

ENERGY DISSIPATOR CHECKLIST			
Project No.	I-31(88) over Example Creek		
Designer	PLT	Date	8/26/88
Reviewer	Te Anh Ngo, OK. DOT	Date	6/2/97

SCOUR EQUATIONS
$\frac{d_s}{R_c}, \frac{W_s}{R_c}, \frac{L_s}{R_c} = C_s C_h \left[ \frac{a}{s^{1/3}} \right] \left[ \frac{Q}{g^{.5} R_c^{2.5}} \right]^b \left[ \frac{t}{316} \right]^q$ $d_s, W_s, L_s = [C_s C_h \alpha / \sigma^{1/3}] [DI]^\beta [t/316]^\theta R_c$ $d_s, W_s, L_s = [F_1] [F_2] [F_3] R_c$

STEP 7A - EQUATION INPUT DATA	
FACTOR	VALUE
Q = Discharge, m <sup>3</sup> /s	11.33 m <sup>3</sup> /s
A <sub>c</sub> = Culvert area, m <sup>2</sup>	3.9 m <sup>2</sup>
P <sub>c</sub> = Perimeter, m	7.92 m
R <sub>c</sub> = A <sub>c</sub> / P <sub>c</sub>	0.49
DI = Discharge Intensity	21.1
t = time of concentration	30 minutes

STEP 6 - DATA SUMMARY		
Parameters	Culvert	Channel
Station	30 + 48	121 + 92
Control	Inlet	Super.
Type	RCB	Natural
Height, D	1830 mm	2.29 m
Width, B	2135 mm	8.84 m
Length, L	91.45 m	-----
Material	Concrete	Gravel
Manning's n	0.012	0.03 & 0.08
Side Slope	---	1V:1H
Discharge, Q	11.33 m <sup>3</sup> /s	11.33 m <sup>3</sup> /s
Depth, d	0.56 m	0.86 m
Velocity, V	8.61 m/s	5.35 m/s
Fr = V/(gd) <sup>0.5</sup>	3.54	2.01
Flow Area, A	1.30 m <sup>2</sup>	2.12 m <sup>2</sup>
Slope	0.05 m/m	0.05 m/m

STEP 7B - SCOUR COMPUTATION			
Factor	Depth	Width	Length
α	2.27	6.94	17.10
β	0.39	0.53	0.47
θ	0.06	0.08	0.10
F <sub>1</sub>	1.92	5.85	14.42
F <sub>2</sub>	3.28	5.03	4.19
F <sub>3</sub>	0.87	0.83	0.79
[F <sub>1</sub> ][F <sub>2</sub> ][F <sub>3</sub> ]R <sub>c</sub>	2.68	11.92	23.39
Allowable	2.13*	8.84*	18.39*
<p>If calculated scour &gt; Allowable and:</p> <ol style="list-style-type: none"> <li>1. Fr &gt; 3, design a SAF basin</li> <li>2. Fr &lt; 3, design a riprap basin</li> <li>3. Fr &lt; 3, design a USBR Type VI</li> </ol> <p>* These values are not standards. They may vary, depending on design criteria. In this case, calculated scour &gt; Allowable and Fr &gt; 3: Recommend a SAF Basin.</p>			

**Figure 34-6A**