KAW VALLEY ENGINEERING
PROJECT: A14D7067-1
STREETS OF WEST PRYOR, LEE'S SUMMIT, MO

esigned By: KCS
Date: 7/3/2019

Rip Rap Calculations

Calculations are based upon
"Hydraulic Design of Energy Dissipators for Culverts and Channels"
Hydraulic Engineering Circulator No.14, 3rd Edition
Federal Highway Administration

Hydraulic Structure 36" PIPE - S-1

$$D_{50} = 0.2 * D\left(\frac{Q}{\sqrt{g}(D)^{2.5}}\right)^{\frac{4}{3}}\left(\frac{D}{TW}\right)$$ EQ. 10.4

D_{50}	Riprap Size, (ft)
D	Culvert Diameter (ft)
Q	Design Discharge, 25-yr storm (cfs)
g	Acceleration due to gravity, (32.2 ft/s^2)
TW	Tailwater Depth, (ft)

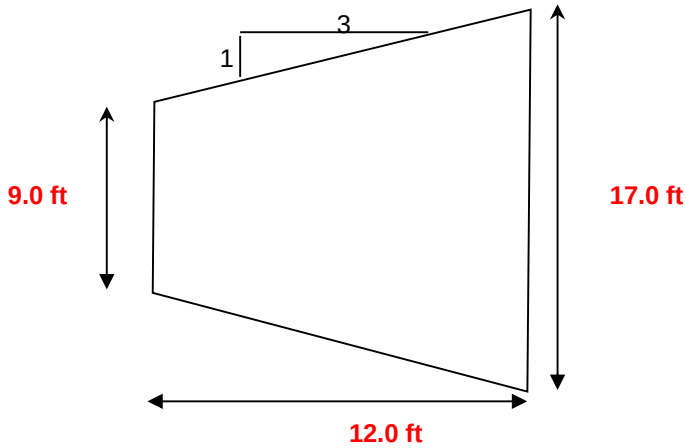
Inputs	
D	3.0 ft
Q	22.00 cfs
TW	1.2 ft

From Hydrograph N/A

D_{50} - Calculated 2.82 in
D_{50} - Design **5.0 in**

Unit Weight of Rip Rap 150 lb/cu.ft

Use Class 1 Rip Rap
Install 17.6 Tons of Rip Rap



Apron Depth **18.0 in**