

**ATTACHMENT C**

**Ditch Riprap Stone Sizing Calculations**

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/1/2003

Vegetated

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 3.00  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 5.00 %  
 MANNING'S N 0.030

DEPTH INCREMENT 0.47 INCH

DEPTH OF FLOW (IN)	1.00	1.47	1.94	2.41	2.88	3.35	3.82	4.29
AREA OF FLOW (SQ. FT.)	0.10	0.17	0.24	0.32	0.41	0.51	0.62	0.74
WETTED PERIMETER (FT)	1.53	1.77	2.02	2.27	2.52	2.77	3.01	3.26
HYDRAULIC RADIUS (FT)	0.07	0.09	0.12	0.14	0.16	0.19	0.21	0.23
FLOW VELOCITY (FPS)	1.85	2.30	2.68	3.01	3.32	3.60	3.87	4.12
CHANNEL CAPACITY (CFS)	0.19	0.38	0.64	0.97	1.37	1.85	2.41	3.06

DEPTH OF FLOW (IN)	4.76	5.23	5.70	6.17	6.64	7.11	7.58	8.05
AREA OF FLOW (SQ. FT.)	0.87	1.01	1.15	1.31	1.47	1.65	1.83	2.02
WETTED PERIMETER (FT)	3.51	3.76	4.00	4.25	4.50	4.75	5.00	5.24
HYDRAULIC RADIUS (FT)	0.25	0.27	0.29	0.31	0.33	0.35	0.37	0.39
FLOW VELOCITY (FPS)	4.37	4.60	4.83	5.05	5.26	5.47	5.67	5.87
CHANNEL CAPACITY (CFS)	3.79	4.63	5.56	6.60	7.74	8.99	10.37	11.86

DEPTH OF FLOW (IN)	8.52	8.99	9.46	9.93	10.40	10.87	11.34	11.81
AREA OF FLOW (SQ. FT.)	2.22	2.43	2.65	2.88	3.12	3.37	3.62	3.89
WETTED PERIMETER (FT)	5.49	5.74	5.99	6.23	6.48	6.73	6.98	7.22
HYDRAULIC RADIUS (FT)	0.40	0.42	0.44	0.46	0.48	0.50	0.52	0.54
FLOW VELOCITY (FPS)	6.06	6.25	6.44	6.62	6.80	6.98	7.16	7.33
CHANNEL CAPACITY (CFS)	13.47	15.21	17.08	19.08	21.23	23.51	25.94	28.52

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

12" - 2.4 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 5.00 %  
 MANNING'S N 0.036

$d_{50}$  DIAMETER = 2" (min. for design)

DEPTH INCREMENT 0.50 INCH

DEPTH OF FLOW (IN)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
AREA OF FLOW (SQ. FT.)	0.09	0.15	0.21	0.27	0.34	0.42	0.50	0.59
WETTED PERIMETER (FT)	1.35	1.52	1.69	1.87	2.04	2.21	2.39	2.56
HYDRAULIC RADIUS (FT)	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.23
FLOW VELOCITY (FPS)	1.56	1.96	2.28	2.56	2.82	3.04	3.26	3.45
CHANNEL CAPACITY (CFS)	0.15	0.29	0.48	0.70	0.97	1.28	1.63	2.02

DEPTH OF FLOW (IN)	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50
AREA OF FLOW (SQ. FT.)	0.68	0.77	0.88	0.98	1.09	1.21	1.33	1.46
WETTED PERIMETER (FT)	2.73	2.91	3.08	3.25	3.43	3.60	3.77	3.95
HYDRAULIC RADIUS (FT)	0.25	0.27	0.28	0.30	0.32	0.34	0.35	0.37
FLOW VELOCITY (FPS)	3.64	3.82	3.99	4.15	4.31	4.46	4.61	4.76
CHANNEL CAPACITY (CFS)	2.46	2.95	3.49	4.08	4.71	5.40	6.15	6.95

$d_{50} = 5"$

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	4.90	5.04	5.17	5.31	5.44	5.57	5.69	5.82
CHANNEL CAPACITY (CFS)	7.81	8.72	9.70	10.74	11.84	13.00	14.23	15.53

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

12" - 2.4 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE **10.00 %**  
 MANNING'S N **0.043**

*d<sub>50</sub> DIAMETER = 3" (MIN FOR DESIGN)*

DEPTH INCREMENT 0.50 INCH

DEPTH OF FLOW (IN)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	<b>4.50</b>
AREA OF FLOW (SQ. FT.)	0.09	0.15	0.21	0.27	0.34	0.42	0.50	0.59
WETTED PERIMETER (FT)	1.35	1.52	1.69	1.87	2.04	2.21	2.39	2.56
HYDRAULIC RADIUS (FT)	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.23
FLOW VELOCITY (FPS)	1.85	2.32	2.70	3.04	3.33	3.60	3.85	<b>4.09</b>
CHANNEL CAPACITY (CFS)	0.17	0.34	0.56	0.83	1.15	1.51	1.93	<b>2.40</b>

DEPTH OF FLOW (IN)	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50
AREA OF FLOW (SQ. FT.)	0.68	0.77	0.88	0.98	1.09	1.21	1.33	1.46
WETTED PERIMETER (FT)	2.73	2.91	3.08	3.25	3.43	3.60	3.77	3.95
HYDRAULIC RADIUS (FT)	0.25	0.27	0.28	0.30	0.32	0.34	0.35	0.37
FLOW VELOCITY (FPS)	4.31	4.52	4.72	4.92	5.10	5.28	5.46	5.63
CHANNEL CAPACITY (CFS)	2.92	3.50	4.13	4.83	5.58	6.40	7.28	8.23

*d<sub>50</sub> = 7"*

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	5.80	5.96	6.12	6.28	6.44	6.59	6.74	6.89
CHANNEL CAPACITY (CFS)	9.24	10.33	11.48	12.71	14.01	15.39	16.85	18.38

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

12" - 2.4 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE **15.00** %  
 MANNING'S N **0.050**

