DOUBLETREE RANCH ROAD REGIONAL DRAINAGE STUDY

FCD 94-28

STORMWATER MANAGEMENT REPORT VOLUME IV

STUDY PROGRESSION INFORMATION

DECEMBER 1996

Registered Professional Engineer (Civil) CERTIFICATE NO. 9993 DELMAR E. FOX Date Signed 12-19-96 ARIZONA, U.S.A.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Registered Professional Engineer (Civil) CERTIFICATE NO 22211 WILLIAM S. SNARR Date Signed ..... ARIZONA, U.S.A.

Prepared For:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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Hook Engineering, Inc.

DOUBLETREE RANCH ROAD

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

STREET CAPACITY CALCULATIONS

ELEVATION	STATION	SLOPE ('/ft)	SLOPE^1/2 ('/ft)	DISCHARGE (V) (cfs)	VELOCIT (V) (fps)	COMMENTS
1323.8	0					Indian Bend Wash Center
1324	40	0.0050	0.0707	25.94	2.85	
1326	70	0.0667	0.2582	94.70	10.42	
1328	160	0.0222	0.1491	54.68	6.02	
1330	720	0.0036	0.0598	21.92	2.41	Via Los Caballos
1332	770	0.0400	0.2000	73.36	8.07	
1334	845	0.0267	0.1633	59.89	6.59	Out of Indian Bend Flood Plain
1336	920	0.0267	0.1633	59.89	6.59	
	1270					Sanna/57th St
1338	1440	0.0038	0.0620	22.75	2.50	
1340	1750	0.0065	0.0803	29.46	3.24	
	2040					56th St
1340	2170	0.0000	0.0000	0.00	0.00	
1342	2325	0.0129	0.1136	41.66	4.58	
	2690					55th St
1344	2775	0.0044	0.0667	24.45	2.69	
1346	3170	0.0051	0.0712	26.10	2.87	
	3325					Channel Ditch
1348	3460	0.0069	0.0830	30.46	3.35	
1350	3840	0.0053	0.0725	26.61	2.93	
	4050					53rd St
1352	4130	0.0069	0.0830	30.46	3.35	
1354	4300	0.0118	0.1085	39.78	4.38	
1356	4560	0.0077	0.0877	32.17	3.54	
	4625					52nd St
1358	4785	0.0089	0.0943	34.58	3.81	
1360	4960	0.0114	0.1069	39.21	4.31	
1362	5265	0.0066	0.0810	29.70	3.27	
	5290					Martingale Rd
1364	5450	0.0108	0.1040	38.14	4.20	
1366	5670	0.0091	0.0953	34.97	3.85	
1368	5885	0.0093	0.0964	35.38	3.89	
1370	6025	0.0143	0.1195	43.84	4.82	
	6165					Foothills Manor Dr
1372	6275	0.0080	0.0894	32.81	3.61	
1374	6480	0.0098	0.0988	36.23	3.99	
1376	6606	0.0159	0.1260	46.21	5.08	
1378	6905	0.0067	0.0818	30.00	3.30	
1380	7180	0.0073	0.0853	31.28	3.44	Detention Basin #8
	7250					Tatum Blvd
	7250					Detention Basin #7
1382	7330	0.0133				
1384	7420	0.0222				
1386	7550	0.0154				
1388	7690	0.0143				
1390	7710	0.1000				
	7730					47th Place
1390	8040	0.0000				Detention Basin #6
1392	8110	0.0286				
1394	8260	0.0133				
1396	8390	0.0154				
1398	8500	0.0182				
1400	8640	0.0143				
1402	8750	0.0182				
1404	8885	0.0148				
	8930					Horseshoe Road
1406	8985	0.0200				
1408	9060	0.0267				
1410	9120	0.0333				Detention Basin #5
1412	9220	0.0200				
1414	9315	0.0211				
1416	9430	0.0174				
1418	9520	0.0222				
1420	9640	0.0167				
1422	9680	0.0500				
1424	9760	0.0250				
1426	9865	0.0190				
1428	9910	0.0444				
1430	9940	0.0667				
1432	9960	0.1000				
1434	10000	0.0500				
1436	10030	0.0667				
1438	10080	0.0400				
1440	10150	0.0286				
1442	10210	0.0333				
1444	10300	0.0222				
1446	10350	0.0400				Detention Basin #4
1448	10420	0.0286				
1450	10480	0.0333				

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

STORM DRAIN ANALYSIS

Doubletree Ranch Road
100-Year With Detention

REACH	SPAN (ft)	DEPTH (ft)	SIZE (ft)	LENGTH (FT)	QUANTITIES/PRICE (Per Linear Ft) Concrete (cuyd)	Sub Cost	Steel (lbs)	Sub Cost	Trench ($)	Backfill ($)	ROAD REMOVAL & REPLACEMENT (Width)	(sqyd)	Sub Cost	TOTAL COST ($)	COMMENTS
Indian Bend Wash				1500											
to 56th Street	2 - 8	5.46	2 - 8 x 6		1.725	517,500	297.6	223,200	49,192	92,430	41	6,833	112,750	995,073	
	2 - 10	4.35	2 - 10 x 5		2.168	650,400	318.4	238,800	52,500	73,320	43	7,167	118,250	1,133,270	
	2 - 12	3.67	-												Eliminated (No Chart)
	10	7.37	10 x 8		1.423	426,900	188.1	141,075	40,425	137,280	38	6,333	104,500	850,180	
	12	6.08	-												Eliminated (No Chart)
														2,978,523	Sum
														992,841	Average
56th Street to				1155											
Via La Serena	2 - 6	5.69	2 - 6 x 6		1.394	322,014	203.3	117,406	31,289	71,171	37	4,748	78,348	620,227	
Channel	2 - 8	3.70	2 - 8 x 4		1.558	359,898	274.9	158,755	31,006	43,393	37	4,748	78,348	671,400	
	2 - 10	3.00	2 - 10 x 3		1.965	453,915	296.9	171,460	32,340	31,982	39	5,005	82,583	772,279	
	8	7.14	8 x 8		1.180	272,580	182.7	105,509	27,246	105,706	36	4,620	76,230	587,271	
	10	5.60	10 x 6		1.262	291,522	173.4	100,139	26,357	71,171	34	4,363	71,995	561,184	
	12	4.68	-												Eliminated (No Chart)
														3,212,361	Sum
		-												642,472	Average
Via La Serena				1165											
Channel to	2 - 6	4.78	2 - 6 x 5		1.32	307560	191.6	111607	28,706	56,945	35	4530.56	74754.167	579,572	
52nd Street	2 - 8	3.54	2 - 8 x 4		1.558	363014	274.9	160129.3	31,274	43,769	37	4789.44	79025.833	677,213	
	2 - 10	2.88	2 - 10 x 3		1.965	457845	296.9	172944.3	32,620	32,259	39	5048.33	83297.5	778,966	
	8	6.01	8 x 6		1.044	243,252	153.3	89,297	23,242	71,787	32	4,142	68,347	495,925	
	10	4.76	10 x 5		1.182	275,406	165.0	96,113	24,180	56,945	32	4,142	68,347	520,990	
	12	4.00	-												Eliminated (No Chart)
														3,052,665	Sum
														610,533	Average
52nd Street to				2465											
Tatum Boulevard	Pipe Culvert														
	2					123,250					14	3,834	63,268	186,518	
	2.5					135,575					15	4,108	67,788	203,363	
	3					32,045					16	4,382	72,307	104,352	
														494,233	Sum
														164,744	Average
Doubletree Ranch Rd				2640											
to Butler Drive	6	5.85	6 x 6		0.802	423,456	137.8	181,896	45,184	162,677	30	8,800	145,200	958,412	
	8	4.27	8 x 5		0.976	515,328	144.3	190,476	47,956	129,043	30	8,800	145,200	1,028,003	
	10	3.44	10 x 4		1.102	581,856	160.4	211,728	49,249	99,185	30	8,800	145,200	1,087,218	
														3,073,633	Sum
														1,024,544	Average
Butler Drive to				1600											
49th Street	Pipe Culvert										14	2,489	41,067	41,067	
	2					80,000									
52nd Street to				1350											
Berneil Wash	6	6.47	-												Eliminated (No Chart)
	8	4.69	8 x 5		0.976	263,520	144.3	97,403	24,523	65,988	30	4,500	74,250	525,683	
	10	3.76	10 x 4		1.102	297,540	160.4	108,270	25,184	50,720	30	4,500	74,250	555,964	
														1,081,647	Sum
														540,824	Average
56th Street to				1900											
Cherokee Wash	6	5.98	6 x 6		0.802	304,760	137.8	130,910	32,518	117,078	30	6,333	104,500	689,767	
	8	4.36	8 x 5		0.976	370,880	144.3	137,085	34,514	92,872	30	6,333	104,500	739,851	
	10	3.51	10 x 4		1.102	418,760	160.4	152,380	35,445	71,383	30	6,333	104,500	782,468	
														2,212,085	Sum
														737,362	Average
													Sub Total	$4,754,386	

Quantities	Cost	Unit
Concrete	200.00	cuyd
Steel	0.50	lbs
Road Removal	2.50	sqyd
Road Replacement	14.00	sqyd
24" Pipe	50.00	Linft
30". Pipe	55.00	Linft
36" Pipe	65.00	Linft
Trench	3.50	cuyd
Backfill	13.00	cuyd

Miscellaneous	Quantity	Unit Cost	Total Cost
Headwalls (each)	4	3,500	14,000
Junction Box (each)	1	3,500	3,500
Manholes (each)	20	1,500	30,000
Inlets (each)	20	1,500	30,000
Channels (cuyd)	5000	5	25,000
Energy Dissipator	1	15,000	15,000
Tatum Crossing	1	50,000	50,000
		Sub Cost	167,500

GRAND TOTAL $ 4,921,886

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

STORM DRAIN ANALYSIS

Doubletree Ranch Road
100-Year With NO Detention

REACH	SPAN (ft)	DEPTH (ft)	SIZE (ft)	LENGTH (FT)	QUANTITIES/PRICE (Per Linear Ft) Concrete (cuyd)	Sub Cost	Steel (lbs)	Sub Cost	Trench ($)	Backfill ($)	ROAD REMOVAL & REPLACEMENT (Width)	(sqyd)	Sub Cost	TOTAL COST ($)	COMMENTS
Indian Bend Wash				1500											
to 56th Street	2 - 8	7.11	2 - 8 x 8		1.892	567,600	337.1	252,825	58,118	137,280	45	7,500	123,750	1,139,573	
	2 - 10	5.58	2 - 10 x 6		2.270	681,000	330.7	248,025	57,750	92,430	45	7,500	123,750	1,202,955	
	2 - 12	4.66	-												Eliminated (No Chart)
	8	-													Eliminated (Depth > Span)
	10	9.62	10 x 10		1.622	486,600	206.4	154,800	46,673	190,710	42	7,000	115,500	994,283	
	12	7.84	12 x 8		1.803	540,900	131.2	98,400	45,518	137,280	40	6,667	110,000	932,098	
														4,268,908	Sum
														1,067,227	Average
56th Street to				1155											
Via La Serna Channel	2 - 8	6.91	2 - 8 x 7		4.892	**********	790.1	456,283	41,314	87,537	43	5,518	91,053	1,806,239	
	2 - 10	5.43	2 - 10 x 6		6.222	**********	894.7	516,689	44,468	71,171	45	5,775	95,288	2,164,897	
	2 - 12	4.55	-												Eliminated (No Chart)
	8	12.30	-												Eliminated (Depth > Span)
	10	9.35	10 x 10		1.622	374,682	206.4	119,196	35,938	146,847	42	5,390	88,935	765,598	
	12	7.64	12 x 8		1.803	416,493	313.2	180,873	35,048	105,706	40	5,133	84,700	822,820	
														5,559,554	Sum
														1,389,889	Average
Via La Serna Channel				1165											
to 52nd Street	2 - 8	4.78	2 - 8 x 5		1.642	382,586	284.3	165,605	34,740	56,945	39	5,048	83,298	723,174	
	2 - 10	3.83	2 - 10 x 4		2.067	481,611	310.0	180,575	36,698	43,769	41	5,307	87,569	830,222	
	2 - 12	3.25	-												Eliminated (No Chart)
	8	8.28	-												Eliminated (Depth > Span)
	10	6.44	10 x 7		1.343	312,919	182.5	106,306	28,991	88,295	36	4,660	76,890	613,402	
	12	5.35	-												Eliminated (No Chart)
														2,166,797	Sum
														722,266	Average
52nd Street				2465											
to Tatum Boulevard	8	4.65	8 x 5		0.976	481,168	144.3	177,850	44,777	120,489	30	8,217	135,575	959,859	
	10	3.73	10 x 4		1.102	543,286	160.4	197,693	45,985	92,610	30	8,217	135,575	1,015,149	
	12	3.17	-												Eliminated (No Chart)
														1,975,007	Sum
														987,504	Average
Doubletree Ranch Rd				2640											
to Butler Drive	6	6.60	-												Eliminated (Depth > Span)
	8	4.78	8 x 5		0.976	515,328	144.3	190,476	47,956	129,043	30	8,800	145,200	1,028,003	
	10	3.83	10 x 4		1.102	581,856	160.4	211,728	49,249	99,185	30	8,800	145,200	1,087,218	
														2,115,221	Sum
														1,057,610	Average
Butler Drive to				1600											
49th Street	Pipe Culvert														
	4					152,000					18	3,200	52,800	204,800	
52nd Street to				1350											
Berneil Wash	6	6.47	-												Eliminated (Depth > Span)
	8	4.69	8 X 5		0.976	263,520	144.3	97,403	24,523	65,988	30	4,500	74,250	525,683	
	10	3.76	10 X 4		1.102	297,540	160.4	108,270	25,184	50,720	30	4,500	74,250	555,964	
														1,081,647	Sum
														540,824	Average
56th Street to				1900											Overflow from Cherokee Wash
Cherokee Wash	6	5.98	6 X 6		0.802	304,760	137.8	130,910	32,518	117,078	30	6,333	104,500	689,767	
	8	4.36	8 X 5		0.976	370,880	144.3	137,085	34,514	92,872	30	6,333	104,500	739,851	
	10	3.51	10 X 4		1.102	418,760	160.4	152,380	35,445	71,383	30	6,333	104,500	782,468	
														2,212,085	Sum
														737,362	Average
													Sub Total	$6,707,480	

Quantities	Cost	Unit
Concrete	200.00	cuyd
Steel	0.50	lbs
Road Removal	2.50	sqyd
Road Replacement	14.00	sqyd
48" Pipe	95.00	Linft
Trench	3.50	cuyd
Backfill	13.00	cuyd

Miscellaneous	Quantity	Unit Cost	Total Cost
Headwalls (each)	6	5,000	30,000
Junction Box (each)	2	5,000	10,000
Manholes (each)	30	2,000	60,000
Inlets (each)	30	2,000	60,000
Channels (cuyd)	5000	5	25,000
Energy Dissiaptor	1	20,000	20,000
Tatum Crossing	1	80,000	80,000
		Sub Cost	205,000

GRAND TOTAL $6,912,480

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

STORM DRAIN ANALYSIS

Doubletree Ranch Road
10-Year With Detention

REACH	CULVERT SIZE (ft)	LENGTH (FT)	QUANTITIES/PRICE (Per Llinear Ft) Concrete (cuyd)	Sub Cost	Steel (lbs)	Sub Cost	Trench ($)	Backfill ($)	ROAD REMOVAL & REPLACEMENT (Width)	(Sqyd)	Sub Cost	TOTAL COST ($)	COMMENTS
Indian Bend Wash to 56th Street	6 x 5	1500	0.746	223,800	123.0	92,250	23,310	73,320	28	4,667	77,000	489,680	
	8 x 4		0.908	272,400	138.8	104,100	24,518	56,355	28	4,667	77,000	534,373	
	10 x 3		1.022	306,600	151.4	113,550	24,885	41,535	28	4,667	77,000	563,570	
												529,208	Average
56th Street to Via La Serna Channel	6 x 4	1155	0.691	159,621	104.4	60,291	16,170	43,393	26	3,337	55,055	334,530	
	8 x 3		0.841	194,271	123.8	71,495	16,776	31,982	26	3,337	55,055	369,579	
	6			231,000					26	3,337	55,055	286,055	
												330,055	Average
Via La Serna Channel to 52nd Street	6 x 3	1165	0.635	147,955	90.0	52,425	14,516	32,259	24	3,107	51,260	298,415	
	6			233,000					26	3,366	55,532	288,532	
												293,473	Average
52nd Street to Tatum Boulevard	2	2465		123,250					14	3,834	63,268	186,518	
Doubletree Ranch Rd to Butler Drive	4.5	2640		316,800					21	6,160	101,640	418,440	
Butler Drive to 49th Street	2	1600		80,000					14	2,489	41,067	121,067	
52nd Street to Berneil Wash	4	1350		148,500					19	2,850	47,025	195,525	
56th Street to Cherokee Wash	4.5	1900		228,000					21	4,433	73,150	301,150	
											Sub Cost	$2,375,435	

Quantities	Cost	Unit
Concrete	200.00	cuyd
Steel	0.50	lbs
Trench	3.50	cuyd
Backfill	13.00	cuyd
24" Pipe	50.00	Linft
48" Pipe	110.00	Linft
54" Pipe	120.00	Linft
72" Pipe	200.00	Linft
Road Removal	2.50	sqyd
Road Replacement	14.00	sqyd

Miscellaneous	Quantity	Unit Cost	Total Cost
Headwalls (each)	4	2,500	10,000
Junction Box (each)	1	2,500	2,500
Manholes (each)	25	1,500	37,500
Inlets (each)	20	1,500	30,000
Channels (cuyd)	5000	5	25,000
Energy Dissipator	1	10,000	10,000
Tatrum Crossing	1	40,000	40,000
		Sub Cost	155,000

GRAND TOTAL $2,530,435

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

STORM DRAIN ANALYSIS

Doubletree Ranch Road
10-Year With NO Detention

REACH	SPAN (ft)	DEPTH (ft)	SIZE (ft)	LENGTH (ft)	QUANTITIES/PRICE (Per Linear Ft) Concrete (cuyd)	Sub Cost	Steel (lbs)	Sub Cost	Trench ($)	Backfill ($)	ROAD REMOVAL & REPACEMENT (Width)	(sqyd)	Sub Cost	TOTAL COST ($)	COMMENTS
56th Street				1500											
	6	6.02	-												Eliminated (Depth > Span)
	8	4.39	8 x 5		0.976	292,800	144.3	108,225	27,248	73,320	30	5,000	82,500	584,093	
	10	3.53	10 x 4		1.102	330,600	160.4	120,300	27,983	56,355	30	5,000	82,500	617,738	
														1,201,830	Sum
														600,915	Average
Channel Ditch				1155											
	6	5.86	6 x 6		0.802	185,262	137.8	79,580	19,768	71,171	30	3,850	63,525	419,305	
	8	4.28	8 x 5		0.976	225,456	144.3	83,333	20,981	56,456	30	3,850	63,525	449,751	
	10	3.45	10 x 4		1.102	254,562	160.4	92,631	21,547	43,393	30	3,850	63,525	475,658	
														1,344,715	Sum
														448,238	Average
52nd Street				1165											
	6	4.03	6 x 5		0.746	173,818	123.0	71,648	18,104	56,945	28	3,624	59,803	380,318	
	8	3.02	8 x 4		0.908	211,564	138.8	80,851	19,042	43,769	28	3,624	59,803	415,029	
	10	2.48	10 x 3		1.022	238,126	151.4	88,191	19,327	32,259	28	3,624	59,803	437,706	
														1,233,053	Sum
														411,018	Average
Tatum Blvd.				2465											
	6	2.33	6 x 3		0.635	313,055	90.0	110,925	30,714	68,256	24	6,573	108,460	631,410	
	8	1.81	-												Eliminated (No Chart)
	10	1.52	-												Eliminated (No Chart)
	Pipe Culvert 5.5					419,050					21	5,752	94,903	513,953	
														1,145,362	Sum
														572,681	Average
Mockingbird Ln				2640											
	6	2.39	6 x 3		0.635	335,280	90.0	118,800	32,894	73,102	24	7,040	116,160	676,236	
	8	1.85	-												Eliminated (No Chart)
	10	1.55	-												Eliminated (No Chart)
	Pipe Culvert 5.5					448,800					24	7,040	116,160	564,960	
														1,241,196	Sum
														620,598	Average
Butler Drive to 49th Street	Pipe Culvert 2			1600		80,000					14	2,489	41,067	121,067	
52nd Street to Berneil Wash	Pipe Culvert 4.5			1350		162,000					21	3,150	51,975	213,975	
56th Street to Cherokee Wash	Pipe Culvert 4.5			1900		228,000					21	4,433	73,150	301,150	Overflow from Cherokee Wash
													Sub Total	$3,289,642	

Quantities	Cost	Unit
Concrete	200.00	cuyd
Steel	0.50	lbs
Road Removal	2.50	sqyd
Road Replacement	14.00	sqyd
24" Pipe	50.00	Linft
54" Pipe	120.00	Linft
66" Pipe	170.00	Linft
Trench	3.50	cuyd
Backfill	13.00	cuyd

Miscellaneous	Quantity	Unit Cost	Total Cost
Headwalls (each)	6	4,000	24,000
Junction Box Each)	2	4,000	8,000
Manholes (each)	35	1,500	52,500
Inlets (each)	35	1,500	52,500
Channels (cuyd)	5000	5	25,000
Energy Dissipator	1	12,000	12,000
Tatum Crossing	1	50,000	50,000
		Sub Cost	$174,000

