DRAINAGE AREAS

AREA DESIGNATION	AREA (Acres)
BEAR CREEK DISTRICT	
bc-a1.1	1073.4
bc-a1.2	907.7
bc-a1.3	906.3
bc-a1.4	578.4
bc-a1.5	556.3
bc-a1.6	1068.8
bc-a1.7	99.6
bc-a1.8	190.7
bc-a1.9	260.7
bc-a1.10	268.1
bc-a1.11	186.6
bc-a1.12	155.4
bc-a1.13	260.8
bc-a1.14	1833.7
bc-a1.15	152.7
bc-a1.16	220.8
bc-a1.17	571.6
bc-a1.18	86.8
bc-a1.19	91.6
bc-a1.20	108.4
bc-a1.21	246.3
bc-a1.22	152.2
bc-a1.23	148.7
bc-a1.24	163.5

AREA DESIGNATION	AREA (Acres)
BEAR CREEK DISTRICT	
bc-a1.25	112.6
bc-a1.26	99.7
bc-a2.1	8280.1
bc-a2.2	3815.1
bc-a2.3	669.2
bc-a2.4	1553.4
bc-a2.5	3568.2
bc-a2.6	116.1
bc-a2.7a	104.4
bc-a2.7b	215.7
bc-a2.8	286.2
bc-a2.9	198.1
bc-a2.10	57.0
bc-a2.11	194.5
bc-a2.12	86.9
bc-a2.13	58.7
bc-a2.14	123.9
bc-a2.15	148.5
bc-a2.16a	68.5
bc-a2.16b	388.7
bc-a2.17	109.1
bc-a2.18	159.6
bc-a2.19	702.0
bc-a2.20	351.4

DRAINAGE AREAS

AREA DESIGNATION	AREA (Acres)
CASCADE CREEK DISTRICT	
cc-a1.1	10447.1
cc-a1.2	185.6
cc-a1.3	333.6
cc-a1.4	247.2
cc-a1.5a	113.1
cc-a1.5b	113.1
cc-a1.5c	60.5
cc-a1.6	61.3
cc-a1.7	189.2
cc-a1.8	132.6
cc-a1.9	355.8
cc-a1.10	266.7
cc-a2.1	1449.4
cc-a2.2	1046.2
cc-a2.3	2425.1
cc-a2.4	627.6
cc-a2.5	226.0
cc-a2.6a	155.9
cc-a2.6b	61.0
cc-a2.7	481.2
cc-a2.8	389.7

AREA DESIGNATION	AREA (Acres)
CASCADE CREEK DISTRICT	
cc-a2.9	97.2
cc-a2.10	348.4
cc-a2.11	66.2
cc-a2.12	46.2
cc-a3.1	301.3
cc-a3.2	367.6
cc-a3.3	356.4
cc-a3.4	190.6
cc-a3.5	168.1
cc-a3.6	339.9
cc-a3.7a	296.0
cc-a3.7b	171.5
cc-a3.8	326.0
cc-a4.1	236.1
cc-a4.2	472.6
cc-a4.3	236.2
cc-a4.4	265.6
cc-a4.5	301.1
cc-a4.6	250.1
cc-a4.7	105.8
cc-a4.8	298.6

DRAINAGE AREAS

AREA DESIGNATION	AREA (Acres)
KINGS RUN DISTRICT	
kr-a1.1	1510.2
kr-a1.2	341.6
kr-a1.3	234.0
kr-a1.4	369.1
kr-a1.5	221.9
kr-a1.6	104.2
kr-a1.7a	196.6
kr-a1.7b	61.3
kr-a1.8a	167.4
kr-a1.8b	87.9
kr-a1.8c	497.1
kr-a1.9	318.0
kr-a1.10	67.9
kr-a1.11	154.9
kr-a1.12	87.0
kr-a1.13	106.9
kr-a1.14	46.3
kr-a1.15	64.3
kr-a1.16	115.1
kr-a1.17	165.7
kr-a1.18a	182.9
kr-a1.18b	74.6
kr-a1.19	213.3

AREA DESIGNATION	AREA (Acres)
KINGS RUN DISTRICT	
kr-a2.1a	106.6
kr-a2.1b	190.7
kr-a2.2	375.9
kr-a2.3	72.2
kr-a2.4	117.8
kr-a2.5a	184.5
kr-a2.5b	28.2
kr-a2.6	132.3
kr-a2.7	182.9
kr-a2.8	229.5
kr-a2.9	175.1
kr-a2.10	326.7
kr-a2.11	125.1
kr-a2.12	256.6
kr-a2.13	360.1
kr-a3.1	153.1
kr-a3.2	185.2
kr-a3.3	162.9
kr-a3.4	182.9
kr-a3.5	208.9
kr-a3.6	395.7
kr-a3.7	107.6
kr-a3.8	204.4

DRAINAGE AREAS

AREA DESIGNATION	AREA (Acres)
SILVER CREEK DISTRICT	
sc-a1.1	2927.1
sc-a1.2	3457.2
sc-a1.3a	426.3
sc-a1.3b	389.8
sc-a1.4a	282.4
sc-a1.4b	107.8
sc-a1.5a	70.2
sc-a1.5b	273.2
sc-a1.6a	240.2
sc-a1.6b	189.8
sc-a1.6c	92.0
sc-a1.7a	606.9
sc-a1.7b	807.3
sc-a1.8	643.3
sc-a1.9a	92.0
sc-a1.9b	301.1
sc-a1.10	318.3
sc-a1.11	195.5
sc-a1.12a	351.6
sc-a1.12b	120.0
sc-a1.13	610.2

AREA DESIGNATION	AREA (Acres)
HADLEY VALLEY CREEK	
hv-a1.1	1107.8
hv-a1.2	851.7
hv-a1.3	312.0
hv-a1.4	426.0
hv-a1.5	177.0
hv-a1.6a	79.5
hv-a1.6b	228.4
hv-a1.6c	111.7
hv-a1.6d	213.1
hv-a1.7a	267.4
hv-a1.7b	172.2
hv-a1.8a	158.8
hv-a1.8b	136.5
hv-a1.9	324.3
hv-a1.10	deleted
hv-a1.11	243.2
hv-a1.12	284.5
hv-a1.13	105.9
hv-a1.14	77.2
hv-a1.15	162.9

DRAINAGE AREAS

AREA DESIGNATION	AREA (Acres)
WILLOW CREEK DISTRICT	
wc-a1.1	139.5
wc-a1.2	370.9
wc-a1.3	311.1
wc-a1.4	108.3
wc-a1.5	544.5
wc-a1.6	205.5
wc-a1.7	310.5
wc-a1.8	175.4
wc-a1.9	386.5
wc-a1.10	248.2
wc-a2.1	248.7
wc-a2.2	171.2
wc-a2.3	151.5
wc-a2.4	222.8
wc-a2.5	94.4
wc-a2.6	185.9
wc-a2.7	275.9
wc-a2.8	96.3
wc-a2.9	233.3
wc-a2.10	212.6
wc-a3.1	112.6
wc-a3.2	810.1
wc-a3.3	361.0
wc-a3.4	121.6

AREA DESIGNATION	AREA (Acres)
WILLOW CREEK DISTRICT	
wc-a3.5	257.1
wc-a3.6	120.0
wc-a3.7	97.7
wc-a3.8	69.6
wc-a3.9	240.9
wc-a3.10	158.8
wc-a3.11	87.4
wc-a3.12	142.8
wc-a3.13	68.3
wc-a3.14	330.0
wc-a3.15	99.9
wc-a4.1	1121.9
wc-a4.2	196.7
wc-a4.3	532.1
wc-a4.4	303.9
wc-a4.5	673.2
wc-a4.6	157.8
wc-a4.7	609.9
wc-a4.8	231.7
wc-a4.9	65.9
wc-a4.10	80.2
wc-a4.11	493.9
wc-a4.12	296.1
wc-a4.13	620.5
wc-a4.14	422.3

DRAINAGE AREAS

AREA DESIGNATION	AREA (Acres)
WILLOW CREEK DISTRICT	
wc-a5.1	198.2
wc-a5.2	305.3
wc-a5.3	160.1
wc-a5.4	134.8
wc-a5.5	146.3
wc-a5.6	172.9
wc-a5.7	141.9
wc-a5.8	176.9
wc-a5.9	94.3
wc-a5.10	114.6
wc-a5.11	263.7
wc-a5.12	223.8
wc-a6.1	144.2
wc-a6.2	124.2

AREA DESIGNATION	AREA (Acres)
WILLOW CREEK DISTRICT	
wc-a6.3	167.7
wc-a6.4	132.1
wc-a6.5	226.5
wc-a6.6	225.1
wc-a6.7	85.0
wc-a6.8	90.7
wc-a6.9	290.9
wc-a6.10	178.8
wc-a6.11	135.9
wc-a6.12	175.4
wc-a6.13a	193.0
wc-a6.13b	337.7
wc-a6.14	395.3
wc-a6.15	131.6

DRAINAGE AREAS

AREA DESIGNATION	AREA (Acres)
ZUMBRO RIVER DISTRICT	
zr-a1.1	485
zr-a1.2	743.7
zr-a1.3	872.3
zr-a1.4	582.9
zr-a1.5	249.2
zr-a1.6	116.5
zr-a1.7a	142.3
zr-a1.7b	195.9
zr-a1.8a	225.7
zr-a1.8b	68.3
zr-a1.9	126.7
zr-a2.1a	215.2
zr-a2.1b	182.5
zr-a2.2	284.9
zr-a2.3	225.1
zr-a2.4	76.7
zr-a2.5a	118.8
zr-a2.5b	101.9
zr-a2.5c	223.3
zr-a2.5d	105.4
zr-a2.6	116
zr-a2.7	156.5
zr-a2.8	191.2

AREA DESIGNATION	AREA (Acres)
ZUMBRO RIVER DISTRICT	
zr-a3.1	170.8
zr-a3.10	153.4
zr-a3.11	487.6
zr-a3.12	173.4
zr-a3.2	91.8
zr-a3.3	237.3
zr-a3.4	184.5
zr-a3.5a	158.4
zr-a3.5b	208.3
zr-a3.6	107.5
zr-a3.7	83.1
zr-a3.7b	150.3
zr-a3.8	427.3
zr-a3.9	383.1
zr-a4.1	1068.3
zr-a4.2	374
zr-a4.3	596
zr-a4.4	195
zr-a4.5	310.9
zr-a4.6	783.1
zr-a4.7	227.3
zr-a4.8	426.8

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
BEAR CREEK DISTRICT								
BC-P1.3	1120	11.4	1123.9	3.9	1004.6	281.6	25.6	48" RCP
BC-P1.4	1116	6.5	1121.7	5.7	40.6	190.1	17.8	Control Struct.
BC-P1.6	1096	9.6	1101.5	5.5	56.3	432.5	34.8	Control Struct.
BC-P1.8	1135	1.5	1140.4	5.4	5.2	122.8	1.3	42" RCP
BC-P1.9a	1170	0.5	1174.7	4.7	3.7	89.3	1.7	36" RCP
BC-P1.9b	1170	0.6	1174.5	4.5	3.5	91.2	1.9	42" RCP
BC-P1.9	1085	7.4	1089.9	4.9	37.4	257.2	N.A.	Control Struct.
BC-P1.10	1067	4.5	1071.7	4.7	23.0	168.7	8.0	48" RCP
BC-P1.11	1070	5	1074.3	4.3	21.6	37.4	15.5	27" RCP
BC-P1.12	1085	3.8	1089.9	4.9	20.4	40.5	4.5	30" RCP
BC-P1.14a	1075	11.7	1081.2	6.2	79.8	226.6	17.5	Control Struct.
BC-P1.14b	1060	15	1064.0	4.0	42.0	534.5	56.4	Control Struct.
BC-P1.15	1040	3.5	1044.8	4.8	18.5	61.4	4.4	36" RCP
BC-P1.17	1068	10.5	1072.7	4.7	52.1	279.7	21.5	Control Struct.

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
BC-P1.18	1052	2	1056.8	4.8	10.9	17.9	2.4	18" RCP
BC-P1.21	1033	4.8	1037.6	4.6	25.8	105.4	8.1	36" Culvert
BC-P1.23	1055	2.5	1059.0	4.0	10.9	58.2	4.3	30" RCP
30th Ave. SE	1017.7	N.A.	1024.9	7.2	N.A.	3311.8	N.A.	(3) 11' Eqiv. Arch
BC-P1.24	1013	3.8	1017.5	4.5	18.6	84.5	5.7	36" RCP
BC-P1.25	1012	1.9	1016.9	4.9	10.7	59.4	4.1	30" RCP
BC Reservior	1155.5	115	1167.2	11.7	1801.8	409.6	N.A.	SCS Stucture
A2.4-Cty Rd 11	1043	0.5	1050.1	7.1	N.A.	2235.3	N.A.	Bridge
A2.5-Cty Rd 11	1048	0.2	1054.1	6.1	N.A.	1237.7	N.A.	Arch Culverts
BC-P2.6	1060	3.6	1064.3	4.3	17.0	15.3	3.3	18" RCP
BC-P2.7a	1088	3.3	1092.2	4.2	15.2	13.8	3.2	18" RCP
BC-P2.7b	1047	4.7	1051.5	4.5	22.8	122.4	6.1	42" RCP
BC-P2.8a	1105	0.5	1110.2	5.2	5.6	85.6	0.0	36" RCP
BC-P2.8b	1047	2.8	1051.9	4.9	14.8	135.2	6.7	42" RCP
BC-P2.12	1033	4.4	1037.7	4.7	22.5	14.9	4.2	18" RCP
A2.14-Marion Rd	1016	N.A.	1027.5	11.5	N.A.	3517.9	N.A.	Bridge

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
BC-P2.15	1031	4.0	1035.1	4.1	17.7	37.2	3.9	24" RCP
BC-P2.16a	1090	1.9	1094.9	4.9	10.7	13.7	1.9	18" RCP
BC-P2.16b	1011	7.2	1015.6	4.6	35.9	195.2	11.1	48" RCP
A2.19-Hwy 14	992	N.A.	1004.5	12.5	N.A.	8949.6	N.A.	Bridge

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
CASCADE CREEK DISTRICT								
CC-P1.1	1051	10	1059.1	8.1	45.1	2471	36.2	Bridge
CC-P1.4a	1045	2.8	1049.8	4.8	15.4	55.5		30" RCP
CC-P1.4b	1044	3.5	1048.5	4.5	12.9	27.9	7.3	24" RCP
CC-P1.5a	1043	3.8	1047.2	4.2	17.3	30.6	3.9	24" RCP
CC-P1.5b	1032	3.5	1036.0	4.0	15.2	16.4	3.7	24" RCP
45th Ave SE	1024	N.A.	1032.5	8.5	N.A.	2831.3	N.A.	Bridge
CC-P1.10	1000	11	1005.2	5.2	60.8	2908.2	43.2	Channel
SCS - KR3	1104.4	24.9	1110.5	6.1	220.4	99.1	226.8	SCS Structure
SCS - KR7	1083.5	48.3	1089.5	6.0	405.3	104.9	437.1	SCS Structure
CC-P2.1	1065	13.5	1071.5	6.5	104.3	722.6	68.7	Weir Structure
A2.4-Cty Rd 104	1053	N.A.	1058.6	5.6	N.A.	634	N.A.	2-Eqv. 10' Arch
CC-P2.6a	1055	6.1	1059.3	4.3	22.5	92.2	11.8	36" RCP
CC-P2.6b	1052	1.8	1056.6	4.6	10.7	30.5	5.7	24" RCP
CC-P2.7	1054	9.5	1059.6	5.6	47.5	208.5	14.5	48" RCP
A2.8 Cty Rd 22	1016	N.A.	1023.2	7.2	N.A.	1306.9	N.A.	2-8X10 Box

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
CC-P2.10a	1080	1.9	1084.5	4.5	9.9	20.9	2.1	24" RCP
CC-P2.10b	1052	1.1	1057.4	5.4	11.1	80.6	1.5	36" RCP
CC-P2.10c	1020	2.1	1024.8	4.8	11.8	347.8	8.5	11' Weir
CC-P2.12	1010	6.8	1014.2	4.2	N.A.	1579	N.A.	4-5X10 Box
CASCADE LK	998	165	1003.8	5.8	973.8	3110.2	301.0	67' Weir
SCS - KR6	1052.3	28.8	1056.6	4.3	153.6	64.5	245.7	SCS Structure
CC-P3.1	1098	2.1	1102.9	4.9	12.3	56.3	3.8	33" RCP
CC-P3.2	1100	2.8	1105.1	5.1	16.4	72.1	5.0	36" RCP
CC-P3.3	1100	2.3	1105.3	5.3	13.7	72.5	4.4	36" RCP
CC-P3.4	1045	5.7	1049.4	4.4	26.9	33.8	5.1	24" RCP
CC-P3.6	1028	17	1033.0	5.0	34.0	193.8	26.1	48" RCP
CC-P3.7	1012	9.1	1017.3	5.3	51.3	138.4	24.6	42" Culvert
A3.8-7th St.NW	1006.5	N.A.	1011.5	5.0	N.A.	436.9	N.A.	3-60"Eqv RCP
A3.9-Hwy 14	997	N.A.	1006.9	9.9	N.A.	596.1	N.A.	7' CMP
Hwy 52	993	N.A.	1002.8	9.8	N.A.	3439.7	N.A.	3-10x12 Box
CC-P4.2a	998	0.75	1003.8	5.8	N.A.	Quality Basin	2.2	Overflow Berm

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
CC-P4.2b	1003	0.6	1005.6	2.6	1.7	Quality Basin	1.9	18" Culvert
CC-P4.2c	1003	0.9	1005.6	2.6	2.4	Quality Basin	2.0	24" RCP
CC-P4.2d	1004	0.8	1006.8	2.8	2.7	Quality Basin	1.6	24" RCP
CC-P4.3	1080	1.2	1084.9	4.9	7.7	33.9	2.2	27" RCP

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
WILLOW CREEK DISTRICT								
WC-P1.7	1125	9.6	1128.9	3.9	39.8	1176.2	17.5	Weir/berm
WC-P1.8	1186	4.7	1190.9	4.9	25.1	27.2	5.1	24" RCP
WC-P1.9	1128	7.9	1132.7	4.7	40.8	121.9	10.8	42" RCP
SCS-WR4	1115.8	39.7	1123.1	7.3	435.5	119.9	243.5	SCS Structure
WC-P2.1	1106	4.9	1110.1	4.1	21.6	69.1	5.0	30" RCP
A2.2 Cty Rd 101	1076	N.A.	1080.5	4.5	N.A.	327.2	N.A.	Ex. Box Culvert
WC-P2.3	1078	3.8	1083.2	5.2	22.5	16.6	4.0	18" RCP
WC-P2.4a	1090	3.0	1095.0	5.0	16.5	46.8	4	30" RCP
WC-P2.4b	1072	2.5	1076.2	4.2	12.0	50.6	3.7	27" RCP
WC-P2.5	1059	2.9	1063.2	4.2	13.7	16.9	3.0	18" RCP
WC-P2.6	1036	7.8	1040.9	4.9	44.2	407.3	8.8	Existing Box
WC-P2.7	1068	6.9	1072.6	4.6	33.3	39.7	9.1	24" RCP
WC-P2.8	1042	2.5	1045.6	3.6	10.3	95.3	2.7	36" RCP
WC-P2.9	1032	5.6	1037.0	5.0	30.5	47.1	5.6	30" RCP
WC-P3.2	1188	19.5	1192.5	4.5	94.4	371.6	29.0	6X6@1.3%

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
WC-P3.3	1180	14.5	1184.8	4.8	73.1	432.9	16.8	6X7@0.6%
WC-P3.6	1176	10.8	1181.1	5.1	57.7	107.4	14.7	36" RCP
WC-P3.7	1168	3.2	1172.3	4.3	15.0	13.6	6.0	18" RCP
WC-P3.8	1148	3.6	1151.9	3.9	8.7	16.8	3.7	18" RCP
WC-P3.9	1196	8.4	1200.4	4.4	39.1	62.5	9.6	36" RCP
WC-P3.10	1140	3.2	1144.3	4.3	15.3	104.9	4.9	36" RCP
WC-P3.11	1128	2.8	1132.7	4.7	15.0	12.5	3.3	18" RCP
WC-P3.12	1154	5	1157.5	3.5	18.6	20.9	4.1	18" RCP
WC-P3.14	1082	5.6	1087.9	5.9	39.7	751.1	5.6	Channel
WC-P4.2	1232	7.1	1236.1	4.1	30.8	151.9	12.6	Control Structure
WC-P4.3	1224	16.5	1227.9	3.9	66.4	237.0	21.5	Control Structure
WC-P4.5	1172	17.3	1176.5	4.5	81.1	787.9	31.8	(8X10)@0.5%
WC-P4.6	1146	6.2	1150.1	4.1	26.8	129.9	3.2	54" RCP
WC-P4.8	1262	7.5	1265.7	3.7	29.0	158.9	11.4	42" RCP
WC-P4.9	1274	2	1279.0	5.0	11.9	39.2	2.9	24" RCP
WC-P4.10	1248	3	1251.9	3.9	12.8	13.6	3.1	24" RCP