*d<sub>50</sub> DIAMETER = 4" (MIN FOR DESIGN)*

DEPTH INCREMENT 0.50 INCH

DEPTH OF FLOW (IN)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	<b>4.50</b>
AREA OF FLOW (SQ. FT.)	0.09	0.15	0.21	0.27	0.34	0.42	0.50	0.59
WETTED PERIMETER (FT)	1.35	1.52	1.69	1.87	2.04	2.21	2.39	2.56
HYDRAULIC RADIUS (FT)	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.23
FLOW VELOCITY (FPS)	1.95	2.44	2.85	3.20	3.51	3.80	4.06	<b>4.31</b>
CHANNEL CAPACITY (CFS)	0.18	0.36	0.59	0.87	1.21	1.59	2.03	<b>2.52</b>

DEPTH OF FLOW (IN)	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50
AREA OF FLOW (SQ. FT.)	0.68	0.77	0.88	0.98	1.09	1.21	1.33	1.46
WETTED PERIMETER (FT)	2.73	2.91	3.08	3.25	3.43	3.60	3.77	3.95
HYDRAULIC RADIUS (FT)	0.25	0.27	0.28	0.30	0.32	0.34	0.35	0.37
FLOW VELOCITY (FPS)	4.54	4.76	4.97	5.18	5.37	5.57	5.75	5.93
CHANNEL CAPACITY (CFS)	3.07	3.68	4.35	5.08	5.88	6.74	7.67	8.67

*d<sub>50</sub> = 7"*

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	6.11	6.28	6.45	6.62	6.78	6.94	7.10	7.25
CHANNEL CAPACITY (CFS)	9.74	10.88	12.10	13.39	14.76	16.21	17.75	19.36

DITCH-clacs for RR w- Rock Cut Face

FILE NAME: DITCH-clacs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

18" - 6.8 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 5.00 %  
 MANNING'S N 0.039

*d<sub>50</sub> DIAMETER = 3" (MIN FOR DESIGN)*

DEPTH INCREMENT 0.50 INCH

DEPTH OF FLOW (IN)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
AREA OF FLOW (SQ. FT.)	0.09	0.15	0.21	0.27	0.34	0.42	0.50	0.59
WETTED PERIMETER (FT)	1.35	1.52	1.69	1.87	2.04	2.21	2.39	2.56
HYDRAULIC RADIUS (FT)	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.23
FLOW VELOCITY (FPS)	1.44	1.81	2.11	2.37	2.60	2.81	3.00	3.19
CHANNEL CAPACITY (CFS)	0.14	0.27	0.44	0.65	0.89	1.18	1.50	1.87

DEPTH OF FLOW (IN)	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50
AREA OF FLOW (SQ. FT.)	0.68	0.77	0.88	0.98	1.09	1.21	1.33	1.46
WETTED PERIMETER (FT)	2.73	2.91	3.08	3.25	3.43	3.60	3.77	3.95
HYDRAULIC RADIUS (FT)	0.25	0.27	0.28	0.30	0.32	0.34	0.35	0.37
FLOW VELOCITY (FPS)	3.36	3.52	3.68	3.83	3.98	4.12	4.26	4.39
CHANNEL CAPACITY (CFS)	2.27	2.73	3.22	3.76	4.35	4.99	5.68	6.42

*d<sub>50</sub> = 4"*

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	4.52	4.65	4.78	4.90	5.02	5.14	5.25	5.37
CHANNEL CAPACITY (CFS)	7.21	8.05	8.95	9.91	10.93	12.00	13.14	14.33

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

18" - 6.8 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE **10.00** %  
 MANNING'S N **0.050**  
 DEPTH INCREMENT 0.50 INCH

*d<sub>50</sub> DIAMETER = 4" (MIN FOR DESIGN)*

DEPTH OF FLOW (IN)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
AREA OF FLOW (SQ. FT.)	0.09	0.15	0.21	0.27	0.34	0.42	0.50	0.59
WETTED PERIMETER (FT)	1.35	1.52	1.69	1.87	2.04	2.21	2.39	2.56
HYDRAULIC RADIUS (FT)	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.23
FLOW VELOCITY (FPS)	1.59	1.99	2.32	2.61	2.87	3.10	3.31	3.52
CHANNEL CAPACITY (CFS)	0.15	0.30	0.48	0.71	0.99	1.30	1.66	2.06

DEPTH OF FLOW (IN)	5.00	5.50	6.00	6.50	7.00	7.50	8.00	<b>8.50</b>
AREA OF FLOW (SQ. FT.)	0.68	0.77	0.88	0.98	1.09	1.21	1.33	1.46
WETTED PERIMETER (FT)	2.73	2.91	3.08	3.25	3.43	3.60	3.77	3.95
HYDRAULIC RADIUS (FT)	0.25	0.27	0.28	0.30	0.32	0.34	0.35	0.37
FLOW VELOCITY (FPS)	3.71	3.89	4.06	4.23	4.39	4.54	4.70	<b>4.84</b>
CHANNEL CAPACITY (CFS)	2.51	3.01	3.55	4.15	4.80	5.50	6.26	<b>7.08</b>

*d<sub>50</sub> = 5"*

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	4.99	5.13	5.27	5.40	5.54	5.67	5.80	5.92
CHANNEL CAPACITY (CFS)	7.95	8.88	9.88	10.93	12.05	13.24	14.49	15.81

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

18" - 6.8 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 15.00 %  
 MANNING'S N 0.051

*d<sub>50</sub> DIAMETER = 5" (MIN FOR DESIGN)*

DEPTH INCREMENT 0.20 INCH

DEPTH OF FLOW (IN)	4.00	4.20	4.40	4.60	4.80	5.00	5.20	5.40
AREA OF FLOW (SQ. FT.)	0.50	0.53	0.57	0.60	0.64	0.68	0.72	0.75
WETTED PERIMETER (FT)	2.39	2.46	2.53	2.60	2.66	2.73	2.80	2.87
HYDRAULIC RADIUS (FT)	0.21	0.22	0.22	0.23	0.24	0.25	0.26	0.26
FLOW VELOCITY (FPS)	3.98	4.08	4.17	4.27	4.36	4.45	4.54	4.62
CHANNEL CAPACITY (CFS)	1.99	2.18	2.37	2.58	2.79	3.01	3.24	3.49