GRAND TOTAL $3,463,642

11-29-95 WSS

PROJECT NO. 2878

DOUBLETREE RANCH ROAD
PRELIMINARY COST ESTIMATE SUMMARY

ALTERNATIVES	LAND ACQUISITION ($)	STORM DRAIN CONST. ($)	DETENTION BASIN CONST. ($)	SUB TOTAL CONST. ($)	UTILITY RELOCATIONS 20% of Construction ($)	ENGINEERING DESIGN Includes: Civil Geotechnical Landscape Structural Survey 10% of Construction ($)	CONSTRUCTION ADMIN. Includes: Inspection Survey Testing 20% of Construction ($)	CONTINGENCY 15% of Land Acquisition & Construction ($)	TOTAL PROJECT COST ($)
(1) NO DETENTION BASINS									
(1A) 100-Year	175,500	6,912,480	-0-	6,912,480	1,382,496	691,248	1,382,496	1,063,197	$11,607,417
(1B) 10-Year	175,500	3,463,642	-0-	3,463,642	692,728	346,364	692,728	545,871	$5,916,834
(2) WITH DETENTION BASINS									
(2A) 100-Year	2,302,616	4,921,886	1,832,232	6,754,118	1,350,824	675,412	1,350,824	1,358,510	$13,792,304
(2B) 10-Year	1,243,413	2,530,435	989,405	3,519,841	703,968	351,984	703,968	714,488	$7,237,662

12-13-95 WSS

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

DETENTION BASINS
CONSTRUCTION COST SUMMARIES

DETENTION BASIN NO.	AREA (Acres)	LAND COST	CLEARING/ CRUBBING ($1850/Acre)	EXCAVATION (cuyd)	EXCAVATION ($8/cuyd)	STRUCTURAL FILL (CUYD)	STRUCTURAL FILL ($13.00)	EROSION CONTROL (sqyd)	EROSION CONTROL ($.30/sqyd)	FENCE (linft)	FENCE ($9/Linft)	OUTLET WEIR (Lump Sum)	TOTAL COST ($)	COMMENTS
1														Eliminated-small volume
1A	1.5		2,775	7,900	63,200	1,600	20,800	7,260	2,178			20,000	108,953	City of Phoenix-Mountain Prese
2														Eliminated-small volume
3														Eliminated-small volume
4	4		7,400	15,500	124,000	10,300	133,900	19,360	5,808			20,000	291,108	City of Phoenix-Mountain Prese
5	2		3,700	12,200	97,600	4,400	57,200	9,680	2,904			20,000	181,404	City of Phoenix-Mountain Prese
6	1	58,500	1,850	7,000	56,000	1,000	13,000	4,840	1,452	750	6,750	20,000	99,052	Doubletree Canyon HOA
7	2	117,000	3,700	13,000	104,000	2,300	29,900	9,680	2,904	1,200	10,800	20,000	171,304	Doubletree Canyon HOA
8	9	1,100,000	16,650	39,100	312,800	7,360	95,680	43,560	13,068	2,400	21,600	20,000	479,798	
9	2.5	305,000	4,625	15,000	120,000	0	0	12,100	3,630	1,250	11,250	20,000	159,505	
10	4	722,116	7,400	26,500	212,000	6,200	80,600	19,360	5,808	1,700	15,300	20,000	341,108	
		$2,302,616	$48,100		$1,089,600		$431,080		$37,752		$65,700	$160,000	1,832,232	Doubletree Ranch Road Subtot
11														Eliminated-small volume
12	2	227,379	3,700	13,800	110,400	4,150	53,950	9,680	2,904	1,200	10,800	20,000	201,754	
13	5	1,044,236	9,250	11,300	90,400	5,200	67,600	24,200	7,260	1,800	16,200	20,000	210,710	
14														Eliminated-small volume
15	11	66,000	20,350	80,000	640,000	2,890	37,570	53,240	15,972			20,000	733,892	Paradise Valley Golf Course
16	5	292,500	9,250	40,700	325,600	4,100	53,300	24,200	7,260	1,700	15,300	20,000	430,710	
		$1,630,115	$42,550		$1,166,400		$212,420		$33,396		$42,300	$80,000	1,577,066	Cherokee Wash Subtotal
	49	$3,932,731	90,650	282,000	2,256,000	49,500	643,500	237,160	71,148	12,000	108,000	240,000	$3,409,298	GRAND TOTAL

DOUBLETREE RANCH ROAD
PROJECT NO. 2878

CONSTRUCTION COST (ADOT 1991)

Clearing and Grubbir (49 acres)

Acres	Bidder #1	Bidder #2	Bidder #3	Average $	Location	Comments
110	500	3500	500	1500	Desert View	
10	1500	100	5000	2200	Superstitution	
			Sum Total	1850		Used

Excavatior (326,276 cuyd)

cuyd	Bidder #1	Bidder #2	Bidder #3	Average $	Location	Comments
8861	4	2.6	3.75	3.45		
4805	3	5.3	9.87	6.06		
2990	2.5	2	2.5	2.33		
179	12	5	50	22.33		
30	15	5	5	8.33		
130	5	2.6	9	5.53		
376	3	3.5	4	3.50		
1	70	35	50	51.67		
3690	7	5	3	5.00		
14035	2	2.5	1.75	2.08	Shea Blvd	
568	12	10	5	9.00		
150	8.8	10	4	7.60		
93030	4.25	2	1.5	2.58	48th St-Priest	
30836	3.5	2.55	4	3.35		
1470	10	6	4	6.67		
35	16	11.3	12.71	13.34		
29	13	20	46	26.33		
55	12	2.5	25	13.17		
30	30	25	20	25.00		
513	4	5	3	4.00		
155	14.5	20	35	23.17		
670	8	12	15	11.67		
588	5	2	10	5.67		
2426	6	2.75	2	3.58		
34	20	12	20	17.33		
160	5	12	1	6.00		
38432	1.5	2.5	1.5	1.83	Pima	
48400	1.6	1.5	1.5	1.53		
110	12	10	5	9.00		
124	8.75	6.52	3	6.09		
1380	3.34	2.5	5	3.61		
4	25	25	8.5	19.50		
924	2.5	6	6	4.83		
10740	2.5	2.5	2	2.33	Pima	
3110	3	3.05	5	3.68		
957	3	3	2	2.67	Maricopa Rd	

298000	2.83	2.65	1.8	2.43	Maricopa Rd
175	7	35	12	18.00	
50	30	20	30	26.67	
20	15	35	30	26.67	
60	30	20	30	26.67	
30	30	20	30	26.67	
315	7	5	4	5.33	Maricopa Rd
110	10	5	4	6.33	Maricopa Rd
135	9	5	4	6.00	Maricopa Rd
117	10	5	4	6.33	Maricopa Rd
150	8	5	4	5.67	Maricopa Rd
			SUM	500.59	
			Avg. Cost	10.65	
					7.31 Used 8.00
			Shading	3.96	

Reinforced Concrete Pipe

18" Class IV

Linft	Bidder #1	Bidder #2	Bidder #3	Average $	Location	Comments
49	50	100	80	76.67		
384	26	40	30	32.00		
1145	30	50	47	42.33		
610	22	67	36	41.67		
50	130	80	70	93.33		
25	48	90	55	64.33		
60	37.5	45	60	47.50		
837	31	40	33.3	34.77		
			SUM	432.6		
			Avg. Cost	54.08		

24" Class III

485	40	50	40	43.33		
1482	36	40	36	37.33		
479	25	45	36	35.33		
74	70	25	83	59.33		
814	43	50	58	50.33		
1380	40	40	45	41.67		
1689	45	50	50	48.33		
28	45	60	100	68.33		
77	70	100	70	80.00		
5133	38	35	43.3	38.77		
116	40.15	35	40	38.38		
			SUM	541.15		
			Avg Cost	49.20		Used 50.00

30" Class III

1649	45.5	60	46	50.50
221	36	57	48	47.00
183	55	45	50	50.00
1108	60	60	67	62.33
1043	38	40	44.4	40.80

80	48.2	45	120	71.07		
			SUM	321.7		
			Avg Cost	53.62		Used 55.00
36" Class III						
72	73	70	68	70.33		
496	48	60	66.5	58.17		
188	51.34	50	95	65.45		
			SUM	193.95		
			Avg Cost	64.65		Used 65.00
48" Pipe						
43	100.5	125	74	99.83		
50	61	120	125	102.00		
425	95	100	85	93.33		
25	96	125	111	110.67		
246	70	100	100	90.00		
104	117	125	90	110.67		
160	85	120	110	105.00		
317	106	100	105	103.67		
40	102	135	122	119.67		
52	100	115	151	122.00		
982	100	135	144	126.33		
				1183.167	Sum	
				107.5606	Average	Used 110
54" Class II, III, IV						
234	95	120	100	105.00		
50	68	135	150	117.67		
50	125	80	149	118.00		
58	96	135	122	117.67		
527	120	180	100	133.33		
839	139	110	110	119.67		
			SUM	711.33		
			Avg Cost	118.56		Used 120.00
60" Class I, III						
1245	145	75	144	121.33		
50	140	140	1	93.67		
			SUM	215.00		
			Avg Cost	107.50		Used 140.00
66" Class IV						
116	135	200	178	171.00		Used 170.00
72" ClassI, IV						
2243	198	125	174	165.67		
86	225	300	235	253.33		
80	145	200	200	181.67		
			SUM	600.67		
			Avg Cost	200.22		Used 200.00
Outlet Structure						
1	1924	2500	1500	1974.67		

1	2665	3500	4000	3388.33	
			SUM	5363.00	
			Avg Cost	2681.50	Used 3000.00

Structural Concrete Class S F'c = 3000

845	143	160	200	167.67
1798	129.06	90	140	119.69
1722	145	160	170	158.33
86	150	150	110	136.67
67	370	340	330	346.67
2268	110	130	440	226.67
1013	190	220	200	203.33
234	210	160	175	181.67
2230	110	200	132	147.33
340	150	248	185	194.33
210	110	125	140	125.00
106	181.59	125	115	140.53
167	150	135	110	131.67
102	215	190	230	211.67
575	110	125	140	125.00
19	214.11	125	150	163.04
387	225	185	350	253.33
432	140	125	110	125.00
3730	110	140	110	120.00
538	140	200	161	167.00
219	110	125	140	125.00
214	159.11	125	115	133.04
141	150	150	110	136.67
525	115	125	100	113.33
286	110	125	140	125.00
217	159.91	125	115	133.30
1085	200	190	220	203.33
1137	110	200	100	136.67
6366	100	110	95	101.67
150	250	365	162	259.00
89	110	150	140	133.33
187	159.91	125	115	133.30
102	110	135	140	128.33
350	159.91	125	115	133.30
381	140	125	110	125.00
1660	110	160	100	123.33
289	105	127	160	130.67
167	110	125	140	125.00
362	159.91	125	115	133.30
1334	130	115	105	116.67
88	170	150	135	151.67
121	150	150	110	136.67
3895	117	150	125	130.67
640	130	210	144.61	161.54
346	140	125	110	125.00
107	180	175	135	163.33
239	150	130	110	130.00
3464	110	140	110	120.00
236	100	100	121.25	107.08

147	170	130	110	136.67	
378	110	175	110	131.67	
411	150	135	138	141.00	
510	140	135	123	132.67	
530	105	125	137	122.33	
		SUM		8084.12	
		AvgCost		149.71	Used 200.00

Headwall

4	2000	4000	2000	2666.67	
2	2000	4000	2000	2666.67	
2	1000	1500	2000	1500.00	
2	4000	1500	3200	2900.00	
2	5500	6500	10500	7500.00	
2	5000	1500	5000	3833.33	
1	15502	18218	10000	14573.33	
1	4000	1500	3200	2900.00	
1	3000	1800	2100	2300.00	
1	15502.99	16000	10000	13834.33	
2	2200	2000	3000	2400.00	
1	3300	2000	2000	2433.33	
1	3500	5000	1500	3333.33	
1	3000	2500	2500	2666.67	
			SUM	65507.66	
			Avg Cost	4679.12	Used 5000.00

Reinforcing Steel

127340	0.31	0.35	0.35	0.34
83794	0.54	0.35	0.3	0.40
406600	0.3	0.32	0.3	0.31
11099	0.3	0.28	0.25	0.28
631900	0.3	0.3	0.28	0.29
632586	0.31	0.32	0.3	0.31
523664	0.3	0.3	0.3	0.30
423200	0.26	0.3	0.27	0.28
2091460	0.3	0.3	0.29	0.30
514420	0.32	0.27	0.33	0.31
70730	0.38	0.35	0.3	0.34
37112	0.32	0.35	0.32	0.33
12395	0.38	0.35	0.3	0.34
21199	0.35	0.28	0.25	0.29
399510	0.26	0.3	0.27	0.28
98940	0.32	0.35	0.32	0.33
2754	0.38	0.35	0.3	0.34
58240	0.32	0.3	0.5	0.37
60763	0.35	0.28	0.25	0.29
1425878	0.31	0.32	0.3	0.31
254425	0.3	0.3	0.29	0.30
34771	0.32	0.35	0.32	0.33
27511	0.38	0.35	0.3	0.34
19116	0.35	0.28	0.25	0.29
88455	0.26	0.3	0.27	0.28
44667	0.32	0.35	0.32	0.33
27732	0.38	0.35	0.3	0.34

1543570	0.25	0.28	0.25	0.26
564100	0.31	0.32	0.3	0.31
895903	0.26	0.3	0.27	0.28
159729	0.3	0.3	0.29	0.30
12000	0.32	0.35	0.32	0.33
23607	0.38	0.35	0.3	0.34
13900	0.32	0.35	0.32	0.33
44969	0.38	0.35	0.3	0.34
51839	0.36	0.28	0.25	0.30
908985	0.31	0.32	0.3	0.31
102734	0.3	0.3	0.29	0.30
21450	0.32	0.35	0.32	0.33
45454	0.38	0.35	0.3	0.34
190186	0.35	0.28	0.25	0.29
16023	0.35	0.28	0.25	0.29
1162540	0.31	0.32	0.3	0.31
308100	0.3	0.3	0.29	0.30
50555	0.35	0.28	0.25	0.29
33800	0.35	0.28	0.25	0.29
1369242	0.31	0.32	0.3	0.31
57250	0.3	0.3	0.29	0.30
20698	0.35	0.28	0.25	0.29
160365	0.31	0.32	0.3	0.31
62100	0.3	0.3	0.29	0.30
79500	0.3	0.3	0.29	0.30
65000	0.3	0.3	0.29	0.30
3288	0.3	0.3	0.29	0.30
			SUM	16.79
			Avg. Cost	0.31

Used .50

Seeding

5	1150	1150	1320	1206.67
28	700	850	690	746.67
2	1500	1500	1800	1600.00
3	1200	1800	1800	1600.00
20	880	925	890	898.33
116	725	860	700	761.67
5	1100	1160	1000	1086.67
4	1411	1240	1200	1283.67
2	1500	1700	2000	1733.33
36	700	850	690	746.67
1	1500	1700	2000	1733.33
1	4200	3916	4000	4038.67
32	758	800	750	769.33
3	2563	1600	2100	2087.67
42	1000	750	739	829.67
1	1500	1478	2000	1659.33
1	2200	1800	2000	2000.00
2	2200	2000	2400	2200.00
3	1572	2000	1350	1640.67
5	1100	996	1000	1032.00
21	1300	1250	2000	1516.67
76	1300	1250	2000	1516.67
83	800	800	760	786.67

96	589.72	700	600	629.91	
588			SUM	34104.24	
		Avg. Cost/Acre		58.00	
		Avg. Cost/ sqyd		0.29	Used .30

Chain Link Fence

3315	9.32	7.6		5.64	
60	12	12	15	13.00	
24129	5.5	6	6	5.83	
35	10	20	25	18.33	
4190	8	7.5	7.5	7.67	
4649	7	10	7	8.00	
6898	5	6	5	5.33	
892	6.2	15	7	9.40	
			SUM	73.21	
			Avg. Cost	9.15	Used 9.00

Channel Excavation (cuyd)

8496	1.5	2	3	2.17	
14520	1.5	2.5	1.75	1.92	
802800	2.2	3	2.1	2.43	
725	9.86	3.5	6	6.45	
			Sum	12.97	
			Avg Cost	3.24	Used 5.00

TABLE 3

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CONCEPTUAL STORM DRAIN ANALYSIS

Doubletree Ranch Road Storm Drain System (Diversion of Cherokee Wash)
100-Year With NO Detention

REACH	DISCHARGE (Q)	SLOPE (ft/ft)	SIZE (ft)	LENGTH (FT)	QUANTITIES/PRICE (Per Linear Ft)						ROAD REMOVAL & REPLACEMENT			TOTAL COST ($)
					Concrete (cuyd)	Sub Cost	Steel (lbs)	Sub Cost	Trench ($)	Backfill ($)	(Width)	(sqyd)	Sub Cost	
Indian Bend Wash to 56th Street	3533	0.0063	3-10x6	1600	3.258	1,042,560	474.9	379,920	86,688	98,592	56	9,956	164,267	1,772,027
56th Street to Via La Serna Channel	3011	0.0045	3-10x6	1300	3.258	847,080	474.9	308,685	70,434	80,106	56	8,089	133,467	1,439,772
Via La Serna Channel to 52nd Street	2947	0.0071	2-10x7	1300	2.372	616,720	355.9	231,335	54,600	98,527	47	6,789	112,017	1,113,199
52nd Street to Tatum Boulevard	744	0.0092	8x5	2465	0.976	481,168	144.3	177,850	51,161	120,489	30	8,217	135,575	966,243
Tatum Boulevard to Concrete Channel	721	0.02	8x4	783	0.908	142,193	138.8	54,340	12,798	29,417	28	2,436	40,194	278,942
Tatum Boulevard to Tomahawk Trail	29	0.0098	30"	1425							15	2,375	39,188	39,188
Doubletree Ranch Rd to Butler Drive (52nd street)	1985	0.003	2-10x7	2650	2.372	1,257,160	355.9	471,567	111,300	200,844	47	13,839	228,342	2,269,213
Bulter Drive to Cherokee Wash (52nd Street)	1574	0.0133	12x6	1250	1.423	355,750	188.1	117,563	32,069	77,025	36	5,000	82,500	664,906
Butler Drive to 49th Street	101	0.0064	48"	1650							18	3,300	54,450	54,450
52nd Street to Berneil Wash	320	0.002	8x5	1350	0.976	263,520	144.3	97,403	24,523	65,988	30	4,500	74,250	525,683
56th Street to Cherokee Wash	374	0.0048	8x4	1900	0.908	345,040	138.8	131,860	31,056	71,383	28	5,911	97,533	676,872
													Sub Total	$9,800,494

Quantities	Cost	Unit
Concrete	200.00	cuyd
Steel	0.50	lbs
Road Removal	2.50	sqyd
Road Replacement	14.00	sqyd
30" Pipe	55.00	Linft
48" Pipe	95.00	Linft
Trench	3.50	cuyd
Backfill	13.00	cuyd

Miscellaneous	Quantity	Unit Cost	Total Cost
Headwalls (each)	6	5,000	30,000
Trash Rack	5	5,000	25,000
Junction Box (each)	5	10,000	50,000
Manholes (each)	36	3,000	108,000
Inlets (each)	36	2,000	72,000
Channels (cuyd)	5000	5	25,000
Energy Dissiaptor	1	50,000	50,000
Tatum Crossing	1	100,000	100,000
		Sub Cost	$460,000

GRAND TOTAL $10,260,494

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

DOUBLETREE RANCH ROAD STORM DRAIN SYSTEM

CONCEPTUAL COST ESTIMATE SUMMARY

ALTERNATIVES	LAND ACQUISITION ($)	STORM DRAIN CONST. ($)	DETENTION BASIN CONST. ($)	SUB TOTAL CONST. ($)	UTILITY RELOCATIONS 20% of Construction ($)	ENGINEERING DESIGN Includes: Civil Geotechnical Landscape Structural Survey 10% of Construction ($)	CONSTRUCTION ADMIN. Includes: Inspection Survey Testing 20% of Construction ($)	CONTINGENCY 15% of Land Acquisition & Construction ($)	TOTAL PROJECT COST ($)
) NO DETENTION BASINS									
100-Year	175,500	10,260,494	-0-	10,260,494	2,052,099	1,026,049	2,052,099	1,565,399	$17,131,640
WITH DETENTION BASINS									
100-Year	1,630,115	0	1,577,066	1,577,066	315,413	157,707	315,413	481,077	$4,476,791

WSS 5/15/96

DOUBLETREE RANCH ROAD

100-YEAR
NO DETENTION

RECTANGULAR
CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0079 ft/ft
Discharge.....	2341.00 cfs

Computed Results:

Depth.....	9.62 ft
Velocity.....	24.34 fps
Flow Area.....	96.16 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	29.23 ft
Critical Depth...	11.94 ft
Critical Slope...	0.0047 ft/ft
Froude Number....	1.38 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0079 ft/ft
Discharge.....	2341.00 cfs

Computed Results:

Depth.....	7.84 ft
Velocity.....	24.88 fps
Flow Area.....	94.09 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	27.68 ft
Critical Depth...	10.57 ft
Critical Slope...	0.0037 ft/ft
Froude Number....	1.57 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0079 ft/ft
Discharge.....	1171.00 cfs

Computed Results:

Depth.....	7.11 ft
Velocity.....	20.59 fps
Flow Area.....	56.86 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	22.21 ft
Critical Depth...	8.73 ft
Critical Slope...	0.0048 ft/ft
Froude Number....	1.36 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0079 ft/ft
Discharge.....	1171.00 cfs

Computed Results:

Depth.....	5.58 ft
Velocity.....	21.00 fps
Flow Area.....	55.75 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	21.15 ft
Critical Depth...	7.52 ft
Critical Slope...	0.0036 ft/ft
Froude Number....	1.57 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0079 ft/ft
Discharge.....	1171.00 cfs

Computed Results:

Depth.....	4.66 ft
Velocity.....	20.94 fps
Flow Area.....	55.93 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	21.32 ft
Critical Depth...	6.66 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	1.71 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year NO Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	1836.00 cfs

Computed Results:

Depth.....	12.30 ft
Velocity.....	18.65 fps
Flow Area.....	98.44 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	32.61 ft
Critical Depth...	11.78 ft
Critical Slope...	0.0058 ft/ft
Froude Number....	0.94 (flow is Subcritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year NO Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	1836.00 cfs

Computed Results:

Depth.....	9.35 ft
Velocity.....	19.63 fps
Flow Area.....	93.55 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	28.71 ft
Critical Depth...	10.15 ft
Critical Slope...	0.0043 ft/ft
Froude Number....	1.13 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	1836.00 cfs

Computed Results:

Depth.....	7.64 ft
Velocity.....	20.03 fps
Flow Area.....	91.65 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	27.27 ft
Critical Depth...	8.99 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	1.28 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	918.00 cfs

