

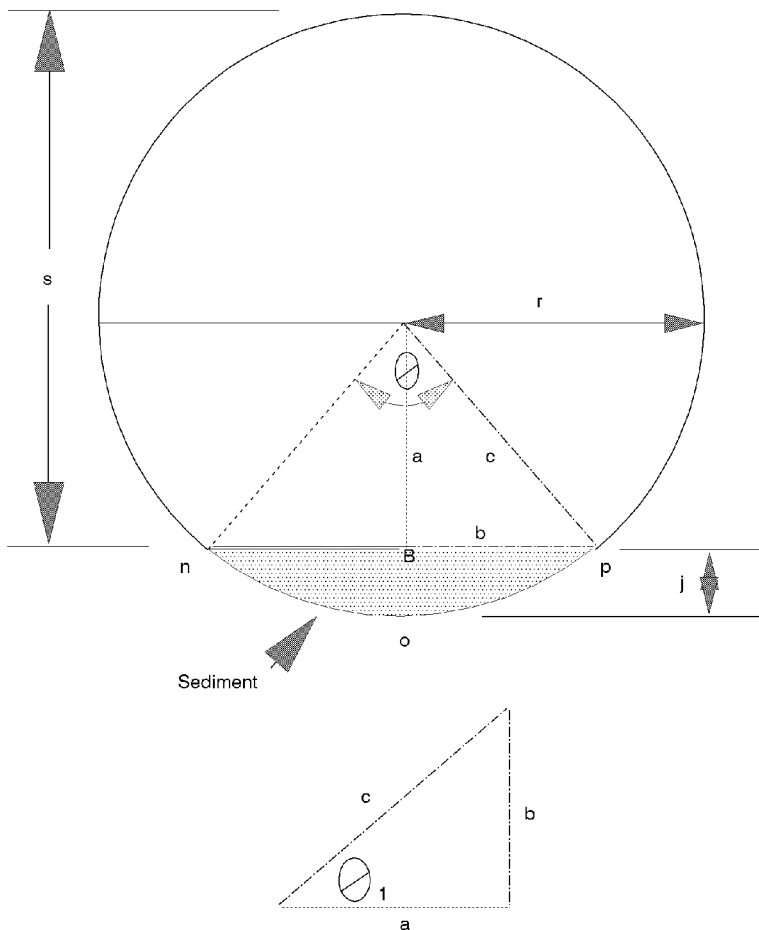
**EMISSION MEASUREMENT CENTER  
TECHNICAL INFORMATION DOCUMENT**

**EFFECTIVE DUCT AREA CALCULATION**

**INTRODUCTION**

Occasionally a horizontal duct may contain bottom sediment that has been deposited over a period of time. The volumetric flow rate calculation may be significantly affected by this displaced cross sectional area. To determine the effective duct area, the following calculation steps are given.

**EFFECTIVE DUCT AREA CALCULATION**



1. Measure distance to sediment from top of duct "s".
2. Determine the radius of the duct "r".
3. Determine the depth of sediment "j".  
 $j = \text{diameter} - s$   
 $a = \text{diameter} - (j + r)$
4. Determine angle  $\theta_1$   
 $\theta_1 = \text{Arccosine } \frac{a}{c}$  and  $c = r$
5. Determine lengths "b" and "B".  
 $b = c(\sin \theta_1)$   
 $B = 2 \times b$
6. Determine  $\theta$   
 $\theta = 2 \times \theta_1$
7. Determine length of ARC (nop)  
 $\text{ARC}_{nop} = \frac{\pi r \theta}{180}$
8. Determine area of segment nop.  
 $\text{Area}_{nop} = \frac{(\text{ARC}_{nop} \times r) - aB}{2}$
9. Determine duct area.  
 $\text{Duct area "A"} = \pi r^2$
10. Determine effective duct area "A<sub>1</sub>".  
 $A_1 = A - \text{Area}_{nop}$