DEPTH OF FLOW (IN)	5.60	5.80	6.00	6.20	6.40	6.60	6.80	7.00
AREA OF FLOW (SQ. FT.)	0.79	0.83	0.88	0.92	0.96	1.00	1.05	1.09
WETTED PERIMETER (FT)	2.94	3.01	3.08	3.15	3.22	3.29	3.36	3.43
HYDRAULIC RADIUS (FT)	0.27	0.28	0.28	0.29	0.30	0.31	0.31	0.32
FLOW VELOCITY (FPS)	4.71	4.79	4.88	4.96	5.04	5.12	5.19	5.27
CHANNEL CAPACITY (CFS)	3.74	4.00	4.27	4.55	4.83	5.13	5.44	5.76

DEPTH OF FLOW (IN)	7.20	7.40	<b>7.60</b>	7.80	8.00	8.20	8.40	8.60
AREA OF FLOW (SQ. FT.)	1.14	1.19	1.24	1.28	1.33	1.38	1.44	1.49
WETTED PERIMETER (FT)	3.50	3.57	3.64	3.71	3.77	3.84	3.91	3.98
HYDRAULIC RADIUS (FT)	0.33	0.33	0.34	0.35	0.35	0.36	0.37	0.37
FLOW VELOCITY (FPS)	5.34	5.42	<b>5.49</b>	5.57	5.64	5.71	5.78	5.85
CHANNEL CAPACITY (CFS)	6.09	6.43	<b>6.78</b>	7.15	7.52	7.90	8.30	8.70



DITCH-calcs for RR w- Rock Cut Face

INCLUDES 12"  
DEPTH

FILE NAME: DITCH-calcs  
PROJECT: JN-1708.02  
LOCATION: Redington, Maine  
DATE: 12/2/2005

18" - 6.8 cfs  
Treatment  
Depth (in): 7.00

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
DITCH SLOPE 15.00 %  
MANNING'S N 0.051

DEPTH INCREMENT 0.50 INCH

DEPTH OF FLOW (IN)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
AREA OF FLOW (SQ. FT.)	0.09	0.15	0.21	0.27	0.34	0.42	0.50	0.59
WETTED PERIMETER (FT)	1.35	1.52	1.69	1.87	2.04	2.21	2.39	2.56
HYDRAULIC RADIUS (FT)	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.23
FLOW VELOCITY (FPS)	1.91	2.39	2.79	3.14	3.44	3.72	3.98	4.22
CHANNEL CAPACITY (CFS)	0.18	0.36	0.58	0.86	1.18	1.56	1.99	2.47

DEPTH OF FLOW (IN)	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50
AREA OF FLOW (SQ. FT.)	0.68	0.77	0.88	0.98	1.09	1.21	1.33	1.46
WETTED PERIMETER (FT)	2.73	2.91	3.08	3.25	3.43	3.60	3.77	3.95
HYDRAULIC RADIUS (FT)	0.25	0.27	0.28	0.30	0.32	0.34	0.35	0.37
FLOW VELOCITY (FPS)	4.45	4.67	4.88	5.08	5.27	5.46	5.64	5.82
CHANNEL CAPACITY (CFS)	3.01	3.61	4.27	4.98	5.76	6.61	7.52	8.50

↙ d<sub>50</sub> = 7"

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	5.99	6.16	6.32	6.49	6.65	6.80	6.96	7.11
CHANNEL CAPACITY (CFS)	9.55	10.67	11.86	13.13	14.47	15.90	17.40	18.98

DITCH-clacs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

24" - 13.6 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 5.00 %  
 MANNING'S N 0.041

*d<sub>50</sub> DIAMETER = 4" (MIN FOR DESIGN)*

DEPTH INCREMENT 0.50 INCH

DEPTH OF FLOW (IN)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
AREA OF FLOW (SQ. FT.)	0.09	0.15	0.21	0.27	0.34	0.42	0.50	0.59
WETTED PERIMETER (FT)	1.35	1.52	1.69	1.87	2.04	2.21	2.39	2.56
HYDRAULIC RADIUS (FT)	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.23
FLOW VELOCITY (FPS)	1.37	1.72	2.00	2.25	2.47	2.67	2.86	3.03
CHANNEL CAPACITY (CFS)	0.13	0.26	0.42	0.62	0.85	1.12	1.43	1.78

DEPTH OF FLOW (IN)	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50
AREA OF FLOW (SQ. FT.)	0.68	0.77	0.88	0.98	1.09	1.21	1.33	1.46
WETTED PERIMETER (FT)	2.73	2.91	3.08	3.25	3.43	3.60	3.77	3.95
HYDRAULIC RADIUS (FT)	0.25	0.27	0.28	0.30	0.32	0.34	0.35	0.37
FLOW VELOCITY (FPS)	3.20	3.35	3.50	3.65	3.78	3.92	4.05	4.18
CHANNEL CAPACITY (CFS)	2.16	2.59	3.06	3.58	4.14	4.75	5.40	6.10

*d<sub>50</sub> = 4"*

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	4.30	4.42	4.54	4.66	4.77	4.89	5.00	5.11
CHANNEL CAPACITY (CFS)	6.86	7.66	8.52	9.43	10.39	11.42	12.49	13.63

DITCH-clacs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

24" - 13.6 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE **10.00** %  
 MANNING'S N **0.046**

*d<sub>50</sub> DIAMETER = 5" (MIN FOR DESIGN)*

DEPTH INCREMENT 0.20 INCH

DEPTH OF FLOW (IN)	8.00	8.20	8.40	8.60	8.80	9.00	9.20	9.40
AREA OF FLOW (SQ. FT.)	1.33	1.38	1.44	1.49	1.54	1.59	1.65	1.70
WETTED PERIMETER (FT)	3.77	3.84	3.91	3.98	4.05	4.12	4.19	4.26
HYDRAULIC RADIUS (FT)	0.35	0.36	0.37	0.37	0.38	0.39	0.39	0.40
FLOW VELOCITY (FPS)	5.10	5.17	5.23	5.30	5.36	5.42	5.48	5.54
CHANNEL CAPACITY (CFS)	6.81	7.15	7.51	7.88	8.25	8.64	9.04	9.45