Computed Results:

Depth.....	6.91 ft
Velocity.....	16.60 fps
Flow Area.....	55.31 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	21.83 ft
Critical Depth...	7.42 ft
Critical Slope...	0.0044 ft/ft
Froude Number....	1.11 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	918.00 cfs

Computed Results:

Depth.....	5.43 ft
Velocity.....	16.90 fps
Flow Area.....	54.32 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	20.86 ft
Critical Depth...	6.40 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	1.28 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	918.00 cfs

Computed Results:

Depth.....	4.55 ft
Velocity.....	16.83 fps
Flow Area.....	54.56 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	21.09 ft
Critical Depth...	5.66 ft
Critical Slope...	0.0029 ft/ft
Froude Number....	1.39 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	1321.00 cfs

Computed Results:

Depth.....	8.28 ft
Velocity.....	19.93 fps
Flow Area.....	66.27 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	24.57 ft
Critical Depth...	9.46 ft
Critical Slope...	0.0050 ft/ft
Froude Number....	1.22 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	1321.00 cfs

Computed Results:

Depth.....	6.44 ft
Velocity.....	20.51 fps
Flow Area.....	64.42 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	22.88 ft
Critical Depth...	8.15 ft
Critical Slope...	0.0038 ft/ft
Froude Number....	1.42 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	1321.00 cfs

Computed Results:

Depth.....	5.35 ft
Velocity.....	20.57 fps
Flow Area.....	64.21 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	22.70 ft
Critical Depth...	7.22 ft
Critical Slope...	0.0031 ft/ft
Froude Number....	1.57 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	661.00 cfs

Computed Results:

Depth.....	4.78 ft
Velocity.....	17.28 fps
Flow Area.....	38.25 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	17.56 ft
Critical Depth...	5.96 ft
Critical Slope...	0.0039 ft/ft
Froude Number....	1.39 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	661.00 cfs

Computed Results:

Depth.....	3.83 ft
Velocity.....	17.24 fps
Flow Area.....	38.34 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	17.67 ft
Critical Depth...	5.14 ft
Critical Slope...	0.0031 ft/ft
Froude Number....	1.55 (flow is Supercritical)

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Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	661.00 cfs

Computed Results:

Depth.....	3.25 ft
Velocity.....	16.92 fps
Flow Area.....	39.06 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	18.51 ft
Critical Depth...	4.55 ft
Critical Slope...	0.0027 ft/ft
Froude Number....	1.65 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	1257.00 cfs

Computed Results:

Depth.....	7.95 ft
Velocity.....	19.76 fps
Flow Area.....	63.63 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	23.91 ft
Critical Depth...	9.15 ft
Critical Slope...	0.0049 ft/ft
Froude Number....	1.23 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	1257.00 cfs

Computed Results:

Depth.....	6.20 ft
Velocity.....	20.28 fps
Flow Area.....	61.99 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	22.40 ft
Critical Depth...	7.89 ft
Critical Slope...	0.0037 ft/ft
Froude Number....	1.44 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	629.00 cfs

Computed Results:

Depth.....	4.60 ft
Velocity.....	17.08 fps
Flow Area.....	36.82 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	17.21 ft
Critical Depth...	5.77 ft
Critical Slope...	0.0039 ft/ft
Froude Number....	1.40 (flow is Supercritical)

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	629.00 cfs

Computed Results:

Depth.....	3.70 ft
Velocity.....	17.01 fps
Flow Area.....	36.98 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	17.40 ft
Critical Depth...	4.97 ft
Critical Slope...	0.0031 ft/ft
Froude Number....	1.56 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	629.00 cfs

Computed Results:

Depth.....	3.14 ft
Velocity.....	16.67 fps
Flow Area.....	37.73 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	18.29 ft
Critical Depth...	4.40 ft
Critical Slope...	0.0027 ft/ft
Froude Number....	1.66 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0089 ft/ft
Discharge.....	724.00 cfs

Computed Results:

Depth.....	4.65 ft
Velocity.....	19.46 fps
Flow Area.....	37.20 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	17.30 ft
Critical Depth...	6.34 ft
Critical Slope...	0.0040 ft/ft
Froude Number....	1.59 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0089 ft/ft
Discharge.....	724.00 cfs

Computed Results:

Depth.....	3.73 ft
Velocity.....	19.39 fps
Flow Area.....	37.34 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	17.47 ft
Critical Depth...	5.46 ft
Critical Slope...	0.0032 ft/ft
Froude Number....	1.77 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 100-Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0089 ft/ft
Discharge.....	724.00 cfs

Computed Results:

Depth.....	3.17 ft
Velocity.....	19.01 fps
Flow Area.....	38.09 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	18.35 ft
Critical Depth...	4.84 ft
Critical Slope...	0.0027 ft/ft
Froude Number....	1.88 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: 52nd St 100 Year

Comment: No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.012
Channel Slope....	0.0045 ft/ft
Discharge.....	533.00 cfs

Computed Results:

Depth.....	6.60 ft
Velocity.....	13.46 fps
Flow Area.....	39.60 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	19.20 ft
Critical Depth...	6.26 ft
Critical Slope...	0.0051 ft/ft
Froude Number....	0.92 (flow is Subcritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: 52nd St 100 Year

Comment: No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0045 ft/ft
Discharge.....	533.00 cfs

Computed Results:

Depth.....	4.78 ft
Velocity.....	13.95 fps
Flow Area.....	38.20 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	17.55 ft
Critical Depth...	5.17 ft
Critical Slope...	0.0037 ft/ft
Froude Number....	1.13 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: 52nd St 100 Year

Comment: No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0045 ft/ft
Discharge.....	533.00 cfs

Computed Results:

Depth.....	3.83 ft
Velocity.....	13.92 fps
Flow Area.....	38.30 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	17.66 ft
Critical Depth...	4.45 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	1.25 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

October 30, 1995
52nd Street
Doubletree Ranch Road
wss

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	5.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.20
Culvert Length (feet).....	2640.0
Culvert Slope (feet per foot).....	0.0050

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
144.0	5.00	5.52	-0.36	3.15	3.44	3.15	11.03

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

October 30, 1995
52nd Street
Doubletree Ranch Road
wss

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	5.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.20
Culvert Length (feet).....	2640.0
Culvert Slope (feet per foot).....	0.0050

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
144.0	5.00	5.11	-3.40	2.93	3.34	2.93	11.18

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

October 30, 1995
52nd Street
Doubletree Ranch Road
wss

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	6.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.20
Culvert Length (feet).....	2640.0
Culvert Slope (feet per foot).....	0.0050

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
144.0	5.00	4.82	-5.13	2.79	3.26	2.79	11.16

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: Butler Drive 100-year NO Detention

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0175 ft/ft
Manning's n.....	0.013
Discharge.....	100.00 cfs

Computed Results:

Full Flow Diameter.....	3.14 ft
Full Flow Depth.....	3.14 ft
Velocity.....	12.88 fps
Flow Area.....	7.76 sf
Critical Depth....	2.98 ft
Critical Slope....	0.0151 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	100.00 cfs
QMAX @.94D.....	107.57 cfs
Froude Number.....	FULL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 52nd Street 100-year NO Detention

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.013
Channel Slope....	0.0020 ft/ft
Discharge.....	320.00 cfs

Computed Results:

Depth.....	6.47 ft
Velocity.....	8.25 fps
Flow Area.....	38.80 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	18.93 ft
Critical Depth...	4.45 ft
Critical Slope...	0.0050 ft/ft
Froude Number....	0.57 (flow is Subcritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 52nd Street 100-year NO Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0020 ft/ft
Discharge.....	320.00 cfs

Computed Results:

Depth.....	4.69 ft
Velocity.....	8.54 fps
Flow Area.....	37.49 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	17.37 ft
Critical Depth...	3.68 ft
Critical Slope...	0.0038 ft/ft
Froude Number....	0.69 (flow is Subcritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 52nd Street 100-year NO Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0020 ft/ft
Discharge.....	320.00 cfs

Computed Results:

Depth.....	3.76 ft
Velocity.....	8.51 fps
Flow Area.....	37.62 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	17.52 ft
Critical Depth...	3.17 ft
Critical Slope...	0.0032 ft/ft
Froude Number....	0.77 (flow is Subcritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 56th St to Cherokee 100-year NO Detention

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.013
Channel Slope....	0.0042 ft/ft
Discharge.....	422.00 cfs

Computed Results:

Depth.....	5.98 ft
Velocity.....	11.75 fps
Flow Area.....	35.91 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	17.97 ft
Critical Depth...	5.36 ft
Critical Slope...	0.0055 ft/ft
Froude Number....	0.85 (flow is Subcritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 56th St to Cherokee 100-year NO Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0042 ft/ft
Discharge.....	422.00 cfs

Computed Results:

Depth.....	4.36 ft
Velocity.....	12.10 fps
Flow Area.....	34.89 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	16.72 ft
Critical Depth...	4.42 ft
Critical Slope...	0.0041 ft/ft
Froude Number....	1.02 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 56th St to Cherokee 100-year NO Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0042 ft/ft
Discharge.....	422.00 cfs

Computed Results:

Depth.....	3.51 ft
Velocity.....	12.01 fps
Flow Area.....	35.14 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	17.03 ft
Critical Depth...	3.81 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	1.13 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

DOUBLETREE RANCH ROAD

10-YEAR
NO DETENTION

RECTANGULAR
CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10-Year NO Detention

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.012
Channel Slope....	0.0089 ft/ft
Discharge.....	196.00 cfs

Computed Results:

Depth.....	2.33 ft
Velocity.....	14.00 fps
Flow Area.....	14.00 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	10.67 ft
Critical Depth...	3.21 ft
Critical Slope...	0.0038 ft/ft
Froude Number....	1.62 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0089 ft/ft
Discharge.....	196.00 cfs

Computed Results:

Depth.....	1.81 ft
Velocity.....	13.53 fps
Flow Area.....	14.49 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	11.62 ft
Critical Depth...	2.65 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	1.77 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0089 ft/ft
Discharge.....	196.00 cfs

Computed Results:

Depth.....	1.52 ft
Velocity.....	12.92 fps
Flow Area.....	15.17 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	13.03 ft
Critical Depth...	2.28 ft
Critical Slope...	0.0026 ft/ft
Froude Number....	1.85 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	357.00 cfs

Computed Results:

Depth.....	4.03 ft
Velocity.....	14.77 fps
Flow Area.....	24.18 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	14.06 ft
Critical Depth...	4.79 ft
Critical Slope...	0.0044 ft/ft
Froude Number....	1.30 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	357.00 cfs

Computed Results:

Depth.....	3.02 ft
Velocity.....	14.77 fps
Flow Area.....	24.17 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	14.04 ft
Critical Depth...	3.95 ft
Critical Slope...	0.0033 ft/ft
Froude Number....	1.50 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0069 ft/ft
Discharge.....	357.00 cfs

Computed Results:

Depth.....	2.48 ft
Velocity.....	14.40 fps
Flow Area.....	24.78 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	14.96 ft
Critical Depth...	3.41 ft
Critical Slope...	0.0028 ft/ft
Froude Number....	1.61 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	496.00 cfs

Computed Results:

Depth.....	5.86 ft
Velocity.....	14.10 fps
Flow Area.....	35.17 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	17.72 ft
Critical Depth...	5.96 ft
Critical Slope...	0.0050 ft/ft
Froude Number....	1.03 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	496.00 cfs

Computed Results:

Depth.....	4.28 ft
Velocity.....	14.49 fps
Flow Area.....	34.23 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	16.56 ft
Critical Depth...	4.92 ft
Critical Slope...	0.0036 ft/ft
Froude Number....	1.23 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	496.00 cfs

Computed Results:

Depth.....	3.45 ft
Velocity.....	14.37 fps
Flow Area.....	34.51 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	16.90 ft
Critical Depth...	4.24 ft
Critical Slope...	0.0029 ft/ft
Froude Number....	1.36 (flow is Supercritical)

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Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0052 ft/ft
Discharge.....	496.00 cfs

Computed Results:

Depth.....	2.94 ft
Velocity.....	14.05 fps
Flow Area.....	35.30 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	17.88 ft
Critical Depth...	3.76 ft
Critical Slope...	0.0026 ft/ft
Froude Number....	1.44 (flow is Supercritical)

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Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.012
Channel Slope....	0.0079 ft/ft
Discharge.....	632.00 cfs

Computed Results:

Depth.....	6.02 ft
Velocity.....	17.49 fps
Flow Area.....	36.14 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	18.05 ft
Critical Depth...	7.01 ft
Critical Slope...	0.0055 ft/ft
Froude Number....	1.26 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0079 ft/ft
Discharge.....	632.00 cfs

Computed Results:

Depth.....	4.39 ft
Velocity.....	18.01 fps
Flow Area.....	35.10 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	16.77 ft
Critical Depth...	5.79 ft
Critical Slope...	0.0039 ft/ft
Froude Number....	1.51 (flow is Supercritical)

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Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0079 ft/ft
Discharge.....	632.00 cfs

Computed Results:

Depth.....	3.53 ft
Velocity.....	17.88 fps
Flow Area.....	35.34 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	17.07 ft
Critical Depth...	4.99 ft
Critical Slope...	0.0031 ft/ft
Froude Number....	1.68 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10 -Year No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.012
Channel Slope....	0.0079 ft/ft
Discharge.....	632.00 cfs

Computed Results:

Depth.....	3.01 ft
Velocity.....	17.50 fps
Flow Area.....	36.12 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	18.02 ft
Critical Depth...	4.42 ft
Critical Slope...	0.0027 ft/ft
Froude Number....	1.78 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: 52nd St 10 Year

Comment: No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.012
Channel Slope....	0.0045 ft/ft
Discharge.....	144.00 cfs

Computed Results:

Depth.....	2.39 ft
Velocity.....	10.05 fps
Flow Area.....	14.33 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	10.78 ft
Critical Depth...	2.62 ft
Critical Slope...	0.0035 ft/ft
Froude Number....	1.15 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: 52nd St 10 Year

Comment: No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0045 ft/ft
Discharge.....	144.00 cfs

Computed Results:

Depth.....	1.85 ft
Velocity.....	9.72 fps
Flow Area.....	14.81 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	11.70 ft
Critical Depth...	2.16 ft
Critical Slope...	0.0029 ft/ft
Froude Number....	1.26 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: 52nd St 10 Year

Comment: No Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0045 ft/ft
Discharge.....	144.00 cfs

Computed Results:

Depth.....	1.55 ft
Velocity.....	9.29 fps
Flow Area.....	15.50 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	13.10 ft
Critical Depth...	1.86 ft
Critical Slope...	0.0026 ft/ft
Froude Number....	1.32 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

DOUBLETREE RANCH ROAD

100-YEAR
DETENTION

RECTANGULAR CHANNEL

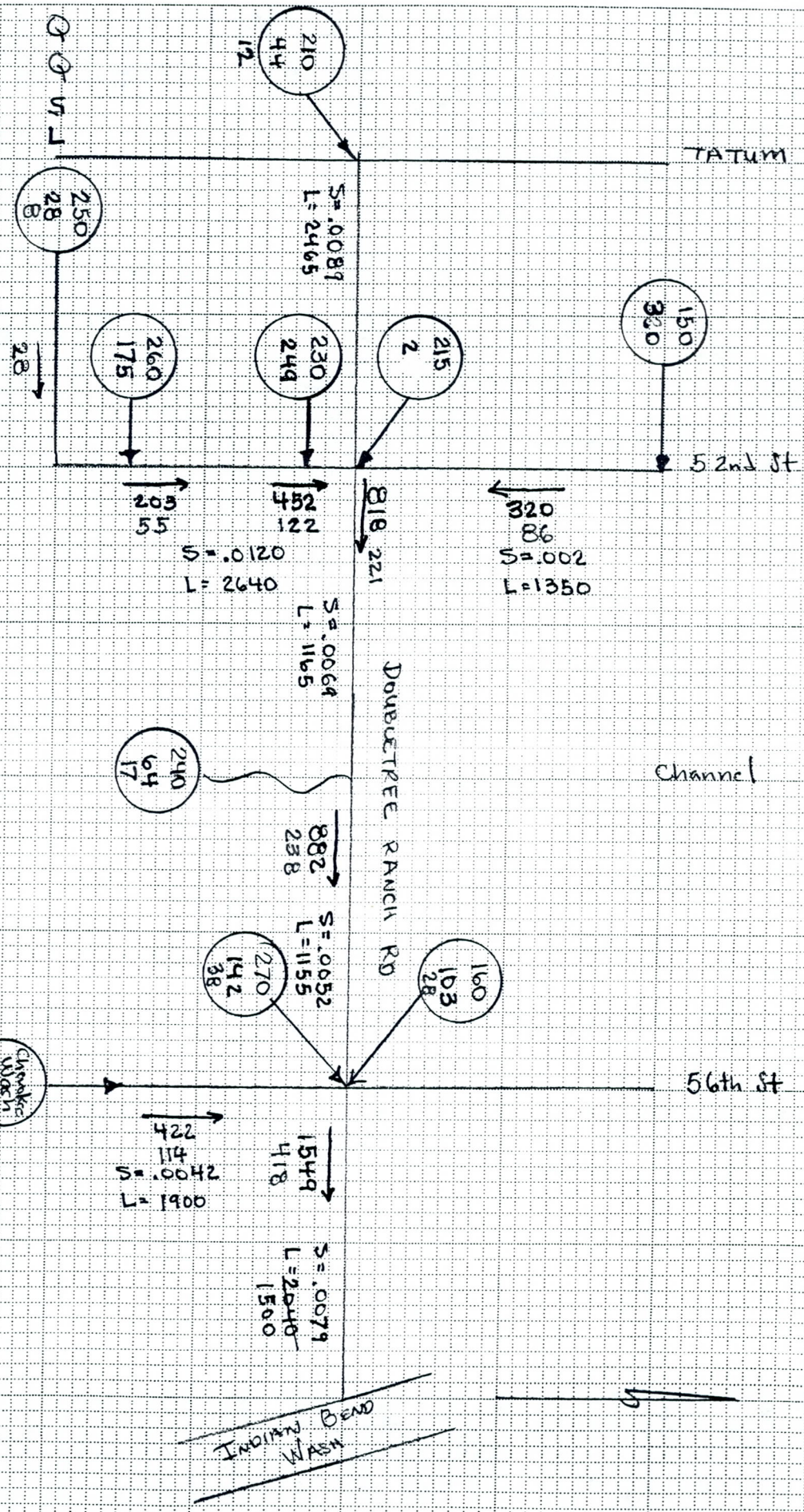
HOOK ENGINEERING, INC.

JOB 2878 - DOUBLETREE RANCH ROAD
COMPUTATION FOR DETENTION
DOUBLETREE RANCH ROAD

SHEET NO. ____ OF ____
DATE 11-27-95
BY WSS CHKD ____

100 year 6-hour
10-year 6-hour

SLOPE
LENGTH



Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 56th St to Indian Bd

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0079 ft/ft
Discharge.....	1549.00 cfs

Computed Results:

Depth.....	7.37 ft
Velocity.....	21.03 fps
Flow Area.....	73.65 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	24.73 ft
Critical Depth...	9.07 ft
Critical Slope...	0.0047 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 56th St to Indian Bd

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Channel Slope....	0.0079 ft/ft
Discharge.....	1549.00 cfs

Computed Results:

Depth.....	6.08 ft
Velocity.....	21.23 fps
Flow Area.....	72.97 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	24.16 ft
Critical Depth...	8.03 ft
Critical Slope...	0.0038 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 56th St to Indian Bd

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0079 ft/ft
Discharge.....	775.00 cfs

Computed Results:

Depth.....	5.46 ft
Velocity.....	17.75 fps
Flow Area.....	43.67 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	18.92 ft
Critical Depth...	6.63 ft
Critical Slope...	0.0048 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 56th St to Indian Bd

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0079 ft/ft
Discharge.....	775.00 cfs

Computed Results:

Depth.....	4.35 ft
Velocity.....	17.83 fps
Flow Area.....	43.46 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	18.69 ft
Critical Depth...	5.71 ft
Critical Slope...	0.0038 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 56th St to Indian Bd

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	12.00 ft
Manning's n.....	0.013
Channel Slope....	0.0079 ft/ft
Discharge.....	775.00 cfs

Computed Results:

Depth.....	3.67 ft
Velocity.....	17.59 fps
Flow Area.....	44.06 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	19.34 ft
Critical Depth...	5.06 ft
Critical Slope...	0.0032 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention Channel to 56th St

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	6.00 ft
Manning's n.....	0.013
Channel Slope....	0.0052 ft/ft
Discharge.....	441.00 cfs

Computed Results:

Depth.....	5.69 ft
Velocity.....	12.93 fps
Flow Area.....	34.12 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	17.37 ft
Critical Depth...	5.52 ft
Critical Slope...	0.0056 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention Channel to 56th St

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0052 ft/ft
Discharge.....	441.00 cfs

Computed Results:

Depth.....	4.16 ft
Velocity.....	13.25 fps
Flow Area.....	33.27 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	16.32 ft
Critical Depth...	4.55 ft
Critical Slope...	0.0041 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention Channel to 56th St

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0052 ft/ft
Discharge.....	441.00 cfs

Computed Results:

Depth.....	3.36 ft
Velocity.....	13.13 fps
Flow Area.....	33.60 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	16.72 ft
Critical Depth...	3.92 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention Channel to 56th St

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0052 ft/ft
Discharge.....	882.00 cfs

Computed Results:

Depth.....	7.14 ft
Velocity.....	15.44 fps
Flow Area.....	57.12 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	22.28 ft
Critical Depth...	7.23 ft
Critical Slope...	0.0050 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention Channel to 56th St

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0052 ft/ft
Discharge.....	882.00 cfs

Computed Results:

Depth.....	5.60 ft
Velocity.....	15.75 fps
Flow Area.....	56.00 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	21.20 ft
Critical Depth...	6.23 ft
Critical Slope...	0.0039 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention Channel to 56th St

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Channel Slope....	0.0052 ft/ft
Discharge.....	882.00 cfs

Computed Results:

Depth.....	4.68 ft
Velocity.....	15.70 fps
Flow Area.....	56.17 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	21.36 ft
Critical Depth...	5.52 ft
Critical Slope...	0.0033 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 52nd St to Channel

