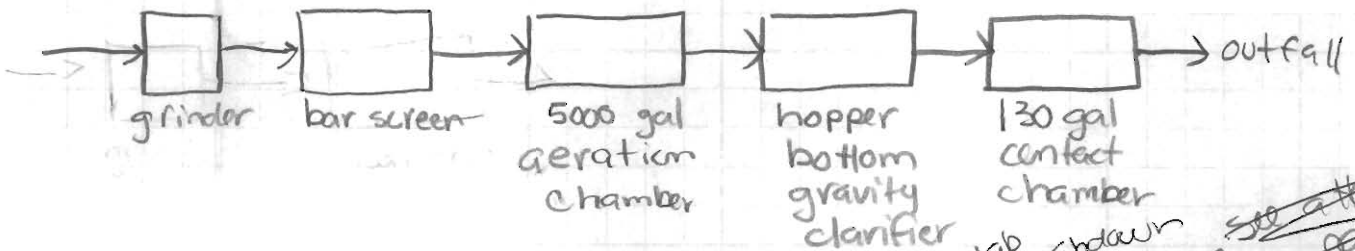
# ADEQ

ARKANSAS  
Department of Environmental Quality

AFIN: \_\_\_\_\_ Permit No.: \_\_\_\_\_  
 Date: \_\_\_\_\_ By: \_\_\_\_\_  
 Project: \_\_\_\_\_  
 Sheet \_\_\_\_\_ of \_\_\_\_\_

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ADEQ Engineer/Geologist Grid Pad - revised 2002

## Treatment System:



Design Flow: sanitary + lab washdown

Population Served: 125 people

Assume 20 gal/day/person for an industry building - m+E table 157

Flow from sanitary: 125 people \*  $\frac{20 \text{ gal/day}}{\text{person}}$

$$= 2500 \text{ gal/day}$$

Flow from lab sinks:

Assume 100 gal/hr for sinks running 24hrs/day:

Flow from lab sinks = 100 gal/hr \*  $\frac{24 \text{ hrs}}{\text{day}}$

$$= 2400 \text{ gal/day}$$

Total Flow for Treatment = 2500 gal/day + 2400 gal/day  
 = 4900 gal/day

Proposed - 5000 gal/day cp

~~see attached page~~  
 any Toxic?  
 Material?  
 - lab washdown will

no longer be directed  
 to the package plant  
 but directly to the  
 process pond.

See letter to Mr  
 ELLI.

## Activated Sludge:

### Assumptions:

BOD5 influent: 225 mg/L  
 NH3-N influent: 40 mg/L  
 MLSS Concn.: 3500 mg/L

BOD5 @ effluent: 20 mg/L  
 NH3-N effluent: 10 mg/L

$$MLVSS/MLSS = 0.8 \quad \rho = 480 \text{ w/weng} \quad m+E$$

### Given:

Design Flow: 0.005 MGD

$$\text{Aeration Basin Volume} = 5,000 \text{ gal.} = 668.4 \text{ ft}^3$$

$$\begin{aligned} \text{BODS Loading} &= 225 \text{ mg/L} \cdot 8.34 \cdot 0.005 \text{ MGD} \\ &= 9.4 \text{ lbs/day} \end{aligned}$$

$$\text{BODS Loading Rate} = \frac{9.4 \text{ lbs/day BODS}}{0.668.4 \cdot 1000 \text{ ft}^3}$$

$$= 14.1 \text{ lb BODS/day} / 1000 \text{ ft}^3$$

$$< 15 \text{ lb BODS/day} / 1000 \text{ ft}^3 \quad (\text{ok})$$

10-55 p90-7

$$\begin{aligned} \frac{F}{M} \text{ ratio} &= \frac{\text{lb BODS/day}}{\text{lb MLVSS}} = \frac{\text{lb BODS/day}}{0.8 \cdot \text{MLSS} \cdot 8.34 \cdot 0.05 \text{ MGD}} \\ &= \frac{9.4 \text{ lbs/day}}{116.76} \end{aligned}$$

$$= 0.081$$

$$0.05 < 0.081 < 0.1 \quad (\text{ok}) \quad 10-55 \text{ p90-}$$

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Sheet \_\_\_\_\_ of \_\_\_\_\_