DEPTH OF FLOW (IN)	9.60	9.80	10.00	10.20	10.40	10.60	10.80	11.00
AREA OF FLOW (SQ. FT.)	1.76	1.82	1.88	1.93	1.99	2.05	2.12	2.18
WETTED PERIMETER (FT)	4.33	4.40	4.47	4.54	4.61	4.68	4.75	4.82
HYDRAULIC RADIUS (FT)	0.41	0.41	0.42	0.43	0.43	0.44	0.45	0.45
FLOW VELOCITY (FPS)	5.61	5.67	5.73	5.78	5.84	5.90	5.96	6.02
CHANNEL CAPACITY (CFS)	9.87	10.30	10.74	11.19	11.65	12.12	12.61	13.10

*d<sub>50</sub> = 6"*

DEPTH OF FLOW (IN)	<b>11.20</b>	11.40	11.60	11.80	12.00	12.20	12.40	12.60
AREA OF FLOW (SQ. FT.)	2.24	2.30	2.37	2.43	2.50	2.57	2.63	2.70
WETTED PERIMETER (FT)	4.88	4.95	5.02	5.09	5.16	5.23	5.30	5.37
HYDRAULIC RADIUS (FT)	0.46	0.47	0.47	0.48	0.48	0.49	0.50	0.50
FLOW VELOCITY (FPS)	<b>6.07</b>	6.13	6.19	6.24	6.30	6.36	6.41	6.46
CHANNEL CAPACITY (CFS)	<b>13.61</b>	14.13	14.66	15.20	15.75	16.31	16.89	17.48

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

24" - 13.6 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 Rock Cut Face  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 15.00 %  
 MANNING'S N 0.051

$d_{50}$  DIAMETER = 6" (MIN FOR DESIGN)

DEPTH INCREMENT 0.20 INCH

DEPTH OF FLOW (IN)	7.00	7.20	7.40	7.60	7.80	8.00	8.20	8.40
AREA OF FLOW (SQ. FT.)	1.09	1.14	1.19	1.24	1.28	1.33	1.38	1.44
WETTED PERIMETER (FT)	3.43	3.50	3.57	3.64	3.71	3.77	3.84	3.91
HYDRAULIC RADIUS (FT)	0.32	0.33	0.33	0.34	0.35	0.35	0.36	0.37
FLOW VELOCITY (FPS)	5.27	5.34	5.42	5.49	5.57	5.64	5.71	5.78
CHANNEL CAPACITY (CFS)	5.76	6.09	6.43	6.78	7.15	7.52	7.90	8.30

DEPTH OF FLOW (IN)	8.60	8.80	9.00	9.20	9.40	9.60	9.80	10.00
AREA OF FLOW (SQ. FT.)	1.49	1.54	1.59	1.65	1.70	1.76	1.82	1.88
WETTED PERIMETER (FT)	3.98	4.05	4.12	4.19	4.26	4.33	4.40	4.47
HYDRAULIC RADIUS (FT)	0.37	0.38	0.39	0.39	0.40	0.41	0.41	0.42
FLOW VELOCITY (FPS)	5.85	5.92	5.99	6.06	6.13	6.19	6.26	6.32
CHANNEL CAPACITY (CFS)	8.70	9.12	9.55	9.99	10.44	10.90	11.37	11.86

DEPTH OF FLOW (IN)	10.20	10.40	10.60	<b>10.80</b>	11.00	11.20	11.40	11.60
AREA OF FLOW (SQ. FT.)	1.93	1.99	2.05	2.12	2.18	2.24	2.30	2.37
WETTED PERIMETER (FT)	4.54	4.61	4.68	4.75	4.82	4.88	4.95	5.02
HYDRAULIC RADIUS (FT)	0.43	0.43	0.44	0.45	0.45	0.46	0.47	0.47
FLOW VELOCITY (FPS)	6.39	6.46	6.52	<b>6.58</b>	6.65	6.71	6.77	6.84
CHANNEL CAPACITY (CFS)	12.36	12.87	13.39	<b>13.92</b>	14.47	15.03	15.60	16.19

INCLUDES 12"  
DEPTH

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
PROJECT: JN-1708.02  
LOCATION: Redington, Maine  
DATE: 12/2/2005

24" - 13.6 cfs  
Treatment  
Depth (in) = 9.50

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
DITCH SLOPE **15.00** %  
MANNING'S N **0.051**  
  
DEPTH INCREMENT 0.50 INCH

DEPTH OF FLOW (IN)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
AREA OF FLOW (SQ. FT.)	0.09	0.15	0.21	0.27	0.34	0.42	0.50	0.59
WETTED PERIMETER (FT)	1.35	1.52	1.69	1.87	2.04	2.21	2.39	2.56
HYDRAULIC RADIUS (FT)	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.23
FLOW VELOCITY (FPS)	1.91	2.39	2.79	3.14	3.44	3.72	3.98	4.22
CHANNEL CAPACITY (CFS)	0.18	0.36	0.58	0.86	1.18	1.56	1.99	2.47

DEPTH OF FLOW (IN)	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50
AREA OF FLOW (SQ. FT.)	0.68	0.77	0.88	0.98	1.09	1.21	1.33	1.46
WETTED PERIMETER (FT)	2.73	2.91	3.08	3.25	3.43	3.60	3.77	3.95
HYDRAULIC RADIUS (FT)	0.25	0.27	0.28	0.30	0.32	0.34	0.35	0.37
FLOW VELOCITY (FPS)	4.45	4.67	4.88	5.08	5.27	5.46	5.64	5.82
CHANNEL CAPACITY (CFS)	3.01	3.61	4.27	4.98	5.76	6.61	7.52	8.50

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	5.99	6.16	6.32	6.49	6.65	6.80	6.96	7.11
CHANNEL CAPACITY (CFS)	9.55	10.67	11.86	13.13	14.47	15.90	17.40	18.98

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

30" - 24 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 5.00 %  
 MANNING'S N 0.042  
 DEPTH INCREMENT 1.00 INCH

$d_{50}$  DIAMETER = 5" (MIN FOR DESIGN)

DEPTH OF FLOW (IN)	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
AREA OF FLOW (SQ. FT.)	0.09	0.21	0.34	0.50	0.68	0.88	1.09	1.33
WETTED PERIMETER (FT)	1.35	1.69	2.04	2.39	2.73	3.08	3.43	3.77
HYDRAULIC RADIUS (FT)	0.07	0.12	0.17	0.21	0.25	0.28	0.32	0.35
FLOW VELOCITY (FPS)	1.34	1.96	2.41	2.79	3.12	3.42	3.69	3.95
CHANNEL CAPACITY (CFS)	0.13	0.41	0.83	1.40	2.11	2.99	4.04	5.27