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	818.00 cfs

Computed Results:

Depth.....	6.01 ft
Velocity.....	17.03 fps
Flow Area.....	48.05 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	20.01 ft
Critical Depth...	6.87 ft
Critical Slope...	0.0049 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 52nd St to Channel

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	818.00 cfs

Computed Results:

Depth.....	4.76 ft
Velocity.....	17.20 fps
Flow Area.....	47.56 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	19.51 ft
Critical Depth...	5.92 ft
Critical Slope...	0.0039 ft/ft
Froude Number....	FULL

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Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 52nd St to Channel

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	818.00 cfs

Computed Results:

Depth.....	4.00 ft
Velocity.....	17.03 fps
Flow Area.....	48.04 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	20.01 ft
Critical Depth...	5.25 ft
Critical Slope...	0.0033 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 52nd St to Channel

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	6.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	409.00 cfs

Computed Results:

Depth.....	4.78 ft
Velocity.....	14.27 fps
Flow Area.....	28.66 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	15.55 ft
Critical Depth...	5.25 ft
Critical Slope...	0.0055 ft/ft
Froude Number....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 52nd St to Channel

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	409.00 cfs

Computed Results:

Depth.....	3.54 ft
Velocity.....	14.45 fps
Flow Area.....	28.30 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	15.08 ft
Critical Depth...	4.33 ft
Critical Slope...	0.0040 ft/ft
Froude Number....	FULL

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Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 52nd St to Channel

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	409.00 cfs

Computed Results:

Depth.....	2.88 ft
Velocity.....	14.20 fps
Flow Area.....	28.81 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	15.76 ft
Critical Depth...	3.73 ft
Critical Slope...	0.0033 ft/ft
Froude Number....	FULL

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-Year WITH Detention 52nd St to Channel

Solve For Depth

Given Input Data:

	DOUBLE
Bottom Width.....	12.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	409.00 cfs

Computed Results:

Depth.....	2.47 ft
Velocity.....	13.79 fps
Flow Area.....	29.66 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	16.94 ft
Critical Depth...	3.30 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	FULL

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DOUBLETREE RANCH ROAD

100-YEAR
DETENTION

PIPE CULVERT ANALYSIS

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

October 31, 1995
D
100-year/With Detention
Outlet Basin #8

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.20
Culvert Length (feet).....	2465.0
Culvert Slope (feet per foot).....	0.0089

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
44.0	0.00	9.15	62.71	2.00	1.97	1.97	14.06

TATUM TO 52nd

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

October 31, 1995
D
100-year/With Detention
Outlet Basin #8

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.20
Culvert Length (feet).....	2465.0
Culvert Slope (feet per foot).....	0.0089

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
44.0	0.00	4.87	5.95	2.19	2.21	2.21	9.59

TATUM TO 52nd

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

October 31, 1995
Doubletree Ranch Road
100-year/With Detention
Outlet Basin #8

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	3.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0120
Entrance Loss Coefficient of Culvert Opening.....	0.20
Culvert Length (feet).....	2465.0
Culvert Slope (feet per foot).....	0.0089

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
44.0	0.00	3.61	-9.55	1.75	2.16	1.75	10.25

Tatum to 52nd

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: 52nd St 100 Year

Comment: With Detention

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.012
Channel Slope....	0.0045 ft/ft
Discharge.....	460.00 cfs

Computed Results:

Depth.....	5.85 ft
Velocity.....	13.11 fps
Flow Area.....	35.09 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	17.70 ft
Critical Depth...	5.67 ft
Critical Slope...	0.0048 ft/ft
Froude Number....	0.96 (flow is Subcritical)

Open Channel Flow Module, Version 3.3 (c) 1991
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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: 52nd St 100 Year

Comment: With Detention

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.012
Channel Slope....	0.0045 ft/ft
Discharge.....	460.00 cfs

Computed Results:

Depth.....	4.27 ft
Velocity.....	13.47 fps
Flow Area.....	34.15 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	16.54 ft
Critical Depth...	4.68 ft
Critical Slope...	0.0035 ft/ft
Froude Number....	1.15 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: 52nd St 100 Year

Comment: With Detention

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.012
Channel Slope....	0.0045 ft/ft
Discharge.....	460.00 cfs

Computed Results:

Depth.....	3.44 ft
Velocity.....	13.36 fps
Flow Area.....	34.44 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	16.89 ft
Critical Depth...	4.04 ft
Critical Slope...	0.0029 ft/ft
Froude Number....	1.27 (flow is Supercritical)

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 100-year/WITH Detention Butler Dr

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0175 ft/ft
Manning's n.....	0.013
Discharge.....	28.00 cfs

Computed Results:

Full Flow Diameter.....	1.95 ft
Full Flow Depth.....	1.95 ft
Velocity.....	9.37 fps
Flow Area.....	2.99 sf
Critical Depth....	1.81 ft
Critical Slope....	0.0151 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	28.00 cfs
QMAX @.94D.....	30.12 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

DOUBLETREE RANCH ROAD

10-YEAR
DETENTION

RECTANGULAR
CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 10-Year WITH Detention 56th St to Indian Bd

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.013
Channel Slope....	0.0079 ft/ft
Discharge.....	418.00 cfs

Computed Results:

Depth.....	4.61 ft
Velocity.....	15.13 fps
Flow Area.....	27.63 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	15.21 ft
Critical Depth...	5.32 ft
Critical Slope...	0.0055 ft/ft
Froude Number....	FULL

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 10-Year WITH Detention 56th St to Indian Bd

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0079 ft/ft
Discharge.....	418.00 cfs

Computed Results:

Depth.....	3.42 ft
Velocity.....	15.28 fps
Flow Area.....	27.36 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	14.84 ft
Critical Depth...	4.39 ft
Critical Slope...	0.0040 ft/ft
Froude Number....	FULL

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 10-Year WITH Detention 56th St to Indian Bd

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0079 ft/ft
Discharge.....	418.00 cfs

Computed Results:

Depth.....	2.79 ft
Velocity.....	14.98 fps
Flow Area.....	27.90 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	15.58 ft
Critical Depth...	3.79 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	FULL

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 10-Year WITH Detention 52nd St to Channel

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	221.00 cfs

Computed Results:

Depth.....	2.97 ft
Velocity.....	12.40 fps
Flow Area.....	17.82 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	11.94 ft
Critical Depth...	3.48 ft
Critical Slope...	0.0045 ft/ft
Froude Number....	FULL

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 10-Year WITH Detention 52nd St to Channel

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	221.00 cfs

Computed Results:

Depth.....	2.27 ft
Velocity.....	12.16 fps
Flow Area.....	18.18 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	12.54 ft
Critical Depth...	2.87 ft
Critical Slope...	0.0036 ft/ft
Froude Number....	FULL

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 10-Year WITH Detention Channel to 56th St

Solve For Depth

Given Input Data:

Bottom Width.....	6.00 ft
Manning's n.....	0.013
Channel Slope....	0.0052 ft/ft
Discharge.....	238.00 cfs

Computed Results:

Depth.....	3.50 ft
Velocity.....	11.34 fps
Flow Area.....	20.98 sf
Flow Top Width...	6.00 ft
Wetted Perimeter.	12.99 ft
Critical Depth...	3.66 ft
Critical Slope...	0.0046 ft/ft
Froude Number....	FULL

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 10-Year WITH Detention Channel to 56th St

Solve For Depth

Given Input Data:

Bottom Width.....	8.00 ft
Manning's n.....	0.013
Channel Slope....	0.0052 ft/ft
Discharge.....	238.00 cfs

Computed Results:

Depth.....	2.65 ft
Velocity.....	11.24 fps
Flow Area.....	21.17 sf
Flow Top Width...	8.00 ft
Wetted Perimeter.	13.29 ft
Critical Depth...	3.02 ft
Critical Slope...	0.0036 ft/ft
Froude Number....	FULL

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 10-Year WITH Detention Channel to 56th St

Solve For Depth

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Channel Slope....	0.0052 ft/ft
Discharge.....	238.00 cfs

Computed Results:

Depth.....	2.18 ft
Velocity.....	10.90 fps
Flow Area.....	21.84 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	14.37 ft
Critical Depth...	2.60 ft
Critical Slope...	0.0031 ft/ft
Froude Number....	FULL

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DOUBLETREE RANCH ROAD

10-YEAR
DETENTION

PIPE CULVERT ANALYSIS

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Channel to 56th Street

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1155.0
Culvert Slope (feet per foot).....	0.0052

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
238.0	4.00	11.93	20.40	4.50	4.23	4.23	15.33

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Channel to 56th Street

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	5.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1155.0
Culvert Slope (feet per foot).....	0.0052

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
238.0	4.00	7.68	7.01	4.40	4.31	4.40	11.67

==========

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Channel to 56th Street

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	6.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1155.0
Culvert Slope (feet per foot).....	0.0052

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
238.0	4.00	6.86	4.38	3.96	4.23	3.96	12.02

==========

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 29, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Channel to 56th Street

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	6.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1155.0
Culvert Slope (feet per foot).....	0.0052

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
238.0	4.00	6.41	2.87	3.74	4.13	3.74	12.03

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 29, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Channel to 56th Street

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	7.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1155.0
Culvert Slope (feet per foot).....	0.0052

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
238.0	4.00	6.08	2.00	3.58	4.04	3.58	12.04

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 29, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Channel

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	6.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1165.0
Culvert Slope (feet per foot).....	0.0069

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
221.0	4.00	6.49	1.57	3.45	4.07	3.45	13.15

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 29, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Channel

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	6.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1165.0
Culvert Slope (feet per foot).....	0.0069

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
221.0	4.00	6.09	0.29	3.28	3.97	3.28	13.18

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Channel

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1165.0
Culvert Slope (feet per foot).....	0.0069

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
221.0	4.00	10.70	15.42	4.50	4.16	4.16	14.40

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Channel

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1165.0
Culvert Slope (feet per foot).....	0.0069

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
221.0	3.00	14.99	30.53	4.00	3.89	3.89	17.71

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Channel

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	5.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1165.0
Culvert Slope (feet per foot).....	0.0069

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
221.0	4.00	8.39	7.86	4.21	4.22	4.21	12.53

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Channel

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	5.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1165.0
Culvert Slope (feet per foot).....	0.0069

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
221.0	4.00	7.17	3.82	3.65	4.16	3.65	13.19

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 29, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Butler Drive

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1600.0
Culvert Slope (feet per foot).....	0.0175

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
8.0	1.00	1.47	-24.36	0.71	1.01	0.71	8.06

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Bypass From Cherokee Wash 56th Street

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1900.0
Culvert Slope (feet per foot).....	0.0042

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
114.0	3.00	5.08	3.39	3.31	3.14	3.31	9.08

==========

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Bypass From Cherokee Wash 56th Street

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	5.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1900.0
Culvert Slope (feet per foot).....	0.0042

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
114.0	3.00	4.66	0.45	3.01	3.05	3.01	9.23

==========

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Bypass From Cherokee Wash 56th Street

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1900.0
Culvert Slope (feet per foot).....	0.0042

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
114.0	3.00	5.96	9.45	4.00	3.22	3.22	10.51

==========

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Butler Drive

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	2640.0
Culvert Slope (feet per foot).....	0.0120

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
122.0	3.00	6.43	-6.89	2.65	3.32	2.65	13.83

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Butler Drive

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	2640.0
Culvert Slope (feet per foot).....	0.0120

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
122.0	3.00	5.45	-16.33	2.41	3.25	2.41	14.08

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Butler Drive

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	5.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	2640.0
Culvert Slope (feet per foot).....	0.0120

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
122.0	3.00	4.89	-20.94	2.28	3.16	2.28	13.96

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
Tatum Boulevard to 52nd Street

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	2.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	2465.0
Culvert Slope (feet per foot).....	0.0089

==========

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
12.0	1.00	1.92	-13.08	1.07	1.24	1.07	6.99

==========

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Berneil Wash

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1350.0
Culvert Slope (feet per foot).....	0.0020

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
86.0	3.00	4.56	6.61	4.00	2.81	3.00	8.51

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Berneil Wash

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	4.50
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1350.0
Culvert Slope (feet per foot).....	0.0020

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
86.0	3.00	4.14	4.16	3.59	2.72	3.00	7.64

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

November 28, 1995
DOUBLETREE RANCH ROAD
10-Year/ WITH Detention
52nd Street to Berneil Wash

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet).....	5.00
FHWA Chart Number (1,2 or 3).....	1
Scale Number on Chart (Type of Culvert Entrance).....	1
Manning's Roughness Coefficient (n-value).....	0.0130
Entrance Loss Coefficient of Culvert Opening.....	0.50
Culvert Length (feet).....	1350.0
Culvert Slope (feet per foot).....	0.0020

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
86.0	3.00	3.87	3.03	3.20	2.63	3.20	6.49

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DOUBLETREE RANCH ROAD

10-YEAR
DETENTION

CIRCULAR CHANNEL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10-Year WITH Detention

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0045 ft/ft
Manning's n.....	0.012
Discharge.....	141.00 cfs

Computed Results:

Full Flow Diameter.....	4.48 ft
Full Flow Depth.....	4.48 ft
Velocity.....	8.96 fps
Flow Area.....	15.74 sf
Critical Depth....	3.49 ft
Critical Slope....	0.0050 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	141.00 cfs
QMAX @.94D.....	151.67 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10-Year WITH Detention -Tatum Blvd.

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0089 ft/ft
Manning's n.....	0.012
Discharge.....	20.00 cfs

Computed Results:

Full Flow Diameter.....	1.89 ft
Full Flow Depth.....	1.89 ft
Velocity.....	7.10 fps
Flow Area.....	2.82 sf
Critical Depth....	1.61 ft
Critical Slope....	0.0084 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	20.00 cfs
QMAX @.94D.....	21.51 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10-Year WITH Detention -52nd St & Channel

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0069 ft/ft
Manning's n.....	0.012
Discharge.....	180.00 cfs

Computed Results:

Full Flow Diameter.....	4.53 ft
Full Flow Depth.....	4.53 ft
Velocity.....	11.17 fps
Flow Area.....	16.11 sf
Critical Depth....	3.89 ft
Critical Slope....	0.0064 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	180.00 cfs
QMAX @.94D.....	193.63 cfs
Froude Number	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10-Year WITH Detention -56th St

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0052 ft/ft
Manning's n.....	0.012
Discharge.....	295.00 cfs

Computed Results:

Full Flow Diameter.....	5.75 ft
Full Flow Depth.....	5.75 ft
Velocity.....	11.37 fps
Flow Area.....	25.94 sf
Critical Depth....	4.73 ft
Critical Slope....	0.0052 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	295.00 cfs
QMAX @.94D.....	317.33 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: Doubletree Ranch Rd

Comment: 10-Year WITH Detention -Indian Bend Wash

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0079 ft/ft
Manning's n.....	0.012
Discharge.....	354.00 cfs

Computed Results:

Full Flow Diameter.....	5.69 ft
Full Flow Depth.....	5.69 ft
Velocity.....	13.92 fps
Flow Area.....	25.43 sf
Critical Depth....	5.08 ft
Critical Slope....	0.0070 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	354.00 cfs
QMAX @.94D.....	380.80 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: Butler Dr 10-year NO Detention

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0175 ft/ft
Manning's n.....	0.013
Discharge.....	27.00 cfs

Computed Results:

Full Flow Diameter.....	1.92 ft
Full Flow Depth.....	1.92 ft
Velocity.....	9.28 fps
Flow Area.....	2.91 sf
Critical Depth....	1.79 ft
Critical Slope....	0.0151 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	27.00 cfs
QMAX @.94D.....	29.04 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: 56th St Cherokee Wash 10-year NO Detention

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0042 ft/ft
Manning's n.....	0.013
Discharge.....	114.00 cfs

Computed Results:

Full Flow Diameter.....	4.32 ft
Full Flow Depth.....	4.32 ft
Velocity.....	7.79 fps
Flow Area.....	14.63 sf
Critical Depth....	3.18 ft
Critical Slope....	0.0053 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	114.00 cfs
QMAX @.94D.....	122.63 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: DOUBLETREE RANCH RD

Comment: Berneil Wash 10-year NO Detention

Solve For Full Flow Diameter

Given Input Data:

Slope.....	0.0020	ft/ft
Manning's n.....	0.013	
Discharge.....	86.00	cfs

Computed Results:

Full Flow Diameter.....	4.46	ft
Full Flow Depth.....	4.46	ft
Velocity.....	5.50	fps
Flow Area.....	15.64	sf
Critical Depth....	2.72	ft
Critical Slope....	0.0042	ft/ft
Percent Full.....	100.00	%
Full Capacity.....	86.00	cfs
QMAX @.94D.....	92.51	cfs
Froude Number.....	FULL	

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

DOUBLETREE RANCH ROAD

BERNEIL WASH

CHANNEL CAPACITY

COMPUTATION FOR Bernell Wash
Hydraulic Capacity

DATE 2-22-96
BY WSS CHKD

TATUM TO BERNELL DR
30 foot easement

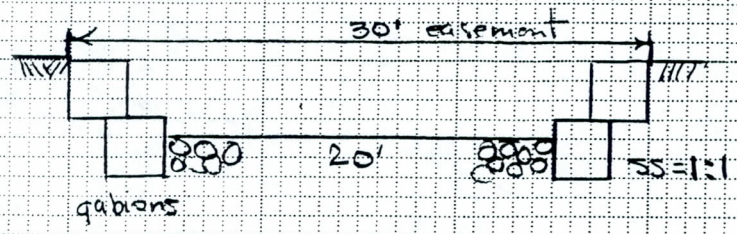
SLOPE = .008 '/ft
1376 - 1370 = 6'
run = 750'

BERNELL DRIVE TO 52nd St.
40' easement

SLOPE = .0074
1370 - 1356 = 14 feet
run = 1900 feet

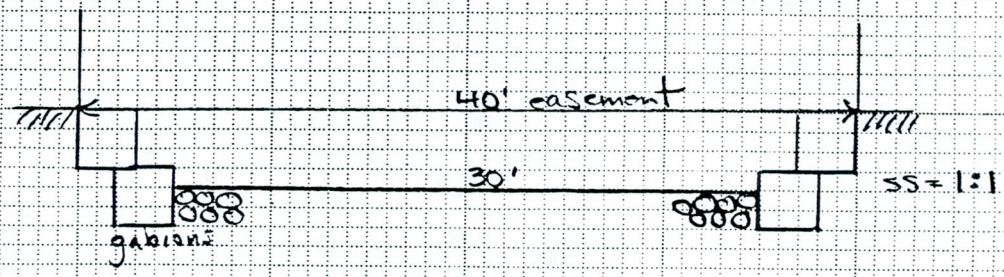
Q = 200 cfs

Q = 300 cfs



n = 0.035
stones, weeds

n = 0.060
Light brush, trees



TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

February 22, 1996
DOUBLETREE RANCH ROAD
BERNEIL WASH 100-YEAR
30 FOOT EASEMENT

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	200.0
Channel Bottom Slope (feet per foot).....	0.0080
Manning's Roughness Coefficient (n-value).....	0.0350
Channel Side Slope - Left Side (horizontal/vertical)....	1.00
Channel Side Slope - Right Side (horizontal/vertical)...	1.00
Channel Bottom Width (feet).....	20.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	1.80
Flow Velocity (feet per second).....	5.11
Froude Number (Flow is Sub-Critical).....	0.699
Velocity Head (feet).....	0.41
Energy Head (feet).....	2.20
Cross-Sectional Area of Flow (square feet).....	39.16
Top Width of Flow (feet).....	23.59

==========

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
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(713) 440-3787. A manual with equations & flow chart is available.

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

February 22, 1996
DOUBLETREE RANCH ROAD
BERNEIL WASH 100-YEAR
30 FOOT EASEMENT

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	200.0
Channel Bottom Slope (feet per foot).....	0.0080
Manning's Roughness Coefficient (n-value).....	0.0600
Channel Side Slope - Left Side (horizontal/vertical)....	1.00
Channel Side Slope - Right Side (horizontal/vertical)...	1.00
Channel Bottom Width (feet).....	20.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	2.48
Flow Velocity (feet per second).....	3.59
Froude Number (Flow is Sub-Critical).....	0.423
Velocity Head (feet).....	0.20
Energy Head (feet).....	2.68
Cross-Sectional Area of Flow (square feet).....	55.72
Top Width of Flow (feet).....	24.96

==========

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
Dodson & Associates, Inc., 5629 FM 1960 W., #314, Houston, TX 77069
(713) 440-3787. A manual with equations & flow chart is available.

