CULVERT DESIGN
STA 0+69.16 CMP
Drainage Area = 12.24 ac

Surface Type	k	Length	
Concrete/Asphalt	0.372	0	0
Commercial	0.445	0	0
Residential	0.511	0	0
Rocky, Bare Soil	0.604	0	0
Cultivated	0.775	0	0
Woodland, Thin Gras:	0.942	0	0
Average Pasture	1.040	500	520
Tall Grass	1.130	0	0
Total	1.040	500	520
Channel Type			
Straight, Clean	0.00592	0	0
Average	0.00835	0	0
Meandering	0.01020	1655	16.881
V-Ditch	0.01252	0	0
Total	0.01020	1655	16.881
C	0.35		
Lo	500		
Slope Overland	6.600%		
Lf	1655		
Slope Channel	2.54%		
To	17.9 min		Vo = 0.5
Tf	12.6 min		Vf = 2.2
Tc	30.5 min		
I(2)	3.09	Q(2)	13.25
I(5)	3.40	Q(5)	14.55
I(10)	3.87	Q(10)	16.57
I(25)	4.48	Q(25)	21.12
I(50)	5.10	Q(50)	26.19
I(100)	5.66	Q(100)	30.32

STA 0+69.16 CMP (CONT)

CULVERT CAPACITY--2 YEAR STORM

Pipe Diameter (in)		Assume	24 in	CMP	
(18 inch is minimum allowed by ODEQ standards)					
Headwater Depth (ft)	(WSEL-Inv)	Assume	2.4 ft		
Slope (%)		Assume	2.00%		
	X-Sectional Area		2.64		
	Wetted Perimeter		6.28		
	Hydraulic Radius		0.42		
Qp (Orifice Equation)			Cd = .60	17.90	
Qp (Orifice Equation)	Mitered 45 Degrees		Cd = .60	25.31	0.707106781
Qp (Manning Equation)			n=.023	18.13	
	Maximum capacity =		17.90 cfs	**OK**	

CULVERT CAPACITY--5 YEAR STORM

Pipe Diameter (in)		Assume	24 in	CMP	
(18 inch is minimum allowed by ODEQ standards)					
Headwater Depth (ft)	(WSEL-Inv)	Assume	2.4 ft		
Slope (%)		Assume	2.00%		
	X-Sectional Area		2.64		
	Wetted Perimeter		6.28		
	Hydraulic Radius		0.42		
Qp (Orifice Equation)			Cd = .60	17.90	
Qp (Orifice Equation)	Mitered 45 Degrees		Cd = .60	25.31	0.707106781
Qp (Manning Equation)			n=.023	18.13	
	Maximum capacity =		17.90 cfs	**OK**	

CULVERT CAPACITY--10 YEAR STORM

Pipe Diameter (in)		Assume	24 in	CMP	
(18 inch is minimum allowed by ODEQ standards)					
Headwater Depth (ft)	(WSEL-Inv)	Assume	2.4 ft		
Slope (%)		Assume	2.00%		
	X-Sectional Area		2.64		
	Wetted Perimeter		6.28		
	Hydraulic Radius		0.42		
Qp (Orifice Equation)			Cd = .60	17.90	
Qp (Orifice Equation)	Mitered 45 Degrees		Cd = .60	25.31	0.707106781
Qp (Manning Equation)			n=.023	18.13	
	Maximum capacity =		17.90 cfs	**OK**	

CULVERT DESIGN
STA 2+30.47 RCB BOX
Drainage Area = 691 ac

Q(2)	312.00
Q(5)	579.00
Q(10)	808.00
Q(25)	1160.00
Q(50)	1530.00
Q(100)	1800.00

STA 2+30.47 RCB BOX (CONT)

CULVERT CAPACITY--2 YEAR STORM

Pipe Height (in)		Assume	60	RCB
Pipe Width (in)		Assume	48	RCB
Manning's n			n=.012	
Pipe slope			2.00%	
Pipe length (ft)			60	
	X-Sectional Area		20.00	
	Wetted Perimeter		18.00	
	Hydraulic Radius		1.11	
Depth (in)		Assume	60	
Headwater Depth (ft)			1	
Energy Grade			0.000	
Number			1	
Q Partial (cfs)			376.8 cfs	
Q Full Flow (cfs)			376.8 cfs	
	Calc Flow		312.0 cfs	
			OK	