

Appendix B – Hydraulic Calculations

- Trench Drain Calculations

Grate Inlet Headwater Depth Calculation

4.5-in by a 108-ft Trench Drain ONT #2

Known:

Q= Flow (cfs)	0.5
W= Width of Grate (ft)	0.375
L= Length of Grate (ft)	108.0
D= Diameter of Circle (in)	
Cf= Clogging Factor (%)	50

Weir Conditions:

$$Hw = (Q / (Cw * P))^{2/3}$$

Cw= Weir Coefficient	2.7
P= Perimeter of grate (ft)	216.8
Pc= Perimeter (w/clogging) (ft)	108.4
Hw= Headwater depth (ft)	0.01

Orifice Conditions:

$$Hw = (Q / (Co * Ac))^2 / 2 * g$$

Co= Orifice Coefficient	0.67
Ag= Grate Area (ft ²)	40.5
Gf= Grate Opening Factor	0.25
Ac= Grate Open Area (w/ clogging) (ft ²)	5.1
Hw= Headwater depth (ft)	0.00

Worst Case Scenario Occurs Under Weir Conditions

Headwater Depth (ft) = 0.01

Grate Inlet Headwater Depth Calculation

4.5-in by 91-ft Trench Drain ONV #1

Known:

Q=	Flow (cfs)	1.0
W=	Width of Grate (ft)	0.375
L=	Length of Grate (ft)	91.0
D=	Diameter of Circle (in)	
Cf=	Clogging Factor (%)	50

Weir Conditions:

$$Hw = (Q / (Cw * P))^{2/3}$$

Cw=	Weir Coefficient	2.7
P=	Perimeter of grate (ft)	182.8
Pc=	Perimeter (w/clogging) (ft)	91.4
Hw=	Headwater depth (ft)	0.03

Orifice Conditions:

$$Hw = (Q / (Co * Ac))^2 / 2 * g$$

Co=	Orifice Coefficient	0.67
Ag=	Grate Area (ft ²)	34.1
Gf=	Grate Opening Factor	0.25
Ac=	Grate Open Area (w/ clogging) (ft ²)	4.3
Hw=	Headwater depth (ft)	0.00

Worst Case Scenario Occurs Under Weir Conditions

Headwater Depth (ft) = 0.03

Grate Inlet Headwater Depth Calculation

4.5-in by 82-ft Trench Drain ONV #2

Known:

Q= Flow (cfs)	1.0
W= Width of Grate (ft)	0.375
L= Length of Grate (ft)	82.0
D= Diameter of Circle (in)	
Cf= Clogging Factor (%)	50

Weir Conditions:

$$Hw = (Q / (Cw * P))^{2/3}$$

Cw= Weir Coefficient	2.7
P= Perimeter of grate (ft)	164.8
Pc= Perimeter (w/clogging) (ft)	82.4
Hw= Headwater depth (ft)	0.03

Orifice Conditions:

$$Hw = (Q / (Co * Ac))^2 / 2 * g$$

Co= Orifice Coefficient	0.67
Ag= Grate Area (ft ²)	30.8
Gf= Grate Opening Factor	0.25
Ac= Grate Open Area (w/ clogging) (ft ²)	3.8
Hw= Headwater depth (ft)	0.00

Worst Case Scenario Occurs Under Weir Conditions

Headwater Depth (ft) = 0.03