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

February 22, 1996
DOUBLETREE RANCH ROAD
BERNEIL WASH 100-YEAR
30 FOOT EASEMENT

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	300.0
Channel Bottom Slope (feet per foot).....	0.0080
Manning's Roughness Coefficient (n-value).....	0.0350
Channel Side Slope - Left Side (horizontal/vertical)....	1.00
Channel Side Slope - Right Side (horizontal/vertical)...	1.00
Channel Bottom Width (feet).....	20.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	2.29
Flow Velocity (feet per second).....	5.88
Froude Number (Flow is Sub-Critical).....	0.719
Velocity Head (feet).....	0.54
Energy Head (feet).....	2.83
Cross-Sectional Area of Flow (square feet).....	51.02
Top Width of Flow (feet).....	24.58

==========

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NORMAL DEPTH COMPUTATION

February 22, 1996
DOUBLETREE RANCH ROAD
BERNEIL WASH 100-YEAR
30 FOOT EASEMENT

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	300.0
Channel Bottom Slope (feet per foot).....	0.0080
Manning's Roughness Coefficient (n-value).....	0.0600
Channel Side Slope - Left Side (horizontal/vertical)....	1.00
Channel Side Slope - Right Side (horizontal/vertical)...	1.00
Channel Bottom Width (feet).....	20.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	3.15
Flow Velocity (feet per second).....	4.11
Froude Number (Flow is Sub-Critical).....	0.434
Velocity Head (feet).....	0.26
Energy Head (feet).....	3.42
Cross-Sectional Area of Flow (square feet).....	73.04
Top Width of Flow (feet).....	26.31

==========

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TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

February 22, 1996
DOUBLETREE RANCH ROAD
BERNEIL WASH 100-YEAR
40 FOOT EASEMENT

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	200.0
Channel Bottom Slope (feet per foot).....	0.0074
Manning's Roughness Coefficient (n-value).....	0.0350
Channel Side Slope - Left Side (horizontal/vertical)....	1.00
Channel Side Slope - Right Side (horizontal/vertical)...	1.00
Channel Bottom Width (feet).....	30.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	1.44
Flow Velocity (feet per second).....	4.41
Froude Number (Flow is Sub-Critical).....	0.663
Velocity Head (feet).....	0.30
Energy Head (feet).....	1.74
Cross-Sectional Area of Flow (square feet).....	45.30
Top Width of Flow (feet).....	32.88

==========

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NORMAL DEPTH COMPUTATION

February 22, 1996
DOUBLETREE RANCH ROAD
BERNEIL WASH 100-YEAR
40 FOOT EASEMENT

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	200.0
Channel Bottom Slope (feet per foot).....	0.0074
Manning's Roughness Coefficient (n-value).....	0.0600
Channel Side Slope - Left Side (horizontal/vertical)....	1.00
Channel Side Slope - Right Side (horizontal/vertical)...	1.00
Channel Bottom Width (feet).....	30.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	1.99
Flow Velocity (feet per second).....	3.14
Froude Number (Flow is Sub-Critical).....	0.404
Velocity Head (feet).....	0.15
Energy Head (feet).....	2.15
Cross-Sectional Area of Flow (square feet).....	63.74
Top Width of Flow (feet).....	33.98

==========

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TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

February 22, 1996
DOUBLETREE RANCH ROAD
BERNEIL WASH 100-YEAR
40 FOOT EASEMENT

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	300.0
Channel Bottom Slope (feet per foot).....	0.0074
Manning's Roughness Coefficient (n-value).....	0.0350
Channel Side Slope - Left Side (horizontal/vertical)....	1.00
Channel Side Slope - Right Side (horizontal/vertical)...	1.00
Channel Bottom Width (feet).....	30.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	1.84
Flow Velocity (feet per second).....	5.12
Froude Number (Flow is Sub-Critical).....	0.685
Velocity Head (feet).....	0.41
Energy Head (feet).....	2.25
Cross-Sectional Area of Flow (square feet).....	58.55
Top Width of Flow (feet).....	33.68

==========

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TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

February 22, 1996
DOUBLETREE RANCH ROAD
BERNEIL WASH 100-YEAR
40 FOOT EASEMENT

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	300.0
Channel Bottom Slope (feet per foot).....	0.0074
Manning's Roughness Coefficient (n-value).....	0.0600
Channel Side Slope - Left Side (horizontal/vertical)....	1.00
Channel Side Slope - Right Side (horizontal/vertical)...	1.00
Channel Bottom Width (feet).....	30.0

==========

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	2.54
Flow Velocity (feet per second).....	3.63
Froude Number (Flow is Sub-Critical).....	0.417
Velocity Head (feet).....	0.20
Energy Head (feet).....	2.75
Cross-Sectional Area of Flow (square feet).....	82.67
Top Width of Flow (feet).....	35.08

==========

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1986
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DOUBLETREE RANCH ROAD

VIA LA SERENA CHANNEL

CHANNEL CAPACITY

HOOK ENGINEERING, INC.

JOB DOUBLETREE RANCH ROAD
COMPUTATION FOR
DITCH Between Via La Sereno and Avenida Del Sol + West Side DTRR

SHEET NO. ____ OF ____
DATE 1-22-96
BY WSS CHKD ____

EXISTING

Channel Slope $\frac{6 \text{ feet drop}}{1100 \text{ feet length}} = .0055'/ft$

Offset	Elev
0	1350
530	easement
540	1348
550	1348
630	1349
710	1348

10:1 SS

easement 10:1 SS

RICK JOHNSON
954-8300

Q = 30.5 cfs

Existing Q_{100} = 593 = 5% > 2yr storm
Q_{10} = 160 = 19% 6yr storm

52nd Cut off Q_{100} = 62 cfs = 49%
Q_{10} = 17 cfs - carry

CLEAN

2.5 depth @ 4:1 SS

Q = 89.52

big enough with condition
1- everything picked up on 52nd St.
2- Cleaned to max capacity

DOUBLETREE RANCH ROAD

0	1344
50	1344
63	1342
80	1344

SLOPE $\frac{1350 - 1340}{1290} = \frac{10 ft}{1290} = .0078'/ft$

Q = 75 cfs

$\frac{2}{13} = 6:1$ SS

$\frac{2}{17} = 9:1$ SS

CLEANED

depth 3.75' @ 4:1

Q = 314.3

not big enough with new road width.

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Via LaSerena Channel

Comment: Doubletree Ranch Road Existing Capacity

Solve For Discharge

Given Input Data:

Bottom Width.....	10.00 ft
Left Side Slope...	6.00:1 (H:V)
Right Side Slope.	9.00:1 (H:V)
Manning's n.....	0.055
Channel Slope....	0.0078 ft/ft
Depth.....	1.50 ft

Computed Results:

Discharge.....	74.76 cfs
Velocity.....	2.35 fps
Flow Area.....	31.88 sf
Flow Top Width...	32.50 ft
Wetted Perimeter.	32.71 ft
Critical Depth...	0.94 ft
Critical Slope...	0.0508 ft/ft
Froude Number....	0.42 (flow is Subcritical)

Triangular Channel Analysis & Design
Open Channel Uniform flow

Worksheet Name: Via LaSerena Channel

Comment: Cleaned Double Tree Ranch Road Capacity

Solve For Discharge

Given Input Data:

Left Side Slope..	4.00:1 (H:V)
Right Side Slope.	4.00:1 (H:V)
Manning's n.....	0.035
Channel Slope...	0.0070 ft/ft
Depth.....	3.75 ft

Computed Results:

Discharge.....	314.30 cfs
Velocity.....	5.59 fps
Flow Area.....	56.25 sf
Flow Top Width...	30.00 ft
Wetted Perimeter.	30.02 ft
Critical Depth...	3.20 ft
Critical Slope...	0.0158 ft/ft
Froude Number....	0.72 (flow is Subcritical)

Open Channel Flow Module, Version 3.0 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Via LaSerena Channel

Comment: LaSerena Channel Capacity Existing

Solve For Discharge

Given Input Data:

Bottom Width.....	10.00 ft
Left Side Slope..	10.00:1 (H:V)
Right Side Slope.	10.00:1 (H:V)
Manning's n.....	0.055
Channel Slope....	0.0055 ft/ft
Depth.....	1.00 ft

Computed Results:

Discharge.....	30.51 cfs
Velocity.....	1.53 fps
Flow Area.....	20.00 sf
Flow Top Width...	30.00 ft
Wetted Perimeter.	30.10 ft
Critical Depth...	0.55 ft
Critical Slope...	0.0599 ft/ft
Froude Number....	0.33 (flow is Subcritical)

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: Via LaSerena Channel

Comment: Cleaned LaSerena Channel Capacity

Solve For Discharge

Given Input Data:

Left Side Slope..	4.00:1 (H:V)
Right Side Slope..	4.00:1 (H:V)
Manning's n.....	0.035
Channel Slope...	0.0055 ft/ft
Depth.....	2.50 ft

Computed Results:

Discharge.....	89.52 cfs
Velocity.....	3.58 fps
Flow Area.....	25.00 sf
Flow Top Width...	20.00 ft
Wetted Perimeter.	20.62 ft
Critical Depth...	1.99 ft
Critical Slope...	0.0186 ft/ft
Froude Number....	0.56 (flow is Subcritical)

CHEROKEE WASH

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CHEROKEE WASH
SLOPES

NO DETENTION

ELEVATION	STATION	SLOPE (ft/ft)	ELEVATION	STATION	SLOPE (ft/ft)	ELEVATION	STATION	SLOPE (ft/ft)	ELEVATION	STATION	SLOPE (ft/ft)
Q@435	Q100=178	Q10=481	53rd Street	6463		1400	10435	0.0250	1390	650	0.0200
1323	0		1362	6761	0.0031	1402	10785	0.0057	1392	750	0.0200
1324	75	0.0133	1364	7055	0.0068	1404	10985	0.0100	1394	825	0.0267
Caballo Ln	240		1366	7273	0.0092	Road Runner	11070		1396	900	0.0267
1326	388	0.0064	Q@385	Q100=157	Q10=424	1406	11240	0.0078	1398	980	0.0250
1328	760	0.0054	Pond 13	7333		1408	11470	0.0087	1400	1040	0.0333
Morning Glory	950		1368	7333	0.0333	Q@335	Q100=424	Q10=114	1402	1095	0.0364
1330	1358	0.0033	1370	7711	0.0053	Pond 15			1404	1180	0.0235
59th Place	1600		51st Street			Golf Course	11470		1406	1290	0.0182
1332	2010	0.0031	1372	7800	0.0225	1410	11605	0.0148	Ridgeview	1400	
58th Place	2345		1374	8070	0.0074	1412	11775	0.0118	1408	1410	0.0167
1334	2675	0.0030	1376	8303	0.0086	1414	11925	0.0133	1410	1491	0.0247
1336	2930	0.0078	Q@365	Q100=115	Q10=312	1416	12055	0.0154	1420	1630	0.0719
1338	3313	0.0052	Pond 16	8462		1418	12205	0.0133	1430	1730	0.1000
1340	3632	0.0063	1378	8627	0.0062	Tatum	12225		Tatum		
1342	3905	0.0073	1380	8756	0.0155	1420	12315	0.0182	Q@290	Q100=120	Q10=32
1344	4045	0.0143	1382	8930	0.0115	Q@320	Q100=238	Q10=64			
1346	4124	0.0253	1384	9204	0.0073				Q@365	Q100=115	Q10=312
Q@405	Q100=178	Q10=480	Deset Jewel	9210					Desert Park		
56th Sreet	4134		1386	9450	0.0081	Q@305	Q100=175	Q10=47	1398	0	
1348	4532	0.0049	Arroyo	9470		51st Street			1400	50	0.0400
1350	4821	0.0069	1388	9517	0.0299	Pond 12			1402	80	0.0667
1352	5130	0.0065	1390	9690	0.0116	1378	0	0.0118	1404	225	0.0138
1354	5313	0.0109	1392	9810	0.0167	1380	170	0.0333	1406	275	0.0400
1356	5517	0.0098	Crestview	9895		1382	230	0.0286	1408	400	0.0160
1358	5542	0.0800	1394	10075	0.0075	1384	300	0.0154	1410	440	0.0500
Q@395	Q100=162	Q10=440	1396	10235	0.0125	1386	430	0.0167	1420	920	0.0208
Mocking Bird	5557		1398	10355	0.0167	1388	550		1430	1250	0.0303
1360	6120	0.0035	Desert Park	10395					Tatum		
									Q@310	Q100=293	Q10=79

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CHEROKEE WASH
SLOPES

WITH DETENTION

ELEVATION	STATION	SLOPE (ft/ft)	ELEVATION	STATION	SLOPE (ft/ft)	ELEVATION	STATION	SLOPE (ft/ft)	ELEVATION	STATION	SLOPE (ft/ft)
Q@435	Q100=793	Q10=214	53rd Street	6463		1400	10435	0.0250	1390	650	0.0200
1323	0		1362	6761	0.0031	1402	10785	0.0057	1392	750	0.0200
1324	75	0.0133	1364	7055	0.0068	1404	10985	0.0100	1394	825	0.0267
Caballo Ln	240		1366	7273	0.0092	Road Runner	11070		1396	900	0.0267
1326	388	0.0064	Q@385	Q100=651	Q10=176	1406	11240	0.0078	1398	980	0.0250
1328	760	0.0054	Pond 13	7333		1408	11470	0.0087	1400	1040	0.0333
Morning Glory	950		1368	7333	0.0333	Q@335	Q100=82	Q10=22	1402	1095	0.0364
1330	1358	0.0033	1370	7711	0.0053	Pond 15			1404	1180	0.0235
59th Place	1600		51st Street			Golf Course	11470		1406	1290	0.0182
1332	2010	0.0031	1372	7800	0.0225	1410	11605	0.0148	Ridgeview	1400	
58th Place	2345		1374	8070	0.0074	1412	11775	0.0118	1408	1410	0.0167
1334	2675	0.0030	1376	8303	0.0086	1414	11925	0.0133	1410	1491	0.0247
1336	2930	0.0078	Q@365	Q100=747	Q10=202	1416	12055	0.0154	1420	1630	0.0719
1338	3313	0.0052	Pond 16	8462		1418	12205	0.0133	1430	1730	0.1000
1340	3632	0.0063	1378	8627	0.0062	Tatum	12225		Tatum		
1342	3905	0.0073	1380	8756	0.0155	1420	12315	0.0182	Q@290	Q100=120	Q10=32
1344	4045	0.0143	1382	8930	0.0115	Q@320	Q100=238	Q10=64			
1346	4124	0.0253	1384	9204	0.0073				Q@365	Q100=747	Q10=202
Q@405	Q100=596	Q10=161	Deset Jewel	9210					Desert Park		
56th Street	4134		1386	9450	0.0081	Q@305	Q100=68	Q10=18	1398	0	
1348	4532	0.0049	Arroyo	9470		51st Street			1400	50	0.0400
1350	4821	0.0069	1388	9517	0.0299	Pond 12			1402	80	0.0667
1352	5130	0.0065	1390	9690	0.0116	1378	0	0.0118	1404	225	0.0138
1354	5313	0.0109	1392	9810	0.0167	1380	170	0.0333	1406	275	0.0400
1356	5517	0.0098	Crestview	9895		1382	230	0.0286	1408	400	0.0160
1358	5542	0.0800	1394	10075	0.0075	1384	300	0.0154	1410	440	0.0500
Q@395	Q100=562	Q10=152	1396	10235	0.0125	1386	430	0.0167	1420	920	0.0208
Mocking Bird	5557		1398	10355	0.0167	1388	550		1430	1250	0.0303
1360	6120	0.0035	Desert Park	10395					Tatum		
									Q@310	Q100=293	Q10=79

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CHEROKEE WASH
REACH LENGTHS

Reach	TO	Reach	Station	Station	Distance	Discharge (100/10) NO	Discharge (100/10) WITH	Elevation	Slope (ft/ft)	Channel Lengths Detention	Channel Lengths No Detention
Indian Bend Wash		Caballo Lane	0	240	240	1790/483	793/214	1323			
Caballo Lane		Morning Glory	240	950	710						
Morning Glory		59th Place	950	1600	650					4134	4134
59th Place		58th Place	1600	2345	745	*					
58th Place		56th Street	2345	4134	1789	1786/481	596/161	1346	0.0056		
56th Street		Mockingbird	4134	5557	1423						
Mockingbird		53rd Street	5557	6463	906					2500	3200
53rd Street		Detention 13	6463	7333	870	1634/441	551/149	1368	0.0069		
Detention 13		Detention 16	7333	8462	1129	1574/423	407/110	1378	0.0089	600	1130
Detention 16		Desert Jewel	8462	9210	748						
Arroyo											
Desert Jewel		Crestview	9210	9895	685						
Crestview		Desert Park	9895	10395	500					2260	3008
Desert Park		Road Runner	10395	11070	675						
Road Runner		Detention 15	11070	11470	400	425/115	82/22	1408	0.0100		
Detention 15		Tatum Boulevard	11470	12315	845	283/64	238/64	1420	0.0142	845	845

* 422 cfs diverted to 56th Street

12-5-95 WSS

Detention Basin	Length
12	400
13	700
15	700
16	550

Culvert Lengths

Street Name	Right-Of-Way (ft)	
Caballo Lane	50	
Morning Glory	50	
59th Place	50	
58th Street	50	
56th Street	80	
Mockingbird Lane	66-71	150 diagionally
53rd Street	50	
Desert Jewel	60	
Arroyo	50	
Crestview	50	
Desert Park	50	
Raod Runner	50	

Tatum Boulevard

Basin	Q = 100	Q = 10
290	120	32
310	293	79
320	238	64

Assume Slope = 0.01'/ft

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CHEROKEE WASH
CHANNEL SUMMARY

Reach	Slope (ft/ft)	Discharge (Q) (cfs)					Depth (ft)				Velocity (fps)				Comments
		Channel Maximum	NO Detention		WITH Detention		NO Detention		WITH Detention		NO Detention		WITH Detention		
			100-Year	10-Year	100-Year	10-Year	100-Year	10-Year	100-Year	10-Year	100-Year	10-Year	100-Year	10-Year	
CONCRETE (34 foot bottom width, n =- 0.013)															
Indian Bend To 56th Street	0.0056	2546	1790	483	793	214	3.19	1.40	1.90	0.85	16.52	10.15	12.25	7.42	Require outlet energy dissipator
56th Street To Det Basin 13	0.0069	2826	1786	481	596	161	2.98	1.31	1.49	0.67	17.65	10.76	11.73	7.08	
Det Basin 13 To Det Basin 16	0.0089	3210	1634	441	551	149	2.59	1.15	1.32	0.59	18.52	11.31	12.32	7.42	
Det Basin 16 To Det Basin 15	0.0100	3403	1574	423	407	110	2.44	1.08	1.05	0.47	18.96	11.54	11.37	6.82	
Det Basin 15 To Tatum Blvd.	0.0142	4055	425	115	82	22	0.97	0.44	0.36	0.16	12.87	7.70	6.76	5.48	
TRIANGULAR (3:1 side slopes, 36 foot top width, n = 0.035)															
Indian Bend To 56th Street	0.0056	689	1790 38% 58	483	793 87% 46	214	8.58	5.25	6.32	3.87	8.1	5.84	6.61	4.76	
56th Street To Det Basin 13	0.0069	765	1786 43% 55	481	596	161	8.25	5.04	5.46	3.34	8.76	6.31	6.65	4.8	
Det Basin 13 To Det Basin 16	0.0089	869	1634 53% 52	441	551	149	7.60	4.65	5.06	3.10	9.42	6.79	7.18	5.18	
Det Basin 16 To Det Basin 15	0.0100	921	1574 59% 52	423	407	110	7.34	4.48	4.42	2.70	9.75	7.02	6.95	5.01	
Det Basin 15 To Tatum Blvd.	0.0142	1097	425	115	82	22	4.20	2.58	2.27	1.38	8.02	5.78	5.31	3.82	
TRAPEZOIDAL (3:1 side slopes, 12 foot bottom width, n = 0.035)															
Indian Bend To 56th Street	0.0056	573	1790 32% 61	483	793 72% 46	214	6.84	3.68	4.68	2.43	8.04	5.70	6.51	4.55	
56th Street To Det Basin 13	0.0069	636	1786 36% 58	481	596	161	6.52	3.49	3.88	1.98	8.68	6.14	6.51	4.52	
Det Basin 13 To Det Basin 16	0.0089	722	1634 44% 55	441	551	149	5.90	1.72	3.50	1.78	9.33	14.99	6.99	4.83	
Det Basin 16 To Det Basin 15	0.0100	766	1574 49% 52	423	407	110	5.64	2.98	2.92	1.46	9.64	6.79	6.72	4.60	
Det Basin 15 To Tatum Blvd.	0.0142	912	425	115	82	22	2.73	1.36	1.13	0.53	7.71	5.26	4.74	3.05	

Will not fit in existing drainage channel
Percent (%) of Maximum channel capacity of required discharge
Required drainage easement for required discharge
Note: No freeboard added

PROJECT NO. 2878

CHEROKEE WASH
CHANNEL CONSTRUCTION COST

Reach No	Description	Lengths	
		NO Detention	WITH Detention
1	Indian Bend Wash to 56th Street	4134	4134
2	56th Street to Detention Basin #13	3200	2500
3	Detention Basin #13 to Detention Basin #1	1130	600
4	Detention Basin #16 to Detention Basin #1	3008	2260
5	Detention Basin #15 to Tatum Boulevard	845	845

Discharge Type	Reach	Depth (ft)	Clearing Grubbing (Acre)	Excavation Grading (cuyd)	Construction (cuyd)	Drainage Easement (Acres)	Cost ($)	Comments
TRIANGULAR	(Construction = RipRap)							
NO Det. Basins	1	8.58	5.5	17,602	17,602	1.4	832,239	
100-Year	2	8.25	4.1	13,156	13,156	1.1	668,209	
	3	7.60	1.3	4,319	4,319	0.3	211,907	
	4	7.34	3.5	11,150	11,150	0.6	525,712	
	5	4.20	0.6	1,953	1,953		79,235	
							2,370,333	SUM
10-Year	1	5.25	3.6	11,483	11,483		465,917	
	2	5.04	2.7	8,590	8,590		348,534	
	3	4.65	0.9	2,838	2,838		115,129	
	4	4.46	2.3	7,326	7,326		297,246	
	5	2.58	0.4	1,344	1,344		54,550	
							1,281,377	SUM
WITH Det. Basins	1	6.32	4.2	13,449	13,449	0.3	582,349	
100-Year	2	5.46	2.2	7,178	7,178		291,226	
	3	5.06	0.5	1,616	1,616		65,567	
	4	4.42	1.7	5,444	5,444		220,885	
	5	2.27	0.4	1,226	1,226		49,627	
							1,209,854	SUM
10-Year	1	3.87	2.8	8,948	8,948		363,043	
	2	3.34	1.5	4,822	4,822		195,654	
	3	3.10	0.3	1,093	1,093		44,360	
	4	2.70	1.2	3,716	3,716		150,789	
	5	1.38	0.3	894	894		36,265	
							790,111	SUM
TRAPEZODIAL	(Construction = RipRap)							
NO Det. Basins	1	6.84	4.5	14,405	14,405	1.7	792,224	
100-Year	2	6.52	3.3	10,695	10,695	1.1	568,381	
	3	5.90	1.1	3,465	3,465	0.3	177,267	
	4	5.64	2.8	8,877	8,877	0.6	433,500	
	5	2.73	0.4	1,401	1,401		56,836	
							2,028,208	SUM
10-Year	1	3.68	2.7	8,599	8,599		348,879	
	2	3.49	2.0	6,386	6,386		259,092	
	3	1.72	0.4	1,366	1,366		55,425	
	4	2.98	1.6	5,321	5,321		215,883	
	5	1.36	0.3	886	886		35,961	
							915,240	SUM
WITH Det. Basins	1	4.68	3.2	10,436	10,436	0.3	460,092	
100-Year	2	3.88	1.7	5,422	5,422		219,998	
	3	3.50	0.4	1,200	1,200		48,688	
	4	2.92	1.2	3,937	3,937		159,754	
	5	1.13	0.2	800	800		32,456	
							920,988	SUM
10-Year	1	2.43	2.0	6,302	6,302		255,695	
	2	1.98	1.0	3,311	3,311		134,343	
	3	1.78	0.2	741	741		30,078	
	4	1.46	0.8	2,471	2,471		100,254	
	5	0.53	0.2	575	575		23,313	
							543,684	SUM
RECTANGULAR	(Construction = concrete)							
NO Det. Basins	1	25 x 4	2.9	15900	5053		1,348,115	
100-Year	2	23 x 4	2.1	11514	3674		979,955	
	3	19 x 4	0.7	3505	1130		301,320	
	4	18 x 4	1.7	8957	2896		771,930	
	5	6 x 4	0.2	1258	438		116,160	
							3,517,480	SUM
10-Year	1	9 x 4	1.4	7694	2602		691,560	
	2	9 x 4	1.1	5955	2015		535,560	
	3	7 x 4	0.3	1822	628		166,665	
	4	9 x 3	1.0	4479	1671		441,995	
	5	5 x 2	0.2	692	282		74,330	
							1,910,110	SUM
WITH Det. Basins	1	13 x 4	1.6	9745	3215		855,805	
100-Year	2	10 x 4	0.9	4963	1667		443,230	
	3	8 x 4	0.2	1042	356		94,560	
	4	9 x 3	0.8	2523	1256		328,095	
	5	4 x 2	0.2	630	250		66,020	
							1,787,730	SUM
10-Year	1	7 x 3	1.2	5334	1990		526,390	
	2	8 x 2	0.8	2605	1111		292,255	
	3	6 x 2	0.2	536	222		58,550	
	4	5 x 2	0.6	1850	753		198,610	
	5	3 x 2	0.2	566	220		58,200	
							1,134,005	SUM