$d_{50} = 3"$

DEPTH OF FLOW (IN)	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00
AREA OF FLOW (SQ. FT.)	1.59	1.88	2.18	2.50	2.84	3.21	3.59	4.00
WETTED PERIMETER (FT)	4.12	4.47	4.82	5.16	5.51	5.86	6.20	6.55
HYDRAULIC RADIUS (FT)	0.39	0.42	0.45	0.48	0.52	0.55	0.58	0.61
FLOW VELOCITY (FPS)	4.20	4.43	4.66	4.88	5.09	5.30	5.50	5.69
CHANNEL CAPACITY (CFS)	6.69	8.31	10.15	12.20	14.48	16.99	19.76	22.78

DEPTH OF FLOW (IN)	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
AREA OF FLOW (SQ. FT.)	4.43	4.88	5.34	5.83	6.34	6.88	7.43	8.00
WETTED PERIMETER (FT)	6.90	7.24	7.59	7.94	8.28	8.63	8.98	9.32
HYDRAULIC RADIUS (FT)	0.64	0.67	0.70	0.73	0.77	0.80	0.83	0.86
FLOW VELOCITY (FPS)	5.89	6.08	6.26	6.44	6.62	6.80	6.97	7.14
CHANNEL CAPACITY (CFS)	26.06	29.62	33.46	37.58	42.01	46.74	51.78	57.15

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

30" - 24 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 10.00 %  
 MANNING'S N 0.049  
 DEPTH INCREMENT 1.00 INCH

$d_{50}$  DIAMETER = 7" (MIN FOR DESIGN)

DEPTH OF FLOW (IN)	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
AREA OF FLOW (SQ. FT.)	0.09	0.21	0.34	0.50	0.68	0.88	1.09	1.33
WETTED PERIMETER (FT)	1.35	1.69	2.04	2.39	2.73	3.08	3.43	3.77
HYDRAULIC RADIUS (FT)	0.07	0.12	0.17	0.21	0.25	0.28	0.32	0.35
FLOW VELOCITY (FPS)	1.62	2.37	2.93	3.38	3.78	4.14	4.48	4.79
CHANNEL CAPACITY (CFS)	0.15	0.49	1.01	1.69	2.56	3.63	4.90	6.39

$d_{50} = 5"$

DEPTH OF FLOW (IN)	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00
AREA OF FLOW (SQ. FT.)	1.59	1.88	2.18	2.50	2.84	3.21	3.59	4.00
WETTED PERIMETER (FT)	4.12	4.47	4.82	5.16	5.51	5.86	6.20	6.55
HYDRAULIC RADIUS (FT)	0.39	0.42	0.45	0.48	0.52	0.55	0.58	0.61
FLOW VELOCITY (FPS)	5.09	5.37	5.65	5.91	6.17	6.42	6.66	6.90
CHANNEL CAPACITY (CFS)	8.11	10.08	12.30	14.79	17.55	20.60	23.95	27.61

DEPTH OF FLOW (IN)	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
AREA OF FLOW (SQ. FT.)	4.43	4.88	5.34	5.83	6.34	6.88	7.43	8.00
WETTED PERIMETER (FT)	6.90	7.24	7.59	7.94	8.28	8.63	8.98	9.32
HYDRAULIC RADIUS (FT)	0.64	0.67	0.70	0.73	0.77	0.80	0.83	0.86
FLOW VELOCITY (FPS)	7.14	7.37	7.59	7.81	8.03	8.24	8.45	8.66
CHANNEL CAPACITY (CFS)	31.59	35.90	40.56	45.56	50.92	56.66	62.77	69.27

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

30" - 24 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE **15.00** %  
 MANNING'S N **0.053**

*d<sub>50</sub> DIAMETER = 8" (MIN FOR DESIGN)*

DEPTH INCREMENT 1.00 INCH

DEPTH OF FLOW (IN)	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
AREA OF FLOW (SQ. FT.)	0.09	0.21	0.34	0.50	0.68	0.88	1.09	1.33
WETTED PERIMETER (FT)	1.35	1.69	2.04	2.39	2.73	3.08	3.43	3.77
HYDRAULIC RADIUS (FT)	0.07	0.12	0.17	0.21	0.25	0.28	0.32	0.35
FLOW VELOCITY (FPS)	1.84	2.69	3.31	3.83	4.28	4.69	5.07	5.43
CHANNEL CAPACITY (CFS)	0.17	0.56	1.14	1.91	2.90	4.11	5.55	7.23

*d<sub>50</sub> = 7"*

DEPTH OF FLOW (IN)	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00
AREA OF FLOW (SQ. FT.)	1.59	1.88	2.18	2.50	2.84	3.21	3.59	4.00
WETTED PERIMETER (FT)	4.12	4.47	4.82	5.16	5.51	5.86	6.20	6.55
HYDRAULIC RADIUS (FT)	0.39	0.42	0.45	0.48	0.52	0.55	0.58	0.61
FLOW VELOCITY (FPS)	5.76	6.09	6.40	6.70	6.99	7.27	7.55	7.82
CHANNEL CAPACITY (CFS)	9.19	11.41	13.93	16.74	19.87	23.33	27.12	31.27

DEPTH OF FLOW (IN)	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
AREA OF FLOW (SQ. FT.)	4.43	4.88	5.34	5.83	6.34	6.88	7.43	8.00
WETTED PERIMETER (FT)	6.90	7.24	7.59	7.94	8.28	8.63	8.98	9.32
HYDRAULIC RADIUS (FT)	0.64	0.67	0.70	0.73	0.77	0.80	0.83	0.86
FLOW VELOCITY (FPS)	8.08	8.34	8.59	8.84	9.09	9.33	9.57	9.80
CHANNEL CAPACITY (CFS)	35.77	40.66	45.92	51.59	57.66	64.15	71.07	78.44



DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

36" - 37 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 5.00 %  
 MANNING'S N 0.043

