ALBUQUERQUE NEW MEXICO 1706

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

December 22, 1999

Ron Bohannan, PE
Tierra West LLC
4421 McLeod NE Suite D
Albuquerque, NM 87109

Re: Desert Willow Apartments Certification of Grading and Drainage Plan
Engineer's Stamp dated 1-21-98 (C17/D20)
Certification date 11-24-99

Dear Mr. Bohannan,

Based upon the information provided in your submittal dated 11-24-99, the above referenced site is approved for Certificate of Occupancy. This CO is for all phases.

If I can be of further assistance, you can contact me at 924-3986

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Hydrology Review Engineer

C: Terri Martin, PWD
file

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

July 26, 1999

Ronald R. Bohannan, P.E.
Tierra West, LLC
4421 McLeod Rd. NE, Suite D
Albuquerque, New Mexico 87109

RE: Drainage Report Addendum to Desert Willow Apartments (C17/D20), Engineer's Stamp Dated 7/7/99.

Dear Mr. Bohannan:

Based on the information provided in the above referenced Addendum, the elimination of the additional storm drain in Jefferson Street is appropriate. The Addendum demonstrates that the storm drain in Jefferson is not needed, therefore, the construction drawings for this storm drain should be deleted from the Work Order plan set.

If you have any questions, or if I may be of further assistance to you, please call me at 924-3982.

Sincerely,

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Terri Martin, City Project #593781
File

Drainage Report Addendum to
Desert Willow Apartments

Prepared by

Tierra West LLC
4421 McLeod Road NE, Suite D
Albuquerque, New Mexico 87109

Prepared for

Mr. Walter O. Grodahl, III
GSL Properties, Inc.
2164 S. W. Park Place
Portland, Oregon 97205