Quantities	Cost ($)	Unit
Clearing & Grubbing	1,850	Acre
Excavation & Grading	5	cuyd
Construction (RipRap)	35	cuyd
Construction (Concrete)	250	cuyd
Land Cost	122,222	Acre

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CHEROKEE WASH

PRELIMINARY COST ESTIMATE SUMMARY

ALTERNATIVES	LAND ACQUISITION ($)	CHANNEL CONST. ($)	CULVERT DRAIN CONST. ($)	DETENTION BASIN CONST. ($)	SUB TOTAL CONST. ($)	UTILITY RELOCATIONS 20% of Construction ($)	ENGINEERING DESIGN Includes: Civil Geotechnical Landscape Structural Survey 10% of Construction ($)	CONSTRUCTION ADMIN. Includes: Inspection Survey Testing 20% of Construction ($)	CONTINGENCY 15% of Land Acquisition & Construction ($)	TOTAL PROJECT COST ($)
CONCRETE CHANNEL (Rectangular)										
(1) NO DETENTION BASINS										
(1A) 100-Year		3,517,480	1,179,605	-0-	4,697,085	939,417	469,708	939,417	704,563	$7,750,190
(1B) 10-Year		1,910,110	491,626	-0-	2,401,736	480,347	240,174	480,347	360,260	$3,962,864
(2) WITH DETENTION BASINS										
(2A) 100-Year	1,630,115	1,787,730	575,724	1,577,066	3,940,520	788,104	394,052	788,104	835,595	$8,376,490
(2B) 10-Year	880,262	1,134,005	303,437	851,616	2,289,057	457,811	228,906	457,811	475,398	$4,789,246
ROCKLINED RIP RAP CHANNEL (Triangular)										
(1) NO DETENTION BASINS										
(1A) 100-Year		2,370,333	1,302,226	-0-	3,672,559	734,512	367,256	734,512	550,884	$6,059,722
(1B) 10-Year		1,281,377	540,937	-0-	1,822,314	364,463	182,231	364,463	273,347	$3,006,818
(2) WITH DETENTION BASINS										
(2A) 100-Year	1,630,115	1,209,854	630,233	1,577,066	3,417,153	683,431	341,715	683,431	757,090	$7,512,935
(2B) 10-Year	880,262	790,111	303,437	851,616	1,945,163	389,033	194,516	389,033	423,814	$4,221,820
DIRT (Decomposed Granite) (Triangular)										
(1) NO DETENTION BASINS										
(1A) 100-Year		NA	1,302,226	-0-	1,302,226	260,445	130,223	260,445	195,334	$2,148,673
(1B) 10-Year		NA	540,937	-0-	540,937	108,187	54,094	108,187	81,140	$892,545
(2) WITH DETENTION BASINS										
(2A) 100-Year	1,630,115	NA	630,233	1,577,066	2,207,299	441,460	220,730	441,460	575,612	$5,516,676
(2B) 10-Year	880,262	NA	303,437	851,616	1,155,052	231,010	115,505	231,010	305,297	$2,918,138

NA Not Available at this Time

WSS 12 20 95
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DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CHEROKEE WASH
CULVERT ANALYSIS

1 0 0-YEAR NO DETENTION

STREET NAME	SIZE (ft)	LENGTH (ft)	CULVERT QUANTITIES / COST: Concrete (cuyd)	Sub Cost ($)	Steel (lbs)	Sub Cost ($)	Trench ($)	Backfill ($)	Sub Cost ($)	ROAD REMOVAL & REPLACEMENT: (Width)	(sqyd)	Sub Cost	SUB COST ($)	HEADWALLS: INLET Concrete	INLET Steel	OUTLET Concrete	OUTLET Steel	SUB COS ($)	TOTAL COST ($)	COMMENTS
Caballo Lane	3-10x5	50	3.122	46,830	459.1	11,478	4,221	3,384	65,913	54	300	4,950	70,863	11.85	927	20.67	1600	11,020	81,882	Headwalls 4:1 Slope, 0 Skew
Morning Glory	3-10x5	50	3.122	46,830	459.1	11,478	4,221	3,384	65,913	54	300	4,950	70,863	11.85	927	20.67	1600	11,020	81,882	
59th Place	3-10x5	50	3.122	46,830	459.1	11,478	4,221	3,384	65,913	54	300	4,950	70,863	11.85	927	20.67	1600	11,020	81,882	
58th Place	3-10x5	50	3.122	46,830	459.1	11,478	4,221	3,384	65,913	54	300	4,950	70,863	11.85	927	20.67	1600	11,020	81,882	
56th Street	3-10x5	80	3.122	74,928	459.1	18,364	6,754	5,414	105,460	54	480	7,920	113,380	11.85	927	20.67	1600	11,020	124,400	
Mockingbird Ln	3-10x5	150	3.122	140,490	459.1	34,433	12,663	10,152	197,738	54	900	14,850	212,588	15.40	1309	23.86	1959	13,412	226,000	40 Skew
53rd Street	3-10x5	50	3.122	46,830	459.1	11,478	4,221	3,384	65,913	54	300	4,950	70,863	11.85	927	20.67	1600	11,020	81,882	
Desert Jewel	1-10x4	60	1.012	18,216	160.4	4,812	1,919	3,121	28,068	30	200	3,300	31,368	6.99	526	12.54	949	6,597	37,965	
Arroyo	1-10x4	50	1.012	15,180	160.4	4,010	1,599	2,601	23,390	30	167	2,750	26,140	6.99	526	12.54	949	6,597	32,737	
Crestview	1-10x4	50	1.012	15,180	160.4	4,010	1,599	2,601	23,390	30	167	2,750	26,140	6.99	526	12.54	949	6,597	32,737	
Desert Park	1-10x4	50	1.012	15,180	160.4	4,010	1,599	2,601	23,390	30	167	2,750	26,140	6.99	526	12.54	949	6,597	32,737	
Road Runner	1-10x4	50	1.012	15,180	160.4	4,010	1,599	2,601	23,390	30	167	2,750	26,140	6.99	526	12.54	949	6,597	32,737	
Tatum Blvd																				
290	3-36"	120		27,000					27,000	27	360	5,940	32,940					2,100	35,040	End Sections
310	3-48"	120		39,600					39,600	32	427	7,040	46,640					4,500	51,140	End Sections
320	3-42"	100		28,500					28,500	29	322	5,317	33,817					3,510	37,327	End Sections
													929,605	Sub Total					1,052,226	Sub Total

QUANTITIES	COST	UNIT
Concrete	300.00	cuyd
Steel	0.50	lbs
Trench	6.00	cuyd
Backfill	18.00	cuyd
Road Removal	2.50	sqyd
Road Replace	14.00	sqyd
36" End Section	350.00	each
42" End Section	585.00	each
48" End Section	750.00	each
36" Pipe	75.00	Linft
42" Pipe	95.00	Linft
48" Pipe	110.00	Linft
54" Pipe	120.00	Linft
60" Pipe	140.00	Linft
66" Pipe	170.00	Linft
72" Pipe	200.00	Linft

MISCELLANEOUS	QUANTIT	UNIT COST	TOTAL COST
Energy Dissipator	1	20,000	20,000
Tatum Crossing	3	50,000	150,000
Grade Control Struct	4	20,000	80,000
		Sub Total	250,000

********** Grand Total 1,302,226 Grand Total Headwalls

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CHEROKEE WASH
CULVERT ANALYSIS

10-YEAR NO DETENTION

STREET NAME	SIZE (ft)	LENGTH (ft)	CULVERT QUANTITIES / COST: Concrete (cuyd)	Sub Cost ($)	Steel (lbs)	Sub Cost ($)	Trench ($)	Backfill ($)	Sub Cost ($)	ROAD REMOVAL & REPLACEMENT: (Width)	(sqyd)	Sub Cost	SUB COST ($)	HEADWALLS: INLET Concrete	INLET Steel	OUTLET Concrete	OUTLET Steel	SUB COS ($)	TOTAL COST ($)	COMMENTS
Caballo Lane	2-6x4	50	1.246	12,460	183.8	4,595	1,108	1,879	20,041	33	183	3,025	23,066	7.24	535	12.95	972	4,792	27,858	Headwalls 4 1 slope, 0 Skew
Morning Glory	2-6x4	50	1.246	12,460	183.8	4,595	1,108	1,879	20,041	33	183	3,025	23,066	7.24	535	12.95	972	4,792	27,858	
59th Place	2-6x4	50	1.246	12,460	183.8	4,595	1,108	1,879	20,041	33	183	3,025	23,066	7.24	535	12.95	972	4,792	27,858	
58th Place	2-6x4	50	1.246	12,460	183.8	4,595	1,108	1,879	20,041	33	183	3,025	23,066	7.24	535	12.95	972	4,792	27,858	
56th Street	2-6x4	80	1.246	19,936	183.8	7,352	1,772	3,006	32,066	33	293	4,840	36,906	7.24	535	12.95	972	4,792	41,698	
Mockingbird Ln	2-6x4	150	1.246	37,380	183.8	13,785	3,323	5,636	60,124	33	550	9,075	69,199	9.47	700	14.61	891	5,612	74,810	40 Skew
53rd Street	2-6x4	50	1.246	12,460	183.8	4,595	1,108	1,879	20,041	33	183	3,025	23,066	7.24	535	12.95	972	4,792	27,858	
Desert Jewel	2-42"	60		10,200					10,200	29	193	3,190	13,390					2,340	15,730	End Sections
Arroyo	2-42"	50		8,500					8,500	29	161	2,658	11,158					2,340	13,498	End Sections
Crestview	2-42"	50		8,500					8,500	29	161	2,658	11,158					2,340	13,498	End Sections
Desert Park	2-42"	50		8,500					8,500	29	161	2,658	11,158					2,340	13,498	End Sections
Road Runner	2-42"	50		8,500					8,500	29	161	2,658	11,158					2,340	13,498	End Sections
Tatum Blvd																				
290	30"	120		6,600					6,600	15	200	3,300	9,900					650	10,550	End Sections
310	2-30"	120		13,200					13,200	20	267	4,400	17,600					1,300	18,900	End Sections
320	2-30"	100		11,000					11,000	20	222	3.667	14,667					1,300	15,967	End Sections
													321,626	Sub Total					370,937	Sub Total

QUANTITIES	COST	UNIT
Concrete	200 00	cuyd
Steel	0 50	lbs
Trench	3 50	cuyd
Backfill	13 00	cuyd
Road Removal	2.50	sqyd
Road Replace	14 00	sqyd
30" End Section	325 00	each
42" End Section	585 00	each
30" Pipe	55 00	Linft
42" Pipe	85.00	Linft
48" Pipe	110 00	Linft
54" Pipe	120 00	Linft
60" Pipe	140 00	Linft
66" Pipe	170 00	Linft
72" Pipe	200 00	Linft

MISCELLANEOUS	QUANTIT	UNIT COST	TOTAL COST
Energy Dissipator	1	20,000	20,000
Tatum Crossing	3	30,000	90,000
Grade Control Struct	4	15,000	60,000
		Sub Total	170,000

491,626 Grand Total

540,937 Grand Total Headwalls

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CHEROKEE WASH
CULVERT ANALYSIS

1 0 0-YEAR WITH DETENTION

STREET NAME	SIZE (ft)	LENGTH (ft)	CULVERT QUANTITIES / COST: Concrete (cuyd)	Sub Cost ($)	Steel (lbs)	Sub Cost ($)	Trench ($)	Backfill ($)	Sub Cost ($)	ROAD REMOVAL & REPLACEMENT: (Width)	(sqyd)	Sub Cost	SUB COST ($)	HEADWALLS: INLET Concrete	INLET Steel	OUTLET Concrete	OUTLET Steel	SUB COS ($)	TOTAL COST ($)	COMMENTS
Caballo Lane	2-10x4	50	2.067	20,670	310.0	7,750	1,575	1,879	31,874	41	228	3,758	35,632	8.39	656	15.05	1169	5,601	41,232	Headwalls 4 1 Slope 0 Skew
Morning Glory	2-10x4	50	2.067	20,670	310.0	7,750	1,575	1,879	31,874	41	228	3,758	35,632	8.39	656	15.05	1169	5,601	41,232	
59th Place	2-10x4	50	2.067	20,670	310.0	7,750	1,575	1,879	31,874	41	228	3,758	35,632	8.39	656	15.05	1169	5,601	41,232	
58th Place	2-8x4	50	1.558	15,580	274.9	6,872	1,342	1,879	25,673	37	206	3,392	29,065	7.81	585	13.98	1054	5,178	34,242	
56th Street	2-8x4	80	1.558	24,928	274.9	10,996	2,148	3,006	41,077	37	329	5,427	46,504	7.81	585	13.98	1054	5,178	51,681	
Mockingbird Ln	2-8x4	150	1.558	46,740	274.9	20,618	4,027	5,636	77,020	37	617	10,175	87,195	10.21	769	15.93	1206	6,216	93,410	40 Skew
53rd Street	2-8x4	50	1.558	15,580	274.9	6,872	1,342	1,879	25,673	37	206	3,392	29,065	7.81	585	13.98	1054	5,178	34,242	
Desert Jewel	1-42"	60		5,100					5,100	17	113	1,870	6,970					1,170	8,140	End Sections
Arroyo	1-42"	50		4,250					4,250	17	94	1,558	5,808					1,170	6,978	End Sections
Crestview	1-42"	50		4,250					4,250	17	94	1,558	5,808					1,170	6,978	End Sections
Desert Park	1-42"	50		4,250					4,250	17	94	1,558	5,808					1,170	6,978	End Sections
Road Runner	1-42"	50		4,250					4,250	17	94	1,558	5,808					1,170	6,978	End Sections
Tatum Blvd																				
290	3-36"	120		23,400					23,400	27	360	5,940	29,340					2,100	31,440	End Sections
310	3-48"	120		39,600					39,600	32	427	7,040	46,640					4,500	51,140	End Sections
320	3-42"	100		25,500					25,500	29	322	5,317	30,817					3,510	34,327	End Sections
													435,724	Sub Total					490,233	Sub Total

QUANTITIES	COST	UNIT
Concrete	200.00	cuyd
Steel	0.50	lbs
Trench	3.50	cuyd
Backfill	13.00	cuyd
Road Removal	2.50	sqyd
Road Replace	14.00	sqyd
36" End Section	350.00	each
42" End Section	585.00	each
48" End Section	750.00	each
36" Pipe	65.00	Linft
42" Pipe	85.00	Linft
48" Pipe	110.00	Linft
54" Pipe	120.00	Linft
60" Pipe	140.00	Linft
66" Pipe	170.00	Linft
72" Pipe	200.00	Linft

MISCELLANEOUS	QUANTIT	UNIT COST	TOTAL COST
Energy Dissipator	1	20,000	20,000
Tatum Crossing	3	20,000	60,000
Grade Control Struct	4	15,000	60,000
		Sub Total	140,000

575,724 Grand Total

630,233 Grand Total Headwalls

WG 12/20/9

DOUBLETREE RANCH ROAD

PROJECT NO. 2878

CHEROKEE WASH
CULVERT ANALYSIS

10-YEAR WITH DETENTION

STREET NAME	SIZE (ft) or (in)	LENGTH (ft)	CULVERT COST ($)	ROAD REMOVAL & REPLACEMENT (Width)	(sqyd)	Sub Cost	END SECTIONS ($)	TOTAL COST ($)
Caballo Lane	2-48"	50	11,000	18	100	1,650	3,000	15,650
Morning Glory	2-48"	50	11,000	18	100	1,650	3,000	15,650
59th Place	2-48"	50	11,000	18	100	1,650	3,000	15,650
58th Place	2-48"	50	11,000	18	100	1,650	3,000	15,650
56th Street	2-42"	80	13,600	17	151	2,493	2,340	18,433
Mockingbird Ln	2-42"	150	25,500	17	283	4,675	2,340	32,515
53rd Street	2-42"	50	8,500	17	94	1,558	2,340	12,398
Desert Jewel	24"	60	3,000	14	93	1,540	480	5,020
Arroyo	24"	50	2,500	14	78	1,283	480	4,263
Crestview	24"	50	2,500	14	78	1,283	480	4,263
Desert Park	24"	50	2,500	14	78	1,283	480	4,263
Road Runner	24"	50	2,500	14	78	1,283	480	4,263
Tatum Blvd								
290	30"	120	6,600	15	200	3,300	650	10,550
310	2-30"	120	13,200	20	267	4,400	1,300	18,900
320	2-30"	100	11,000	20	222	3,667	1,300	15,967
							Sub Total	193,437

QUANTITIES	COST	UNIT
Concrete	200.00	cuyd
Steel	0.50	lbs
Trench	3.50	cuyd
Backfill	13.00	cuyd
Road Removal	2.50	sqyd
Road Replace	14.00	sqyd
24" End Sections	240.00	each
30" End Sections	325.00	each
42" End Sections	585.00	each
48" End Sections	750.00	each
24" Pipe	50.00	Linft
30" Pipe	55.00	Linft
42" Pipe	85.00	Linft
48" Pipe	110.00	Linft
54" Pipe	120.00	Linft
60" Pipe	140.00	Linft
66" Pipe	170.00	Linft
72" Pipe	200.00	Linft

MISCELLANEOUS	QUANTIT	UNIT COST	TOTAL COST
Energy Dissipator	1	10,000	10,000
Tatum Crossing	3	20,000	60,000
Grade Control Struct	4	10,000	40,000
		Sub Total	110,000

Grand Total 303,437

CHEROKEE WASH

MAXIMUM FLOW
CONCRETE CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MAXIMUM CONCRETE CHANNEL PER SLOPE

Solve For Discharge

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0056 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	2546.25 cfs
Velocity.....	18.72 fps
Flow Area.....	136.00 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	42.00 ft
Critical Depth...	5.58 ft
Critical Slope...	0.0020 ft/ft
Froude Number....	1.65 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MAXIMUM CONCRETE CHANNEL PER SLOPE

Solve For Discharge

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	2826.39 cfs
Velocity.....	20.78 fps
Flow Area.....	136.00 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	42.00 ft
Critical Depth...	5.99 ft
Critical Slope...	0.0020 ft/ft
Froude Number....	1.83 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MAXIMUM CONCRETE CHANNEL PER SLOPE

Solve For Discharge

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0089 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	3209.98 cfs
Velocity.....	23.60 fps
Flow Area.....	136.00 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	42.00 ft
Critical Depth...	6.52 ft
Critical Slope...	0.0020 ft/ft
Froude Number....	2.08 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MAXIMUM CONCRETE CHANNEL PER SLOPE

Solve For Discharge

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0100 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	3402.57 cfs
Velocity.....	25.02 fps
Flow Area.....	136.00 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	42.00 ft
Critical Depth...	6.78 ft
Critical Slope...	0.0020 ft/ft
Froude Number....	2.20 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MAXIMUM CONCRETE CHANNEL PER SLOPE

Solve For Discharge

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0142 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	4054.63 cfs
Velocity.....	29.81 fps
Flow Area.....	136.00 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	42.00 ft
Critical Depth...	7.62 ft
Critical Slope...	0.0021 ft/ft
Froude Number....	2.63 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

CHEROKEE WASH

100-YEAR
NO DETENTION

RECTANGULAR CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0056 ft/ft
Depth.....	4.00 ft
Discharge.....	1790.00 cfs

Computed Results:

Bottom Width.....	24.98 ft
Velocity.....	17.91 fps
Flow Area.....	99.94 sf
Flow Top Width...	24.98 ft
Wetted Perimeter.	32.98 ft
Critical Depth...	5.42 ft
Critical Slope...	0.0023 ft/ft
Froude Number....	1.58 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Depth.....	4.00 ft
Discharge.....	1786.00 cfs

Computed Results:

Bottom Width.....	22.80 ft
Velocity.....	19.58 fps
Flow Area.....	91.22 sf
Flow Top Width...	22.80 ft
Wetted Perimeter.	30.80 ft
Critical Depth...	5.75 ft
Critical Slope...	0.0024 ft/ft
Froude Number....	1.73 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0089 ft/ft
Depth.....	4.00 ft
Discharge.....	1634.00 cfs

Computed Results:

