City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

December 11, 2001

Ronald Bohannan, P.E.
Tierra West, LLC
8509 Jefferson NE
Albuquerque, New Mexico 87113

RE: **BOSQUE MONTANO SUBDIVISION** **(E12/D12)**
Engineers Certification For Release of Financial Guaranty
Engineers Stamp dated 9/14/2000
Engineer's Certification dated 12/10/2001

Dear Mr. Bohannan:

Based upon the information provided in your submittal dated 12/11/2001, the above referenced plan is adequate to satisfy the Grading and Drainage Certification requirements for release of financial guaranty for the above mentioned project.

If you have any questions, please call me at 924-3981.

Sincerely,

Teresa A. Martin

Teresa A. Martin
Hydrology Plan Checker
Public Works Department
BLB

C: Arlene Portillo, PWD – #654781
File

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

October 10, 2000

Ron R. Bohannan, P.E.
Tierra West, LLC
8509 Jefferson NE
Albuquerque, NM 87113

RE: GRADING & DRAINAGE PLAN FOR BOSQUE MONTANO SUBDIVISION (E12/D12)ENGINEER'S PLAN STAMP DATED SEPTEMBER 14, 2000, (DRAINAGE REPORT DATED 9/8/00)SUBMITTED FOR SITE DEVELOPMENT PLAN FOR BUILDING PERMIT/SUBDIVISION APPROVAL.

Dear Mr. Bohannan,

Based upon the information provided in your September 14, 2000 submittal, the project referred to above is Approved for Grading and Drainage for Site Plan for Building Permit/Subdivision.

As part of DRC review, the following comments must be addressed.

1. Provide details for pathways used for drainage.
2. Provide slope protection details for curb rundowns.
3. Provide additional details for pathways and driveway access at Winterhaven Road to insure containment of Winterhaven Rd. drainage.
4. Provide cross-sections for slope/retaining wall along Montano Road.
5. Provide details for pond emergency overflows and obtain MRGCD approval of drainage weirs on Riverside Drain.

If you have any questions, please call me at 924-3980.