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
WC-P4.11	1261	0.8	1265.2	4.2	11.8	174.5	0.0	Control Structure
WC-6A Reservoir	1115.2	71.8	1124.7	9.5	886.7	131.6	629.1	SCS structure
WC-P4.12	1123	3.9	1127.4	4.4	18.7	258.6	9.2	Overflow Weir
WC-P4.13	1150	8.5	1153.9	3.9	35.6	566.1	19.9	Control Structure
WC-P5.1	1220	4.6	1224.9	4.9	24.6	110.3	7.4	42" RCP
WC-P5.2	1200	7.8	1205.0	5.0	41.3	182.4	12.1	54" RCP
WC-P5.3	1152	3.1	1157.4	5.4	19.2	108.9	3.4	36" RCP
WC-P5.4	1148	3.3	1152.3	4.3	15.9	180.5	2.9	54" RCP
WC-P5.8	1100	0.9	1104.8	4.8	5.1	58.9	2.1	27" RCP
WC-P5.9	1062	7.5	1066.7	4.7	43.5	1245.7	13.8	Overflow Weir
WC-P5.10	1180	3.6	1183.7	3.7	14.5	36.6	3.7	30" RCP
WC-P5.11	1096	6.4	1100.8	4.8	32.8	63.2	7.1	30" RCP
WC-P5.12	1052	4.0	1057.9	5.9	26.5	98.2	6.8	36" RCP
WC-P6.1	1097	4.0	1101.1	4.1	17.8	29.1	3.6	24" RCP
WC-P6.2	1084	4.2	1088.1	4.1	18.6	20.9	4.6	18" RCP
WC-P6.3	1045	8.5	1048.2	3.2	28.5	109.9	10.9	(2)42" Culvert

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
WC-P6.4	1044	4.0	1049.0	5.0	22.0	42.3	4.2	36" RCP
WC-P6.5	1039	10.1	1042.7	3.7	39.1	375.4	10.5	Control Structure
WC-P6.8	1220	3.2	1224.1	4.1	14.3	7.5	3.9	18" RCP
WC-P6.9	1104	2.3	1108.9	4.9	18.1	193.7	N.A.	54" RCP
WC-P6.10	1056	7	1060.8	4.8	35.9	165.7	15.4	48" RCP
WC-P6.11	1034	7	1037.9	3.9	28.7	57.7	14.5	(2) 54" Culverts
WC-P6.13a	1031	5.8	1034.2	3.2	22.1	135.6	9.7	48" RCP
WC-P6.13b	1020	9.6	1024.2	4.2	42.2	183.1	21.7	48" RCP
WC-P6.14	1009	N.A.	1018.0	9.0	N.A.	2087.2	N.A.	Bridge

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
ZUMBRO RIVER DISTRICT								
ZR-P1.6	1120	3	1124.1	4.1	13.4	19.1	2.4	18" RCP
ZR-P1.7a	1130	3	1134.7	4.7	15.6	57.2	4.1	30" RCP
ZR-P1.7b	1124	3.9	1128.9	4.9	21.1	67.2	5.5	36" RCP
ZR-P1.8a	1120	5	1124.2	4.2	22.5	68.8	5.9	Control Structure
ZR-P1.9	1028	1.8	1032.2	4.2	8.7	15.4	1.8	18" RCP
ZR-P1.10	1004	N.A.	1016.9	12.9	N.A.	13852	N.A.	Bambler Lake
ZR-P2.1a	1140	0.2	1145.5	5.5	6.9	192.8	18.9	54" RCP
ZR-P2.1b	1080	4	1084.7	4.7	20.6	236.5	10.4	54" RCP
ZR-P2.2	1168	3.7	1173.5	5.5	22.9	77.4	5.7	33" RCP
ZR-P2.3	1074	2.9	1078.4	4.4	14.1	97.2	4.4	36" RCP
ZR-P2.5a	1200	3.2	1204.5	4.5	14.0	23.5	3.3	24" RCP
ZR-P2.5b	1136	3	1139.5	3.5	9.1	28.1	2.9	24" RCP
ZR-P2.5c	1068	2	1072.7	4.6	10.4	184.9	6.3	54" RCP
ZR-P2.5d	1040	2.6	1045.0	5.2	15.5	211.6	2.7	54" RCP
A2.7-Mayowd Rd		N.A.		0	N.A.		N.A.	Bridge

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
ZR-P2.8	1016	2.9	1020.4	4.4	14.1	97.4	6.1	36" RCP
A3.1-Hwy 52	998	N.A.	1011.5	13.5	N.A.	13853	3.3	Bridge
ZR-P3.5a	1080	1.8	1084.7	4.7	9.9	139.3	4.4	42" RCP
ZR-P3.7	1025	2.7	1028.6	3.6	10.7	14.7	2.4	18" RCP
A3.8-12th St.SE	987	N.A.	1001.8	14.8	N.A.	13857	N.A.	Bridge
A3.11-Broadway	976	N.A.	992.5	16.5	N.A.	13854	N.A.	Bridge
A3.12-3rd Ave.SE	972	N.A.	986.5	14.5	N.A.	13854	N.A.	Bridge
ZR-P4.3a	1080	0.1	1086.3	6.3	2.1	64.9	0.3	30" RCP*
ZR-P4.3b	1153	0	1161.6	8.6	3.4	13.7	N.A.	15" RCP*
ZR-P4.3c	1040	0.9	1045.1	5.1	7.2	169.7	2.8	48" RCP
ZR-P4.4	1070	1.2	1073.4	3.4	5.9	49.7	2.6	30" RCP
ZR-P4.5	985	0.6	989.9	4.9	4.1	8.9	1.6	15"RCP
ZR-P4.6	985	3.8	989.4	4.4	17.9	111.1	4.6	42" RCP
A4.5-37th St.NE	952	N.A.	972.3	20.3	N.A.	20317	N.A.	Bridge

* Calculated from data for ponds currently being proposed for development

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
SILVER CREEK DISTRICT								
SR-2	1165	98.3	1172.4	7.4	1029.1	103.2	741.0	SCS Structure
SC-P1.4b	1160	2.1	1163.7	3.7	8.8	31.1	2.6	24" RCP
SC-P1.5a	1170	1.4	1174.1	4.1	7.1	9.44	1.6	15" RCP
A1.6-Sil.Ck.Rd	1042	N.A.	1050.8	8.8	N.A.	1458.4	N.A.	Road Crossing
SC-P1.6b	1100	2.1	1105.1	5.1	13.1	106.5	5.4	36" RCP
SC-P1.6c	1074	2	1078.1	4.1	9.5	34.4	2.1	24" RCP
SC-P1.7a1	1139	2.8	1143.9	4.9	15.7	84.4	5.1	36" RCP
SC-P1.7a2	1135	4.4	1140.2	5.2	25.1	85.2	6.8	36" RCP
SC-P1.7a3	1096	4.2	1100.2	4.2	19.3	271.1	5.5	54" RCP
SC-P1.7b1	1110	5.8	1114.5	4.5	28.5	185.3	8.6	48" RCP
SC-P1.7b2	1165	7.4	1169.9	4.9	39.1	358.5	14.4	60" RCP
SC-P1.8a	1062	2.2	1067.0	5	13.2	83.3	4.4	36" RCP
A1.8-Cty Rd 9	1058	9.8	1062.0	4	55.5	348.2	N.A.	Box Culvert
SC-P1.9a	1060	2.4	1064.0	4	10.7	16.4	2.5	18" RCP
A1.10-East Cir.Dr	1006	N.A.	1014.1	8.1	N.A.	2428.1	N.A.	Bridge

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
SC-P1.11	1025	4.3	1029.7	4.7	22.1	54.6	5.6	30" RCP
School Pond	1220	0.5	1225.8	5.8	5.8	8.5	2.1	Orifice Outlet
SC-P1.12a1	1120	2.8	1124.0	4	14.5	104	10.2	48" RCP
SC-P1.12a2	1082	2.9	1086.2	4.2	15.1	58.7	3.5	24" RCP
SC-P1.12b	1016	1.6	1019.9	3.9	9.4	183.8	2.9	54" RCP

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
HADLEY VALLEY CREEK DISTRICT								
A2.1-Cty Rd 124	1098	N.A.	1102.4	4.4	N.A.	426.6	N.A.	10'x10' Box
HV-P1.2	1075	14	1080.7	5.7	83.9	776.5	40.0	20' weir
HV-P2.5	1000	9.5	1005.2	5.2	53.9	830.6	23.3	22' weir
HV-P1.6a	1150	1.4	1154.9	4.9	8.3	23.9	2.0	24" RCP
HV-P1.6c	1120	2.6	1125.1	5.1	15.9	158.2	6.1	48" RCP
HV-P1.6d	1035	4.1	1040.6	5.6	25.3	241.2	7.7	48" RCP
HV-P1.7a	1100	2.8	1104.1	4.1	13.0	163.8	7.2	48" RCP
HV-P1.7b	1035	3.3	1039.9	4.9	18.6	160	4.6	48" RCP
HV-P1.8a	1110	3	1114.8	4.8	16.1	80.8	4.7	36" RCP
HV-P1.8b	1040	2.5	1044.5	4.5	12.8	106.4	3.7	42" RCP
HV-P1.9	1018	6	1022.5	4.5	29.9	608.6	8.5	20' weir
HV-P1.11	1006	4.7	1010.9	4.9	25.0	86	7.1	36" RCP
A1.12-TH 63	980	N.A.	989.6	9.6	N.A.	1588.1	N.A.	Bridge
HV-P1.13	988	2.9	992.5	4.5	14.6	20.3	3.2	21" RCP

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
KINGS RUN DISTRICT								
KR-P1.1 *	1070	Upstream Stor.	1076.9	6.9	142.0	370.8	48.1	Control Structure
KR-P1.2	1086	6.2	1091.2	5.2	34.9	132.8	12.1	Control Structure
KR-P1.4	1057	8.2	1061.7	4.7	41.5	188.2	16.5	54" RCP
KR-P1.5a	1064	2.7	1068.8	4.8	14.9	16.1	3.1	18" RCP
KR-P1.5b	1055	2.7	1059.9	4.9	15.2	17.3	3.1	18" RCP
KR-P1.6	1041	2	1045.8	4.8	10.9	61.2	3.2	27" RCP
S. 50th Ave. **	1038	N.A.	1043.1	5.1	N.A.	229.3	N.A.	(2) 48" RCPArch
N. 50th Ave. **	1036	N.A.	1040.8	4.8	N.A.	406.3	N.A.	(2) 48" RCPArch
KR-P1.7a	1040	4.4	1044.8	4.8	23.2	53.4	5.6	30" RCP
KR-P1.8a	1125	2.8	1129.9	4.9	16.1	89.5	5.3	36" RCP
KR-P1.8b	1125	2.1	1129.3	4.3	10.1	32.2	2.8	24"@1.0%
KR-P1.8c	1064	10.4	1068.8	4.8	52.8	217.6	32.4	54" RCP
KR-P1.9a	1060	1.9	1062.9	2.9	6.0	5.7	1.4	12" RCP
KR-P1.9b	1070	0.4	1072.3	2.3	1.1	150	0.7	overland
KR-P1.9c	1030	0.1	1035.2	5.2	0.3	430.5	N.A.	2-48"@1.0%

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
KR-P1.10	1102	1.6	1106.4	4.4	8.0	16.1	2.1	18" RCP
KR-P1.11	1031	1.3 mult. levels	1037.6	6.6	17.7	447.1	4.3	2-stage weir
KR-P1.12	1025.5	See Model	1031.8	6.3	0.0	63.3	N.A.	48"@0.5%
KR-P1.13	1025	1.4	1030.2	5.2	9.1	103.3	5.1	36" RCP
A1.16-Cty Rd 22	1019	N.A.	1025.1	6.1	N.A.	921.8	N.A.	Ex. Box Stuctures
KR-P1.17	1016	4.4	1021.7	5.7	27.8	34.3	11.1	36" RCP
KR-P1.18a	1050	3.6	1054.2	4.2	16.4	105.5	5.9	36" RCP
KR-P1.18b	1055	1.5	1060.0	5	7.2	36.1	2.0	24" RCP
A1.19-Hwy 52	1006	0.1	1009.5	3.5	0.8	1019.3	N.A.	3-10X10
KR-P2.1a	1090	2.7	1094.3	4.3	12.8	30.1	3.1	24" RCP
KR-P2.1b	1050	4.3	1054.9	4.9	23.1	145.3	12.7	42" RCP
KR-P2.2a	1024	7.8	1029.2	5.2	45.7	333.5	27.9	60" & 54" RCP
KR-P2.2b	1016	N.A.	1021.6	5.6	N.A.	354.5	N.A.	2-60" Eq. CMPs
KR-P2.3	1050	2.1	1054.9	4.9	11.7	64.1	5.8	30" RCP
KR-P2.5a	1002	5.5	1007.1	5.1	30.9	678.2	23.4	Control Structure
KR-P2.7	1000	3.1	1004.5	4.5	15.5	78.8	4.8	30" RCP

Appendix A-2: Stormwater Basin Parameters

Watershed Pond ID#	Normal Water Level Elevation (NWL) (ft)	Basin Surface Area at NWL (Ac.)	100 Year High Water Level (HWL) (ft)	100 Year Water Level Fluctuation (ft)	100 Year Detention Volume (Ac.-Ft)	100 Year Peak Discharge (cfs)	Water Quality Volume (Ac.-Ft)	Basin Primary High Flow Outlet
KR-P2.8a	1036	2.5	1040.9	4.9	13.7	87.8	3.1	36" RCP
KR-P2.8b	1005	2.4	1009.8	4.8	12.9	61.4	5.1	36" RCP
KR-P2.9a	1036	1.9	1040.8	4.8	10.7	35.7	2.8	24" RCP
KR-P2.9b	1008	1.9	1012.2	4.2	9.0	49.0	3.9	27" RCP
A2.10-18th Ave.	986	0.1	994.5	8.5	2.1	2348.5	N.A.	Bridge
KR-P2.11	990	2.6	994.5	4.5	13.1	59.8	3.9	30" RCP
A2.12-55th St.NW	960	N.A.	967.9	7.9	N.A.	2133.4	N.A.	3 - 10' RCPArch
KR-P2.13a	1005	1.9	1010.2	5.2	11.5	63.9	4.3	30" RCP
KR-P2.13b	980	1.0	985.7	5.7	7.9	204.1	N.A.	42" RCP
KR-P2.13c	965	3.0	970.3	5.3	18.2	166.1	7.5	48" RCP
KR-P3.1	1056	3.3	1062.0	6	22.5	189.3	12.5	48" RCP
KR-P3.2	1038	3.8	1043.8	5.8	25.1	190.4	11.6	48" RCP
A3.3-18th Ave.	1020	N.A.	1024.3	4.3	N.A.	431.7	N.A.	bridge
KR-P3.5 ***	995	0.5	1000.1	5.1	5.6	63.8	N.A.	30" RCP Ex.

* Assumed storage in upper portion of watershed.
** North and South crossings under 50th Ave. N.W. with proposed outlets to correct current capacity problem.
*** Proposed detention area for existing downstream capacity problem

WATER QUALITY RESULTS FOR BEAR CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
BC-P1.2 *	199637	108.7	324	0.177	2550	1.388	294	0.160	107	0.058
BC-P1.3	25962	28.1	86	0.093	1026	1.113	99	0.107	20	0.021
BC-P1.4	17606	28.6	58	0.094	686	1.114	66	0.107	13	0.021
BC-P1.6	35893	28.5	117	0.093	1393	1.105	134	0.106	27	0.021
BC-P1.9	387748	97.6	760	0.191	6628	1.669	706	0.178	209	0.053
BC-P1.1	7725	25.3	33	0.108	358	1.172	30	0.097	6	0.019
BC-P1.11	12313	17.4	129	0.182	1278	1.807	57	0.080	36	0.051
BC-P1.12	2961	18.0	29	0.178	297	1.804	14	0.083	9	0.053
BC-P1.14	58425	28.8	191	0.094	2268	1.117	219	0.108	44	0.022
BC-P1.15	3222	18.1	32	0.179	322	1.812	15	0.083	9	0.053
BC-P1.17	21981	28.5	72	0.093	856	1.109	82	0.107	17	0.021
BC-P1.18	1523	17.8	15	0.177	153	1.789	7	0.083	4	0.052
BC-P1.21	4796	16.4	46	0.158	478	1.636	29	0.100	15	0.050
BC-P1.23	2803	18.1	28	0.179	280	1.813	13	0.084	8	0.053
BC-P1.24	3773	18.0	38	0.179	379	1.812	17	0.083	11	0.053
BC-P1.25	2725	18.6	26	0.181	266	1.819	12	0.084	8	0.054
SCS BR-1	54494	5.9	536	0.058	6651	0.718	506	0.055	83	0.009
BC-P2.6	2015	16.9	20	0.170	208	1.738	9	0.079	6	0.050
BC-P2.7a	1846	17.1	19	0.173	190	1.757	9	0.080	5	0.051
BC-P2.7b	7729	17.2	79	0.174	799	1.775	36	0.081	23	0.051

WATER QUALITY RESULTS FOR BEAR CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
BC-P2.8b	4192	15.9	50	0.188	475	1.799	19	0.071	12	0.045
A2.9 **	1387418	48.2	4192	0.146	27249	0.946	2111	0.073	895	0.031
BC-P2.12	2583	16.6	26	0.168	266	1.711	12	0.078	8	0.049
BC-P2.15	2573	18.1	25	0.179	258	1.816	12	0.083	8	0.053
BC-P2.16a	1327	17.5	13	0.177	136	1.801	6	0.082	4	0.052
BC-P2.16	8569	17.2	84	0.168	862	1.727	46	0.092	25	0.051
End ***	1427861	47.0	4796	0.158	30391	1.001	2223	0.073	988	0.033

* Badger Run at entrance to study area

** Bear Creek at entrance to study area

*** Bear Creek at confluence with Badger Run

WATER QUALITY RESULTS FOR CASCADE CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
Cascade Ck *	822648	82.0	1360	0.136	12287	1.224	1415	0.141	390	0.039
CC-P1.4a	2227	19.3	23	0.192	231	1.820	10	0.083	6	0.051
CC-P1.4b	2637	18.8	25	0.187	252	1.880	11	0.087	8	0.055
CC-P1.5a	2494	17.5	25	0.177	256	1.801	12	0.082	7	0.052
CC-P1.5b	1890	16.5	19	0.170	198	1.732	9	0.080	6	0.050
CC-P1.5c	922214	82.4	1736	0.155	14748	1.317	1558	0.139	544	0.049
45th Ave.SE	979850	83.5	2026	0.173	16085	1.370	1625	0.138	615	0.052
CC-P1.10a	2993	21.1	30	0.213	307	2.162	14	0.099	9	0.063
CC-P1.10c	640550	53.5	1419	0.119	11810	0.986	1134	0.095	417	0.035
KR3	25202	22.5	85	0.076	1012	0.905	97	0.087	19	0.017
KR7	58622	21.8	194	0.072	2297	0.854	222	0.082	44	0.016
A2.2-Cty Rd 104	55542	29.9	194	0.104	2169	1.168	195	0.105	43	0.023
CC-P2.6a	4479	11.3	36	0.092	429	1.084	58	0.146	15	0.039
CC-P2.6b	1865	12.4	15	0.097	170	1.134	23	0.153	6	0.041
CC-P2.7	10742	17.3	106	0.171	1098	1.769	54	0.088	33	0.053
A2.8 Cty Rd 22	343210	39.9	1089	0.127	9325	1.084	928	0.108	293	0.034
CC2.9,10.	11084	19.2	100	0.174	990	1.719	54	0.094	31	0.053
CC-P2.12	369410	39.6	1291	0.138	11026	1.182	1034	0.111	342	0.037
KR6	16984	15.7	168	0.155	1725	1.594	82	0.076	49	0.045
CC-P3.4	3037	14.4	31	0.147	330	1.569	21	0.099	10	0.047

WATER QUALITY RESULTS FOR CASCADE CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
CC-P3.7	9852	26.1	95	0.252	1039	2.758	77	0.205	33	0.086
CC-P3.8	176583	46.0	875	0.228	5816	1.515	611	0.159	325	0.085
CC-P4.1,2	248591	10.6	1990	0.085	25126	1.071	1893	0.081	373	0.016
CC-4.2a	854067	71.3	1893	0.158	15747	1.315	1512	0.126	557	0.046
CC-4.2b	1323	13.5	14	0.139	139	1.478	7	0.072	4	0.041
CC-4.2c	1588	16.2	16	0.167	166	1.774	8	0.086	5	0.049
CC-4.2d	1455	14.9	15	0.153	152	1.626	8	0.079	5	0.045
CC-P4.3	1890	16.5	19	0.170	198	1.732	10	0.080	6	0.050