June 1999

Ronald R. Bohannan P.E. No. 7868

Addendum

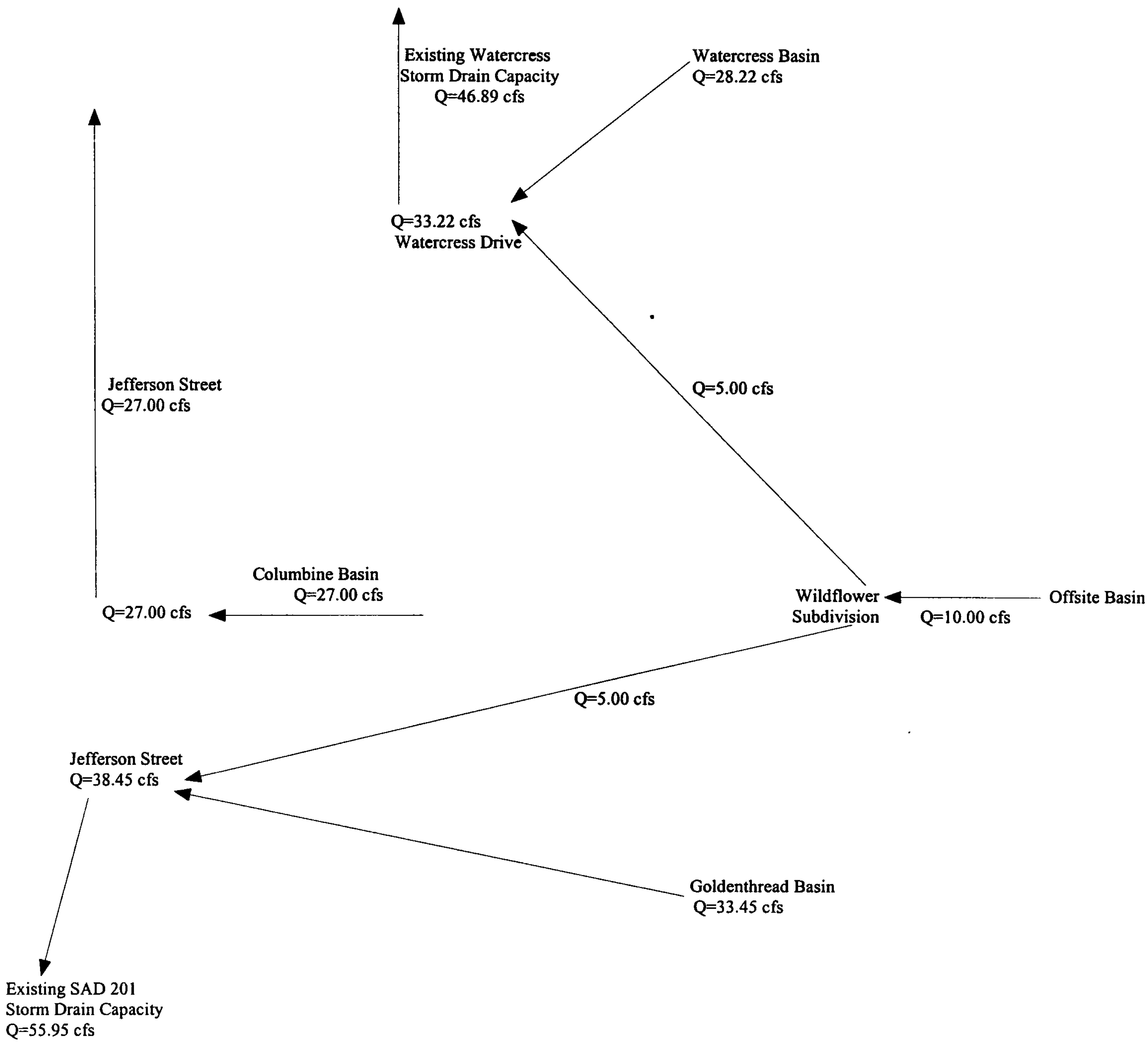
The site is located on FEMA Map 35001C0137 D and 35001C0129 D as shown on the attached excerpt. The map shows that the site lies within several 100 year flood plains. These flood plains are not currently in existence. No offsite flows enter the site. The storm drainage systems within Jefferson Street and San Mateo to the east and Alameda Boulevard to the south divert the storm drainage around the proposed project to the North Diversion Channel. A LOMR will be submitted to FEMA by Bohannan-Huston, Inc. to remove the flood plain within the site.

The original drainage report for the Desert Willow Apartments stated that a new storm drain would have to built in Jefferson to accommodate the offsite flows. After the storm drain was constructed, a LOMR would have been prepared to remove the existing flood plain from the site. However, AMAFCA has contracted Bohannan-Huston, Inc. to prepare a LOMR that will remove the flood plain from San Mateo Boulevard west to the North Diversion Channel. It also came to our attention that a storm drain was built in San Mateo Boulevard that will capture any offsite flows before they enter the Wildflower Subdivision. A storm drain in Jefferson is no longer needed to control the water depth in the street from the offsite basins.

The storm drain in San Mateo Boulevard was built when the street was widened. This storm drain was analyzed in a report by Jake Bordenave. The storm drain in very flat and has limited capacity. However, most of the flows in San Mateo are captured by the storm drain. Any overflow would be carried by existing culverts into the Wildflower Subdivision.

According to the Bordenave report the storm drain in San Mateo has capacity for 96 cfs. There is 106 cfs entering the street from east of San Mateo. The 10 cfs not captured by the storm drain will enter Wildflower Subdivision through the existing 3-36" culverts located between Oakland and Eagle Rock. This flow will join with the flows from the subdivision and be routed through the streets to Jefferson Street. The existing storm drain in Jefferson will capture the flows and convey them south to Alameda Boulevard. The northern part of the subdivision drains to Watercress Drive and an existing storm drain that discharges to the South La Cueva Arroyo. Jefferson has capacity for any flows not captured by the existing storm drains. See the attached exhibit for a schematic of the flows entering the subdivision.

