

## **APPENDIX C**

### **USEFUL CONVERSIONS AND MEASUREMENTS FOR LENGTH, AREA, AND FLOW:**

#### **PIPES AND CANALS/DITCHES**



## LENGTH, AREA AND FLOW CONVERSIONS

Length:

$$1 \text{ foot (ft)} = 12 \text{ inches (in)}$$

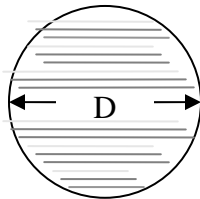
Area:

$$1 \text{ foot}^2 = 144 \text{ in}^2$$

Flow:

$$1 \text{ cubic foot per second (cfs)} = 448.8 \text{ gallons per minute (gpm)}$$

### CROSS-SECTIONAL AREA OF A PIPE FLOWING FULL



D = **Inside** pipe diameter

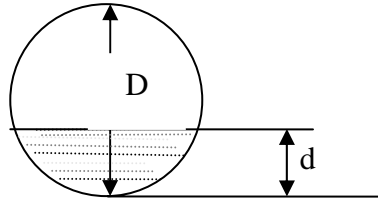
$$\text{Area} = \pi \times \left(\frac{D}{2}\right)^2 = \pi \times \frac{D^2}{4}$$

The Area will be expressed in  $\text{ft}^2$  if D is measured in feet

The Area will be expressed in  $\text{in}^2$  if D is measured in inches



## CROSS-SECTIONAL WET AREA OF A PIPE FLOWING PARTIALLY FULL



D = **Inside** pipe diameter

d = depth of water inside pipe

**Wet Area =  $D^2$  x Multiplication Factor**

The Areas will be expressed in ft<sup>2</sup> if “D” and “d” are measured in feet

The Areas will be expressed in in<sup>2</sup> if “D” and “d” are measured in inches

**Example**     d = 3 inches, D = 8 inches

Multiplication Factor can be found from the table below as follows:

Calculate  $\frac{d}{D} = \frac{3}{8} = 0.38$

**Multiplication Factor** for  $\frac{d}{D} = 0.38$  is 0.2739 (see highlighted cells)

Wet Area =  $8^2 \times 0.2739 = 64 \times 0.2739 \text{ in}^2 = 17.53 \text{ in}^2 = 17.53/144 = 0.1217 \text{ ft}^2$

$\frac{d}{D}$	Multiplication Factor = $\frac{\text{WetArea}}{D^2}$
0.01	0.0013
0.02	0.0037
0.03	0.0069
0.04	0.0105
0.05	0.0147
0.06	0.0192
0.07	0.0242
0.08	0.0294
0.09	0.0350
0.1	0.0409
0.11	0.0470
0.12	0.0534
0.13	0.0600
0.14	0.0668
0.15	0.0739
0.16	0.0811
0.17	0.0885
0.18	0.0961
0.19	0.1039
0.2	0.1118
0.21	0.1199
0.22	0.1281
0.23	0.1365
0.24	0.1449
0.25	0.1535

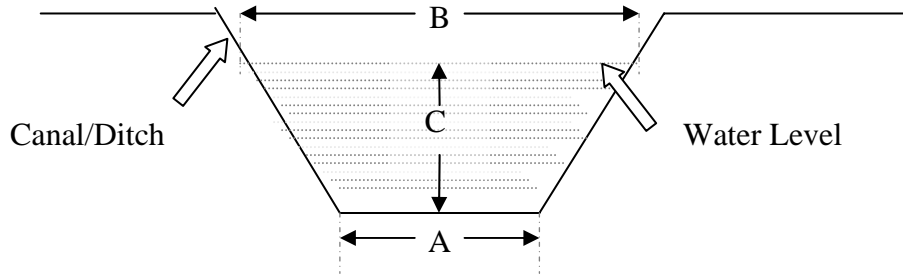
$\frac{d}{D}$	Multiplication Factor = $\frac{\text{WetArea}}{D^2}$
0.26	0.1623
0.27	0.1711
0.28	0.1800
0.29	0.1890
0.3	0.1982
0.31	0.2074
0.32	0.2167
0.33	0.2260
0.34	0.2355
0.35	0.2450
0.36	0.2546
0.37	0.2642
<b>0.38</b>	<b>0.2739</b>
0.39	0.2836
0.4	0.2934
0.41	0.3032
0.42	0.3130
0.43	0.3229
0.44	0.3328
0.45	0.3428
0.46	0.3527
0.47	0.3627
0.48	0.3727
0.49	0.3827
0.5	0.3927

$\frac{d}{D}$	Multiplication Factor = $\frac{\text{WetArea}}{D^2}$
0.51	0.4027
0.52	0.4127
0.53	0.4227
0.54	0.4327
0.55	0.4426
0.56	0.4526
0.57	0.4625
0.58	0.4724
0.59	0.4822
0.6	0.4920
0.61	0.5018
0.62	0.5115
0.63	0.5212
0.64	0.5308
0.65	0.5404
0.66	0.5499
0.67	0.5594
0.68	0.5687
0.69	0.5780
0.7	0.5872
0.71	0.5964
0.72	0.6054
0.73	0.6143
0.74	0.6231
0.75	0.6319

$\frac{d}{D}$	Multiplication Factor = $\frac{\text{WetArea}}{D^2}$
0.76	0.6405
0.77	0.6489
0.78	0.6573
0.79	0.6655
0.8	0.6736
0.81	0.6815
0.82	0.6893
0.83	0.6969
0.84	0.7043
0.85	0.7115
0.86	0.7186
0.87	0.7254
0.88	0.7320
0.89	0.7384
0.9	0.7445
0.91	0.7504
0.92	0.7560
0.93	0.7612
0.94	0.7662
0.95	0.7707
0.96	0.7749
0.97	0.7785
0.98	0.7816
0.99	0.7841
1	0.7850



## CROSS-SECTIONAL WET AREA OF A CANAL/DITCH



A = bottom width of canal/ditch (feet)

B = width of canal/ditch **at canal/ditch water level** (feet)

C = depth of water in the canal/ditch (feet)

Use the following formula to determine the cross-sectional area of water flow in the canal/ditch:

$$\text{Area} = (A + B) \times \frac{C}{2}$$

The Area will be expressed in ft<sup>2</sup> if A, B and C are measured in feet