*d<sub>50</sub> DIAMETER = 6" (MIN FOR DESIGN)*

DEPTH INCREMENT 1.00 INCH

DEPTH OF FLOW (IN)	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
AREA OF FLOW (SQ. FT.)	0.09	0.21	0.34	0.50	0.68	0.88	1.09	1.33
WETTED PERIMETER (FT)	1.35	1.69	2.04	2.39	2.73	3.08	3.43	3.77
HYDRAULIC RADIUS (FT)	0.07	0.12	0.17	0.21	0.25	0.28	0.32	0.35
FLOW VELOCITY (FPS)	1.31	1.91	2.36	2.73	3.05	3.34	3.61	3.86
CHANNEL CAPACITY (CFS)	0.12	0.40	0.81	1.36	2.06	2.92	3.95	5.15

*d<sub>50</sub> = 3"*

DEPTH OF FLOW (IN)	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00
AREA OF FLOW (SQ. FT.)	1.59	1.88	2.18	2.50	2.84	3.21	3.59	4.00
WETTED PERIMETER (FT)	4.12	4.47	4.82	5.16	5.51	5.86	6.20	6.55
HYDRAULIC RADIUS (FT)	0.39	0.42	0.45	0.48	0.52	0.55	0.58	0.61
FLOW VELOCITY (FPS)	4.10	4.33	4.55	4.77	4.97	5.17	5.37	5.56
CHANNEL CAPACITY (CFS)	6.54	8.12	9.91	11.91	14.14	16.60	19.30	22.25

DEPTH OF FLOW (IN)	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
AREA OF FLOW (SQ. FT.)	4.43	4.88	5.34	5.83	6.34	6.88	7.43	8.00
WETTED PERIMETER (FT)	6.90	7.24	7.59	7.94	8.28	8.63	8.98	9.32
HYDRAULIC RADIUS (FT)	0.64	0.67	0.70	0.73	0.77	0.80	0.83	0.86
FLOW VELOCITY (FPS)	5.75	5.93	6.12	6.29	6.47	6.64	6.81	6.98
CHANNEL CAPACITY (CFS)	25.46	28.93	32.68	36.71	41.03	45.65	50.58	55.82

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

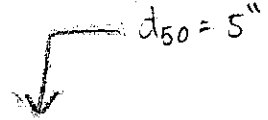
36" - 37 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 10.00 %  
 MANNING'S N 0.050

*d<sub>50</sub> DIAMETER = 8" (MIN FOR DESIGN)*

DEPTH INCREMENT 0.50 INCH

*d<sub>50</sub> = 5"*  


DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	4.99	5.13	5.27	5.40	5.54	5.67	5.80	5.92
CHANNEL CAPACITY (CFS)	7.95	8.88	9.88	10.93	12.05	13.24	14.49	15.81

DEPTH OF FLOW (IN)	13.00	13.50	14.00	14.50	15.00	15.50	16.00	16.50
AREA OF FLOW (SQ. FT.)	2.84	3.02	3.21	3.40	3.59	3.79	4.00	4.21
WETTED PERIMETER (FT)	5.51	5.68	5.86	6.03	6.20	6.38	6.55	6.72
HYDRAULIC RADIUS (FT)	0.52	0.53	0.55	0.56	0.58	0.60	0.61	0.63
FLOW VELOCITY (FPS)	6.05	6.17	6.29	6.41	6.53	6.65	6.77	6.88
CHANNEL CAPACITY (CFS)	17.20	18.66	20.19	21.79	23.47	25.23	27.06	28.97

DEPTH OF FLOW (IN)	17.00	17.50	18.00	18.50	19.00	19.50	20.00	20.50
AREA OF FLOW (SQ. FT.)	4.43	4.65	4.88	5.11	5.34	5.59	5.83	6.09
WETTED PERIMETER (FT)	6.90	7.07	7.24	7.42	7.59	7.76	7.94	8.11
HYDRAULIC RADIUS (FT)	0.64	0.66	0.67	0.69	0.70	0.72	0.73	0.75
FLOW VELOCITY (FPS)	6.99	7.11	7.22	7.33	7.44	7.55	7.65	7.76
CHANNEL CAPACITY (CFS)	30.96	33.03	35.19	37.42	39.75	42.15	44.65	47.23

DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

36" - 37 cfs

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE **15.00 %**  
 MANNING'S N **0.054**

*d<sub>50</sub> DIAMETER = 10" (MIN FOR DESIGN)*

DEPTH INCREMENT 0.50 INCH

*d<sub>50</sub> = 6"* ↓

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	2.50	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	5.16	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	0.48	0.50
FLOW VELOCITY (FPS)	5.66	5.82	5.97	6.13	6.28	6.43	6.57	6.72
CHANNEL CAPACITY (CFS)	9.02	10.07	11.20	12.40	13.67	15.01	16.43	17.93

DEPTH OF FLOW (IN)	13.00	13.50	14.00	14.50	15.00	15.50	16.00	16.50
AREA OF FLOW (SQ. FT.)	2.84	3.02	3.21	3.40	3.59	3.79	4.00	4.21
WETTED PERIMETER (FT)	5.51	5.68	5.86	6.03	6.20	6.38	6.55	6.72
HYDRAULIC RADIUS (FT)	0.52	0.53	0.55	0.56	0.58	0.60	0.61	0.63
FLOW VELOCITY (FPS)	6.86	7.00	7.14	7.27	7.41	7.54	7.67	7.80
CHANNEL CAPACITY (CFS)	19.50	21.16	22.89	24.71	26.62	28.61	30.69	32.85

DEPTH OF FLOW (IN)	17.00	<b>17.50</b>	18.00	18.50	19.00	19.50	20.00	20.50
AREA OF FLOW (SQ. FT.)	4.43	4.65	4.88	5.11	5.34	5.59	5.83	6.09
WETTED PERIMETER (FT)	6.90	7.07	7.24	7.42	7.59	7.76	7.94	8.11
HYDRAULIC RADIUS (FT)	0.64	0.66	0.67	0.69	0.70	0.72	0.73	0.75
FLOW VELOCITY (FPS)	7.93	<b>8.06</b>	8.19	8.31	8.43	8.56	8.68	8.80
CHANNEL CAPACITY (CFS)	35.11	<b>37.46</b>	39.90	42.44	45.07	47.80	50.63	53.56