* Main branch of Cascade Creek at entrance to study area assuming conservation practices in upper portion of watershed

WATER QUALITY RESULTS FOR HADLEY VALLEY CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
HV-P1.2	25675	13.6	312	0.165	2534	1.339	87	0.046	25	0.013
HV-P1.6a	1143	14.9	14	0.188	135	1.759	5	0.067	3	0.043
HV-P1.6c	7598	24.6	66	0.213	569	1.839	24	0.077	17	0.056
HV-P1.6d	17161	27.8	135	0.218	1149	1.860	51	0.082	38	0.061
HV-p1.7a	5527	19.3	52	0.182	520	1.816	24	0.085	16	0.055
HV-P1.7b	8750	19.3	82	0.181	817	1.802	38	0.084	25	0.055
HV-P1.8a	3118	18.3	31	0.180	310	1.818	14	0.084	9	0.054
HV-P1.8b	5711	18.8	55	0.182	554	1.820	26	0.085	17	0.054
HV-P1.9	37465	22.1	336	0.199	3118	1.841	139	0.082	95	0.056
HV-P1.11	4663	18.1	46	0.179	465	1.807	22	0.084	14	0.053
HV-P1.13	2093	18.1	21	0.180	209	1.811	10	0.084	6	0.054

WATER QUALITY RESULTS FOR KINGS RUN WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
KR-P1.1	51611	33.7	178	0.116	2064	1.349	190	0.124	42	0.028
KR-P1.2	11318	28.2	38	0.093	447	1.113	43	0.107	9	0.021
KR-P1.4	20568	25.3	160	0.197	1179	1.452	95	0.117	35	0.043
KR-P1.5a	2043	18.0	20	0.180	206	1.816	10	0.085	6	0.054
KR-P1.5b	2247	19.8	22	0.198	226	1.998	11	0.093	7	0.059
KR-P1.6	1952	18.1	19	0.180	196	1.816	9	0.085	6	0.054
KR-P1.7a	3642	18.0	36	0.179	367	1.808	17	0.084	11	0.054
KR-P1.8a	5761	29.5	18	0.094	218	1.114	21	0.108	4	0.022
KR-P1.8b	2882	27.6	10	0.092	115	1.105	11	0.106	2	0.021
KR-P1.8c	26067	32.3	156	0.193	1252	1.550	81	0.100	29	0.036
KR-P1.9a	595	12.8	8	0.166	79	1.693	4	0.078	2	0.049
KR-P1.9b	1289	18.6	13	0.184	129	1.858	6	0.087	4	0.055
KR-P1.10	1448	18.0	14	0.179	145	1.805	7	0.084	4	0.053
KR-P1.11	62352	26.5	303	0.129	3118	1.324	243	0.103	76	0.032
KR-P1.13	3930	17.0	40	0.173	403	1.738	19	0.081	12	0.051
A1.16-Cty Rd 22	159031	42.6	988	0.265	7754	2.079	523	0.140	229	0.061
A1.19-Hwy 52	228720	50.2	1286	0.282	9931	2.181	688	0.151	359	0.079
KR-P1.18a	1781	18.1	18	0.180	179	1.814	8	0.085	5	0.054
KR-P1.18b	2138	21.7	21	0.216	215	2.177	10	0.101	6	0.064
KR-P1.17	7073	16.9	69	0.164	723	1.728	38	0.091	22	0.053
KR-P2.1a	2039	18.0	20	0.180	205	1.812	10	0.084	6	0.054

WATER QUALITY RESULTS FOR KINGS RUN WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
KR-P2.1b	19281	32.7	126	0.213	897	1.521	97	0.165	35	0.059
KR-P2.2	63401	39.3	321	0.199	2236	1.384	305	0.189	93	0.058
KR-P2.3	2699	12.6	21	0.098	244	1.141	33	0.154	9	0.042
KR-P2.5a	109251	51.2	522	0.245	3616	1.695	511	0.240	178	0.084
KR-P2.7	3091	17.5	31	0.175	314	1.783	15	0.086	9	0.053
KR-P2.8a	1479	13.7	22	0.199	194	1.789	7	0.061	4	0.039
KR-P2.8b	1951	12.3	40	0.250	38	0.239	11	0.069	7	0.043
KR-P2.9a	1995	18.3	20	0.182	200	1.832	9	0.085	6	0.054
KR-P2.9b	2699	15.5	43	0.244	323	1.857	16	0.089	10	0.055
KR-P2.11	2308	16.5	26	0.185	251	1.794	11	0.076	7	0.048
KR-P2.13a	341	3.0	3	0.030	34	0.302	2	0.014	1	0.009
KR-P2.13c	6263	18.2	80	0.233	483	1.404	29	0.086	18	0.051
outlet*	408709	47.3	2338	0.270	16610	1.921	1390	0.161	674	0.078

* Kings Run at confluence of the South Fork Zumbro River

WATER QUALITY RESULTS FOR SILVER CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
Sil. Ck. Reservior	48992	7.0	582	0.083	6681	0.958	456	0.065	75	0.011
SC-P1.4b	1410	15.2	18	0.193	166	1.795	6	0.069	4	0.044
SC-P1.5a	1004	17.4	10	0.180	105	1.813	5	0.085	3	0.054
A1.6-Silver Ck Rd	194925	21.7	1455	0.162	10820	1.204	636	0.071	217	0.024
SC-P1.6b	3118	16.8	36	0.192	335	1.800	14	0.074	9	0.047
SC-P1.6c	1445	15.2	18	0.192	170	1.795	7	0.069	4	0.044
SC-P1.7a1	3563	19.1	34	0.182	337	1.806	16	0.085	10	0.055
SC-P1.7a2	4480	18.3	44	0.181	445	1.819	21	0.085	13	0.054
SC-P1.7a3	12759	19.6	119	0.183	1181	1.811	56	0.086	36	0.056
SC-P1.7b1	5423	17.4	57	0.183	562	1.802	25	0.081	16	0.051
SC-P1.7b2	15300	20.5	142	0.190	1349	1.812	62	0.083	41	0.055
SC-P1.8a	1669	3.3	92	0.183	849	1.682	17	0.033	9	0.017
SC-P1.9a	1631	18.0	16	0.178	163	1.793	8	0.084	5	0.053
A1.10-East Cir. Dr.	285570	24.2	2159	0.183	16374	1.388	884	0.075	402	0.034
SC-P1.11	3196	16.6	36	0.186	346	1.797	15	0.077	9	0.049
SC-P1.12a1	3228	16.8	37	0.191	345	1.795	14	0.074	9	0.047
SC-P1.12a2	3551	18.5	40	0.210	380	1.974	16	0.081	10	0.052
SC-P1.12b	8148	17.6	89	0.192	833	1.799	35	0.075	23	0.049

WATER QUALITY RESULTS FOR WILLOW CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
WC-P1.7	202520	107.1	457	0.242	2856	1.511	259.9	0.137	99.9	0.053
WC-P1.8	3301	18.1	33	0.180	331	1.814	15.2	0.083	9.7	0.053
WC-P1.9	10086	17.5	100	0.174	1018	1.763	51.5	0.089	30.4	0.053
Reservior WR4	25492	11.8	305	0.141	4192	1.936	197.4	0.091	42.9	0.020
WC-P2.1	5030	19.4	38	0.148	367	1.417	20.2	0.078	6.0	0.023
WC-P2.3	2522	17.4	26	0.177	260	1.797	11.9	0.082	7.6	0.052
WC-P2.4a	3003	18.1	30	0.179	300	1.806	14	0.083	9	0.053
WC-P2.4b	4805	21.7	47	0.215	479	2.167	22	0.100	14	0.064
WC-P2.5	1252	11.6	19	0.178	195	1.803	9.0	0.083	5.7	0.053
WC-P2.6	68904	18.6	650	0.175	7123	1.924	341.4	0.092	138.0	0.037
WC-P2.7	5214	17.5	53	0.177	535	1.796	24.6	0.083	15.5	0.052
WC-P2.8	7362	18.3	73	0.180	727	1.807	340.9	0.847	21.7	0.054
WC-P2.9	4218	17.7	43	0.178	432	1.811	19.8	0.083	12.5	0.052
WC-P3.2	31703	27.9	105	0.093	1259	1.107	120.9	0.106	24.1	0.021
WC-P3.3	42967	23.5	182	0.100	2132	1.167	205.2	0.112	49.2	0.027
WC-P3.6	9062	15.3	84	0.143	892	1.509	68.0	0.115	28.3	0.048
WC-P3.7	1588	12.9	15	0.123	168	1.364	15.6	0.127	5.3	0.044
WC-P3.8	1135	16.7	12	0.175	122	1.796	5.6	0.082	3.5	0.052
WC-P3.9	5657	15.1	52	0.140	557	1.486	43.8	0.117	17.7	0.047
WC-P3.10	8201	13.9	81	0.138	864	1.468	69.9	0.119	27.7	0.047

WATER QUALITY RESULTS FOR WILLOW CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
WC-P3.11	1937	16.6	19	0.161	193	1.659	11.2	0.097	5.8	0.050
WC-P3.12	2231	15.3	27	0.186	260	1.778	10.4	0.071	6.6	0.045
WC-P3.14	78860	15.2	551	0.106	5686	1.098	421.6	0.081	152.7	0.029
WC-P4.2	8435	19.8	55	0.128	596	1.397	46.4	0.109	16.6	0.039
WC-P4.3	4768	6.9	74	0.107	694	1.003	57.6	0.083	15.6	0.023
WC-P4.5	179466	50.1	375	0.105	3956	1.105	379.6	0.106	101.0	0.028
WC-P4.6	4425	11.5	37	0.096	436	1.134	58.5	0.152	15.5	0.040
WC-P4.8	3982	9.2	60	0.139	563	1.304	46.8	0.109	12.8	0.030
WC-P4.9	2672	11.9	22	0.097	255	1.137	34.3	0.153	9.2	0.041
WC-P4.10	1157	10.2	13	0.118	139	1.223	14.8	0.131	4.0	0.035
Reservoir WC-6A	30913	3.9	593	0.075	8410	1.059	398.8	0.050	98.0	0.012
WC-P4.12	6735	17.0	76	0.192	718	1.807	29.0	0.073	18.8	0.047
WC-P4.13	21458	29.5	69	0.094	812	1.115	78.4	0.108	15.8	0.022
WC-P5.1	6442	25.8	23	0.091	276	1.106	26.3	0.105	5.1	0.021
WC-P5.2	10453	27.0	36	0.092	428	1.106	41.0	0.106	8.1	0.021
WC-P5.3	10036	24.0	45	0.108	521	1.245	42.2	0.101	11.2	0.027
WC-P5.4	11920	23.6	59	0.116	638	1.261	48.0	0.095	12.5	0.025
WC-P5.8	2338	14.2	24	0.149	256	1.554	13.2	0.080	7.5	0.045
WC-P5.9	162695	17.2	1460	0.154	16662	1.760	969.3	0.102	324.8	0.034
WC-P5.10	3275	24.0	17	0.128	190	1.391	13.3	0.098	4.6	0.034

WATER QUALITY RESULTS FOR WILLOW CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
WC-P5.11	5423	13.7	62	0.156	523	1.316	20.8	0.052	12.0	0.030
WC-P5.12	3354	13.0	52	0.201	459	1.776	14.6	0.057	9.2	0.036
WC-P6.1	2460	15.2	26	0.160	264	1.634	12.2	0.076	7.6	0.047
WC-P6.2	2338	14.2	24	0.149	256	1.554	13.2	0.080	7.5	0.045
WC-P6.3	14619	19.2	132	0.172	1358	1.780	102.2	0.134	43.9	0.058
WC-P6.4	3563	15.6	35	0.154	362	1.586	17.8	0.078	10.8	0.047
WC-P6.5	20251	12.9	193	0.123	2013	1.279	170.2	0.108	63.5	0.040
WC-P6.8	1632	15.8	16	0.153	160	1.552	7.4	0.072	4.7	0.045
WC-P6.9	32488	78.6	134	0.325	679	1.642	42.0	0.102	48.7	0.118
WC-P6.10	10086	14.1	108	0.151	1055	1.480	60.2	0.084	29.7	0.042
WC-P6.11	4508	9.9	39	0.086	463	1.016	62.0	0.136	16.3	0.036
WC-P6.12	6417	14.9	62	0.144	636	1.478	39.4	0.092	20.4	0.047
WC-P6.13	10846	13.3	108	0.132	1115	1.363	82.8	0.101	33.8	0.041
Outlet *	0	0.0	0	0.000	0	0.000	0.0	0.000	0.0	0.000

* Willow Creek at confluence with Bear Creek

WATER QUALITY RESULTS FOR ZUMBRO CREEK WATERSHED

Watershed Pond ID#	Suspended Solids		Total Phosphorus		Total Kjeldahl Nitrogen		Zinc		Lead	
	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)	Annual Dis.Load (Lbs)	Annual Mean Conc. (mg/L)
ZR-P1.6	1645	14.5	21	0.188	200	1.762	8	0.067	5	0.042
ZR-P1.7a	2242	15.9	27	0.189	253	1.798	10	0.073	6	0.046
ZR-P1.7b	3142	15.9	37	0.189	355	1.793	14	0.073	9	0.046
ZR-P1.8a	2856	12.9	44	0.201	392	1.776	13	0.057	8	0.036
ZR-P1.9	1243	17.6	13	0.178	128	1.803	6	0.083	4	0.053
ZR-P2.1b	6129	15.2	79	0.196	719	1.782	26	0.065	17	0.042
ZR-P2.2	5319	20.4	36	0.137	336	1.290	20	0.077	4	0.016
ZR-P2.3	2987	15.5	32	0.167	271	1.411	11	0.056	2	0.012
ZR-P2.5a	2183	19.4	17	0.154	177	1.573	10	0.086	45	0.403
ZR-P2.5b	1705	16.9	18	0.182	182	1.805	8	0.080	5	0.051
ZR-P2.5c	9430	21.3	84	0.190	781	1.763	36	0.080	22	0.051
ZR-P2.5d	11005	19.9	102	0.186	973	1.763	44	0.080	28	0.050
ZR-P2.8	5055	19.3	48	0.183	476	1.816	22	0.085	14	0.055
ZR-P3.5	3196	19.7	30	0.184	295	1.820	14	0.085	9	0.056
ZR-P3.7	1598	17.4	16	0.176	164	1.786	8	0.083	5	0.052
ZR-P4.3c	5657	21.3	52	0.198	557	1.877	44	0.097	18	0.053
ZR-P4.4	1222	17.5	13	0.177	136	1.801	6	0.082	4	0.049
ZR-P4.5	1039	14.9	11	0.150	116	1.531	5	0.070	3	0.042
ZR-P4.6	4978	19.8	46	0.184	490	1.746	39	0.090	16	0.049

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
BEAR CREEK DISTRICT									
BC1.1	BC1.2	100	101.0	400	42	101	40,560	14,196	54,756
BC1.3	BC1.4	192	176.4	700	48	116	80,990	28,347	109,337
BC1.5	BC1.6	291	319.2	400	60	152	60,840	21,294	82,134
BC1.7	BC1.8	50	82.1	1300	36	77	99,710	34,899	134,609
BC1.9	BC1.10	70	82.1	800	36	77	61,360	21,476	82,836
BC1.10	BC1.13	108	101.0	400	42	101	40,560	14,196	54,756
BC1.11	BC1.13	36	67.0	800	36	77	61,360	21,476	82,836
BC1.12	BC1.13	33	50.5	800	30	56	44,720	15,652	60,372
BC1.13	BC-P1.10	224	197.0	1300	54	139	180,830	63,291	244,121
BC1.15	BC1.16	37	58.3	1200	30	56	67,080	23,478	90,558
BC1.16	BC1.17	72	94.8	2100	36	77	161,070	56,375	217,445
BC1.17	BC-P1.11	522	610.0	500	CHAN	22	11,000	3,850	14,850
BC1.18	BC-P1.11	39	58.3	600	30	56	33,540	11,739	45,279
BC-P1.11	BC1.19	704	379.2	600	54	139	83,460	29,211	112,671
BC1.20	BC1.21	33	50.5	800	30	56	44,720	15,652	60,372
BC1.21	BC1.22	56	82.1	1200	36	77	92,040	32,214	124,254

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
BC1.22	BC-P1.12	99	142.8	700	42	101	70,980	24,843	95,823
BC-P1.12	BC1.19	160	49.3	500	30	56	27,950	9,783	37,733
BC1.19	BC1.23	864	430.0	900	CHAN	22	19,800	6,930	26,730
BC1.24	BC-P1.15	32	50.5	900	30	56	50,310	17,609	67,919
BC1.25	BC1.26	46	67.0	600	36	77	46,020	16,107	62,127
BC1.26	BC-P1.15	86	123.7	900	42	101	91,260	31,941	123,201
BC-P1.15	BC-P1.15b	156	123.7	400	42	101	40,560	14,196	54,756
BC1.28	BC1.30	44	67.0	600	36	77	46,020	16,107	62,127
BC1.29	BC1.30	45	67.0	300	36	77	23,010	8,054	31,064
BC1.30	BC1.31	111	123.7	1200	42	101	121,680	42,588	164,268
BC1.31	BC1.32	152	176.4	700	48	116	80,990	28,347	109,337
BC1.32	BC-P1.21	193	260.7	200	60	152	30,420	10,647	41,067
BC-P1.21	BADGER RUN	241	70.7	200	36	77	15,340	5,369	20,709
BC1.34	BC-P1.18	38	58.3	800	30	56	44,720	15,652	60,372
BC1.35	BC1.36	32	61.2	1300	30	56	72,670	25,435	98,105
BC1.36	BC1.38	70	94.8	700	36	77	53,690	18,792	72,482
BC1.37	BC1.38	33	65.2	1300	30	56	72,670	25,435	98,105

Pipe Designation		Drainage Area (Ac)	Design Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Subtotal Cost ($)	Additional Cost ($)	Total Cost ($)
Flow From	Flow To								
BC1.38	BC-P1.23	131	164.2	600	48	116	69,420	24,297	93,717
BC-P1.23	BC-P1.23b	149	90.0	200	36	77	15,340	5,369	20,709
BC-P1.23b	BADGER RUN	150	60.9	200	30	56	11,180	3,913	15,093
BC1.40	BC1.42	38	65.2	1500	30	56	83,850	29,348	113,198
BC1.41	BC1.42	36	64.1	600	30	56	33,600	11,760	45,360
BC1.42	BC1.43	60	101.0	700	42	101	70,980	24,843	95,823
BC1.43	BC1.44	106	209.0	600	54	139	83,460	29,211	112,671
BC1.44	BC-P1.24	115	270.0	900	CHAN	22	19,800	6,930	26,730
BC1.46	BC-P1.25	96	241.0	500	54	139	69,550	24,343	93,893
BC2.1	BC2.2	50	71.5	600	30	56	33,540	11,739	45,279
BC2.2	BC2.3	108	149.8	700	42	101	70,980	24,843	95,823
BC2.3	BC2.4	142	203.7	1000	48	116	115,700	40,495	156,195
BC2.4	BC-P2.8	191	241.3	1500	54	139	208,650	73,028	281,678
BC2.5	BC-P2.8	37	59.9	800	36	77	61,360	21,476	82,836
BC-P2.8	BEAR CREEK	301	175.6	200	48	116	23,140	8,099	31,239
BC2.7	BC-P2.7a	38	58.3	1100	30	56	61,600	21,560	83,160
BC-P2.7a	BC2.9	105	16.0	1500	18	23	35,100	12,285	47,385

Pipe Designation		Drainage Area (Ac)	Design Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Subtotal Cost ($)	Additional Cost ($)	Total Cost ($)
Flow From	Flow To								
BC2.8	BC-P2.6	44	82.1	1300	36	77	99,710	34,899	134,609
BC-P2.6	BC2.9	116	15.3	900	18	23	21,060	7,371	28,431
BC2.9	BC2.11	78	144.0	800	48	116	92,560	32,396	124,956
BC2.10	BC2.11	30	50.5	600	30	56	33,540	11,739	45,279
BC2.11	BC-P2.7	376	260.7	500	60	152	76,050	26,618	102,668
BC-P2.7	BEAR CREEK	437	175.4	300	42	101	30,420	10,647	41,067
BC1.12	BC1.13	40	59.9	600	36	77	46,020	16,107	62,127
BC1.13	BC-P2.12	62	90.3	800	42	101	81,120	28,392	109,512
BC1.14	BC1.15	38	58.3	800	30	56	44,720	15,652	60,372
BC1.15	BC-P2.12	47	67.0	300	36	77	23,010	8,054	31,064
BC-P2.12	BEAR CREEK	140	94.1	600	18	23	14,040	4,914	18,954
BC2.18	BC2.19	48	71.4	300	42	101	30,420	10,647	41,067
BC2.19	BC2.20	69	101.8	700	48	116	80,990	28,347	109,337
BC2.20	BC-P2.15	99	139.3	600	54	139	83,460	29,211	112,671
BC-P2.15	BEAR CREEK	138	94	200	18	23	4,680	1,638	6,318
BC-P2.16a	BC2.22	74	13.7	500	12	19	9,500	3,325	12,825
BC2.22	BC2.23	110	19.6	1200	21	42	50,400	17,640	68,040