Bottom Width.....	19.00 ft
Velocity.....	21.50 fps
Flow Area.....	76.01 sf
Flow Top Width...	19.00 ft
Wetted Perimeter.	27.00 ft
Critical Depth...	6.12 ft
Critical Slope...	0.0026 ft/ft
Froude Number....	1.89 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0100 ft/ft
Depth.....	4.00 ft
Discharge.....	1574.00 cfs

Computed Results:

Bottom Width.....	17.55 ft
Velocity.....	22.42 fps
Flow Area.....	70.19 sf
Flow Top Width...	17.55 ft
Wetted Perimeter.	25.55 ft
Critical Depth...	6.30 ft
Critical Slope...	0.0027 ft/ft
Froude Number....	1.98 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0142 ft/ft
Depth.....	4.00 ft
Discharge.....	425.00 cfs

Computed Results:

Bottom Width.....	5.59 ft
Velocity.....	18.99 fps
Flow Area.....	22.38 sf
Flow Top Width...	5.59 ft
Wetted Perimeter.	13.59 ft
Critical Depth...	5.64 ft
Critical Slope...	0.0060 ft/ft
Froude Number....	1.67 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
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CHEROKEE WASH

10-YEAR
NO DETENTION

RECTANGULAR CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0056 ft/ft
Depth.....	4.00 ft
Discharge.....	483.00 cfs

Computed Results:

Bottom Width.....	8.66 ft
Velocity.....	13.94 fps
Flow Area.....	34.66 sf
Flow Top Width...	8.66 ft
Wetted Perimeter.	16.66 ft
Critical Depth...	4.59 ft
Critical Slope...	0.0039 ft/ft
Froude Number....	1.23 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0089 ft/ft
Depth.....	4.00 ft
Discharge.....	441.00 cfs

Computed Results:

Bottom Width.....	6.81 ft
Velocity.....	16.19 fps
Flow Area.....	27.24 sf
Flow Top Width...	6.81 ft
Wetted Perimeter.	14.81 ft
Critical Depth...	5.07 ft
Critical Slope...	0.0048 ft/ft
Froude Number....	1.43 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0100 ft/ft
Depth.....	3.00 ft
Discharge.....	423.00 cfs

Computed Results:

Bottom Width.....	8.47 ft
Velocity.....	16.64 fps
Flow Area.....	25.42 sf
Flow Top Width...	8.47 ft
Wetted Perimeter.	14.47 ft
Critical Depth...	4.26 ft
Critical Slope...	0.0038 ft/ft
Froude Number....	1.69 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0142 ft/ft
Depth.....	2.00 ft
Discharge.....	115.00 cfs

Computed Results:

Bottom Width.....	4.17 ft
Velocity.....	13.80 fps
Flow Area.....	8.33 sf
Flow Top Width...	4.17 ft
Wetted Perimeter.	8.17 ft
Critical Depth...	2.87 ft
Critical Slope...	0.0055 ft/ft
Froude Number....	1.72 (flow is Supercritical)

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CHEROKEE WASH

10-YEAR
NO DETENTION

CONCRETE CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0056 ft/ft
Discharge.....	483.00 cfs

Computed Results:

Depth.....	1.40 ft
Velocity.....	10.15 fps
Flow Area.....	47.58 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	36.80 ft
Critical Depth...	1.84 ft
Critical Slope...	0.0023 ft/ft
Froude Number....	1.51 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0068 ft/ft
Discharge.....	481.00 cfs

Computed Results:

Depth.....	1.31 ft
Velocity.....	10.76 fps
Flow Area.....	44.69 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	36.63 ft
Critical Depth...	1.84 ft
Critical Slope...	0.0023 ft/ft
Froude Number....	1.65 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0089 ft/ft
Discharge.....	441.00 cfs

Computed Results:

Depth.....	1.15 ft
Velocity.....	11.31 fps
Flow Area.....	38.99 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	36.29 ft
Critical Depth...	1.74 ft
Critical Slope...	0.0023 ft/ft
Froude Number....	1.86 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0100 ft/ft
Discharge.....	423.00 cfs

Computed Results:

Depth.....	1.08 ft
Velocity.....	11.54 fps
Flow Area.....	36.66 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	36.16 ft
Critical Depth...	1.69 ft
Critical Slope...	0.0023 ft/ft
Froude Number....	1.96 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0142 ft/ft
Discharge.....	114.00 cfs

Computed Results:

Depth.....	0.44 ft
Velocity.....	7.70 fps
Flow Area.....	14.81 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	34.87 ft
Critical Depth...	0.70 ft
Critical Slope...	0.0029 ft/ft
Froude Number....	2.06 (flow is Supercritical)

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CHEROKEE WASH

100-YEAR
DETENTION

RECTANGULAR CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year WITH Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0056 ft/ft
Depth.....	4.00 ft
Discharge.....	793.00 cfs

Computed Results:

Bottom Width.....	12.73 ft
Velocity.....	15.57 fps
Flow Area.....	50.92 sf
Flow Top Width...	12.73 ft
Wetted Perimeter.	20.73 ft
Critical Depth...	4.94 ft
Critical Slope...	0.0031 ft/ft
Froude Number....	1.37 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year WITH Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Depth.....	4.00 ft
Discharge.....	596.00 cfs

Computed Results:

Bottom Width.....	9.39 ft
Velocity.....	15.87 fps
Flow Area.....	37.56 sf
Flow Top Width...	9.39 ft
Wetted Perimeter.	17.39 ft
Critical Depth...	5.00 ft
Critical Slope...	0.0038 ft/ft
Froude Number....	1.40 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year WITH Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0089 ft/ft
Depth.....	4.00 ft
Discharge.....	551.00 cfs

Computed Results:

Bottom Width.....	8.04 ft
Velocity.....	17.14 fps
Flow Area.....	32.14 sf
Flow Top Width...	8.04 ft
Wetted Perimeter.	16.04 ft
Critical Depth...	5.27 ft
Critical Slope...	0.0043 ft/ft
Froude Number....	1.51 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year WITH Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0100 ft/ft
Depth.....	3.00 ft
Discharge.....	407.00 cfs

Computed Results:

Bottom Width.....	8.22 ft
Velocity.....	16.50 fps
Flow Area.....	24.67 sf
Flow Top Width...	8.22 ft
Wetted Perimeter.	14.22 ft
Critical Depth...	4.24 ft
Critical Slope...	0.0039 ft/ft
Froude Number....	1.68 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year WITH Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0142 ft/ft
Depth.....	2.00 ft
Discharge.....	82.00 cfs

Computed Results:

Bottom Width.....	3.24 ft
Velocity.....	12.65 fps
Flow Area.....	6.48 sf
Flow Top Width...	3.24 ft
Wetted Perimeter.	7.24 ft
Critical Depth...	2.71 ft
Critical Slope...	0.0066 ft/ft
Froude Number....	1.58 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

CHEROKEE WASH

10-YEAR
DETENTION

RECTANGULAR CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0056 ft/ft
Depth.....	3.00 ft
Discharge.....	214.00 cfs

Computed Results:

Bottom Width.....	6.27 ft
Velocity.....	11.37 fps
Flow Area.....	18.82 sf
Flow Top Width...	6.27 ft
Wetted Perimeter.	12.27 ft
Critical Depth...	3.31 ft
Critical Slope...	0.0043 ft/ft
Froude Number....	1.16 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Depth.....	2.00 ft
Discharge.....	161.00 cfs

Computed Results:

Bottom Width.....	7.18 ft
Velocity.....	11.22 fps
Flow Area.....	14.35 sf
Flow Top Width...	7.18 ft
Wetted Perimeter.	11.18 ft
Critical Depth...	2.50 ft
Critical Slope...	0.0037 ft/ft
Froude Number....	1.40 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0089 ft/ft
Depth.....	2.00 ft
Discharge.....	149.00 cfs

Computed Results:

Bottom Width.....	6.09 ft
Velocity.....	12.23 fps
Flow Area.....	12.19 sf
Flow Top Width...	6.09 ft
Wetted Perimeter.	10.09 ft
Critical Depth...	2.65 ft
Critical Slope...	0.0041 ft/ft
Froude Number....	1.52 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention CONCRETE

Solve For Bottom Width

Given Input Data:

Manning's n.....	0.013
Channel Slope....	0.0100 ft/ft
Depth.....	2.00 ft
Discharge.....	110.00 cfs

Computed Results:

Bottom Width.....	4.60 ft
Velocity.....	11.96 fps
Flow Area.....	9.20 sf
Flow Top Width...	4.60 ft
Wetted Perimeter.	8.60 ft
Critical Depth...	2.61 ft
Critical Slope...	0.0049 ft/ft
Froude Number....	1.49 (flow is Supercritical)

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CHEROKEE WASH

10-YEAR
DETENTION

CONCRETE CHANNEL

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0056 ft/ft
Discharge.....	214.00 cfs

Computed Results:

Depth.....	0.85 ft
Velocity.....	7.42 fps
Flow Area.....	28.84 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	35.70 ft
Critical Depth...	1.07 ft
Critical Slope...	0.0026 ft/ft
Froude Number....	1.42 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0069 ft/ft
Discharge.....	161.00 cfs

Computed Results:

Depth.....	0.67 ft
Velocity.....	7.08 fps
Flow Area.....	22.75 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	35.34 ft
Critical Depth...	0.89 ft
Critical Slope...	0.0027 ft/ft
Froude Number....	1.53 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0089 ft/ft
Discharge.....	149.00 cfs

Computed Results:

Depth.....	0.59 ft
Velocity.....	7.42 fps
Flow Area.....	20.08 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	35.18 ft
Critical Depth...	0.84 ft
Critical Slope...	0.0028 ft/ft
Froude Number....	1.70 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0100 ft/ft
Discharge.....	110.00 cfs

Computed Results:

Depth.....	0.47 ft
Velocity.....	6.82 fps
Flow Area.....	16.12 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	34.95 ft
Critical Depth...	0.69 ft
Critical Slope...	0.0029 ft/ft
Froude Number....	1.75 (flow is Supercritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention CONCRETE

Solve For Depth

Given Input Data:

Bottom Width.....	34.00 ft
Manning's n.....	0.013
Channel Slope....	0.0142 ft/ft
Discharge.....	22.00 cfs

Computed Results:

Depth.....	0.16 ft
Velocity.....	4.01 fps
Flow Area.....	5.48 sf
Flow Top Width...	34.00 ft
Wetted Perimeter.	34.32 ft
Critical Depth...	0.24 ft
Critical Slope...	0.0041 ft/ft
Froude Number....	1.76 (flow is Supercritical)

Open Channel Flow Module, Version 3.3 (c) 1991
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CHEROKEE WASH

100-YEAR
NO DETENTION

TRAPEZODIAL CHANNEL

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Trapezodial Natural

Solve For Discharge

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0056 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	572.85 cfs
Velocity.....	5.97 fps
Flow Area.....	96.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.30 ft
Critical Depth...	3.17 ft
Critical Slope...	0.0144 ft/ft
Froude Number....	0.64 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Trapezodial Natural

Solve For Discharge

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0069 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	635.87 cfs
Velocity.....	6.62 fps
Flow Area.....	96.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.30 ft
Critical Depth...	3.35 ft
Critical Slope...	0.0141 ft/ft
Froude Number....	0.71 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Trapezodial Natural

Solve For Discharge

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0089 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	722.17 cfs
Velocity.....	7.52 fps
Flow Area.....	96.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.30 ft
Critical Depth...	3.58 ft
Critical Slope...	0.0139 ft/ft
Froude Number....	0.81 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Trapezodial Natural

Solve For Discharge

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0100 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	765.50 cfs
Velocity.....	7.97 fps
Flow Area.....	96.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.30 ft
Critical Depth...	3.70 ft
Critical Slope...	0.0138 ft/ft
Froude Number....	0.86 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Trapezodial Natural

Solve For Discharge

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0142 ft/ft
Depth.....	4.00 ft

Computed Results:

Discharge.....	912.20 cfs
Velocity.....	9.50 fps
Flow Area.....	96.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.30 ft
Critical Depth...	4.05 ft
Critical Slope...	0.0135 ft/ft
Froude Number....	1.03 (flow is Supercritical)

CHEROKEE WASH

10-YEAR
NO DETENTION

TRAPEZODIAL CHANNEL

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0056 ft/ft
Discharge.....	483.00 cfs

Computed Results:

Depth.....	3.68 ft
Velocity.....	5.70 fps
Flow Area.....	84.74 sf
Flow Top Width...	34.07 ft
Wetted Perimeter.	35.27 ft
Critical Depth...	2.89 ft
Critical Slope...	0.0147 ft/ft
Froude Number....	0.64 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0069 ft/ft
Discharge.....	481.00 cfs

Computed Results:

Depth.....	3.49 ft
Velocity.....	6.14 fps
Flow Area.....	78.29 sf
Flow Top Width...	32.92 ft
Wetted Perimeter.	34.05 ft
Critical Depth...	2.88 ft
Critical Slope...	0.0147 ft/ft
Froude Number....	0.70 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0890 ft/ft
Discharge.....	441.00 cfs

Computed Results:

Depth.....	1.72 ft
Velocity.....	14.99 fps
Flow Area.....	29.42 sf
Flow Top Width...	22.29 ft
Wetted Perimeter.	22.85 ft
Critical Depth...	2.75 ft
Critical Slope...	0.0149 ft/ft
Froude Number....	2.30 (flow is Supercritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0100 ft/ft
Discharge.....	423.00 cfs

Computed Results:

Depth.....	2.98 ft
Velocity.....	6.79 fps
Flow Area.....	62.32 sf
Flow Top Width...	29.86 ft
Wetted Perimeter.	30.83 ft
Critical Depth...	2.69 ft
Critical Slope...	0.0150 ft/ft
Froude Number....	0.83 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0142 ft/ft
Discharge.....	115.00 cfs

Computed Results:

Depth.....	1.36 ft
Velocity.....	5.26 fps
Flow Area.....	21.85 sf
Flow Top Width...	20.15 ft
Wetted Perimeter.	20.60 ft
Critical Depth...	1.27 ft
Critical Slope...	0.0182 ft/ft
Froude Number....	0.89 (flow is Subcritical)

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CHEROKEE WASH

10-YEAR
DETENTION

TRAPEZODIAL CHANNEL

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0056 ft/ft
Discharge.....	214.00 cfs

Computed Results:

Depth.....	2.43 ft
Velocity.....	4.55 fps
Flow Area.....	47.00 sf
Flow Top Width...	26.61 ft
Wetted Perimeter.	27.40 ft
Critical Depth...	1.83 ft
Critical Slope...	0.0166 ft/ft
Froude Number....	0.60 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0069 ft/ft
Discharge.....	161.00 cfs

Computed Results:

Depth.....	1.98 ft
Velocity.....	4.52 fps
Flow Area.....	35.62 sf
Flow Top Width...	23.90 ft
Wetted Perimeter.	24.55 ft
Critical Depth...	1.55 ft
Critical Slope...	0.0173 ft/ft
Froude Number....	0.65 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0089 ft/ft
Discharge.....	149.00 cfs

Computed Results:

Depth.....	1.78 ft
Velocity.....	4.83 fps
Flow Area.....	30.82 sf
Flow Top Width...	22.67 ft
Wetted Perimeter.	23.25 ft
Critical Depth...	1.48 ft
Critical Slope...	0.0175 ft/ft
Froude Number....	0.73 (flow is Subcritical)

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Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0100 ft/ft
Discharge.....	110.00 cfs

Computed Results:

Depth.....	1.46 ft
Velocity.....	4.60 fps
Flow Area.....	23.93 sf
Flow Top Width...	20.76 ft
Wetted Perimeter.	21.24 ft
Critical Depth...	1.23 ft
Critical Slope...	0.0184 ft/ft
Froude Number....	0.75 (flow is Subcritical)

Trapezoidal Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Trapezodial Natural

Solve For Depth

Given Input Data:

Bottom Width.....	12.00 ft
Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0142 ft/ft
Discharge.....	22.00 cfs

Computed Results:

Depth.....	0.53 ft
Velocity.....	3.05 fps
Flow Area.....	7.20 sf
Flow Top Width...	15.18 ft
Wetted Perimeter.	15.35 ft
Critical Depth...	0.45 ft
Critical Slope...	0.0243 ft/ft
Froude Number....	0.78 (flow is Subcritical)

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CHEROKEE WASH

100-YEAR
NO DETENTION

TRIAGULAR CHANNEL

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Triagular Channel

Solve For Discharge

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0056 ft/ft
Depth.....	6.00 ft

Computed Results:

Discharge.....	689.12 cfs
Velocity.....	6.38 fps
Flow Area.....	108.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.95 ft
Critical Depth...	5.05 ft
Critical Slope...	0.0141 ft/ft
Froude Number....	0.65 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Triagular Channel

Solve For Discharge

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0069 ft/ft
Depth.....	6.00 ft

Computed Results:

Discharge.....	764.94 cfs
Velocity.....	7.08 fps
Flow Area.....	108.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.95 ft
Critical Depth...	5.26 ft
Critical Slope...	0.0139 ft/ft
Froude Number....	0.72 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Triagular Channel

Solve For Discharge

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0089 ft/ft
Depth.....	6.00 ft

Computed Results:

Discharge.....	868.76 cfs
Velocity.....	8.04 fps
Flow Area.....	108.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.95 ft
Critical Depth...	5.54 ft
Critical Slope...	0.0136 ft/ft
Froude Number....	0.82 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Triagular Channel

Solve For Discharge

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0100 ft/ft
Depth.....	6.00 ft

Computed Results:

Discharge.....	920.88 cfs
Velocity.....	8.53 fps
Flow Area.....	108.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.95 ft
Critical Depth...	5.67 ft
Critical Slope...	0.0135 ft/ft
Froude Number....	0.87 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 100-Year NO Detention Triagular Channel

Solve For Discharge

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0142 ft/ft
Depth.....	6.00 ft

Computed Results:

Discharge.....	1097.35 cfs
Velocity.....	10.16 fps
Flow Area.....	108.00 sf
Flow Top Width...	36.00 ft
Wetted Perimeter.	37.95 ft
Critical Depth...	6.08 ft
Critical Slope...	0.0132 ft/ft
Froude Number....	1.03 (flow is Supercritical)

CHEROKEE WASH

10-YEAR
NO DETENTION

TRIAGULAR CHANNEL

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Triagular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0056 ft/ft
Discharge.....	483.00 cfs

Computed Results:

Depth.....	5.25 ft
Velocity.....	5.84 fps
Flow Area.....	82.73 sf
Flow Top Width...	31.51 ft
Wetted Perimeter.	33.21 ft
Critical Depth...	4.38 ft
Critical Slope...	0.0148 ft/ft
Froude Number....	0.63 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Triagular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0069 ft/ft
Discharge.....	481.00 cfs

Computed Results:

Depth.....	5.04 ft
Velocity.....	6.31 fps
Flow Area.....	76.26 sf
Flow Top Width...	30.25 ft
Wetted Perimeter.	31.89 ft
Critical Depth...	4.37 ft
Critical Slope...	0.0148 ft/ft
Froude Number....	0.70 (flow is Subcritical)

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Triagular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0089 ft/ft
Discharge.....	441.00 cfs

Computed Results:

Depth.....	4.65 ft
Velocity.....	6.79 fps
Flow Area.....	64.95 sf
Flow Top Width...	27.92 ft
Wetted Perimeter.	29.43 ft
Critical Depth...	4.22 ft
Critical Slope...	0.0149 ft/ft
Froude Number....	0.78 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Triagular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0100 ft/ft
Discharge.....	423.00 cfs

Computed Results:

Depth.....	4.48 ft
Velocity.....	7.02 fps
Flow Area.....	60.26 sf
Flow Top Width...	26.89 ft
Wetted Perimeter.	28.35 ft
Critical Depth...	4.15 ft
Critical Slope...	0.0150 ft/ft
Froude Number....	0.83 (flow is Subcritical)

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year NO Detention Triagular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0142 ft/ft
Discharge.....	115.00 cfs

Computed Results:

Depth.....	2.58 ft
Velocity.....	5.78 fps
Flow Area.....	19.89 sf
Flow Top Width...	15.45 ft
Wetted Perimeter.	16.29 ft
Critical Depth...	2.47 ft
Critical Slope...	0.0179 ft/ft
Froude Number....	0.90 (flow is Subcritical)

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CHEROKEE WASH

10-YEAR
DETENTION

TRIAGULAR CHANNEL

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Triangular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0056 ft/ft
Discharge.....	214.00 cfs

Computed Results:

Depth.....	3.87 ft
Velocity.....	4.76 fps
Flow Area.....	44.93 sf
Flow Top Width...	23.22 ft
Wetted Perimeter.	24.48 ft
Critical Depth...	3.16 ft
Critical Slope...	0.0164 ft/ft
Froude Number....	0.60 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Triangular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0069 ft/ft
Discharge.....	161.00 cfs

Computed Results:

Depth.....	3.34 ft
Velocity.....	4.80 fps
Flow Area.....	33.56 sf
Flow Top Width...	20.07 ft
Wetted Perimeter.	21.15 ft
Critical Depth...	2.82 ft
Critical Slope...	0.0171 ft/ft
Froude Number....	0.65 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Triangular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0089 ft/ft
Discharge.....	149.00 cfs

Computed Results:

Depth.....	3.10 ft
Velocity.....	5.18 fps
Flow Area.....	28.78 sf
Flow Top Width...	18.58 ft
Wetted Perimeter.	19.59 ft
Critical Depth...	2.74 ft
Critical Slope...	0.0173 ft/ft
Froude Number....	0.73 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Triangular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0100 ft/ft
Discharge.....	110.00 cfs

Computed Results:

Depth.....	2.70 ft
Velocity.....	5.01 fps
Flow Area.....	21.94 sf
Flow Top Width...	16.23 ft
Wetted Perimeter.	17.11 ft
Critical Depth...	2.42 ft
Critical Slope...	0.0180 ft/ft
Froude Number....	0.76 (flow is Subcritical)

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Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 10-Year WITH Detention Triangular Channel

Solve For Depth

Given Input Data:

Left Side Slope..	3.00:1 (H:V)
Right Side Slope.	3.00:1 (H:V)
Manning's n.....	0.035
Channel Slope....	0.0142 ft/ft
Discharge.....	22.00 cfs