Sincerely,

Loren D. Meinz, P.E.
Hydrology Division

xc: Whitney Reierson
File

DRAINAGE REPORT

for

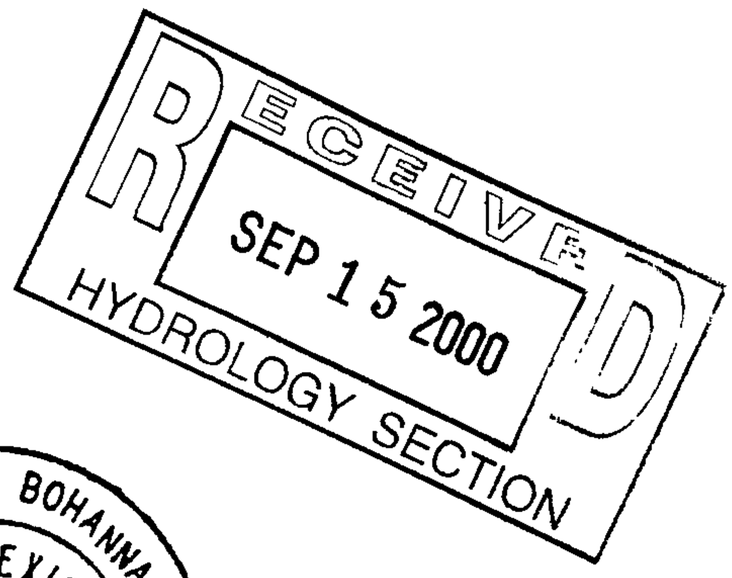
Bosque Montano Subdivision

Prepared by

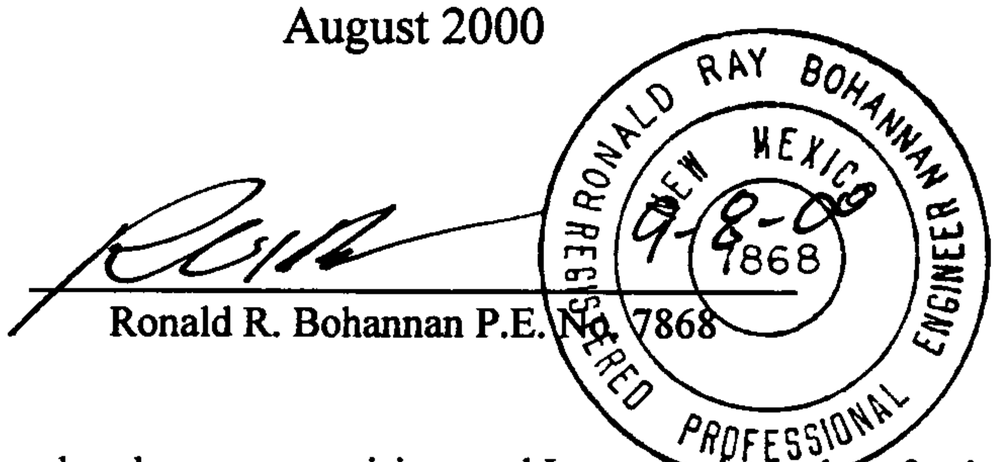
Tierra West, LLC
8509 Jefferson NE
Albuquerque, New Mexico 87113

Prepared for

Bill Allen
3804 Carlisle NE
Albuquerque, New Mexico 87107



August 2000



Ronald R. Bohannan P.E. No. 7868

I certify that this report was prepared under my supervision, and I am a registered professional engineer in the state of New Mexico in good standing.

Location

Bosque Montano is the proposed location of a 61 unit subdivision. It is located north of Montano Road between Winter Haven Road and the Lower Corrales Riverside Drain. The site is shown on the attached Zone Atlas Map E-12 and contains approximately 9.996 acres. The legal description of the property is Tract B-1B of the Lands of Joel P. Taylor. The purpose of this report is to provide the drainage analysis and management plan for the subdivision.

Existing Drainage Conditions

The site is currently undeveloped. There is one existing basin on the site. The basin sheet flows east with an undeveloped discharge rate of 20.69 cfs towards the Lower Corrales Riverside Drain. The site is located lower that Montano Road and the undeveloped discharge of from the right-of-way enters the site. This has been incorporated into developed Basins 1 and 5. Montano Road itself drains to a storm drain system located in the road. Montano Road intercepts all other flows from the south before they enter the site. To the west, an existing shopping center captures any flows coming from that direction. The natural topography of the site prevents any flows from the north or east from entering the site.

FIRM Map and Soil Conditions

The site is located on FIRM Map 35001C0118 D as shown on the attached excerpt. The map show that the site lies partially within a 500 year flood plain, but it does not lie in the 100 year zone.

The site contains two soils from the Soil Conservation Service Soil Survey of Bernalillo County. The first soil is a Bluepoint loamy fine sand which has slow runoff and a severe hazard of soil blowing. The second soil is a Vinton and Brazito soil. The surface layer of the soil ranges from sand to clay. The soil has slight runoff and a slight hazard of water erosion except during periods of flooding.

On-Site Drainage Management Plan

The site will continue to flow from west to east through the private streets to a proposed retention ponds on the east side. The site is too low to drain to the existing storm sewer system in Montano Road or to Winterhaven Road. For this reason we are proposing several ponds in the buffer zone between the site and the Lower Corrales Main Canal. The ponds will collect the flow from the proposed five basins located on the site. The developed basins are shown on the attached basin map showing the magnitude and direction of flow.

As shown, there are five proposed basins on the site. The developed flows from Basins 1 through 4 will flow east towards the Lower Corrales Riverside Drain. The 7.86 cfs flow rate from Basins 1 and 2 will drain through three sidewalk culverts to the pedestrian trail entering the buffer area. The trail will act as a channel for the site drainage to enter Pond 1. Basins 1 and 2 have a required 10-day, 100-year volume requirement of 0.788 ac-ft. Ponds 1 and 2 have capacity for 0.810 ac-ft. Pond 1 has capacity for 0.63 ac-ft and upon reaching capacity will overflow to Pond 2, which has capacity for 0.17 ac-ft. This is a combined capacity of 0.81 ac-ft. Basin 3 has a developed discharge of 4.16 cfs and will flow east to a curb cut and then enter Pond 3. Basin 4, with a developed discharge of 4.77 cfs, will also flow east to a curb cut and then enter Pond 3. Pond 3 has capacity for 0.97 ac-ft. The 10-day, 100-year volume for Basins 3, 4 and half of Basin 5 is 0.89 ac-ft. Basin 5 consists of the landscape area on the east side of the site and is the location of the retention ponds. To avoid disturbing the natural bosque-like plant growth on the east side of the site, minimal grading will occur in Basin 5. The ponds will be able to contain a total of 1.776 ac-ft of runoff volume, which is greater than the required volume of 1.675 ac-ft. The five basins will discharge a total developed flow of 32.78 cfs to the proposed retention ponds.