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
BC2.23	BC2.24	150	27.9	1300	24	44	57,460	20,111	77,571
BC2.24	BC2.25	206	241.3	1000	54	139	139,100	48,685	187,785
BC2.25	BC-P2.16	325	319.3	400	60	152	60,840	21,294	82,134
BC-P2.16	BEAR CREEK	392	195.2	200	48	116	23,140	8,099	31,239

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
CASCADE CREEK DISTRICT									
CC1.1	CC1.2	52	71.5	1000	30	56	55,900	19,565	75,465
CC1.2	CC1.3	85	116.1	700	36	77	53,690	18,792	72,482
CC1.3	Cascade Creek	110	142.8	400	42	101	40,560	14,196	54,756
CC1.4	CC1.5	52	71.5	1100	30	56	61,490	21,522	83,012
CC1.5	Cascade Creek	95	116.1	1000	36	77	76,700	26,845	103,545
CC1.7	CC1.9	67	94.8	700	36	77	53,690	18,792	72,482
CC1.8	CC1.9	39	58.3	1200	30	56	67,080	23,478	90,558
CC1.9	CC-P1.4	95	203.7	1100	48	116	127,270	44,545	171,815
CC-P1.4	Cascade Creek	250	78.9	600	36	77	46,020	16,107	62,127
CC1.10	CC-P1.5a	52	71.5	900	30	56	50,310	17,609	67,919
CC-P1.5a	Cascade Creek	138	30.1	200	24	44	8,840	3,094	11,934
CC1.11	Cascade Creek	65	58.3	700	30	56	39,130	13,696	52,826
CC1.12	CC1.13	46	65.2	800	30	56	44,720	15,652	60,372
CC1.13	CC-P1.5b	68	94.8	500	36	77	38,350	13,423	51,773
CC-P1.5b	Cascade Creek	111	16.3	200	24	44	8,840	3,094	11,934

Pipe Designation		Drainage Area (Ac)	Design Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Subtotal Cost ($)	Additional Cost ($)	Total Cost ($)
Flow From	Flow To								
CC2.1	CC2.2	15	50.5	800	30	56	44,720	15,652	60,372
CC2.2	CC2.4	29	101.0	800	42	101	81,120	28,392	109,512
CC2.3	CC2.4	16	50.5	600	30	56	33,540	11,739	45,279
CC2.4	CC-P2.6a	78	260.7	1200	60	152	182,520	63,882	246,402
CC-P2.6a	CB-cascade Ck	162	94.2	200	36	77	15,340	5,369	20,709
CC2.5	CC2.6	15	50.5	600	30	56	33,540	11,739	45,279
CC2.6	CC-P2.6b	37	123.7	500	42	101	50,700	17,745	68,445
CC-P2.6b	CB-cascade Ck	63	31.0	200	24	44	8,840	3,094	11,934
CC2.8	CC2.9	78	89.9	1700	36	77	130,390	45,637	176,027
CC2.9	CC-P2.7	130	135.5	1100	42	101	111,540	39,039	150,579
CC-P2.7	CB-cascade Ck	482	263.6	100	60	152	15,210	5,324	20,534
CC2.10	CC2.11	28	42.0	300	30	56	16,770	5,870	22,640
CC2.11	CC2.12	37	71.4	500	42	101	50,700	17,745	68,445
CC2.12	CC-P2.7	72	101.8	1500	48	116	173,550	60,743	234,293
CC2.31	CC2.32	30	50.5	500	30	56	28,000	9,800	37,800
CC2.32	CC2.33	52	82.1	625	36	77	48,125	16,844	64,969

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
CC2.33	CC2.34	95	123.7	450	42	101	45,450	15,908	61,358
CC2.34	CC2.20	106	176.4	525	48	116	60,900	21,315	82,215
CC3.1	CC3.2	38	58.3	800	30	56	44,720	15,652	60,372
CC3.2	CC3.3	64	94.8	1100	36	77	84,370	29,530	113,900
CC3.4	CC3.6	37	58.3	600	30	56	33,540	11,739	45,279
CC3.5	CC3.6	38	58.3	1300	30	56	72,670	25,435	98,105
CC3.6	CHAN	125	241.3	150	54	139	20,865	7,303	28,168
CC3.7	CC3.8	45	65.2	600	30	56	33,540	11,739	45,279
CC3.8	CC3.9	104	123.7	800	36	77	61,360	21,476	82,836
CC3.9	CC3.10	172	241.3	150	54	139	20,865	7,303	28,168
CC3.12	CC3.14	39	58.3	500	30	56	27,950	9,783	37,733
CC3.13	CC3.14	39	58.3	500	30	56	27,950	9,783	37,733
CC3.14	CC3.15	95	142.8	1400	42	101	141,960	49,686	191,646
CC3.15	CC3.15a	125	144.0	1050	48	116	121,485	42,520	164,005
CC3.15a	CC-P3.4	140	174.0	800	54	139	111,200	38,920	150,120
CC-P3.4	CC3.16	177	33.8	1000	24	44	44,200	15,470	59,670

Pipe Designation		Drainage Area (Ac)	Design Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Subtotal Cost ($)	Additional Cost ($)	Total Cost ($)
Flow From	Flow To								
CC3.18	CC3.19	16	50.5	700	30	56	39,130	13,696	52,826
CC3.19	CC3.20	32	101.0	400	42	101	40,560	14,196	54,756
CC3.20	CC3.22	63	197.0	1000	54	139	139,100	48,685	187,785
CC3.21	CC3.22	18	58.3	600	30	56	33,540	11,739	45,279
CC3.22	CC3.23	98	278.6	400	54	139	55,640	19,474	75,114
CC3.23	CC3.27	118	292.4	700	CHAN	22	15,400	5,390	20,790
CC3.24	CHAN	16	50.5	500	30	56	27,950	9,783	37,733
CC3.25	CC3.26	16	50.5	600	30	56	33,540	11,739	45,279
CC3.26	CC3.27	28	82.1	400	36	77	30,680	10,738	41,418
CC3.27	CC-P3.6	320	292.4	1500	CHAN	22	33,000	11,550	44,550
CC4.1	CC4.2	96	99.1	1200	42	101	121,200	42,420	163,620
CC4.3	CC4.4	150	266.5	1700	54	139	236,300	82,705	319,005
CC4.32	CC-P4.2a	31	51.1	700	30	56	39,130	13,696	52,826

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
HADLEY VALLEY DISTRICT									
HV1.1	HV1.2	39	69	650	30	56	36,335	12,717	49,052
HV1.3	HV1.4	66	116.1	675	36	77	51,773	18,120	69,893
HV1.5	HV1.7	47	69	650	30	56	36,335	12,717	49,052
HV1.6	HV1.7	50	71.5	650	30	56	36,335	12,717	49,052
HV1.7	HV-P1.5	126	159.6	1200	42	101	121,680	42,588	164,268
HV1.8	HV1.9	31	58.3	575	30	56	32,143	11,250	43,392
HV1.12	HV-P1.5	29	65.2	875	30	56	48,913	17,119	66,032
HV1.13	HV1.14	66	94.8	1000	36	77	76,700	26,845	103,545
HV1.14	HV-P1.5	88	123.7	650	42	101	65,910	23,069	88,979
HV1.17	HV1.18	22	41.3	700	30	56	39,130	13,696	52,826
HV1.18	HV1.19	42	94.8	550	36	77	42,185	14,765	56,950
HV1.24	HV1.25	42	65.2	700	30	56	39,130	13,696	52,826
HV1.25	HV1.26	75	99.4	1000	36	77	76,700	26,845	103,545
HV1.28	HV-P1.6a	39	65.2	575	30	56	32,143	11,250	43,392
HV1.30	HV-P1.6b	48	71.5	800	30	56	44,720	15,652	60,372

Pipe Designation		Drainage Area (Ac)	Design Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Subtotal Cost ($)	Additional Cost ($)	Total Cost ($)
Flow From	Flow To								
HV1.32	HV1.33	45	65.2	450	30	56	25,155	8,804	33,959
HV1.33	HV1.34	61	105.9	500	36	77	38,350	13,423	51,773
HV1.35	HV1.36	30	55.3	400	30	56	22,360	7,826	30,186
HV1.37	HV1.38	89	123.7	650	42	101	65,910	23,069	88,979
HV1.38	HV1.41	131	159.6	500	42	101	50,700	17,745	68,445
HV1.39	HV1.40	53	71.5	500	30	56	27,950	9,783	37,733
HV1.40	HV1.41	68	94.8	650	36	77	49,855	17,449	67,304
HV1.41	HV-P1.7a	240	292.2	400	54	139	55,640	19,474	75,114
HV1.43	HV1.44	50	71.5	800	30	56	44,720	15,652	60,372
HV1.47	HV1.48	32	50.5	400	30	56	22,360	7,826	30,186
HV1.48	HV1.49	60	82.1	600	36	77	46,020	16,107	62,127
HV1.49	HV-P1.8a	100	123.7	450	42	101	45,630	15,971	61,601
HV1.50	HV-P1.8b	33	52.2	425	30	56	23,758	8,315	32,073
HV1.51	HV1.52	37	65.2	500	30	56	27,950	9,783	37,733
HV1.52	HV1.57	56	80.1	1200	36	77	92,400	32,340	124,740
HV1.55	HV1.56	36	67.8	550	30	56	30,745	10,761	41,506

Pipe Designation		Drainage Area (Ac)	Design Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Subtotal Cost ($)	Additional Cost ($)	Total Cost ($)
Flow From	Flow To								
HV1.56	HV1.57	48	99.4	475	36	77	36,433	12,751	49,184
HV1.57	HV-P1.11	149	149.8	1100	CHAN	40	44,000	15,400	59,400
HV1.59	HV1.60	31	50.5	900	30	56	50,310	17,609	67,919
HV1.60	HV-P1.13	53	73.4	500	36	77	38,350	13,423	51,773

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
KINGS RUN DISTRICT									
KR1.1	KR1.3	39	58.3	1100	30	56	61,490	21,522	83,012
KR1.2	KR1.3	38	58.3	925	30	56	51,708	18,098	69,805
KR1.3	KR-P1.3	97	132.2	275	42	101	27,885	9,760	37,645
KR1.4	KR1.5	36	55.3	725	30	56	40,528	14,185	54,712
KR1.5	KR1.6	66	89.9	600	36	77	46,020	16,107	62,127
KR1.7	KR1.8	43	65.2	725	30	56	40,528	14,185	54,712
KR1.8	KR-P1.5	76	99.4	650	36	77	49,855	17,449	67,304
KR1.9	KR1.10	30	50.5	650	30	56	36,335	12,717	49,052
KR1.10	KR-P1.6	60	82.1	700	36	77	53,690	18,792	72,482
KR-P1.10	KR1.13	67	16.1	900	18	23	21,060	7,371	28,431
KR1.13	KR1.15	42	94.8	1200	36	77	92,040	32,214	124,254
KR1.14	KR-P1.11	43	63.9	1125	30	56	62,888	22,011	84,898
KR1.15	KR-P1.11	69	105.9	900	42	101	91,260	31,941	123,201
KR1.17	KR1.18	25	41.3	575	30	56	32,143	11,250	43,392
KR1.18	KR1.19	43	67.0	500	36	77	38,350	13,423	51,773

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
KR1.19	KR1.20	82	142.8	600	42	101	60,840	21,294	82,134
KR1.21	KR-P1.7	90	105.9	675	42	101	68,445	23,956	92,401
KR1.22	KR-P1.7	44	46.5	600	30	56	33,600	11,760	45,360
KR1.24	KR1.25	36	58.3	725	30	56	40,528	14,185	54,712
KR1.25	KR1.26	60	82.1	525	36	77	40,268	14,094	54,361
KR1.27	KR1.28	26	43.3	625	30	56	34,938	12,228	47,166
KR1.28	KR-P1.4	42	67.0	700	36	77	53,690	18,792	72,482
KR1.29	KR1.30	26	43.3	500	30	56	27,950	9,783	37,733
KR1.31	KR1.32	24	42.1	800	30	56	44,800	15,680	60,480
KR1.33	KR1.34	40	59.8	1175	30	56	65,683	22,989	88,671
KR1.34	KR1.35	66	94.8	600	36	77	46,020	16,107	62,127
KR1.35	KR1.39	82	123.7	450	42	101	45,630	15,971	61,601
KR1.36	KR1.37	36	55.3	575	30	56	32,143	11,250	43,392
KR1.37	KR1.38	62	89.9	500	36	77	38,350	13,423	51,773
KR1.40	KR1.41	33	58.3	550	30	56	30,745	10,761	41,506
KR1.42	KR1.43	36	55.3	800	30	56	44,720	15,652	60,372

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
KR1.45	KR1.46	45	62.5	825	30	56	46,118	16,141	62,259
KR1.46	KR1.47	73	94.8	550	36	77	42,185	14,765	56,950
KR1.47	KR-P1.18	103	135.5	775	42	101	78,585	27,505	106,090
KR1.49	KR-P1.18	38	58.3	400	30	56	22,360	7,826	30,186
KR1.52	KR1.53	22	45.2	600	30	56	33,540	11,739	45,279
KR1.53	KR-P1.17	32	73.4	400	36	77	30,680	10,738	41,418
KR1.54	KR1.55	37	73.4	550	36	77	42,185	14,765	56,950
KR1.55	KR-P1.17	72	144.0	1200	48	116	138,840	48,594	187,434
KR2.1	KR-P2.1b	16	41.3	550	30	56	30,745	10,761	41,506
KR2.2	KR2.5	15	41.3	400	30	56	22,360	7,826	30,186
KR2.5	KR-P2.1b	23	73.4	500	36	77	38,350	13,423	51,773
KR2.3	KR2.4	20	41.3	600	30	56	33,540	11,739	45,279
KR2.4	KR-P2.2	35	67.0	700	36	77	53,690	18,792	72,482
KR2.6	KR2.7	16	40.9	725	30	56	40,600	14,210	54,810
KR2.8	KR2.9	21	58.3	475	30	56	26,553	9,293	35,846
KR2.9	KR2.10	36	94.8	550	36	77	42,185	14,765	56,950

Pipe Designation		Drainage Area (Ac)	Design Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Subtotal Cost ($)	Additional Cost ($)	Total Cost ($)
Flow From	Flow To								
KR2.10	KR-P3.2	53	135.5	500	42	101	50,700	17,745	68,445
KR2.11	KR-P2.1b	25	45.2	375	30	56	20,963	7,337	28,299
KR2.12	KR-P2.1b	38	58.3	600	30	56	33,540	11,739	45,279
KR2.15	KR2.16	33	58.3	725	30	56	40,528	14,185	54,712
KR2.16	KR-P2.8a	101	127.7	500	42	101	50,700	17,745	68,445
KR2.17	KR-P2.8a	31	50.5	275	30	56	15,373	5,380	20,753
KR2.19	KR2.20	33	58.3	600	30	56	33,540	11,739	45,279
KR2.20	KR-P2.9a	44	89.9	250	36	77	19,175	6,711	25,886
KR2.21	KR-P2.9a	30	41.3	625	30	56	34,938	12,228	47,166
KR-P2.9a	KR2.23	106	35.7	600	24	44	26,520	9,282	35,802
KR2.23	KR-P2.9b	20	58.3	725	30	56	40,528	14,185	54,712
KR-P2.8b	KR-P2.9b out	226	61.1	800	30	56	44,800	15,680	60,480
KR-P2.9b out	KR2.34	177	128.1	600	48	116	69,600	24,360	93,960
KR-P2.13a	KR2.24	130	63.9	500	30	56	27,950	9,783	37,733
KR2.24	KR2.25	15	50.5	900	30	56	50,310	17,609	67,919
KR2.25	KR-P2.13b	61	82.1	400	36	77	30,680	10,738	41,418

Pipe Designation		Drainage Area (Ac)	Design Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Subtotal Cost ($)	Additional Cost ($)	Total Cost ($)
Flow From	Flow To								
KR2.28	KR-P2.13b	35	55.3	675	30	56	37,733	13,206	50,939
KR-P2.13b	KR-P2.13c	301	204.1	950	42	101	95,950	33,583	129,533
KR2.30	KR2.31	32	67.0	1000	36	77	76,700	26,845	103,545
KR2.32	KR2.33	21	47.2	550	36	77	42,185	14,765	56,950
KR2.33	KR-P2.7	115	144.0	300	48	116	34,710	12,149	46,859

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
SILVER CREEK DISTRICT									
SC1.1	SC1.2	41	58.3	625	30	56	34,938	12,228	47,166
SC1.6	SC1.7	82	123.7	500	42	101	50,700	17,745	68,445
SC1.9	SC1.10	44	73.4	700	36	77	53,690	18,792	72,482
SC1.10	SC1.11	94	127.7	950	42	101	96,330	33,716	130,046
SC1.11	SC1.12	148	176.4	700	48	116	80,990	28,347	109,337
SC1.14	SC1.15	32	50.5	600	30	56	33,540	11,739	45,279
SC1.16	SC1.17	36	55.3	575	30	56	32,143	11,250	43,392
SC1.17	SC1.18	67	105.9	725	36	77	55,608	19,463	75,070
SC1.18	SC1.19	88	112.1	925	36	77	70,948	24,832	95,779
SC1.20	SC1.21	42	69.0	725	30	56	40,528	14,185	54,712
SC1.24	SC1.27	33	58.3	550	30	56	30,745	10,761	41,506
SC1.25	SC1.26	39	65.2	750	30	56	41,925	14,674	56,599
SC1.26	SC1.27	50	105.9	575	36	77	44,103	15,436	59,538

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
SC1.27	SC1.28	124	159.6	550	42	101	55,770	19,520	75,290
SC1.30	SC-P1.9a	37	65.2	525	30	56	29,348	10,272	39,619
SC-P1.9a	SC1.31	82	24.9	525	18	23	12,285	4,300	16,585
SC1.35	SC1.36	39	79.3	1200	36	77	92,040	32,214	124,254
SC1.39	SC1.40	45	56.2	675	30	56	37,733	13,206	50,939
SC1.40	SC1.41	59	99.4	600	36	77	46,020	16,107	62,127
SC1.41	SC1.42	85	123.7	325	42	101	32,955	11,534	44,489
SC1.43	SC1.44	62	116.1	675	36	77	51,773	18,120	69,893
SC1.47	SC1.48	48	7.2	675	30	56	37,733	13,206	50,939
SC1.49	SC1.50	56	94.8	900	36	77	69,030	24,161	93,191
SC1.50	SC1.51	73	135.5	775	42	101	78,585	27,505	106,090
SC1.52	SC1.53	118	32.4	750	CHAN	22	16,500	5,775	22,275
SC1.54	SC1.55	39	69.0	800	30	56	44,720	15,652	60,372
SC1.58	SC1.59	44	99.4	1050	36	77	80,535	28,187	108,722
SC1.62	SC1.63	33	50.5	800	30	56	44,720	15,652	60,372
SC1.63	CP-10	64	82.1	475	36	77	36,433	12,751	49,184

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
CP-10	EP-16	75	12.6	1050	15	27	28,350	9,923	38,273
EP-14	EP-16	46	3.5	1900	12	25	47,500	16,625	64,125
EP-15	EP-16	100	3.1	1400	12	25	35,000	12,250	47,250

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
WILLOW CREEK DISTRICT									
WC1.1	WC1.2	40	58.3	800	30	56	44,720	15,652	60,372
WC1.2	WC-P1.8	70	94.8	600	36	77	46,020	16,107	62,127
WC1.3	WC-P1.8	17	58.3	1000	30	56	55,900	19,565	75,465
WC1.5	WC1.4	45	65.2	1300	30	56	72,670	25,435	98,105
WC1.6	WC1.4	39	58.3	900	30	56	50,310	17,609	67,919
WC1.7	WC1.8	40	58.3	500	30	56	27,950	9,783	37,733
WC1.8	WC-P1.9	75	94.8	1000	36	77	76,700	26,845	103,545
WC1.9	WC-P1.9	51	71.5	800	30	56	44,720	15,652	60,372
WC-P2.1	WC2.1	254	69.1	300	30	56	16,770	5,870	22,640
WC2.2	WC2.3	50	71.5	1400	30	56	78,260	27,391	105,651
WC2.3	WC2.4	75	94.8	500	36	77	38,350	13,423	51,773
WC2.5	WC2.6	38	65.2	600	30	56	33,540	11,739	45,279
WC2.6	WC-P2.3	95	139.3	200	54	139	27,820	9,737	37,557
WC2.7	EB WILLOW	152	25.0	300	CHAN	22	6,600	2,310	8,910
WC2.9	WC2.10	101	174.9	1200	42	101	121,680	42,588	164,268