RUNOFF FLOW PATH



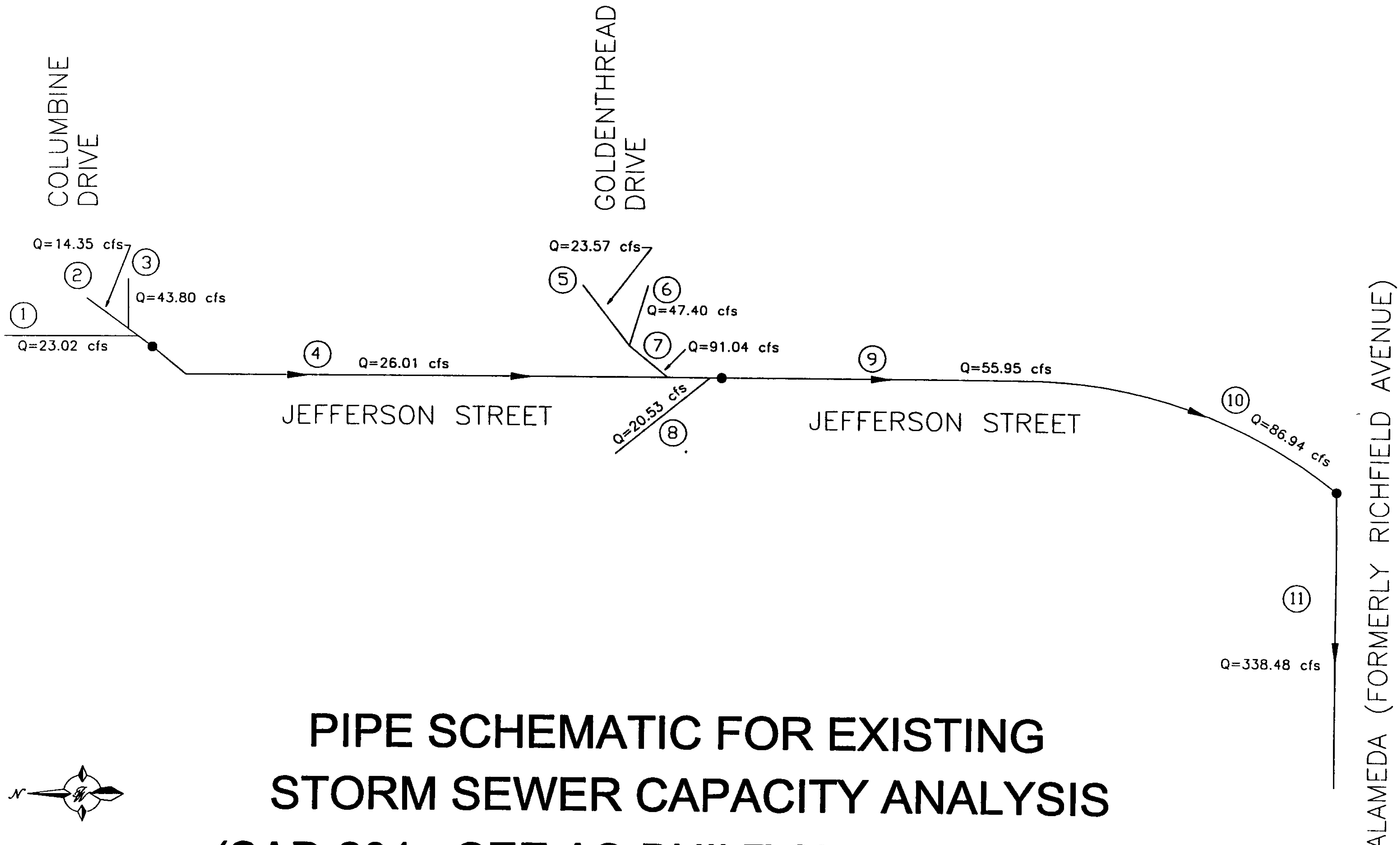
Pipe Capacity

Manning's Equation:

Q = 1.49/n * A * R^(2/3) * S^(1/2)