Wier Eq

$$Q=CwLw(H-Ho)^{1.5}$$

Culvert	Q	Cw	H	Lw
12	2.4	2.68	0.5	2.53
18	6.8	2.68	0.5	7.18
24	13.6	2.68	0.5	14.35
30	24	2.68	0.5	25.33
36	37	2.68	0.5	39.05

DITCH-clacs for RR - varied cut slope

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/1/2003

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 6.00 %  
 MANNING'S N 0.040

DEPTH INCREMENT 1.00 INCH

DEPTH OF FLOW (IN)	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
AREA OF FLOW (SQ. FT.)	0.09	0.21	0.34	0.50	0.68	0.88	1.09	1.33
WETTED PERIMETER (FT)	1.35	1.69	2.04	2.39	2.73	3.08	3.43	3.77
HYDRAULIC RADIUS (FT)	0.07	0.12	0.17	0.21	0.25	0.28	0.32	0.35
FLOW VELOCITY (FPS)	1.54	2.25	2.78	3.21	3.59	3.93	4.25	4.55
CHANNEL CAPACITY (CFS)	0.14	0.47	0.95	1.60	2.43	3.44	4.65	6.06

DEPTH OF FLOW (IN)	9.00	10.00	11.00	<b>12.00</b>	13.00	14.00	15.00	16.00
AREA OF FLOW (SQ. FT.)	1.59	1.88	2.18	<b>2.50</b>	2.84	3.21	3.59	4.00
WETTED PERIMETER (FT)	4.12	4.47	4.82	<b>5.16</b>	5.51	5.86	6.20	6.55
HYDRAULIC RADIUS (FT)	0.39	0.42	0.45	<b>0.48</b>	0.52	0.55	0.58	0.61
FLOW VELOCITY (FPS)	4.83	5.10	5.36	<b>5.61</b>	5.86	6.09	6.32	6.55
CHANNEL CAPACITY (CFS)	7.70	9.56	11.67	<b>14.03</b>	16.65	19.55	22.73	26.20

DEPTH OF FLOW (IN)	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
AREA OF FLOW (SQ. FT.)	4.43	4.88	5.34	5.83	6.34	6.88	7.43	8.00
WETTED PERIMETER (FT)	6.90	7.24	7.59	7.94	8.28	8.63	8.98	9.32
HYDRAULIC RADIUS (FT)	0.64	0.67	0.70	0.73	0.77	0.80	0.83	0.86
FLOW VELOCITY (FPS)	6.77	6.99	7.20	7.41	7.62	7.82	8.02	8.22
CHANNEL CAPACITY (CFS)	29.98	34.07	38.48	43.23	48.32	53.76	59.56	65.73

DITCH-calcs for RR - varied cut slope

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/1/2003

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 8.00 %  
 MANNING'S N 0.040

DEPTH INCREMENT 1.00 INCH

DEPTH OF FLOW (IN)	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
AREA OF FLOW (SQ. FT.)	0.09	0.21	0.34	0.50	0.68	0.88	1.09	1.33
WETTED PERIMETER (FT)	1.35	1.69	2.04	2.39	2.73	3.08	3.43	3.77
HYDRAULIC RADIUS (FT)	0.07	0.12	0.17	0.21	0.25	0.28	0.32	0.35
FLOW VELOCITY (FPS)	1.78	2.60	3.21	3.71	4.14	4.54	4.91	5.25
CHANNEL CAPACITY (CFS)	0.17	0.54	1.10	1.85	2.81	3.97	5.37	7.00

DEPTH OF FLOW (IN)	9.00	10.00	11.00	<b>12.00</b>	13.00	14.00	15.00	16.00
AREA OF FLOW (SQ. FT.)	1.59	1.88	2.18	<b>2.50</b>	2.84	3.21	3.59	4.00
WETTED PERIMETER (FT)	4.12	4.47	4.82	<b>5.16</b>	5.51	5.86	6.20	6.55
HYDRAULIC RADIUS (FT)	0.39	0.42	0.45	<b>0.48</b>	0.52	0.55	0.58	0.61
FLOW VELOCITY (FPS)	5.58	5.89	6.19	<b>6.48</b>	6.76	7.04	7.30	7.56
CHANNEL CAPACITY (CFS)	8.89	11.04	13.48	<b>16.20</b>	19.23	22.57	26.24	30.25

DEPTH OF FLOW (IN)	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
AREA OF FLOW (SQ. FT.)	4.43	4.88	5.34	5.83	6.34	6.88	7.43	8.00
WETTED PERIMETER (FT)	6.90	7.24	7.59	7.94	8.28	8.63	8.98	9.32
HYDRAULIC RADIUS (FT)	0.64	0.67	0.70	0.73	0.77	0.80	0.83	0.86
FLOW VELOCITY (FPS)	7.82	8.07	8.32	8.56	8.80	9.03	9.26	9.49
CHANNEL CAPACITY (CFS)	34.62	39.34	44.44	49.92	55.79	62.08	68.77	75.90

DITCH-calcs for RR - varied cut slope

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/1/2003

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 10.00 %  
 MANNING'S N 0.040

DEPTH INCREMENT 1.00 INCH

DEPTH OF FLOW (IN)	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
AREA OF FLOW (SQ. FT.)	0.09	0.21	0.34	0.50	0.68	0.88	1.09	1.33
WETTED PERIMETER (FT)	1.35	1.69	2.04	2.39	2.73	3.08	3.43	3.77
HYDRAULIC RADIUS (FT)	0.07	0.12	0.17	0.21	0.25	0.28	0.32	0.35
FLOW VELOCITY (FPS)	1.99	2.91	3.58	4.14	4.63	5.08	5.49	5.87
CHANNEL CAPACITY (CFS)	0.19	0.61	1.23	2.07	3.14	4.44	6.00	7.83