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
WC2.10	WC-P2.4	150	203.7	900	48	116	104,130	36,446	140,576
WC-P2.4	EB WILLOW	260	97.3	200	36	77	15,340	5,369	20,709
WC2.12	WC-P2.5	38	67.0	900	36	77	69,030	24,161	93,191
WC2.13	WC-P2.5	45	176.2	200	48	116	23,140	8,099	31,239
WC2.14	EB WILLOW	105	25.0	400	CHAN	22	8,800	3,080	11,880
WC2.16	WC2.17	42	65.2	800	30	56	44,720	15,652	60,372
WC2.17	WC2.18	80	105.9	1000	36	77	76,700	26,845	103,545
WC2.18	WC2.20	129	159.6	700	42	101	70,980	24,843	95,823
WC2.19	WC2.20	42	65.2	1100	30	56	61,490	21,522	83,012
WC2.20	WC-P2.7	218	278.6	400	54	139	55,640	19,474	75,114
WC-P2.7	WC2.22	321	40.8	700	24	44	30,940	10,829	41,769
WC2.21	WC2.22	37	58.2	400	30	56	22,360	7,826	30,186
WC2.22	WC-P2.8	67	142.1	800	42	101	81,120	28,392	109,512
WC2.24	WC2.25	42	65.1	600	30	56	33,540	11,739	45,279
WC-P2.9	WC2.26	233	47.1	900	30	56	50,310	17,609	67,919
WC3.1	WC3.2	24	115.0	1600	CHAN	22	35,200	12,320	47,520

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
WC3.2	WC3.3	46	205.0	800	CHAN	22	17,600	6,160	23,760
WC3.4	WC3.5	24	65.2	500	30	56	27,950	9,783	37,733
WC3.5	WC3.6	39	105.9	500	36	77	38,350	13,423	51,773
WC3.6	WC-P3.2	55	159.6	400	42	101	40,560	14,196	54,756
WC3.7	WC-P3.9	31	47.0	900	30	56	50,400	17,640	68,040
WC3.8	WC3.9	39	58.3	600	30	56	33,540	11,739	45,279
WC3.9	WC3.10	62	94.8	500	36	77	38,350	13,423	51,773
WC3.10	WC3.12	103	142.8	800	42	101	81,120	28,392	109,512
WC3.11	WC3.12	174	195.2	800	E CHAN	22	17,600	6,160	23,760
WC3.12	WC3.13	277	338.0	600	E CHAN	22	13,200	4,620	17,820
WC3.14	WC3.15	39	58.3	900	30	56	50,310	17,609	67,919
WC3.15	WC3.16	57	94.8	400	36	77	30,680	10,738	41,418
WC3.16	WC3.17	92	142.8	500	42	101	50,700	17,745	68,445
WC3.17	WC-P3.3	148	203.7	700	48	116	80,990	28,347	109,337
WC3.19	WC3.20	26	71.5	700	30	56	39,130	13,696	52,826
WC3.20	WC3.21	42	116.1	400	36	77	30,680	10,738	41,418

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
WC3.21	WC-P3.6	70	203.7	500	48	116	57,850	20,248	78,098
WC3.22	WC3.23	28	50.5	800	30	56	44,720	15,652	60,372
WC3.23	WC3.24	48	67.0	600	36	77	46,020	16,107	62,127
WC3.24	WC-P3.6	101	123.7	200	42	101	20,280	7,098	27,378
WC3.26	WC3.28	10	29.2	600	30	56	33,540	11,739	45,279
WC3.27	WC3.28	20	58.3	500	30	56	27,950	9,783	37,733
WC3.28	WC-P3.7	57	159.6	300	42	101	30,420	10,647	41,067
WC2.29	WC2.30	18	50.5	500	30	56	27,950	9,783	37,733
WC2.30	WC2.31	30	82.1	1000	36	77	76,700	26,845	103,545
WC2.31	WC2.32	45	123.7	500	42	101	50,700	17,745	68,445
WC3.34	WC-P3.11	40	67.0	1200	36	77	92,040	32,214	124,254
WC3.35	WC3.36	35	50.5	1000	30	56	55,900	19,565	75,465
WC3.36	WILLOW CK	47	71.5	600	30	56	33,540	11,739	45,279
WC4.1	WC-P4.9	19	67.0	1100	36	77	84,370	29,530	113,900
WC4.2	WC-P4.9	23	67.0	700	36	77	53,690	18,792	72,482
WC4.3	WC4.4	22	65.2	800	30	56	44,720	15,652	60,372

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
WC4.4	WC-P4.10	49	159.6	600	42	101	60,840	21,294	82,134
WC4.5	WC4.6	59	104.2	1400	36	77	107,800	37,730	145,530
WC5.1	WC5.2	45	65.2	800	30	56	44,720	15,652	60,372
WC5.2	WILLOW CK	81	105.9	900	36	77	69,030	24,161	93,191
WC5.3	WC5.4	35	67.0	900	36	77	69,030	24,161	93,191
WC5.4	WC5.5	81	101.0	800	42	101	81,120	28,392	109,512
WC5.5	WILLOW CK	97	144.0	300	48	116	34,710	12,149	46,859
WC5.6	WILLOW CK	37	55.3	1000	30	56	56,000	19,600	75,600
WC5.8	WC-P5.12	61	192.2	800	CHAN	22	17,600	6,160	23,760
WC5.9	WC-P5.12	84	252.0	700	CHAN	22	15,400	5,390	20,790
WC6.1	WC6.2	32	50.5	800	30	56	44,720	15,652	60,372
WC6.3	WC6.4	35	58.3	500	30	56	27,950	9,783	37,733
WC6.4	WC-P6.2	62	101.0	500	42	101	50,700	17,745	68,445
WC6.5	WC-P6.2	20	50.5	400	30	56	22,360	7,826	30,186
WC-P6.2	WC6.6	126	20.2	500	18	23	11,700	4,095	15,795
WC6.7	WC6.8	22	41.3	500	30	56	27,950	9,783	37,733

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
WC6.8	WC6.9	30	67.0	300	36	77	23,010	8,054	31,064
WC6.10	WC6.11	28	82.1	600	36	77	46,020	16,107	62,127
WC6.12	WC6.16	32	50.5	1300	30	56	72,670	25,435	98,105
WC6.13	WC6.15	18	82.1	600	36	77	46,020	16,107	62,127
WC6.14	WC6.15	20	58.3	400	30	56	22,360	7,826	30,186
WC6.15	WC6.16	50	135.5	500	42	101	50,700	17,745	68,445
WC6.16	WC6.17	110	349.8	400	60	152	60,840	21,294	82,134
WC6.17	WC6.18	130	349.8	500	60	152	76,050	26,618	102,668
WC6.18	WC-P6.5	155	411.5	700	66	170	119,000	41,650	160,650
WC6.19	WC-P6.5	18	50.5	400	30	56	22,360	7,826	30,186
WC6.20	WC-P6.1	30	45.3	700	30	56	39,200	13,720	52,920
WC6.21	WC6.22	27	67.0	600	36	77	46,020	16,107	62,127
WC6.22	WC-P6.10	56	144.0	900	48	116	104,130	36,446	140,576
WC6.23	WC-P6.10	471	256.3	200	CHAN	22	4,400	1,540	5,940
WC-P6.10	WILLOW CK	180	138.2	200	48	116	23,140	8,099	31,239
WC6.26	WC-P6.12	310	300.0	200	CHAN	22	4,400	1,540	5,940

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
WC6.28	WC-P6.12	59	177.4	1300	CHAN	22	28,600	10,010	38,610
WC6.29	WC-P6.13	139	423.9	1900	CHAN	22	41,800	14,630	56,430
WC6.30	WC6.31	24	45.2	400	30	56	22,360	7,826	30,186
WC6.31	WC6.32	46	82.1	1100	36	77	84,370	29,530	113,900
WC6.32	WC6.33	87	123.7	600	42	101	60,840	21,294	82,134
WC6.33	WC-P6.4	106	144.0	700	48	116	80,990	28,347	109,337

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
S.F. ZUMBRO RIVER DISTRICT									
ZR-1.1	ZR1.2	22	36.9	325	30	56	18,168	6,359	24,526
ZR1.2	ZR-P1.7a	34	59.9	1000	36	77	76,700	26,845	103,545
ZR1.3	ZR-P1.7a	64	90.3	650	42	101	65,910	23,069	88,979
ZR-P1.7a	ZR1.4	145	57.2	800	18	23	18,720	6,552	25,272
ZR1.4	ZR1.19	15+P1.7		1150	0	14	16,100	5,635	21,735
ZR-P1.7b	ZR1.9			300	0	14	4,200	1,470	5,670
ZR1.5	ZR1.7	21	41.3	800	30	56	44,720	15,652	60,372
ZR1.6	ZR1.9	34	67.0	475	36	77	36,433	12,751	49,184
ZR1.9	ZR-P1.7b	51	110.6	400	42	101	40,560	14,196	54,756
ZR1.7	ZR-P1.7b	81	110.6	625	42	101	63,375	22,181	85,556
ZR1.8	ZR-P1.7b	31	67.0	1000	36	77	76,700	26,845	103,545
ZR-P1.7b	ZR1.19	192	67.2	125	24	44	5,525	1,934	7,459
ZR1.19	ZR1.20	201	128.8	200	48	116	23,140	8,099	31,239
ZR1.20	RAMBLER LAKE	208	130.0	1175	CHAN	22	25,850	9,048	34,898
ZR1.10	ZR1.11	118	159.6	700	42	101	70,980	24,843	95,823
ZR1.11	ZR-P1.8a	162	203.7	525	48	116	60,743	21,260	82,002
ZR1.12	ZR1.13	24	50.5	600	30	56	33,540	11,739	45,279
ZR1.13	ZR-P1.8a	35	67.0	525	36	77	40,268	14,094	54,361

Pipe Designation		Drainage	Design				Subtotal	Additional	Total
Flow From	Flow To	Area (Ac)	Capacity (CFS)	Length (Feet)	Diameter (in)	Unit Cost ($/Lin. Ft)	Cost ($)	Cost ($)	Cost ($)
ZR-P1.8a	RAMBLER LAKE	227	68.8	350	24	44	15,470	5,415	20,885
ZR1.15	ZR-P1.8b	30	55.3	475	30	56	26,553	9,293	35,846
ZR-P1.8b	RAMBLER LAKE	69	15.4	775	18	23	18,135	6,347	24,482
ZR1.17	ZR1.18	37	59.9	800	36	77	61,360	21,476	82,836
ZR1.18	ZR-P1.6	62	90.3	775	42	101	78,585	27,505	106,090
ZR-P1.6	ZUMBRO RIVER	117	19.1	425	30	56	23,758	8,315	32,073
ZR2.1	ZR2.2	41	58.3	1275	30	56	71,273	24,945	96,218
ZR2.4	ZR2.5	60	94.8	650	36	77	49,855	17,449	67,304
ZR2.5	ZR2.6	98	142.8	1500	42	101	152,100	53,235	205,335
ZR2.8	ZR2.9	17	29.2	475	30	56	26,553	9,293	35,846
ZR3.1	ZR-P3.5a	35	58.3	400	30	56	22,360	7,826	30,186
ZR4.1	ZR4.3	49	71.5	850	30	56	47,515	16,630	64,145
ZR4.2	ZR4.3	48	71.5	1000	30	56	55,900	19,565	75,465
ZR4.3	ZR4.4	134	153.1	950	42	101	96,330	33,716	130,046
ZR4.4	ZR4.5	158	203.7	3125	48	116	361,563	126,547	488,109
ZR4.5	ZR4.6	230	261.0	900	60	152	136,800	47,880	184,680

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
BEAR CREEK DISTRICT					
BC2.30	BC2.31	8.7	30	41.3	YES
BC2.31	BC2.32	16.9	36	67.0	YES
BC3.34	BC2.35	17.1	30	50.5	NO
BC2.36	BC2.37	21.9	33	58.2	YES
BC2.37	BC2.38	34.9	36	73.4	YES
BC2.40	BC2.41	35.4	30	45.2	NO
BC2.41	BC2.42	44.2	33	58.2	YES
BC2.42	BC2.43	61.2	42	101.0	YES
BC2.43	BC2.44	72.4	48	128.8	YES
BC2.44	BC2.45	97.5	54	176.2	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
CASCADE CREEK DISTRICT					
CC3.35	CC3.36	23.3	30	43.3	YES
CC3.36	CC3.38	29.7	33	53.2	YES
CC3.37	CC3.38	12.9	30	41.3	YES
CC3.38	CC3.39	46.4	48	144.0	YES
CC3.40	CC3.41	31.8	30	48.8	YES
CC3.41	CC3.42	40.7	36	67.0	YES
CC3.42	CC3.45	67.3	42	101.0	YES
CC3.43	CC3.44	43.5	33	53.2	NO
CC3.44	CC3.45	80.1	42	101.0	YES
CC3.45	CC3.46	157.5	60	218.2	YES
CC4.1	CC4.2	72.4	36	76.4	NO
CC4.2	CC4.3	116.4	42	115.1	NO
CC4.3	CC4.4	147.9	48	164.2	YES
CC4.6	CC4.7	43.2	30	50.5	NO
CC4.7	CC4.11	50.1	33	65.1	YES
CC4.8	CC4.9	13.4	36	67.0	YES
CC4.9	CC4.11	27.4	36	67.0	YES
CC4.10	CC4.11	21.5	33	53.2	YES
CC4.11	CC4.12	121.9	54	197.0	YES
CC4.12	CC4.13	146.7	66	336.0	YES
CC4.15	CC4.16	34.2	36	47.4	NO
CC4.16	CC4.17	41.1	42	71.4	NO
CC4.17	CC4.18	49.9	48	96.6	NO
CC4.18	CC4.19	62.8	54	132.2	YES
CC4.20	CC4.21	40.1	42	95.8	NO
CC4.22	CC4.23	56.3	48	136.6	YES
CC4.25	CC4.28	76.1	42	123.7	YES
CC4.26	CC4.28	85.2	42	123.7	YES
CC4.28	CC4.31	175.5	60	260.7	YES
CC4.27	CC4.29	27.1	30	41.3	NO
CC4.29	CC4.30	40.2	36	73.4	YES
CC4.30	CC4.31	43.7	42	101.0	YES
CC2.20	CC2.21	110.2	72	423.5	YES
CC2.22	CC2.24	154.7	(2) 48	288.1	YES
CC2.23	CC2.24	23.5	30	45.2	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
CC2.25	CC2.27	34.1	42	101.0	YES
CC2.26	CC2.27	40.1	30	50.5	YES
CC2.27	CC2.28	81.1	48	144.0	NO
CC2.28	CC2.29	94.5	54	197.0	YES
CC2.29	CC2.30	103.9	66	336.0	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
HADLEY VALLEY CREEK DISTRICT					
HV1.61	HV1.62	37.2	30	55.3	YES
HV1.62	HV1.63	62.5	33	78.8	YES
HV1.63	HV1.64	81.2	42	101.0	YES
HV1.64	HV1.65	92.2	48	144.0	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
KINGS RUN DISTRICT					
KR1.44	KR1.60	27.5	30	45.2	YES
KR1.60	KR1.61	44.6	33	58.2	YES
KR1.61	KR1.62	62.6	36	73.4	YES
KR1.62	KR1.63	76.12	42	110.6	YES
KR1.63	KR1.64	86.3	48	157.8	YES
KR1.68	KR1.69	22	30	45.2	YES
KR1.69	KR1.70	28.5	33	58.2	YES
KR1.70	KR1.71	37.1	36	73.4	YES
KR2.40	KR2.41	26.5	33	58.2	NO
KR2.41	KR2.42	34.5	36	73.4	NO
KR2.42	KR2.43	0	48	229.3	YES
KR2.44	KR2.45	34.9	30	50.5	YES
KR2.45	KR2.46	51.2	36	82.1	YES
KR2.46	KR2.47	72.5	42	123.7	YES
KR2.47	KR2.48	87.8	48	176.4	YES
KR2.48	KR2.33 prop	106.7	54	241.3	YES
KR2.33 prop	KR-P2.7	139	54	215.8	YES
KR2.50	Ditch	27.1	30	45.2	YES
KR2.52	KR2.53	19.1	30	41.3	YES
KR2.53	KR2.54	25.9	36	67.0	YES
KR2.54	KR2.55	46.9	42	101.0	YES
KR2.56	KR2.57	33.9	30	50.5	NO
KR2.57	KR2.58	61.3	36	82.1	NO
KR2.58	KR2.59	78.7	42	110.6	YES
KR2.59	KR2.60	97.6	48	157.8	YES
KR2.62	KR2.63	32.1	33	58.2	YES
KR2.63	KR2.64	42.2	36	73.4	YES
KR2.65	KR2.36 prop.	21.1	30	45.2	YES
KR2.68	KR2.69	14.8	30	41.3	YES
KR2.69	KR2.70	26.2	36	67.0	YES
KR2.70	KR-P2.11	37.5	42	101.0	YES
KR3.5	KR3.6	25.6	30	45.2	YES
KR3.6	KR3.7	38.4	33	58.2	YES
KR3.7	KR3.8	69.8	36	73.4	NO
KR3.10	KR3.11	29.2	30	45.2	NO

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
KR3.11	KR3.12	52.2	36	67.0	YES
KR3.12	KR3.13	67.8	42	101.0	YES
KR3.14	KR3.16	11.5	36	67.0	YES
KR3.15	KR3.16	16.8	30	41.3	YES
KR3.18	KR3.19	44.9	30	50.5	NO
KR3.19	KR3.20	56.5	33	65.1	YES
KR3.20	KR3.21	70.1	36	82.1	YES
KR3.22	KR3.24	201.1	54	197.0	YES
KR3.23	KR3.24	N.A.	54	215.8	N.A.
KR3.26	KR3.27	19.5	30	41.3	YES
KR3.27	KR3.28	33.6	48	144.0	YES
KR3.29	KR3.30	205	60	285.6	YES
KR3.30	KR3.31	222.2	42+48	268.4	YES
KR3.31	KR3.40	290.3	48+54	373.6	YES
KR3.34	KR3.39	34.9	30	45.2	NO
KR3.37	KR3.38	33.8	30	45.2	NO
KR3.38	KR3.39	37.4	30	45.2	NO
KR3.39	KR3.40	191.8	36	73.4	NO
KR3.40	KR3.41	469	60+66	653.7	YES
KR3.42	KR3.43	16.5	30	45.2	YES
KR3.44	KR3.45	15.2	36	67.0	YES
KR3.46	KR3.47	18.9	30	41.3	YES
KR3.47	KR3.48	29.4	33	53.2	YES
KR3.48	KR3.49	37.1	36	67.0	YES
KR3.49	KR3.50	50.5	42	101.0	YES
KR3.50	KR3.51	57.7	48	144.0	YES
KR3.55	KR3.56	25.9	30	41.3	YES
KR3.56	KR3.57	46.7	33	58.2	NO
KR3.57	KR3.58	70.1	42	101.0	YES
KR3.58	KR3.60	85.3	54	197.0	YES
KR3.59	KR3.60	19.6	36	67.0	YES
KR3.60	KR3.61	115.2	54	197.0	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
SILVER CREEK DISTRICT					
SC1.65	SC1.66	28.9	30	45.2	YES
SC1.66	SC1.67	39.2	36	73.4	YES
SC1.67	SC1.68	49.6	42	110.6	YES
SC1.68	SC1.69	62.9	48	157.8	YES
SC1.70	SC1.71	19.5	36	59.9	YES
SC1.71	SC1.72	32.1	42	95.8	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
ZUMBRO RIVER DISTRICT					
ZR3.5	ZR3.6	40.4	33	53.2	NO
ZR3.6	ZR-P3.3a	46.8	36	67.0	YES
ZR3.10	ZR3.11	12.2	30	41.3	YES
ZR3.11	ZR3.14	25.4	33	58.2	YES
ZR3.12	ZR3.13	13.4	30	41.3	YES
ZR3.13	ZR3.14	16.2	33	53.2	YES
ZR3.14	ZR3.15	45.8	42	101.0	NO
ZR3.15	ZR3.16	57.7	48	144.0	YES
ZR3.20	ZR3.21	16.2	36	67.0	YES
ZR3.21	ZR3.22	67.9	42	101.0	NO
ZR3.23	ZR3.24	69.3	42	101.0	YES
ZR3.27	ZR3.28	49.3	33	53.2	NO
ZR3.28	ZR3.29	88.1	42	101.0	NO
ZR3.29	ZR3.30	107.2	48	120.5	YES
ZR3.30	ZR3.34	145.8	54	164.8	YES
ZR3.31	ZR3.32	23.1	30	41.3	NO
ZR3.32	ZR3.33	30.9	33	53.2	YES
ZR3.33	ZR3.34	42.1	48	144.0	YES
ZR3.34	ZR3.35	230.6	72	328.0	YES
ZR3.35	ZR3.39	337.4	90	593.9	YES
ZR3.36	ZR3.37	35.2	36	67.0	NO
ZR3.37	ZR3.38	53.2	48	144.0	YES
ZR3.38	ZR3.39	58.9	54	197.0	YES
ZR3.39	ZR3.40	401.4	90	593.9	YES
ZR3.40	ZR3.41	419.3	84	533.9	YES
ZR3.44	ZR3.45	31.4	36	59.9	YES
ZR3.45	ZR3.46	46.7	42	84.5	YES
ZR3.46	ZR3.48	63.3	48	120.5	YES
ZR3.47	ZR3.48	16.7	30	36.9	YES
ZR3.48	ZR3.49	91	54	176.2	YES
ZR3.50	ZR3.51	28.2	30	41.3	NO
ZR3.51	ZR3.52	51.7	48	144.0	NO
ZR3.55	ZR3.56	27.4	33	53.2	YES
ZR3.56	ZR3.57	38.7	42	101.0	YES
ZR3.58	ZR3.59	40.8	33	65.1	NO