A = Area
R = D/4
S = Slope
n = 0.013

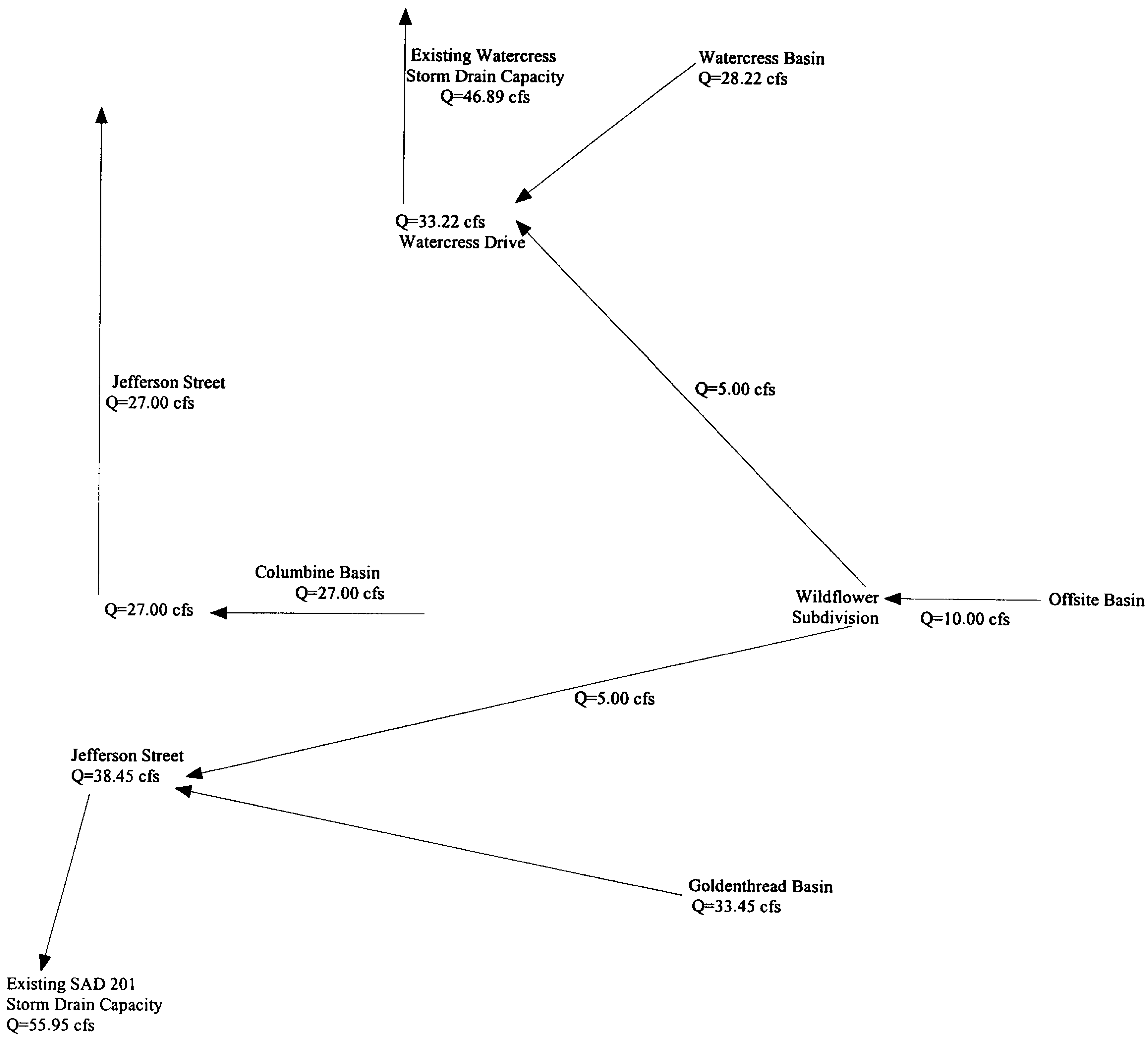
Pipe	Location	D	Slope	Area	R	Q Provided
		(in)	(%)	(ft^2)		(cfs)
1	Columbine	21	2.1	2.41	0.4375	23.02
2	Columbine	24	0.4	3.14	0.5	14.35
3	Columbine	21	7.6	2.41	0.4375	43.80
4	Jefferson	30	0.4	4.91	0.625	26.01
5	Goldenthread	21	2.2	2.41	0.4375	23.57
6	Goldenthread	21	8.9	2.41	0.4375	47.40
7	Goldenthread	30	4.9	4.91	0.625	91.04
8	Jefferson	18	3.8	1.77	0.375	20.53
9	Jefferson	36	0.7	7.07	0.75	55.95
10	Jefferson	36	1.69	7.07	0.75	86.94
11	Alameda	60	1.68	19.63	1.25	338.48
San Mateo Culverts	San Mateo	3-36	0.75	7.07	0.75	173.75
Watercress Drain	Jefferson	30	1.3	4.91	0.625	46.89
	La Cueva Channel	96	1.8	50.27	2	1226.97