DEPTH OF FLOW (IN)	9.00	10.00	11.00	<b>12.00</b>	13.00	14.00	15.00	16.00
AREA OF FLOW (SQ. FT.)	1.59	1.88	2.18	<b>2.50</b>	2.84	3.21	3.59	4.00
WETTED PERIMETER (FT)	4.12	4.47	4.82	<b>5.16</b>	5.51	5.86	6.20	6.55
HYDRAULIC RADIUS (FT)	0.39	0.42	0.45	<b>0.48</b>	0.52	0.55	0.58	0.61
FLOW VELOCITY (FPS)	6.24	6.58	6.92	<b>7.24</b>	7.56	7.87	8.16	8.46
CHANNEL CAPACITY (CFS)	9.94	12.35	15.07	<b>18.11</b>	21.50	25.24	29.34	33.83

DEPTH OF FLOW (IN)	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
AREA OF FLOW (SQ. FT.)	4.43	4.88	5.34	5.83	6.34	6.88	7.43	8.00
WETTED PERIMETER (FT)	6.90	7.24	7.59	7.94	8.28	8.63	8.98	9.32
HYDRAULIC RADIUS (FT)	0.64	0.67	0.70	0.73	0.77	0.80	0.83	0.86
FLOW VELOCITY (FPS)	8.74	9.02	9.30	9.57	9.83	10.09	10.35	10.61
CHANNEL CAPACITY (CFS)	38.70	43.98	49.68	55.81	62.38	69.40	76.89	84.86

DITCH-calcs for RR - varied cut slope

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/1/2003

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE 12.00 %  
 MANNING'S N 0.040

DEPTH INCREMENT 1.00 INCH

DEPTH OF FLOW (IN)	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00
AREA OF FLOW (SQ. FT.)	0.09	0.21	0.34	0.50	0.68	0.88	1.09	1.33
WETTED PERIMETER (FT)	1.35	1.69	2.04	2.39	2.73	3.08	3.43	3.77
HYDRAULIC RADIUS (FT)	0.07	0.12	0.17	0.21	0.25	0.28	0.32	0.35
FLOW VELOCITY (FPS)	2.18	3.18	3.93	4.54	5.07	5.56	6.01	6.43
CHANNEL CAPACITY (CFS)	0.20	0.66	1.35	2.27	3.44	4.87	6.57	8.57

DEPTH OF FLOW (IN)	9.00	10.00	11.00	<b>12.00</b>	13.00	14.00	15.00	16.00
AREA OF FLOW (SQ. FT.)	1.59	1.88	2.18	<b>2.50</b>	2.84	3.21	3.59	4.00
WETTED PERIMETER (FT)	4.12	4.47	4.82	<b>5.16</b>	5.51	5.86	6.20	6.55
HYDRAULIC RADIUS (FT)	0.39	0.42	0.45	<b>0.48</b>	0.52	0.55	0.58	0.61
FLOW VELOCITY (FPS)	6.83	7.21	7.58	<b>7.94</b>	8.28	8.62	8.94	9.26
CHANNEL CAPACITY (CFS)	10.89	13.52	16.50	<b>19.84</b>	23.55	27.64	32.14	37.05

DEPTH OF FLOW (IN)	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
AREA OF FLOW (SQ. FT.)	4.43	4.88	5.34	5.83	6.34	6.88	7.43	8.00
WETTED PERIMETER (FT)	6.90	7.24	7.59	7.94	8.28	8.63	8.98	9.32
HYDRAULIC RADIUS (FT)	0.64	0.67	0.70	0.73	0.77	0.80	0.83	0.86
FLOW VELOCITY (FPS)	9.58	9.88	10.18	10.48	10.77	11.06	11.34	11.62
CHANNEL CAPACITY (CFS)	42.40	48.18	54.42	61.14	68.33	76.03	84.23	92.96



DITCH-calcs for RR w- Rock Cut Face

FILE NAME: DITCH-calcs  
 PROJECT: JN-1708.02  
 LOCATION: Redington, Maine  
 DATE: 12/2/2005

CHANNEL CONFIGURATION:

BOTTOM WIDTH 1.00 FT  
 LEFT SIDE SLOPE (HORZ:1 VERT) 0.00 **Rock Cut Face**  
 RIGHT SIDE SLOPE (HORZ:1 VERT) 3.00  
 DITCH SLOPE **14.00** %  
 MANNING'S N **0.040**

DEPTH INCREMENT 0.50 INCH

DEPTH OF FLOW (IN)	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
AREA OF FLOW (SQ. FT.)	0.09	0.15	0.21	0.27	0.34	0.42	0.50	0.59
WETTED PERIMETER (FT)	1.35	1.52	1.69	1.87	2.04	2.21	2.39	2.56
HYDRAULIC RADIUS (FT)	0.07	0.10	0.12	0.15	0.17	0.19	0.21	0.23
FLOW VELOCITY (FPS)	2.35	2.95	3.44	3.86	4.24	4.58	4.90	5.20
CHANNEL CAPACITY (CFS)	0.22	0.44	0.72	1.06	1.46	1.92	2.45	3.05

DEPTH OF FLOW (IN)	5.00	5.50	6.00	6.50	7.00	7.50	8.00	8.50
AREA OF FLOW (SQ. FT.)	0.68	0.77	0.88	0.98	1.09	1.21	1.33	1.46
WETTED PERIMETER (FT)	2.73	2.91	3.08	3.25	3.43	3.60	3.77	3.95
HYDRAULIC RADIUS (FT)	0.25	0.27	0.28	0.30	0.32	0.34	0.35	0.37
FLOW VELOCITY (FPS)	5.48	5.75	6.01	6.25	6.49	6.72	6.95	7.16
CHANNEL CAPACITY (CFS)	3.71	4.45	5.25	6.14	7.10	8.14	9.26	10.47

DEPTH OF FLOW (IN)	9.00	9.50	10.00	10.50	11.00	11.50	<b>12.00</b>	12.50
AREA OF FLOW (SQ. FT.)	1.59	1.73	1.88	2.02	2.18	2.34	<b>2.50</b>	2.67
WETTED PERIMETER (FT)	4.12	4.30	4.47	4.64	4.82	4.99	<b>5.16</b>	5.34
HYDRAULIC RADIUS (FT)	0.39	0.40	0.42	0.44	0.45	0.47	<b>0.48</b>	0.50
FLOW VELOCITY (FPS)	7.38	7.59	7.79	7.99	8.19	8.38	<b>8.57</b>	8.76
CHANNEL CAPACITY (CFS)	11.76	13.14	14.61	16.17	17.83	19.58	<b>21.43</b>	23.38