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$$\text{Detention Time} = \theta = \frac{V}{Q} = \frac{5000 \text{ gal}}{5000 \text{ gal/day}} = 1 \text{ day} = 24 \text{ hrs}$$

Range 20-30 hrs for  
extended aeration

p 747 m+E wweng 4th ed

OB

Air Requirements:

O<sub>2</sub> Requirements:

$$\begin{aligned} \text{O}_2 \text{ for BODS} &\Rightarrow 9.4 \text{ lbs/day} \cdot 1.5 \text{ lb O}_2 / \text{lb BODS} \\ &= 14.10 \text{ lb O}_2 / \text{day} \end{aligned}$$

$$\begin{aligned} \text{O}_2 \text{ for NH}_3\text{-N} &\Rightarrow 30 \text{ mg/L} \cdot 8.34 \cdot 0.005 \text{ mg/L} \cdot 4.6 \text{ lb O}_2 / \text{lb N} \\ &= 5.74 \text{ lb O}_2 / \text{day} \end{aligned}$$

$$\begin{aligned} \text{Actual O}_2 \text{ Requirements (AOR)} &= \text{BODS} + \text{NH}_3\text{-N} \\ &= 14.10 \frac{\text{lb O}_2}{\text{day}} + 5.74 \frac{\text{lb O}_2}{\text{day}} \end{aligned}$$

$$= 19.85 \text{ lb O}_2 / \text{day}$$

$$= 0.827 \text{ lb O}_2 / \text{hr}$$

$$\text{Standard O}_2 \text{ Requirements (SOR)} = \text{AOR} / 0.5$$

$$= 0.827 \text{ lb O}_2 / \text{hr} / 0.5$$

$$= 1.65 \text{ lb O}_2 / \text{hr}$$

$$= 0.028 \text{ lb O}_2 / \text{min}$$

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Project: \_\_\_\_\_

Sheet \_\_\_\_\_ of \_\_\_\_\_

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Air Volume Required:

Air contains 23.2% O<sub>2</sub> by weight

density of air -  $\rho_{air} = 0.075 \text{ lb/ft}^3$

$$\begin{aligned} \text{O}_2 \text{ density} &= 23.2\% \text{ density of air} = 0.232 \cdot 0.075 \text{ lb/ft}^3 \\ &= 0.0174 \text{ lb/ft}^3 \end{aligned}$$

O<sub>2</sub> transfer efficiency for coarse bubble diffuser:  
= 8% M&E WUW 2nd ed p table 10-6

$$\begin{aligned} \text{Air required} &= \frac{0.028 \text{ lb O}_2 / \text{min}}{0.08 \cdot 0.0174 \text{ lb/ft}^3} = 201 \text{ SCFM} \end{aligned}$$

2 blowers @ 44 SCFM each

EB

$$\text{hp required} = \frac{\text{AOR}}{\text{transfer rate}}$$

$$= \frac{0.827 \text{ lb O}_2 / \text{hr}}{2 \text{ lb O}_2 / \text{hp-h}} \leftarrow 10-55$$

$$= 0.4135 \text{ hp}$$

two 2.4 hp motors provided

EB



## Grinder:

1 Grinder pump is provided before the bar screens.

## Bar Screens:

\* spacing per 10-SS less than 1 inch for manually cleaned bar screens p 60-1

per email from consulting engineer, the spacing is one inch

ab

## Clarifier:

$$\text{Area of Clarifier} = 4.5 \text{ ft} \times 8 \text{ ft} = 36.00 \text{ ft}^2$$

$$\text{Overflow rate} = \frac{\text{Peak flow}}{\text{area}} = \frac{12,500 \text{ GPD}}{36.00 \text{ ft}^2} = 347.0 \text{ gpd/ft}^2$$

ab

< 1,000 gpd/ft<sup>2</sup>  
per 10-SS p 70-3

## Disinfection:

contact basin volume = 130 gallons

$$\text{contact time} = \frac{V}{Q} = \frac{130 \text{ gal}}{12,500 \text{ gpd}} = 0.0104 \text{ day} = 0.25 \text{ hr} = 15 \text{ min}$$

ab

p 10-SS

p 100-3