PIPE SCHEMATIC FOR EXISTING STORM SEWER CAPACITY ANALYSIS

(SAD 201 - SEE AS-BUILT SHEET 39 OF 63)

RUNOFF FLOW PATH



Street Capacity Calculations

JEFFERSON STREET

66' F-F with 16' Median Street Section with 8" curb

Slope= 0.006

For water depths less than 0.125 feet

Y= Water depth

Area = 8*Y^2

P= SQRT(257*Y^2) + Y

n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.1703	0.0047	0.0002	0.0003	0.1899	0.0019	0.3347	0.0019
0.02	0.0032	0.3406	0.0094	0.0010	0.0019	0.3015	0.0060	0.3757	0.0046
0.04	0.0128	0.6812	0.0188	0.0061	0.0123	0.4785	0.0191	0.4217	0.0111
0.06	0.0288	1.0219	0.0282	0.0181	0.0361	0.6271	0.0376	0.4511	0.0186
0.08	0.0512	1.3625	0.0376	0.0389	0.0778	0.7596	0.0608	0.4733	0.0268
0.1	0.0800	1.7031	0.0470	0.0705	0.1410	0.8815	0.0881	0.4912	0.0356
0.12	0.1152	2.0437	0.0564	0.1147	0.2293	0.9954	0.1194	0.5064	0.0448
0.125	0.1250	2.1289	0.0587	0.1279	0.2557	1.0229	0.1279	0.5098	0.0472

For water depths greater than 0.125 ft but less than 0.565 ft

Y1= Y-0.125

A2= A1 + 2*Y1 + 25*Y1^2

P2= P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.1356	2.3840	0.0569	0.1358	0.2717	1.0016	0.1302	0.4895	0.0460
0.18	0.3106	4.9345	0.0630	0.3328	0.6656	1.0715	0.1929	0.4451	0.0547
0.24	0.6856	7.9951	0.0858	0.9028	1.8055	1.3167	0.3160	0.4736	0.0806
0.3	1.2406	11.0557	0.1122	1.9543	3.9086	1.5753	0.4726	0.5068	0.1122
0.35	1.8406	13.6062	0.1353	3.2842	6.5684	1.7843	0.6245	0.5315	0.1410
0.4	2.5656	16.1567	0.1588	5.0941	10.1882	1.9855	0.7942	0.5532	0.1714
0.45	3.4156	18.7072	0.1826	7.4432	14.8863	2.1792	0.9806	0.5725	0.2032
0.5	4.3906	21.2577	0.2065	10.3875	20.7751	2.3658	1.1829	0.5896	0.2361
0.565	5.8450	24.5733	0.2379	15.1930	30.3860	2.5993	1.4686	0.6094	0.2804