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
ZR3.59	ZR3.60	61.4	36	76.4	NO
ZR3.60	ZR3.61	66	48	164.2	YES
ZR3.65	ZR3.66	21.1	30	41.3	NO
ZR3.66	ZR3.67	36.5	33	58.2	NO
ZR3.67	ZR3.68	45.5	36	82.1	NO
ZR3.68	ZR3.69	59.9	48	144.0	YES
ZR3.71	ZR3.72	21.9	30	45.2	NO
ZR3.72	ZR3.73	28.8	42	90.3	YES
ZR4.5	ZR4.8	11.2	36	47.4	YES
ZR4.6	ZR4.8	7.1	48	101.8	YES
ZR4.8	ZR4.9	38.1	72	299.5	YES
ZR4.9	ZR4.10/4.14	46.9	48	193.5	YES
ZR4.10	ZR4.11	8.9	60	184.4	YES
ZR4.11	ZR4.12	18.2	72	299.5	YES
ZR4.12	ZR4.13	24.9	78	370.5	YES
ZR4.14	ZR4.15	7.1	54	139.3	YES
ZR4.15	ZR4.16	14.2	48	111.6	YES
ZR4.16	ZR4.17	23.5	54	152.6	YES
ZR4.17	ZR4.18	20.5	54	152.6	YES
ZR4.18	ZR4.19	32.2	60	202.0	YES
ZR4.20	ZR4.21	11.7	30	32.0	NO
ZR4.21	ZR4.22	14.1	36	47.4	YES
ZR4.23	ZR4.24	13.1	30	29.2	NO
ZR4.25	ZR4.26	7.5	48	101.8	YES
ZR4.27	ZR4.28	8.2	60	184.4	YES
ZR4.30	ZR4.31	29.8	30	55.3	YES
ZR4.31	ZR4.32	44.1	36	89.9	YES
ZR4.32	ZR4.33	58.5	42	115.1	YES
ZR4.34	ZR4.35	34.9	33	71.3	YES
ZR4.35	ZR4.36	85.7	36	89.9	NO
ZR4.36	ZR4.37	98.2	42	135.5	NO
ZR4.37	ZR4.38	18.7	30	55.3	YES
ZR4.38	ZR4.42	141.1	48	176.4	YES
ZR4.39	ZR4.40	40.1	30	55.3	YES
ZR4.40	ZR4.41	47.7	36	89.9	YES
ZR4.41	ZR4.42	58.5	42	135.5	YES
ZR4.42	ZR4.46	177.9	54	264.3	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
ZR4.43	ZR4.44	22.9	30	41.3	YES
ZR4.44	ZR4.45	38.8	33	71.3	YES
ZR4.45	ZR4.46	45.3	36	89.9	YES
ZR4.46	ZR4.48	237.2	60	349.8	YES
ZR4.47	ZR4.48	16.4	30	41.3	YES
ZR4.48	ZR4.49	252.3	54	264.3	YES
ZR4.49	ZR4.50	261.2	60	349.8	YES
ZR4.51	ZR4.52	14.5	30	35.7	YES
ZR4.52	ZR4.53	21.9	33	46.0	YES
ZR4.53	ZR4.56	31.4	36	67.0	YES
ZR4.54	ZR4.55	32.3	33	58.2	YES
ZR4.55	ZR4.56	53.9	42	101.0	YES
ZR4.56	ZR4.57	91.1	48	157.8	YES
ZR4.60	ZR4.61	21.4	30	41.3	YES
ZR4.61	ZR4.62	47.3	36	82.1	YES
ZR4.62	ZR4.63	81.2	42	123.7	YES
ZR4.63	ZR4.64	117.1	42	142.8	YES
ZR4.65	ZR4.66	125.2	30	50.5	Pres. Flow
ZR4.66	ZR4.67	139.2	33	65.1	Pres. Flow
ZR4.68	ZR4.69	125.2	33	65.1	Pres. Flow
ZR4.69	ZR4.70	142.1	36	82.1	Pres. Flow
ZR4.71	ZR4.72	19.3	33	53.2	YES
ZR4.72	ZR4.73	28.3	36	67.0	YES
ZR4.74	ZR4.75	43.1	30	50.5	YES
ZR4.75	ZR4.76	57.2	33	65.1	YES
ZR4.77	ZR4.78	51.3	30	62.6	NO
ZR4.78	ZR4.79	61.9	36	94.8	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
BEAR CREEK DISTRICT					
BC2.30	BC2.31	8.7	30	41.3	YES
BC2.31	BC2.32	16.9	36	67.0	YES
BC3.34	BC2.35	17.1	30	50.5	NO
BC2.36	BC2.37	21.9	33	58.2	YES
BC2.37	BC2.38	34.9	36	73.4	YES
BC2.40	BC2.41	35.4	30	45.2	NO
BC2.41	BC2.42	44.2	33	58.2	YES
BC2.42	BC2.43	61.2	42	101.0	YES
BC2.43	BC2.44	72.4	48	128.8	YES
BC2.44	BC2.45	97.5	54	176.2	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
CASCADE CREEK DISTRICT					
CC3.35	CC3.36	23.3	30	43.3	YES
CC3.36	CC3.38	29.7	33	53.2	YES
CC3.37	CC3.38	12.9	30	41.3	YES
CC3.38	CC3.39	46.4	48	144.0	YES
CC3.40	CC3.41	31.8	30	48.8	YES
CC3.41	CC3.42	40.7	36	67.0	YES
CC3.42	CC3.45	67.3	42	101.0	YES
CC3.43	CC3.44	43.5	33	53.2	NO
CC3.44	CC3.45	80.1	42	101.0	YES
CC3.45	CC3.46	157.5	60	218.2	YES
CC4.1	CC4.2	72.4	36	76.4	NO
CC4.2	CC4.3	116.4	42	115.1	NO
CC4.3	CC4.4	147.9	48	164.2	YES
CC4.6	CC4.7	43.2	30	50.5	NO
CC4.7	CC4.11	50.1	33	65.1	YES
CC4.8	CC4.9	13.4	36	67.0	YES
CC4.9	CC4.11	27.4	36	67.0	YES
CC4.10	CC4.11	21.5	33	53.2	YES
CC4.11	CC4.12	121.9	54	197.0	YES
CC4.12	CC4.13	146.7	66	336.0	YES
CC4.15	CC4.16	34.2	36	47.4	NO
CC4.16	CC4.17	41.1	42	71.4	NO
CC4.17	CC4.18	49.9	48	96.6	NO
CC4.18	CC4.19	62.8	54	132.2	YES
CC4.20	CC4.21	40.1	42	95.8	NO
CC4.22	CC4.23	56.3	48	136.6	YES
CC4.25	CC4.28	76.1	42	123.7	YES
CC4.26	CC4.28	85.2	42	123.7	YES
CC4.28	CC4.31	175.5	60	260.7	YES
CC4.27	CC4.29	27.1	30	41.3	NO
CC4.29	CC4.30	40.2	36	73.4	YES
CC4.30	CC4.31	43.7	42	101.0	YES
CC2.20	CC2.21	110.2	72	423.5	YES
CC2.22	CC2.24	154.7	(2) 48	288.1	YES
CC2.23	CC2.24	23.5	30	45.2	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
CC2.25	CC2.27	34.1	42	101.0	YES
CC2.26	CC2.27	40.1	30	50.5	YES
CC2.27	CC2.28	81.1	48	144.0	NO
CC2.28	CC2.29	94.5	54	197.0	YES
CC2.29	CC2.30	103.9	66	336.0	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
HADLEY VALLEY CREEK DISTRICT					
HV1.61	HV1.62	37.2	30	55.3	YES
HV1.62	HV1.63	62.5	33	78.8	YES
HV1.63	HV1.64	81.2	42	101.0	YES
HV1.64	HV1.65	92.2	48	144.0	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
KINGS RUN DISTRICT					
KR1.44	KR1.60	27.5	30	45.2	YES
KR1.60	KR1.61	44.6	33	58.2	YES
KR1.61	KR1.62	62.6	36	73.4	YES
KR1.62	KR1.63	76.12	42	110.6	YES
KR1.63	KR1.64	86.3	48	157.8	YES
KR1.68	KR1.69	22	30	45.2	YES
KR1.69	KR1.70	28.5	33	58.2	YES
KR1.70	KR1.71	37.1	36	73.4	YES
KR2.40	KR2.41	26.5	33	58.2	NO
KR2.41	KR2.42	34.5	36	73.4	NO
KR2.42	KR2.43	0	48	229.3	YES
KR2.44	KR2.45	34.9	30	50.5	YES
KR2.45	KR2.46	51.2	36	82.1	YES
KR2.46	KR2.47	72.5	42	123.7	YES
KR2.47	KR2.48	87.8	48	176.4	YES
KR2.48	KR2.33 prop	106.7	54	241.3	YES
KR2.33 prop	KR-P2.7	139	54	215.8	YES
KR2.50	Ditch	27.1	30	45.2	YES
KR2.52	KR2.53	19.1	30	41.3	YES
KR2.53	KR2.54	25.9	36	67.0	YES
KR2.54	KR2.55	46.9	42	101.0	YES
KR2.56	KR2.57	33.9	30	50.5	NO
KR2.57	KR2.58	61.3	36	82.1	NO
KR2.58	KR2.59	78.7	42	110.6	YES
KR2.59	KR2.60	97.6	48	157.8	YES
KR2.62	KR2.63	32.1	33	58.2	YES
KR2.63	KR2.64	42.2	36	73.4	YES
KR2.65	KR2.36 prop.	21.1	30	45.2	YES
KR2.68	KR2.69	14.8	30	41.3	YES
KR2.69	KR2.70	26.2	36	67.0	YES
KR2.70	KR-P2.11	37.5	42	101.0	YES
KR3.5	KR3.6	25.6	30	45.2	YES
KR3.6	KR3.7	38.4	33	58.2	YES
KR3.7	KR3.8	69.8	36	73.4	NO
KR3.10	KR3.11	29.2	30	45.2	NO

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
KR3.11	KR3.12	52.2	36	67.0	YES
KR3.12	KR3.13	67.8	42	101.0	YES
KR3.14	KR3.16	11.5	36	67.0	YES
KR3.15	KR3.16	16.8	30	41.3	YES
KR3.18	KR3.19	44.9	30	50.5	NO
KR3.19	KR3.20	56.5	33	65.1	YES
KR3.20	KR3.21	70.1	36	82.1	YES
KR3.22	KR3.24	201.1	54	197.0	YES
KR3.23	KR3.24	N.A.	54	215.8	N.A.
KR3.26	KR3.27	19.5	30	41.3	YES
KR3.27	KR3.28	33.6	48	144.0	YES
KR3.29	KR3.30	205	60	285.6	YES
KR3.30	KR3.31	222.2	42+48	268.4	YES
KR3.31	KR3.40	290.3	48+54	373.6	YES
KR3.34	KR3.39	34.9	30	45.2	NO
KR3.37	KR3.38	33.8	30	45.2	NO
KR3.38	KR3.39	37.4	30	45.2	NO
KR3.39	KR3.40	191.8	36	73.4	NO
KR3.40	KR3.41	469	60+66	653.7	YES
KR3.42	KR3.43	16.5	30	45.2	YES
KR3.44	KR3.45	15.2	36	67.0	YES
KR3.46	KR3.47	18.9	30	41.3	YES
KR3.47	KR3.48	29.4	33	53.2	YES
KR3.48	KR3.49	37.1	36	67.0	YES
KR3.49	KR3.50	50.5	42	101.0	YES
KR3.50	KR3.51	57.7	48	144.0	YES
KR3.55	KR3.56	25.9	30	41.3	YES
KR3.56	KR3.57	46.7	33	58.2	NO
KR3.57	KR3.58	70.1	42	101.0	YES
KR3.58	KR3.60	85.3	54	197.0	YES
KR3.59	KR3.60	19.6	36	67.0	YES
KR3.60	KR3.61	115.2	54	197.0	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
SILVER CREEK DISTRICT					
SC1.65	SC1.66	28.9	30	45.2	YES
SC1.66	SC1.67	39.2	36	73.4	YES
SC1.67	SC1.68	49.6	42	110.6	YES
SC1.68	SC1.69	62.9	48	157.8	YES
SC1.70	SC1.71	19.5	36	59.9	YES
SC1.71	SC1.72	32.1	42	95.8	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
ZUMBRO RIVER DISTRICT					
ZR3.5	ZR3.6	40.4	33	53.2	NO
ZR3.6	ZR-P3.3a	46.8	36	67.0	YES
ZR3.10	ZR3.11	12.2	30	41.3	YES
ZR3.11	ZR3.14	25.4	33	58.2	YES
ZR3.12	ZR3.13	13.4	30	41.3	YES
ZR3.13	ZR3.14	16.2	33	53.2	YES
ZR3.14	ZR3.15	45.8	42	101.0	NO
ZR3.15	ZR3.16	57.7	48	144.0	YES
ZR3.20	ZR3.21	16.2	36	67.0	YES
ZR3.21	ZR3.22	67.9	42	101.0	NO
ZR3.23	ZR3.24	69.3	42	101.0	YES
ZR3.27	ZR3.28	49.3	33	53.2	NO
ZR3.28	ZR3.29	88.1	42	101.0	NO
ZR3.29	ZR3.30	107.2	48	120.5	YES
ZR3.30	ZR3.34	145.8	54	164.8	YES
ZR3.31	ZR3.32	23.1	30	41.3	NO
ZR3.32	ZR3.33	30.9	33	53.2	YES
ZR3.33	ZR3.34	42.1	48	144.0	YES
ZR3.34	ZR3.35	230.6	72	328.0	YES
ZR3.35	ZR3.39	337.4	90	593.9	YES
ZR3.36	ZR3.37	35.2	36	67.0	NO
ZR3.37	ZR3.38	53.2	48	144.0	YES
ZR3.38	ZR3.39	58.9	54	197.0	YES
ZR3.39	ZR3.40	401.4	90	593.9	YES
ZR3.40	ZR3.41	419.3	84	533.9	YES
ZR3.44	ZR3.45	31.4	36	59.9	YES
ZR3.45	ZR3.46	46.7	42	84.5	YES
ZR3.46	ZR3.48	63.3	48	120.5	YES
ZR3.47	ZR3.48	16.7	30	36.9	YES
ZR3.48	ZR3.49	91	54	176.2	YES
ZR3.50	ZR3.51	28.2	30	41.3	NO
ZR3.51	ZR3.52	51.7	48	144.0	NO
ZR3.55	ZR3.56	27.4	33	53.2	YES
ZR3.56	ZR3.57	38.7	42	101.0	YES
ZR3.58	ZR3.59	40.8	33	65.1	NO

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
ZR3.59	ZR3.60	61.4	36	76.4	NO
ZR3.60	ZR3.61	66	48	164.2	YES
ZR3.65	ZR3.66	21.1	30	41.3	NO
ZR3.66	ZR3.67	36.5	33	58.2	NO
ZR3.67	ZR3.68	45.5	36	82.1	NO
ZR3.68	ZR3.69	59.9	48	144.0	YES
ZR3.71	ZR3.72	21.9	30	45.2	NO
ZR3.72	ZR3.73	28.8	42	90.3	YES
ZR4.5	ZR4.8	11.2	36	47.4	YES
ZR4.6	ZR4.8	7.1	48	101.8	YES
ZR4.8	ZR4.9	38.1	72	299.5	YES
ZR4.9	ZR4.10/4.14	46.9	48	193.5	YES
ZR4.10	ZR4.11	8.9	60	184.4	YES
ZR4.11	ZR4.12	18.2	72	299.5	YES
ZR4.12	ZR4.13	24.9	78	370.5	YES
ZR4.14	ZR4.15	7.1	54	139.3	YES
ZR4.15	ZR4.16	14.2	48	111.6	YES
ZR4.16	ZR4.17	23.5	54	152.6	YES
ZR4.17	ZR4.18	20.5	54	152.6	YES
ZR4.18	ZR4.19	32.2	60	202.0	YES
ZR4.20	ZR4.21	11.7	30	32.0	NO
ZR4.21	ZR4.22	14.1	36	47.4	YES
ZR4.23	ZR4.24	13.1	30	29.2	NO
ZR4.25	ZR4.26	7.5	48	101.8	YES
ZR4.27	ZR4.28	8.2	60	184.4	YES
ZR4.30	ZR4.31	29.8	30	55.3	YES
ZR4.31	ZR4.32	44.1	36	89.9	YES
ZR4.32	ZR4.33	58.5	42	115.1	YES
ZR4.34	ZR4.35	34.9	33	71.3	YES
ZR4.35	ZR4.36	85.7	36	89.9	NO
ZR4.36	ZR4.37	98.2	42	135.5	NO
ZR4.37	ZR4.38	18.7	30	55.3	YES
ZR4.38	ZR4.42	141.1	48	176.4	YES
ZR4.39	ZR4.40	40.1	30	55.3	YES
ZR4.40	ZR4.41	47.7	36	89.9	YES
ZR4.41	ZR4.42	58.5	42	135.5	YES
ZR4.42	ZR4.46	177.9	54	264.3	YES

Pipe Designation		Drainage Area (Ac)	Pipe Diameter (in)	Pipe Capacity (cfs)	10 - Year Capacity Yes / No
Flow From	Flow To				
ZR4.43	ZR4.44	22.9	30	41.3	YES
ZR4.44	ZR4.45	38.8	33	71.3	YES
ZR4.45	ZR4.46	45.3	36	89.9	YES
ZR4.46	ZR4.48	237.2	60	349.8	YES
ZR4.47	ZR4.48	16.4	30	41.3	YES
ZR4.48	ZR4.49	252.3	54	264.3	YES
ZR4.49	ZR4.50	261.2	60	349.8	YES
ZR4.51	ZR4.52	14.5	30	35.7	YES
ZR4.52	ZR4.53	21.9	33	46.0	YES
ZR4.53	ZR4.56	31.4	36	67.0	YES
ZR4.54	ZR4.55	32.3	33	58.2	YES
ZR4.55	ZR4.56	53.9	42	101.0	YES
ZR4.56	ZR4.57	91.1	48	157.8	YES
ZR4.60	ZR4.61	21.4	30	41.3	YES
ZR4.61	ZR4.62	47.3	36	82.1	YES
ZR4.62	ZR4.63	81.2	42	123.7	YES
ZR4.63	ZR4.64	117.1	42	142.8	YES
ZR4.65	ZR4.66	125.2	30	50.5	Pres. Flow
ZR4.66	ZR4.67	139.2	33	65.1	Pres. Flow
ZR4.68	ZR4.69	125.2	33	65.1	Pres. Flow
ZR4.69	ZR4.70	142.1	36	82.1	Pres. Flow
ZR4.71	ZR4.72	19.3	33	53.2	YES
ZR4.72	ZR4.73	28.3	36	67.0	YES
ZR4.74	ZR4.75	43.1	30	50.5	YES
ZR4.75	ZR4.76	57.2	33	65.1	YES
ZR4.77	ZR4.78	51.3	30	62.6	NO
ZR4.78	ZR4.79	61.9	36	94.8	YES