Computed Results:

Depth.....	1.38 ft
Velocity.....	3.82 fps
Flow Area.....	5.75 sf
Flow Top Width...	8.31 ft
Wetted Perimeter.	8.76 ft
Critical Depth...	1.27 ft
Critical Slope...	0.0223 ft/ft
Froude Number....	0.81 (flow is Subcritical)

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CHEROKEE WASH

100-YEAR
NO DETENTION

RECTANGULAR CHANNEL
CULVERT ANALYSIS

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: CABALLO LANE 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	30.00 ft
Manning's n.....	0.013
Depth.....	5.00 ft
Discharge.....	1790.00 cfs

Computed Results:

Channel Slope....	0.0019 ft/ft
Velocity.....	11.93 fps
Flow Area.....	150.00 sf
Flow Top Width...	30.00 ft
Wetted Perimeter.	40.00 ft
Critical Depth...	4.80 ft
Critical Slope...	0.0021 ft/ft
Froude Number....	0.94 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MORNING GLORY 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	30.00 ft
Manning's n.....	0.013
Depth.....	5.00 ft
Discharge.....	1790.00 cfs

Computed Results:

Channel Slope....	0.0019 ft/ft
Velocity.....	11.93 fps
Flow Area.....	150.00 sf
Flow Top Width...	30.00 ft
Wetted Perimeter.	40.00 ft
Critical Depth...	4.80 ft
Critical Slope...	0.0021 ft/ft
Froude Number....	0.94 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 59TH PLACE 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	30.00 ft
Manning's n.....	0.013
Depth.....	5.00 ft
Discharge.....	1790.00 cfs

Computed Results:

Channel Slope....	0.0019 ft/ft
Velocity.....	11.93 fps
Flow Area.....	150.00 sf
Flow Top Width...	30.00 ft
Wetted Perimeter.	40.00 ft
Critical Depth...	4.80 ft
Critical Slope...	0.0021 ft/ft
Froude Number....	0.94 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 58TH PLACE 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	30.00 ft
Manning's n.....	0.013
Depth.....	5.00 ft
Discharge.....	1786.00 cfs

Computed Results:

Channel Slope....	0.0019 ft/ft
Velocity.....	11.91 fps
Flow Area.....	150.00 sf
Flow Top Width...	30.00 ft
Wetted Perimeter.	40.00 ft
Critical Depth...	4.79 ft
Critical Slope...	0.0021 ft/ft
Froude Number....	0.94 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 56TH PLACE 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	30.00 ft
Manning's n.....	0.013
Depth.....	5.00 ft
Discharge.....	1634.00 cfs

Computed Results:

Channel Slope....	0.0016 ft/ft
Velocity.....	10.89 fps
Flow Area.....	150.00 sf
Flow Top Width...	30.00 ft
Wetted Perimeter.	40.00 ft
Critical Depth...	4.52 ft
Critical Slope...	0.0021 ft/ft
Froude Number....	0.86 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MOCKINGBIRD 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	30.00 ft
Manning's n.....	0.013
Depth.....	5.00 ft
Discharge.....	1634.00 cfs

Computed Results:

Channel Slope....	0.0016 ft/ft
Velocity.....	10.89 fps
Flow Area.....	150.00 sf
Flow Top Width...	30.00 ft
Wetted Perimeter.	40.00 ft
Critical Depth...	4.52 ft
Critical Slope...	0.0021 ft/ft
Froude Number....	0.86 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 53RD STREET 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	30.00 ft
Manning's n.....	0.013
Depth.....	5.00 ft
Discharge.....	1634.00 cfs

Computed Results:

Channel Slope....	0.0016 ft/ft
Velocity.....	10.89 fps
Flow Area.....	150.00 sf
Flow Top Width...	30.00 ft
Wetted Perimeter.	40.00 ft
Critical Depth...	4.52 ft
Critical Slope...	0.0021 ft/ft
Froude Number....	0.86 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: DESERT JEWEL 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	425.00 cfs

Computed Results:

Channel Slope....	0.0030 ft/ft
Velocity.....	10.63 fps
Flow Area.....	40.00 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	18.00 ft
Critical Depth...	3.83 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	0.94 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: ARROYO 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	425.00 cfs

Computed Results:

Channel Slope....	0.0030 ft/ft
Velocity.....	10.63 fps
Flow Area.....	40.00 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	18.00 ft
Critical Depth...	3.83 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	0.94 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: CRESTVIEW 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	425.00 cfs

Computed Results:

Channel Slope....	0.0030 ft/ft
Velocity.....	10.63 fps
Flow Area.....	40.00 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	18.00 ft
Critical Depth...	3.83 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	0.94 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: DESERT PARK 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	425.00 cfs

Computed Results:

Channel Slope....	0.0030 ft/ft
Velocity.....	10.63 fps
Flow Area.....	40.00 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	18.00 ft
Critical Depth...	3.83 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	0.94 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: ROAD RUNNER 100-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	10.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	425.00 cfs

Computed Results:

Channel Slope....	0.0030 ft/ft
Velocity.....	10.63 fps
Flow Area.....	40.00 sf
Flow Top Width...	10.00 ft
Wetted Perimeter.	18.00 ft
Critical Depth...	3.83 ft
Critical Slope...	0.0034 ft/ft
Froude Number....	0.94 (flow is Subcritical)

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CHEROKEE WASH

100-YEAR
DETENTION

RECTANGULAR CHANNEL
CULVERT ANALYSIS

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: CABALLO LANE 100-YR WITH DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	20.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	793.00 cfs

Computed Results:

Channel Slope....	0.0019 ft/ft
Velocity.....	9.91 fps
Flow Area.....	80.00 sf
Flow Top Width...	20.00 ft
Wetted Perimeter.	28.00 ft
Critical Depth...	3.65 ft
Critical Slope...	0.0024 ft/ft
Froude Number....	0.87 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MORNING GLORY 100-YR WITH DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	20.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	793.00 cfs

Computed Results:

Channel Slope....	0.0019 ft/ft
Velocity.....	9.91 fps
Flow Area.....	80.00 sf
Flow Top Width...	20.00 ft
Wetted Perimeter.	28.00 ft
Critical Depth...	3.65 ft
Critical Slope...	0.0024 ft/ft
Froude Number....	0.87 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 59TH PLACE 100-YR WITH DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	20.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	793.00 cfs

Computed Results:

Channel Slope....	0.0019 ft/ft
Velocity.....	9.91 fps
Flow Area.....	80.00 sf
Flow Top Width...	20.00 ft
Wetted Perimeter.	28.00 ft
Critical Depth...	3.65 ft
Critical Slope...	0.0024 ft/ft
Froude Number....	0.87 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 58TH PLACE 100-YR WITH DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	16.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	596.00 cfs

Computed Results:

Channel Slope....	0.0018 ft/ft
Velocity.....	9.31 fps
Flow Area.....	64.00 sf
Flow Top Width...	16.00 ft
Wetted Perimeter.	24.00 ft
Critical Depth...	3.51 ft
Critical Slope...	0.0026 ft/ft
Froude Number....	0.82 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 56TH STREET 100-YR WITH DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	16.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	551.00 cfs

Computed Results:

Channel Slope....	0.0015 ft/ft
Velocity.....	8.61 fps
Flow Area.....	64.00 sf
Flow Top Width...	16.00 ft
Wetted Perimeter.	24.00 ft
Critical Depth...	3.33 ft
Critical Slope...	0.0026 ft/ft
Froude Number....	0.76 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MOCKINGBIRD 100-YR WITH DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	16.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	551.00 cfs

Computed Results:

Channel Slope....	0.0015 ft/ft
Velocity.....	8.61 fps
Flow Area.....	64.00 sf
Flow Top Width...	16.00 ft
Wetted Perimeter.	24.00 ft
Critical Depth...	3.33 ft
Critical Slope...	0.0026 ft/ft
Froude Number....	0.76 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 53RD STREET 100-YR WITH DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	16.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	551.00 cfs

Computed Results:

Channel Slope....	0.0015 ft/ft
Velocity.....	8.61 fps
Flow Area.....	64.00 sf
Flow Top Width...	16.00 ft
Wetted Perimeter.	24.00 ft
Critical Depth...	3.33 ft
Critical Slope...	0.0026 ft/ft
Froude Number....	0.76 (flow is Subcritical)

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CHEROKEE WASH

100-YEAR
DETENTION

CIRCULAR CHANNEL
CULVERT ANALYSIS

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: DESERT JEWEL 100-YR WITH DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	82.00 cfs

Computed Results:

Full Flow Channel Slope	0.0066 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	8.52 fps
Flow Area.....	9.62 sf
Critical Depth....	2.83 ft
Critical Slope....	0.0068 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	82.00 cfs
QMAX @.94D.....	88.21 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: ARROYO 100-YR WITH DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	82.00 cfs

Computed Results:

Full Flow Channel Slope	0.0066 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	8.52 fps
Flow Area.....	9.62 sf
Critical Depth....	2.83 ft
Critical Slope....	0.0068 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	82.00 cfs
QMAX @.94D.....	88.21 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: CRESTVIEW 100-YR WITH DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	82.00 cfs

Computed Results:

Full Flow Channel Slope	0.0066 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	8.52 fps
Flow Area.....	9.62 sf
Critical Depth....	2.83 ft
Critical Slope....	0.0068 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	82.00 cfs
QMAX @.94D.....	88.21 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: DESERT PARK 100-YR WITH DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	82.00 cfs

Computed Results:

Full Flow Channel Slope	0.0066 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	8.52 fps
Flow Area.....	9.62 sf
Critical Depth....	2.83 ft
Critical Slope....	0.0068 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	82.00 cfs
QMAX @.94D.....	88.21 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: ROAD RUNNER 100-YR WITH DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	82.00 cfs

Computed Results:

Full Flow Channel Slope	0.0066 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	8.52 fps
Flow Area.....	9.62 sf
Critical Depth....	2.83 ft
Critical Slope....	0.0068 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	82.00 cfs
QMAX @.94D.....	88.21 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: TATUM BASIN 290 100-YR WITH DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.00 ft
Manning's n.....	0.013
Discharge.....	40.00 cfs

Computed Results:

Full Flow Channel Slope	0.0036 ft/ft
Full Flow Depth.....	3.00 ft
Velocity.....	5.66 fps
Flow Area.....	7.07 sf
Critical Depth....	2.06 ft
Critical Slope....	0.0054 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	40.00 cfs
QMAX @.94D.....	43.03 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: TATUM BASIN 310 100-YR WITH DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	4.00 ft
Manning's n.....	0.013
Discharge.....	98.00 cfs

Computed Results:

Full Flow Channel Slope	0.0047 ft/ft
Full Flow Depth.....	4.00 ft
Velocity.....	7.80 fps
Flow Area.....	12.57 sf
Critical Depth....	3.00 ft
Critical Slope....	0.0056 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	98.00 cfs
QMAX @.94D.....	105.42 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: TATUM BASIN 320 100-YR WITH DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	80.00 cfs

Computed Results:

Full Flow Channel Slope	0.0063 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	8.32 fps
Flow Area.....	9.62 sf
Critical Depth....	2.79 ft
Critical Slope....	0.0066 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	80.00 cfs
QMAX @.94D.....	86.06 cfs
Froude Number.....	FULL

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CHEROKEE WASH

10-YEAR
DETENTION

CIRCULAR CHANNEL
CULVERT ANALYSIS

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: CABALLO LANE 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	4.00 ft
Manning's n.....	0.013
Discharge.....	107.00 cfs

Computed Results:

Full Flow Channel Slope	0.0055 ft/ft
Full Flow Depth.....	4.00 ft
Velocity.....	8.51 fps
Flow Area.....	12.57 sf
Critical Depth....	3.13 ft
Critical Slope....	0.0061 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	107.00 cfs
QMAX @.94D.....	115.10 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MORNING GLORY 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	4.00 ft
Manning's n.....	0.013
Discharge.....	107.00 cfs

Computed Results:

Full Flow Channel Slope	0.0055 ft/ft
Full Flow Depth.....	4.00 ft
Velocity.....	8.51 fps
Flow Area.....	12.57 sf
Critical Depth....	3.13 ft
Critical Slope....	0.0061 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	107.00 cfs
QMAX @.94D.....	115.10 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 59TH PLACE 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	4.00 ft
Manning's n.....	0.013
Discharge.....	107.00 cfs

Computed Results:

Full Flow Channel Slope	0.0055 ft/ft
Full Flow Depth.....	4.00 ft
Velocity.....	8.51 fps
Flow Area.....	12.57 sf
Critical Depth....	3.13 ft
Critical Slope....	0.0061 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	107.00 cfs
QMAX @.94D.....	115.10 cfs
Froude Number.....	FULL

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 58TH PLACE 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	4.00 ft
Manning's n.....	0.013
Discharge.....	82.00 cfs

Computed Results:

Full Flow Channel Slope	0.0033 ft/ft
Full Flow Depth.....	4.00 ft
Velocity.....	6.53 fps
Flow Area.....	12.57 sf
Critical Depth....	2.74 ft
Critical Slope....	0.0049 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	82.00 cfs
QMAX @.94D.....	88.21 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 56TH STREET 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	75.00 cfs

Computed Results:

Full Flow Channel Slope	0.0056 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	7.80 fps
Flow Area.....	9.62 sf
Critical Depth....	2.71 ft
Critical Slope....	0.0062 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	75.00 cfs
QMAX @.94D.....	80.68 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MOCKINGBIRD 10-YR WITH RETENTION

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	3.50 ft
Slope.....	0.0056 ft/ft
Manning's n.....	0.013
Discharge.....	75.29 cfs

Computed Results:

Full Flow Capacity.....	75.29 cfs
Full Flow Depth.....	3.50 ft
Velocity.....	7.83 fps
Flow Area.....	9.62 sf
Critical Depth....	2.72 ft
Critical Slope....	0.0062 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	75.29 cfs
QMAX @.94D.....	80.99 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 53RD STREET 10-YR WITH RETENTION

Solve For Full Flow Capacity

Given Input Data:

Diameter.....	3.50 ft
Slope.....	0.0056 ft/ft
Manning's n.....	0.013
Discharge.....	75.29 cfs

Computed Results:

Full Flow Capacity.....	75.29 cfs
Full Flow Depth.....	3.50 ft
Velocity.....	7.83 fps
Flow Area.....	9.62 sf
Critical Depth....	2.72 ft
Critical Slope....	0.0062 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	75.29 cfs
QMAX @.94D.....	80.99 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: DESERT JEWEL 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	2.00 ft
Manning's n.....	0.013
Discharge.....	22.00 cfs

Computed Results:

Full Flow Channel Slope	0.0095 ft/ft
Full Flow Depth.....	2.00 ft
Velocity.....	7.00 fps
Flow Area.....	3.14 sf
Critical Depth....	1.68 ft
Critical Slope....	0.0091 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	22.00 cfs
QMAX @.94D.....	23.67 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: ARROYO 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	2.00 ft
Manning's n.....	0.013
Discharge.....	22.00 cfs

Computed Results:

Full Flow Channel Slope	0.0095 ft/ft
Full Flow Depth.....	2.00 ft
Velocity.....	7.00 fps
Flow Area.....	3.14 sf
Critical Depth....	1.68 ft
Critical Slope....	0.0091 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	22.00 cfs
QMAX @.94D.....	23.67 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: CRESTVIEW 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	2.00 ft
Manning's n.....	0.013
Discharge.....	22.00 cfs

Computed Results:

Full Flow Channel Slope	0.0095 ft/ft
Full Flow Depth.....	2.00 ft
Velocity.....	7.00 fps
Flow Area.....	3.14 sf
Critical Depth....	1.68 ft
Critical Slope....	0.0091 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	22.00 cfs
QMAX @.94D.....	23.67 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: DESERT PARK 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	2.00 ft
Manning's n.....	0.013
Discharge.....	22.00 cfs

Computed Results:

Full Flow Channel Slope	0.0095 ft/ft
Full Flow Depth.....	2.00 ft
Velocity.....	7.00 fps
Flow Area.....	3.14 sf
Critical Depth....	1.68 ft
Critical Slope....	0.0091 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	22.00 cfs
QMAX @.94D.....	23.67 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: ROAD RUNNER 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	2.00 ft
Manning's n.....	0.013
Discharge.....	22.00 cfs

Computed Results:

Full Flow Channel Slope	0.0095 ft/ft
Full Flow Depth.....	2.00 ft
Velocity.....	7.00 fps
Flow Area.....	3.14 sf
Critical Depth....	1.68 ft
Critical Slope....	0.0091 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	22.00 cfs
QMAX @.94D.....	23.67 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: TATUM BASIN 290 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	2.50 ft
Manning's n.....	0.013
Discharge.....	32.00 cfs

Computed Results:

Full Flow Channel Slope	0.0061 ft/ft
Full Flow Depth.....	2.50 ft
Velocity.....	6.52 fps
Flow Area.....	4.91 sf
Critical Depth....	1.93 ft
Critical Slope....	0.0069 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	32.00 cfs
QMAX @.94D.....	34.42 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: TATUM BASIN 310 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	2.50 ft
Manning's n.....	0.013
Discharge.....	40.00 cfs

Computed Results:

Full Flow Channel Slope	0.0095 ft/ft
Full Flow Depth.....	2.50 ft
Velocity.....	8.15 fps
Flow Area.....	4.91 sf
Critical Depth....	2.13 ft
Critical Slope....	0.0089 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	40.00 cfs
QMAX @.94D.....	43.03 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: TATUM BASIN 320 10-YR WITH RETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	2.50 ft
Manning's n.....	0.013
Discharge.....	32.00 cfs

Computed Results:

Full Flow Channel Slope	0.0061 ft/ft
Full Flow Depth.....	2.50 ft
Velocity.....	6.52 fps
Flow Area.....	4.91 sf
Critical Depth....	1.93 ft
Critical Slope....	0.0069 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	32.00 cfs
QMAX @.94D.....	34.42 cfs
Froude Number.....	FULL

CHEROKEE WASH

10-YEAR
NO DETENTION

RECTANGULAR CHANNEL
CULVERT ANALYSIS

Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: CABALLO LANE 10-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	483.00 cfs

Computed Results:

Channel Slope....	0.0024 ft/ft
Velocity.....	10.06 fps
Flow Area.....	48.00 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	20.00 ft
Critical Depth...	3.69 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	0.89 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MORNING GLORY 10-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	483.00 cfs

Computed Results:

Channel Slope....	0.0024 ft/ft
Velocity.....	10.06 fps
Flow Area.....	48.00 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	20.00 ft
Critical Depth...	3.69 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	0.89 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 59TH PLACE 10-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	483.00 cfs

Computed Results:

Channel Slope....	0.0024 ft/ft
Velocity.....	10.06 fps
Flow Area.....	48.00 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	20.00 ft
Critical Depth...	3.69 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	0.89 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 58TH PLACE 10-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	481.00 cfs

Computed Results:

Channel Slope....	0.0024 ft/ft
Velocity.....	10.02 fps
Flow Area.....	48.00 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	20.00 ft
Critical Depth...	3.68 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	0.88 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 56TH STREET 10-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	441.00 cfs

Computed Results:

Channel Slope....	0.0020 ft/ft
Velocity.....	9.19 fps
Flow Area.....	48.00 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	20.00 ft
Critical Depth...	3.47 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	0.81 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: MOCKINGBIRD 10-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	441.00 cfs

Computed Results:

Channel Slope....	0.0020 ft/ft
Velocity.....	9.19 fps
Flow Area.....	48.00 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	20.00 ft
Critical Depth...	3.47 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	0.81 (flow is Subcritical)

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Rectangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: 53RD STREET 10-YR NO DETENTION

Solve For Channel Slope

Given Input Data:

Bottom Width.....	12.00 ft
Manning's n.....	0.013
Depth.....	4.00 ft
Discharge.....	441.00 cfs

Computed Results:

Channel Slope....	0.0020 ft/ft
Velocity.....	9.19 fps
Flow Area.....	48.00 sf
Flow Top Width...	12.00 ft
Wetted Perimeter.	20.00 ft
Critical Depth...	3.47 ft
Critical Slope...	0.0030 ft/ft
Froude Number....	0.81 (flow is Subcritical)

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CHEROKEE WASH

10-YEAR
NO DETENTION

CIRCULAR CHANNEL
CULVERT ANALYSIS

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: DESERT JEWEL 10-YR NO DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	58.00 cfs

Computed Results:

Full Flow Channel Slope	0.0033 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	6.03 fps
Flow Area.....	9.62 sf
Critical Depth....	2.39 ft
Critical Slope....	0.0051 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	58.00 cfs
QMAX @.94D.....	62.39 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: ARROYO 10-YR NO DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	58.00 cfs

Computed Results:

Full Flow Channel Slope	0.0033 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	6.03 fps
Flow Area.....	9.62 sf
Critical Depth....	2.39 ft
Critical Slope....	0.0051 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	58.00 cfs
QMAX @.94D.....	62.39 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: CRESTVIEW 10-YR NO DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	58.00 cfs

Computed Results:

Full Flow Channel Slope	0.0033 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	6.03 fps
Flow Area.....	9.62 sf
Critical Depth....	2.39 ft
Critical Slope....	0.0051 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	58.00 cfs
QMAX @.94D.....	62.39 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: DESERT PARK 10-YR NO DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	58.00 cfs

Computed Results:

Full Flow Channel Slope	0.0033 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	6.03 fps
Flow Area.....	9.62 sf
Critical Depth....	2.39 ft
Critical Slope....	0.0051 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	58.00 cfs
QMAX @.94D.....	62.39 cfs
Froude Number.....	FULL

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Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: CHEROKEE WASH

Comment: ROAD RUNNER 10-YR NO DETENTION

Solve For Full Flow Slope

Given Input Data:

Diameter.....	3.50 ft
Manning's n.....	0.013
Discharge.....	58.00 cfs

Computed Results:

Full Flow Channel Slope	0.0033 ft/ft
Full Flow Depth.....	3.50 ft
Velocity.....	6.03 fps
Flow Area.....	9.62 sf
Critical Depth....	2.39 ft
Critical Slope....	0.0051 ft/ft
Percent Full.....	100.00 %
Full Capacity.....	58.00 cfs
QMAX @.94D.....	62.39 cfs
Froude Number.....	FULL