For water depths greater than 0.565 ft but less than 0.667 ft

Y2= Y - 0.565

A3= A2 + Y2*22

P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.57	5.9550	24.5783	0.2423	15.6704	31.3408	2.6315	1.4999	0.6142	0.2863
0.58	6.1750	24.5883	0.2511	16.6426	33.2852	2.6952	1.5632	0.6237	0.2980
0.59	6.3950	24.5983	0.2600	17.6377	35.2755	2.7581	1.6273	0.6328	0.3098
0.6	6.6150	24.6083	0.2688	18.6555	37.3111	2.8202	1.6921	0.6416	0.3216
0.61	6.8350	24.6183	0.2776	19.6957	39.3914	2.8816	1.7578	0.6502	0.3335
0.6268	7.2046	24.6351	0.2925	21.4928	42.9855	2.9832	1.8699	0.6640	0.3535
0.65	7.7150	24.6583	0.3129	24.0748	48.1497	3.1205	2.0283	0.6821	0.3812
0.667	8.0890	24.6753	0.3278	26.0393	52.0785	3.2191	2.1471	0.6946	0.4017

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667

A4= A3 + Y2*22+25Y3^2

P4= P3 + SQRT (2501 Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.67	8.1552	24.8253	0.3285	26.2891	52.5782	3.2236	2.1598	0.6940	0.4030
0.705	8.9611	26.5757	0.3372	29.3940	58.7879	3.2802	2.3125	0.6885	0.4191
0.73	9.5742	27.8259	0.3441	31.8311	63.6622	3.3247	2.4270	0.6857	0.4315
0.7507	10.1055	28.8611	0.3501	33.9914	67.9828	3.3636	2.5251	0.6841	0.4422
0.78	10.8942	30.3264	0.3592	37.2756	74.5513	3.4216	2.6688	0.6827	0.4581
0.805	11.6011	31.5767	0.3674	40.2933	80.5867	3.4732	2.7960	0.6822	0.4722
0.82	12.0402	32.3268	0.3725	42.2015	84.4030	3.5050	2.8741	0.6821	0.4810
0.847	**12.8590**	**33.6771**	**0.3818**	**45.8248**	**91.6497**	**3.5636**	**3.0184**	**0.6824**	**0.4971**

Street Capacity

Cross-Section for 66' F-F with a 16' Median and 8" Curb

Manning's Equation:

$$Q=\frac{1.49}{n}AR^{2/3}S^{1/2}$$

Q = Flow (cfs)
n = 0.017
S = Street Slope
R = $A_{Area}/P_{Wetted\ Perimeter}$

Half Street Calculations

@ Y ≤ 0.125:

$$A=\frac{1}{2}Y\left(\frac{Y}{0.0625}\right)$$
$$=8Y^2$$

$$P=\sqrt{Y^2+\left(\frac{Y}{0.0625}\right)^2}+Y$$
$$=\sqrt{257Y^2}+Y$$

@ 0.125 < Y ≤ 0.565:
$Y_1 = Y - 0.125$

$$A_1=A+\frac{1}{2}Y_1\left(\frac{Y_1}{0.02}\right)+2Y_1$$
$$=A+25Y_1^2+2Y_1$$

$$P_1=P+\sqrt{Y_1^2+\left(\frac{Y_1}{0.02}\right)^2}+Y_1$$
$$=P+\sqrt{2501Y_1^2}+Y_1$$

@ 0.565 < Y ≤0.667:
$Y_2 = Y - 0.565$

$$A_2=A_1+24Y_2$$

$$P_2=P_1+Y_2$$

@ $0.667 < Y \leq 0.847$:
$Y_2 = Y - 0.667$

$$A_3 = A_2 + \frac{1}{2} Y_3 \left(\frac{Y_3}{0.02} \right)$$

$$A_3 = A_2 + 25 Y_3^2$$

$$P_3 = P_2 + \sqrt{Y_3^2 + \left(\frac{Y_3}{0.02} \right)^2}$$

$$P_3 = P_2 + \sqrt{2501 Y_3^2}$$