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
BEAR CREEK DISTRICT								
BC-P1.3	17.65	5.20	148,049	12.7	1500	7500	---	174,569
BC-P1.4	12.25	5.20	102,754	7.7	1500	7500	---	121,856
BC-P1.6	15.55	5.20	130,435	10.9	1500	7500	---	154,260
BC-P1.8	1.50	5.20	12,582	2.0	3000	3500	22,082	---
BC-P1.9a	1.50	5.20	12,582	0.8	11000	3500	24,332	---
BC-P1.9b	1.85	5.20	15,518	0.8	11000	3500	27,268	---
BC-P1.9c	16.02	5.20	134,397	8.8	11000	7500	238,697	---
BC-P1.10	12.56	5.20	105,324	6.1	11000	7500	180,419	---
BC-P1.11	11.25	5.20	94,366	6.5	11000	3500	169,366	---
BC-P1.12	11.33	5.20	94,997	4.5	11000	3500	147,868	---
BC-P1.14a	N.A.	N.A.	N.A.	N.A.	N.A.	7500	---	7,500
BC-P1.14b	31.25	5.20	262,127	16.7	1500	7500	---	294,645
BC-P1.15	13.72	5.20	115,048	4.5	11000	7500	171,608	---
BC-P1.17	21.11	5.20	177,097	15.5	1500	7500	---	207,867
BC-P1.18	6.98	5.20	58,522	3.0	11000	3500	94,582	---
BC-A1.19	N.A.	N.A.	N.A.	4.0	1500	N.A.	6,000	---
BC-P1.21	17.54	5.20	147,155	9.6	11000	7500	260,585	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
BC-P1.23	7.20	5.20	60,435	3.8	7500	7500	96,247	---
BC-P1.24	11.04	5.20	92,591	4.9	5000	7500	124,824	---
BC-P1.25	8.70	5.20	73,021	3.2	5000	5000	94,054	---
BC-P2.6	6.76	5.20	56,720	5.1	11000	3500	116,686	---
BC-P2.7a	5.71	5.20	47,866	4.1	11000	3500	96,466	---
BC-P2.7b	10.33	5.20	86,683	5.5	11000	7500	154,133	---
BC-P2.8a	1.65	5.20	13,842	1.2	11000	3500	30,542	---
BC-P2.8b	12.00	5.20	100,672	4.5	11000	7500	157,672	---
BC-P2.12	14.06	5.20	117,990	6.2	11000	3500	190,185	---
BC-P2.15	7.02	5.20	58,887	4.2	11000	3500	83,387	---
BC-P2.16a	4.12	5.20	34,540	2.47	11000	3500	65,229	---
BC-P2.16b	25.40	5.20	213,112	9.5	1500	7500	234,862	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
CASCADE CREEK DISTRICT								
CC-P1.1	25.35	5.20	212,670	41.5	1500	7500	---	282,457
CC-P1.4a	9.75	5.20	81,796	3.2	11000	3500	120,496	---
CC-P1.4b	12.25	5.20	102,769	4.0	11000	3500	150,269	---
CC-P1.5a	7.23	5.20	60,643	4.4	11000	3500	113,038	---
CC-P1.5b	6.00	5.20	50,358	4.1	11000	3500	98,958	---
CC-P1.10	N.A.	N.A.	N.A.	N.A.	N.A.	26000	26,000	---
CC-P2.1	28.50	5.20	239,096	15.3	1500	7500	---	269,546
CC-P2.6a	16.22	5.20	136,089	5.3	10000	7500	196,839	---
CC-P2.6b	9.26	5.20	77,654	2.5	20000	3500	130,954	---
CC-P2.7	20.08	5.20	168,450	10.4	11000	7500	290,130	---
CC-P2.8	12.30	5.20	103,189	4.7	20000	3500	200,689	---
CC-P2.10a	4.50	5.20	37,752	2.2	11000	3500	65,452	---
CC-P2.10b	1.85	5.20	15,520	N.A.	N.A.	N.A.	15,520	---
CC-P2.10c	8.75	5.20	73,407	2.9	15000	7500	124,782	---
CC-P2.12	N.A.	N.A.	N.A.	7.5	1500	N.A.	11,250	---
CASCADE LK	N.A.	N.A.	N.A.	N.A.	N.A.	75000	75,000	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
CC-P3.1	5.55	5.20	46,561	2.5	11000	3500	77,561	---
CC-P3.2	7.55	5.20	63,339	3.0	11000	3500	99,839	---
CC-P3.3	6.25	5.20	52,433	3.7	11000	3500	96,633	---
CC-P3.4	2.50	5.20	20,973	6.5	11000	3500	96,047	---
CC-P3.6	29.15	5.20	244,549	19.5	3500	7500	320,299	---
CC-P3.7a	27.02	5.20	226,679	10.2	10000	7500	336,662	---
CC-P3.7b	N.A.	N.A.	N.A.	N.A.	N.A.	7500	7,500	---
CC-P4.2a	N.A.	N.A.	N.A.	N.A.	N.A.	15000	15,000	---
CC-P4.2b	2.40	5.20	20,134	1.00	11000	3500	34,634	---
CC-P4.2c	3.20	5.20	26,846	1.50	11000	3500	46,846	---
CC-P4.2d	2.95	5.20	24,749	1.40	11000	3500	43,649	---
CC-P4.3	3.35	5.20	28,104	1.50	11000	3500	48,104	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
WILLOW CREEK DISTRICT								
WC-P1.7	10.75	5.20	90,200	10.6	3500	7500	---	134,662
WC-P1.8	11.10	5.20	93,142	5.6	11000	3500	157,775	---
WC-P1.9	18.04	5.20	151,380	10.0	11000	7500	268,650	---
WC-P2.1	10.98	5.20	92,073	6.8	5000	7500	133,407	---
WC-P2.3	9.38	5.20	78,705	4.8	11000	3500	135,445	---
WC-P2.4a	8.50	5.20	71,309	4.0	11000	3500	118,809	---
WC-P2.4b	8.10	5.20	67,954	3.5	11000	3500	109,954	---
WC-P2.5	5.98	5.20	50,140	3.3	11000	3500	89,940	---
WC-P2.6	13.38	5.20	112,264	10.3	11000	7500	232,514	---
WC-P2.7	16.95	5.20	142,189	8.6	11000	3500	240,429	---
WC-P2.8	4.65	5.20	38,995	3.2	11000	7500	81,915	---
WC-P2.9	14.75	5.20	123,784	6.6	11000	3500	199,884	---
WC-P3.2	22.95	5.20	192,540	22.0	1500	7500	232,965	---
WC-P3.3	23.05	5.20	193,402	14.7	10000	7500	348,160	---
WC-P3.6	25.34	5.20	212,592	11.8	11000	7500	350,112	---
WC-P3.7	8.18	5.20	68,591	1.3	11000	3500	86,465	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
WC-P3.8	5.78	5.20	48,507	4.4	5000	3500	73,907	---
WC-P3.9	21.46	5.20	180,029	9.4	7500	7500	257,679	---
WC-P3.10	9.04	5.20	75,858	3.9	11000	7500	126,441	---
WC-P3.11	5.31	5.20	44,513	3.6	11000	3500	87,430	---
WC-P3.12	7.48	5.20	62,786	5.6	5000	3500	94,440	---
WC-P3.14	N.A.	N.A.	N.A.	8.0	7500	3500	63,325	---
WC-P4.2	16.25	5.20	136,310	7.9	10000	7500	223,010	---
WC-P4.3	25.70	5.20	215,593	17.5	10000	7500	398,493	---
WC-P4.5	5.20	5.20	43,625	18.7	1500	7500	---	79,212
WC-P4.6	11.23	5.20	94,238	6.9	10000	7500	170,571	---
WC-P4.8	13.80	5.20	115,742	8.2	10000	7500	205,025	---
WC-P4.9	4.23	5.20	35,515	2.8	10000	3500	66,515	---
WC-P4.10	4.36	5.20	36,578	3.6	5000	3500	58,003	---
WC-P4.11	2.65	5.20	22,232	N.A.	N.A.	7500	29,732	---
WC-P4.12	9.07	5.20	76,100	4.6	10000	7500	129,650	---
WC-P4.13	6.26	5.20	52,540	9.7	1500	7500	74,642	---
WC-P5.1	7.40	5.20	62,108	5.4	1500	7500	77,782	---
WC-P5.2	14.46	5.20	121,281	8.7	1500	7500	141,856	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
WC-P5.3	6.12	5.20	51,306	4.0	7500	7500	88,806	---
WC-P5.4	4.97	5.20	41,676	4.1	7500	7500	79,839	---
WC-P5.8	3.20	5.20	26,846	2.1	11000	3500	53,446	---
WC-P5.10	5.09	5.20	42,691	4.2	5000	3500	67,275	---
WC-P5.11	N.A.	N.A.	N.A.	N.A.	N.A.	7500	7,500	---
WC-P5.12	10.19	5.20	85,457	5.0	11000	7500	147,774	---
WC-P6.1	7.37	5.20	61,823	4.7	11000	3500	116,635	---
WC-P6.2	7.61	5.20	63,821	4.9	11000	3500	121,004	---
WC-P6.3	14.38	5.20	120,667	9.3	10000	7500	221,167	---
WC-P6.4	9.59	5.20	80,461	4.8	20000	3500	180,174	---
WC-P6.5	20.88	5.20	175,188	11.3	10000	7500	296,058	---
WC-P6.8	4.39	5.20	36,807	3.8	5000	3500	59,299	---
WC-P6.9	0.25	5.20	2,097	5.1	11000	7500	65,441	---
WC-P6.10	20.56	5.20	172,471	8.0	20000	7500	339,971	---
WC-P6.13a	6.50	5.20	54,531	4.5	20000	7500	152,031	---
WC-P6.13b	22.23	5.20	186,517	10.7	10000	7500	300,634	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
ZUMBRO RIVER DISTRICT								
ZR-P1.6	5.16	5.20	43,279	3.5	11000	3500	85,793	---
ZR-P1.7a	10.07	5.20	84,501	3.6	11000	3500	127,894	---
ZR-P1.7b	6.78	5.20	56,917	4.7	11000	7500	116,300	---
ZR-P1.8a1	10.55	5.20	88,529	5.7	11000	7500	158,729	---
ZR-P1.8b	5.31	5.20	44,542	2.4	11000	3500	74,002	---
ZR-P2.1a	8.40	5.20	70,470	2.3	7500	7500	95,283	---
ZR-P2.1b	11.56	5.20	96,978	4.8	5000	7500	128,395	---
ZR-P2.2	8.73	5.20	73,255	4.6	2500	7500	---	92,297
ZR-P2.3	7.23	5.20	60,688	3.5	2500	7500	---	76,905
ZR-P2.5a	5.86	5.20	49,156	3.0	7500	3500	75,156	---
ZR-P2.5b	5.49	5.20	46,039	2.2	11000	3500	73,922	---
ZR-P2.5c	9.06	5.20	75,969	2.5	7500	7500	102,494	---
ZR-P2.5d	5.91	5.20	49,598	3.4	11000	7500	94,278	---
A2.7 Mayowd Rd	2.50	5.20	20,973	3.5	3500	6000	39,223	---
ZR-P2.8	7.80	5.20	65,446	3.5	11000	7500	111,300	---
ZR-P3.5a	7.17	5.20	60,152	2.4	11000	7500	94,346	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
ZR-P3.7	3.50	5.20	29,363	3.2	11000	3500	68,503	---
ZR-P4.3a	4.20	5.20	35,235	1.5	3500	3500	43,985	---
ZR-P4.3b	0.90	5.20	7,550	0.5	3500	7500	16,800	---
ZR-P4.3c	3.60	5.20	30,202	2.1	11000	3500	56,802	---
ZR-P4.4	3.95	5.20	33,138	2.0	11000	3500	58,638	---
ZR-P4.5	2.15	5.20	18,037	1.8	11000	3500	41,337	---
ZR-P4.6	12.45	5.20	104,447	4.8	11000	7500	164,747	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
SILVER CREEK DISTRICT								
SC-P1.4b	4.43	5.20	37,151	2.7	5000	3500	53,926	---
SC-P1.5a	2.67	5.20	22,391	2.1	5000	3500	36,141	---
SC-P1.6a	N.A.	N.A.	N.A.	2.1	5000	N.A.	10,500	---
SC-P1.6b	3.20	5.20	26,869	3.0	7500	7500	57,132	---
SC-P1.6c	4.70	5.20	39,435	2.6	7500	3500	62,323	---
SC-P1.7a1	2.57	5.20	21,585	3.6	5000	7500	47,169	---
SC-P1.7a2	12.72	5.20	106,705	5.2	11000	7500	171,588	---
SC-P1.7a3	7.20	5.20	60,403	5.0	11000	7500	122,903	---
SC-P1.7b1	12.10	5.20	101,511	6.9	11000	3500	180,911	---
SC-P1.7b2	21.46	5.20	180,054	8.6	7500	7500	252,316	---
SC-P1.8	1.50	5.20	12,584	1.3	11000	3500	30,384	---
SC-P1.9a	3.62	5.20	30,395	2.9	11000	3500	66,015	---
SC-P1.11	15.79	5.20	132,468	5.1	11000	3500	191,518	---
SC-P1.12a1	6.34	5.20	53,188	2.5	11000	7500	88,188	---
SC-P1.12a2	5.85	5.20	49,078	2.3	11000	7500	81,878	---
SC-P1.12b	5.04	5.20	42,319	3.5	5000	7500	67,194	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
HADLEY VALLEY CREEK DISTRICT								
HV-P1.2	32.97	5.20	276,625	15.3	5000	7500	360,625	---
HV-P1.5	29.85	5.20	250,422	N.A.	N.A.	9500	259,922	---
HV-P1.6a	2.49	5.20	20,896	2.0	5000	3500	34,255	---
HV-P1.6c	9.38	5.20	78,695	3.6	7500	7500	113,045	---
HV-P1.6d	10.85	5.20	90,995	3.8	11000	7500	140,350	---
HV-P1.7a	4.35	5.20	36,469	3.8	5000	7500	62,736	---
HV-P1.7b	10.59	5.20	88,804	3.3	11000	7500	132,164	---
HV-P1.8a	3.92	5.20	32,854	3.7	5000	7500	58,804	---
HV-P1.9	13.36	5.20	112,068	7.5	11000	7500	201,774	---
HV-P1.11	10.98	5.20	92,154	5.5	11000	7500	160,338	---
HV-P1.13	6.83	5.20	57,293	3.5	11000	3500	99,293	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
KINGS RUN DISTRICT								
KR-P1.1	34.45	5.20	289,022	26.4	1500	7500	---	336,182
KR-P1.2	15.70	5.20	131,702	7.1	1500	7500	---	149,822
Trail Crossing	N.A.	N.A.	N.A.	N.A.	N.A.	10000	10,000	---
KR-P1.4	23.13	5.20	194,011	9.5	11000	7500	306,084	---
KR-P1.5a	5.97	5.20	50,045	3.5	11000	3500	92,045	---
KR-P1.5b	6.01	5.20	50,409	3.5	11000	3500	92,593	---
KR-P1.6	4.51	5.20	37,863	2.5	11000	7500	72,368	---
KR-P1.7a	10.06	5.20	84,419	5.2	11000	3500	145,596	---
KR-P1.8a	8.28	5.20	69,465	3.8	1500	7500	---	---
KR-P1.8b	5.53	5.20	46,394	2.6	1500	3500	53,797	---
KR-P1.8c	28.57	5.20	239,663	11.6	11000	7500	374,763	---
KR-P1.9b	1.45	5.20	12,165	0.8	5000	2500	18,665	---
KR-P1.9c	1.15	5.20	9,648	0.5	5000	2500	14,648	---
KR-P1.10	3.42	5.20	28,662	2.0	11000	3500	54,602	---
KR-P1.12	N.A.	N.A.	N.A.	N.A.	N.A.	7500	7,500	---
KR-P1.13	7.49	5.20	62,819	N.A.	N.A.	7500	70,319	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
KR-P1.17	15.74	5.20	132,071	5.3	11000	7500	198,054	---
KR-P1.18a	4.38	5.20	36,745	2.2	11000	7500	68,445	---
KR-P1.18b	4.05	5.20	33,977	2.1	11000	3500	60,577	---
KR-P2.1a	5.48	5.20	45,955	3.3	11000	3500	85,461	---
KR-P2.1b	16.96	5.20	142,289	5.2	20000	7500	253,789	---
KR-P2.2	30.26	5.20	253,853	9.9	10000	7500	360,053	---
KR-P2.3	7.75	5.20	64,985	2.7	20000	7500	125,919	---
KR-P2.5a	19.10	5.20	160,236	N.A.	N.A.	7500	167,736	---
KR-P2.7	7.66	5.20	64,243	3.8	11000	7500	113,268	---
KR-P2.8a	6.61	5.20	55,464	3.0	11000	7500	96,495	---
KR-P2.8b	6.58	5.20	55,171	3.0	11000	7500	95,231	---
KR-P2.9a	5.47	5.20	45,868	2.5	7500	3500	68,418	---
KR-P2.9b	6.04	5.20	50,663	2.4	11000	3500	80,453	---
KR-P2.11	6.24	5.20	52,348	3.2	11000	3500	91,048	---
KR-P2.13a	6.43	5.20	53,930	2.5	11000	7500	89,003	---
KR-P2.13b	2.25	5.20	18,876	1.8	11000	9500	47,736	---
KR-P2.13c	7.65	5.20	64,192	3.9	11000	7500	114,409	---
KR-P3.1	16.12	5.20	135,229	4.2	20000	7500	226,729	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
KR-P3.2	15.88	5.20	133,241	4.9	20000	7500	238,008	---
KR-P3.5	1.30	5.20	10,906	1.3	11000	3500	28,706	---

Basin Cost Estimates

Pond Designation	Pond Exacavation (Ac-Ft)	Unit Cost Exc. /1 ($/CY)	Excavation Cost ($)	Land Acquisition (Ac)	Unit Cost Land ($/Ac)	Outlet Cost ($)	Total City Cost ($)	Total Cost Outside USA ($)
MAYO RUN DISTRICT								
WP-1	10.15	5.20	85,152	6.5	3000	3500	108,152	---
WP-2	2.50	5.20	20,973	2.5	10000	2000	47,973	---
CP-10	15.25	5.20	127,937	5.5	11000	3500	191,937	---
EP-1	2.95	5.20	24,749	2.5	5000	3500	40,749	---
EP-2	3.25	5.20	27,265	2.5	5000	3500	43,265	---
EP-10	2.50	5.20	20,973	1.5	5000	3500	31,973	---
EP-11	4.90	5.20	41,108	3.5	5000	3500	62,108	---
EP-12	13.85	5.20	116,192	N.A.	N.A.	3500	119,692	---
EP-14	4.20	5.20	35,235	N.A.	N.A.	3500	38,735	---
EP-15	3.15	5.20	26,426	N.A.	N.A.	3500	29,926	---
Estimated Cost of all Proposed stormwater basins wi							$22,705,431	$2,381,781

First Reading
ORDINANCE NO. _____

Storm Water Management Ordinance

AN ORDINANCE PROMOTING THE HEALTH, SAFETY AND GENERAL WELFARE OF THE CITIZENS OF _____, MINNESOTA BY AMENDING THE ZONING ORDINANCE TO INCLUDE A SECTION REQUIRING STORM WATER MANAGEMENT PRACTICES

SECTION 1. FINDINGS.

The City of _____ hereby finds that uncontrolled and inadequately planned use of wetlands, woodlands, natural habitat areas, are subject to soil erosion and areas containing restrictive soils adversely affects the public health, safety and general welfare by impacting water quality and contributing to other environmental problems, creating nuisances, impairing other beneficial uses of environmental resources and hindering the ability of the City of _____ to provide adequate flood control and other community services. In addition, extraordinary public expenditures may be required for the protection of persons and property in such areas which may be affected by unplanned land usage.

SECTION 2 PURPOSE.

The purpose of the ordinance is to promote, preserve and enhance the natural resources within the City of _____ and protect them from adverse effects occasioned by poorly sited development or incompatible activities by regulating land disturbing or development activities that would have an adverse and potentially irreversible impact on water quality and unique and fragile environmentally sensitive land; by minimizing conflicts and encouraging compatibility between land disturbing and development activities and water quality and environmentally sensitive lands; and by requiring detailed review standards and procedures for land disturbing or development activities proposed for such areas, thereby achieving a balance between urban growth and development and protection of water quality and natural areas.

SECTION 3. DEFINITIONS.

For the purpose of this ordinance, the following terms, phrases, words and their derivatives shall have the meaning stated below. When not inconsistent with the context, words used in the present tense include the future tense, words in the plural number includes the singular number, and words in the singular number include the plural number. The word “shall” is always mandatory and not merely directive.

A. Applicant. Any person who wishes to obtain a building permit, zoning or subdivision approval.

B. Control measure. A practice or combination of practices to control erosion and attendant pollution.

C. Detention facility. A permanent natural or man-made structure, including wetlands, for the temporary storage of run off which contains a permanent pool of water.

D. Flood fringe. The portion of the floodplain outside of the floodway.

E. Floodplain. The areas adjoining a watercourse or water basin that have been or may be covered by a regional flood.

F. Floodway. The channel of the watercourse, the bed of water basins, and those portions of the adjoining floodplains that are reasonably required to carry and discharge floodwater and provide water storage during a regional flood.

G. Hydric soils. Soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

H. Hydrophytic vegetation. Macrophytic plant life growing in water, soil or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

I. Land disturbing or development activities. any change of the land surface including removing vegetative cover, excavating, filling, grading and the construction of any structure.

J. Person. Any individual, firm, corporation, partnership, franchise, association or governmental entity.

K. Public waters. Waters of the state as defined in Minnesota Statutes, Section 103G.00S, subdivision 15.

L. Regional flood. A flood that is representative of large floods known to have occurred generally in the state and reasonably characteristic of what can be expected to occur on an average frequency in the magnitude of a 100-year recurrence interval.

M. Retention facility. A permanent natural or man made structure that provides for the storage of storm water runoff by means of a permanent pool of water.

N. Sediment. Solid matter carried by water, sewage, or other liquids.

O. Structure. Anything manufactured, constructed or erected which is normally attached to or positioned on land, including portable structures, earthen structures, roads, parking lots, and paved storage areas.

P. Wetlands. Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this definition, wetlands must have the following three attributes:
   1. Have a predominance of Hydric soils;
   2. Are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of Hydrophytic vegetation typically adapted for life in saturated soil conditions; and
   3. Under normal circumstances support a prevalence of such vegetation.

SECTION 4 SCOPE AND EFFECT.

4.1 Applicability.

Every applicant for a building permit, subdivision approval, or a permit to allow land disturbing activities must submit a storm water management plan to the Zoning Administrator. No building permit, subdivision approval, or permit to allow land disturbing activities shall be issued until approval of the storm water management plan or a waiver of the approval requirement has been obtained in strict conformance with the provisions of this ordinance. The provisions of Section 8 of this ordinance apply to all land, public or private, within the City of _____ .

4.2 Exemptions.

The provisions of this ordinance do not apply to:

1. Any part of a subdivision if a plat for the subdivision has been approved by the City Council on or before the effective date of this ordinance;

2. Any land disturbing activity for which plans have been approved by the Valley Branch watershed District within six months prior to the effective date of this ordinance;

3. A lot for which a building permit has been approved on or before the effective date of this ordinance;

4. Installation of fence, sign, telephone, and electric poles and other kinds of posts or poles; or

5. Emergency work to protect life, limb or property

4.3 Waiver.

The City Council, upon recommendation of the Planning Commission, may waive any requirement of this ordinance upon making a finding that compliance with the requirement will not adversely affect the standards and requirements set forth in Section 6. The City Council may require as a condition of the waiver such dedication or construction, or agreement to dedicate or construct as may be necessary to adequately meet said standards and requirements.

SECTION 5 STORM WATER MANAGEMENT PLAN APPROVAL PROCEDURES.

5.1 Application.

A written application for storm water management plan approval, along with the proposed storm water management plan, shall be filed with the Zoning Administrator and shall include a statement indicating the grounds upon which the approval is requested, that the proposed use permitted by right or as an exception in the underlying zoning district, and adequate evidence showing that the proposed use will conform to the standards set forth in this ordinance.

Two sets of clearly legible blue or black lined copies of drawings and required information shall be submitted to the Zoning Administrator and shall be accompanied by a receipt from the City Clerk evidencing the payment of all required fees for processing and approval as set forth in Section 6.5 and a bond when required by Section 6.4. in the amount to be calculated in accordance with that section. Drawings shall be prepared to a scale appropriate to the site of the project and suitable for the review to be performed. At a minimum, the scale shall be 1 inch equals 100 feet.

5.2 Storm water management plan.

At a minimum, the storm water management plan shall contain the following information:

1. Existing site map. A map of existing site conditions showing the site and immediately adjacent areas, including:

    a. The name and address of the applicant, the section, township and range, north point, date and scale of drawing and number of sheets;

    b. Location of the tract by an insert map at a scale sufficient to clearly identify the location of the property and giving such information as the names and numbers of adjoining roads, railroads, utilities, subdivision, towns and districts or other landmarks;

    c. Existing topography with a contour interval appropriate to the topography of the land.

    d. A delineation of all streams, rivers, public waters and wetlands located on and immediately adjacent to the site, including depth of water, a description of vegetation which may be found in the water, a statement of general water quality and any classification given to the water body or wetland by the Minnesota Department of

Natural Resources, the Minnesota Pollution Control Agency, and/or the United States Army Corps of Engineers;

e. Location and dimensions of existing storm water drainage systems and natural drainage patterns on and immediately adjacent to the site delineating in which direction and at what rate storm water is conveyed from the site, identifying the receiving stream, river, public water, or wetland, and setting forth those areas of the unaltered site where storm water collects;

f. A description of the soils of the site, including a map indicating soil types of areas to be disturbed as well as a soil report containing information on the suitability of the soils for the type of development proposed and for the type of sewage disposal proposed and describing any remedial steps to be taken by the developer to render the soils suitable;

g. Vegetative cover and clearly delineating any vegetation proposed for removal; and

h. 100 year floodplain, flood fringes and floodways.

2. Site construction plan. A site construction plan including;

a. Locations and dimensions of all proposed land disturbing activities;

b. Locations and dimensions of all temporary soil or dirt stockpiles;

c. Locations and dimensions of all construction site erosion control measures necessary to meet the requirements of this ordinance;

d. Schedule of anticipated starting and completion date of each land disturbing activity including the installation of construction site erosion control measures needed to meet the requirements of this ordinance; and

e. Provisions for maintenance of the construction site erosion control measures during construction.

3. Plan of final site conditions. A plan of final site conditions on the same scale as the existing site map showing the site changes including;

   a. Finished grading shown at contours at the same interval as provided above or as required to clearly indicate the relationship of proposed changes to existing topography and remaining features;

   b. A landscape plan, drawn to an appropriate scale, including dimensions and distances and the location, type, size and description of all proposed landscape materials which will be added to the site as part of the development;

   c. A drainage plan of the developed site delineating in which direction and at what rate storm water will be conveyed from the site and setting forth the areas of the site where storm water will be allowed to collect;

   d. The proposed size, alignments and intended use of any structures to be erected on the site;

   e. A clear delineation and tabulation of all areas which shall be paved or surfaced, including a description of the surfacing material to be used; and

   f. Any other information pertinent to the particular project which in the opinion of the applicant is necessary for the review of the project.

SECTION 6 PLAN REVIEW PROCEDURES.

6.1 Process.

Storm water management plans meeting the requirements of Section 5 shall be submitted by the Zoning Administrator to the Planning Commission for review in accordance with the standards of Section 7. The Commission shall recommend approval, recommend approval with conditions or recommend denial of the storm water management plan. Following Planning Commission action, the storm water management plan shall be submitted to the City Council at its next available meeting. City Council action on the storm water management plan must be accomplished within 120 days following the date the application for approval is filed with the Zoning Administrator.

6.2 Duration.

Approval of a plan submitted under the provisions of this ordinance shall expire one year after the date of approval unless construction has commenced in accordance with the plan. However, if prior to the expiration of the approval, the applicant makes a written request to the Zoning Administrator for an extension of time to commence construction setting forth the reason for the requested extension, the planning commission may grant one extension of not greater than one single year. Receipt of any request for an extension shall be acknowledged by the Zoning Administrator within 15 days. The Zoning Administrator shall make a decision on the extension within 30 days of receipt. Any plan may be revised in the same manner as originally approved.

6.3 Conditions.

A storm water management plan may be approved subject to compliance with conditions reasonable and necessary to insure that the requirements contained in the ordinance are met. Such conditions may, among other matters, limit the size, kind or character of the proposed development, require replacement of vegetation, establish required monitoring procedures, stage the work over time, require alteration of the site design to insure buffering, and require the conveyance to the City or other public entity of certain lands or interests therein.

6.4 Performance bond.

Prior to approval of any storm water management plan, the applicant shall submit an agreement to construct such required physical improvements, to dedicated property or easements, or to comply with such conditions as may have been agreed to. Such agreement shall be accompanied by a bond to cover the amount of the established cost of complying with the agreement. The agreement and bond shall guarantee completion and compliance with conditions within a specific time, which time may be extended in accordance with Section 6.2.

The adequacy, conditions and acceptability of any agreement and bond shall be determined by the City Council or any official of the City as may be designated by resolution of the City Council.

6.5 Fees.

All applications for storm water management plan approval shall be accompanied by a process and approval fee as set by Council Fees Resolution.

SECTION 7. APPROVAL STANDARDS.

7.1 Storm Water Management Plans shall be reviewed and approved by the City Council.

7.2 Site dewatering.

Water pumped from the site shall be treated by temporary sedimentation basins, grit chambers, sand filters, upflow chambers, hydrocyclones, swirl concentrators or other appropriate controls as appropriate. Water may not be discharged in a manner that causes erosion or flooding of the site or receiving channels or a wetland.

7.3 Waste and material disposal.

All waste and unused building materials (including garbage debris, cleaning wastes, wastewater, toxic materials or hazardous materials) shall be properly disposed of off-site and not allowed to be carried by runoff into a receiving channel or storage sewer system.

7.4 Tracking.

Each site shall have graveled roads, access drives and parking areas of sufficient width and length to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by street cleaning (or flushing) before the end of each workday.

7.5 Drain inlet protection.

All storm drain inlets shall be protected during construction until control measures are in place with a straw bale, silt fence or equivalent barrier meeting accepted design criteria, standards and specifications contained in the MPCA publication "Protecting Water Quality in Urban Areas".

7.6 Site erosion control.

The following criteria (1 through 4) apply only to construction activities that result in runoff leaving the site.

A. Channelized runoff from adjacent areas passing through the site shall be diverted around disturbed areas, if practical. Diverted runoff shall be conveyed in a manner that will not erode the conveyance and receiving channels.

B. All activities on the site shall be conducted in a logical sequence to minimize the area of bare soil exposed at any one time.

C. Runoff from the entire disturbed area on the site shall be controlled by meeting either subsections a. and b. or a. and c.

1. All disturbed ground left inactive for fourteen or more days shall be stabilized by seeding or sodding (only available prior to September 15) or by mulching or covering or other equivalent control measure.

2. For sites with more than ten (10) acres disturbed at one time, or if a channel originates in the disturbed area, one or more temporary or permanent sedimentation basin shall be constructed. Each sedimentation basin shall have a surface area of at least one percent of the area draining to the basin and at least three feet of depth and constructed in accordance with accepted design specifications. Sediment shall be removed to maintain a depth of three feet. The basin discharge rate shall also be sufficiently low as to not cause erosion along the discharge channel or the receiving water.

3. For sites with less than ten (10) acres disturbed at one time, silt fences, straw bales or equivalent control measures shall be placed along all sidesteps and downslides sides of the site. If a channel or area of concentrated runoff passes through the site, silt fences shall be placed along the channel edges to reduce sediment reaching the channel. The use of silt fences, straw bales or equivalent control measures must include a maintenance and inspection schedule.

D. Any soil or dirt storage piles containing more than ten (10) cubic yards of material should not be located with a downslide drainage length of less than twenty-five (25) feet from the toe of the pile to a roadway or drainage channel. If remaining for more than seven days, they shall be stabilized by mulching vegetative cover, tarps or other means. Erosion from piles which will be in existence for less than seven days shall be controlled by placing straw bales or silt fence barriers around the pile. In-street utility repair or construction soil or dirt storage piles located closer than twenty-five (25) feet of a roadway or drainage channel must be covered with tarps or suitable alternative control, if exposed for more than seven (7) days, and the stormdrain inlets must be protected with straw bale or other appropriate filtering barriers.

7.7 Storm water management criteria for permanent facilities.

A. An applicant shall give consideration to participating in the City's Storm Water Management Program to construct regional storm water management facilities. If a regional facility is not available or feasible, the applicant shall install or construct, on or for the proposed land disturbing development activity, all storm water management facilities necessary to manage increased runoff so that the two-year, ten-year and 100-year storm peak discharge rate existing before the proposed development shall not be increased and accelerate channel erosion will not occur as a result of the proposed land disturbing or development activity.

B. The applicant shall give consideration to reducing the need for storm water management facilities by incorporating the use of natural topography and land cover such as wetlands, ponds, natural swales and depressions as they exist before development to the degree that they can accommodate the additional flow of water without compromising the integrity or quality of the wetland or pond.

C. The following storm water management practices shall be investigated in developing a storm water management plan in the following descending order of preference:
   a. Natural infiltration of precipitation on-site;
   b. Flow attenuation by use of open vegetated swales and natural depressions;
   c. Regional storm water management facilities; and
   d. On-site storm water management facilities.

D. A combination of successive practices may be used to achieve the applicable minimum control requirements specified in subsection (1) above. Justification shall be provided by the applicant for the method selected.

7.8 Design Standards.

Storm water management facilities constructed in the City of _____ shall be designed according to the most current technology and as provided in the City's Storm Water Management Plan. At a minimum, the following design factors shall be used:

A. A permanent pool volume equal to or greater than the runoff from a 1.8-inch, 24-hour storm event for the tributary drainage area;

B. An average permanent pool depth of four to ten feet;

C. A permanent pool length-to-width ratio of 3:1 or greater;

D. A minimum protective shelf extending ten feet into the permanent pool with a slope of 10:1, beyond which slopes should not exceed 3:1;

5. A protective buffer strip of vegetation surrounding the permanent pool at a minimum width of one rod (16.5 feet)

6. At a minimum, storm water detention facilities for new development must be sufficient to limit peak flows from the service area to those that existed before the development for the two (2), ten (10), and one hundred (100) year storm event. Target flow rates for the City drainage system are provided in the Storm Water Management Plan. All calculations and hydrologic

models/information used in determining peak flows shall be submitted along with the storm water management plan to the City for review

7.9 Wetlands.

Wetlands must not be drained or filled, wholly or partially, unless replaced by restoring or creating wetland areas of at least equal public value under an approved replacement plan as required by the Minnesota Wetland Conservation Act.

7.10 Steep Slopes.

No land disturbing or development activities shall be allowed on slopes of 18 per cent or more.

7.11 Models/methodologies/computations.

Hydrologic models and design methodologies used for the determination of runoff and analysis of storm water management structures shall be approved by the City Engineer. Plans, specifications and computations for storm water management facilities submitted for review shall be sealed and signed by a registered professional engineer. All computations shall appear on the plans submitted for review, unless otherwise approved by the City Engineer.

7.12 Easements.

If a storm water management plan involves direction of some or all runoff off of the site, it shall be the responsibility of the applicant to obtain from adjacent property owners any necessary easements or other property interests concerning flowage of water.

SECTION 8. LAWN FERTILIZER REGULATIONS.

8.1 Use of impervious surfaces.

No person shall apply fertilizer to or deposit grass clippings, leaves or other vegetative materials on impervious surfaces, or within storm water drainage systems, natural drainage ways, or buffer zones.

8.2 Unimproved land areas.

Except for driveways, sidewalks, patios, areas occupied by structures or areas which have been improved by landscaping, all areas shall be covered by plants or vegetative growth.

8.3 Buffer zone.

Fertilizer applications shall not be made within one rod (16.5 feet) of any wetland or water resource.

SECTION 9 PENALTY.

Any person, firm or corporation violating any provision of this ordinance shall be fined not less than five dollars nor more than five hundred dollars for each offense, and a separate offense shall be deemed committed on each day during or on which a violation occurs or continues.

SECTION 10. OTHER CONTROLS.

In the event of any conflict between the provisions of an erosion control or shoreland protection ordinance adopted by the City Council, the more restrictive standard prevails.

SECTION 11. SEVERABILITY.

The provisions of this ordinance are severable. If any provision of this ordinance or the application thereof to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications of this ordinance which can be given effect without the invalid provision or application.

SECTION 12. EFFECTIVE DATE.

This ordinance shall become effective three days following its publication in the official newspaper of the City.

Adopted by the City Council of the City of _____, _____ County, Minnesota this ____ day of _____ , 1999.

_____
Mayor

ATTEST:

Moved by:
Seconded by:

_____

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Draft 10/16/97

Minnesota Pollution Control Agency (MPCA)

MANAGING STORM WATER SEDIMENTS

Controlling storm water and snowmelt runoff are pollution control activities undertaken by cities, counties, and private firms. Proper removal, transport and disposal of the sediments produced through these activities is an important part of the project. This fact sheet is intended to provide guidance on disposal practices for sediments from construction activities, publicly-owned storm water ponds and storm water system grit chambers.

By following these guidelines carefully and completely, you can make sure that your project is protecting the environment.

GENERAL GUIDELINES FOR DISPOSAL

Storm water sediments removed from publicly-owned systems are generally considered safe and acceptable for use as fill in many upland areas. (Upland areas are areas away from water bodies and wetlands.)

Sediments should never be disposed of in water or allowed to erode into waters, including wetlands. In choosing the area to place the fill, the MPCA recommends that you maintain the separation distances outlined in the table below:

Separation Distances for Using Sediments as Fill	
Distance from surface water (including wetlands)	100 feet
Distance from streets, sidewalks, other drainage ways	100 feet
Depth to ground water	3 feet
Depth to fractured bedrock	10 feet

Minnesota Pollution Control Agency
520 Lafayette Road, St. Paul, MN 55155-4194

LOUIS L. FLYNN
Water Quality Division
(612) 296-6575 FAX (612) 282-6247
INTERNET: louis.flynn@pca.state.mn.us

Because sediments can easily erode, care should be taken to ensure that the materials do not erode from the disposal site. To prevent erosion, unless the fill is used on tilled farm land, the area should be seeded with a grass mixture or covered with mulch or other cover material within the following time frames:

Type of slope (horizontal : vertical)	Seed or cover within:
Steeper than 3:1	7 days
10:1 to 3:1	14 days
Flatter than 10:1	21 days

If the removed sediments contain liquid and need dewatering, a berm or other device should be placed around the disposal site to make sure the liquids do not escape during dewatering. Rain and snowmelt should be diverted around and away from the impounded sediment. This will prevent the liquid from carrying sediment back into a waterway.

SEDIMENTS NOT COVERED UNDER THESE GUIDELINES

Because some industrial sites may pose a greater environmental risk, the disposal guidelines in this fact sheet **do NOT** apply to sediments from industrial storm water ponds located on private property and permitted under the National Pollutant Discharge Elimination System (NPDES) program. To dispose of industrial pond sediments, you must obtain approval from the MPCA. Contact the MPCA's Water Quality Division at 612/296-7203 for more information.

In certain situations, municipal storm water sediments may become contaminated. Typically, this will occur when the area through which the storm water drains is the site of a major spill or on-going hazardous waste cleanup. When sediments are associated with such situations, these guidelines for disposal **do NOT** apply. In these cases, the sediments must be tested and handled appropriately, based on the testing. Contact the MPCA's cleanup coordinator for the specific spill or cleanup project.

The guidelines in this fact sheet **do NOT** apply to dredge spoil materials removed from lakes, rivers and wetlands. For dredging projects, you need to obtain a general or individual permit from the MPCA's Water Quality Division. Contact the MPCA at 612/296-7315 for more information on dredging projects.

REUSE IDEAS AND SUGGESTED DISPOSAL LOCATIONS

As long as the above guidelines are followed, many locations can benefit from reuse of sediments as fill material. Ideas include using dewatered sediment as fill in commercial/industrial development projects, on farm fields, on park lands, and other areas.

In some areas of Minnesota, fill materials are needed for use as daily cover on landfills. Dewatered storm water sediments may be used as daily cover material, although the MPCA recommends that they be used as cover on lined areas of sanitary landfills or on demolition landfills that have ground water monitoring systems. Individual counties may have additional restrictions; contact the county's solid waste officer for more information.

Areas to avoid for reuse of sediments include playgrounds, children's' play areas, residential yards or courtyards where human contact occurs on a continuous basis. Also, because sediments usually have a fine texture, they should not be used as fill in areas that may be used in the future for on-site sewage treatment systems.

TIPS FOR REMOVAL AND TRANSPORTATION OF SEDIMENTS

Sediments from ponds, lakes, rivers, streams, harbors or other waters must be carefully removed to minimize turbidity, further sedimentation or other water quality impacts. Careful transportation of sediments to the disposal site is essential to prevent spills:

- Sediments should be transported by motor vehicle only after dewatering.
- Hydraulically-transported sediments should go only to a secure disposal facility designed to hold the entire volume of sediment and the transport water.
- In general, supernatant, underdrains or wash waters are prohibited from discharge to water bodies, except in unusual circumstances. The MPCA recommends that these waters be evaporated, recycled or discharged to a sanitary sewer system, with the approval of the wastewater treatment operator.
- Should a spill occur during transportation, cleanup of the spilled material should be started as soon as possible, within 24 hours. The spilled material should be cleaned up to the maximum extent practical.

MORE INFORMATION

For more information on disposal of sediments, contact the MPCA at 612/296-7315.