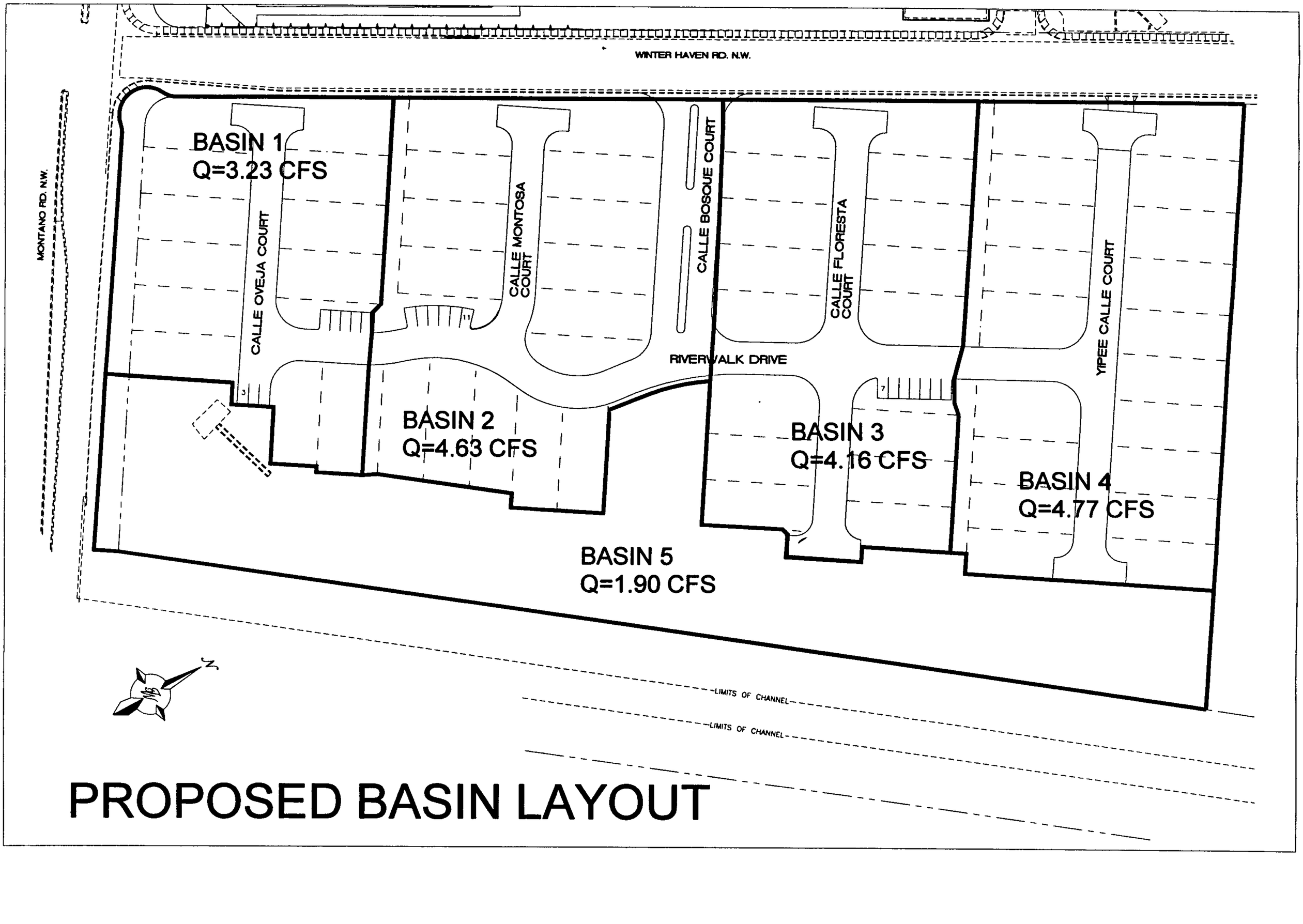
In the event of an emergency or a storm greater than a 100 year storm the site will overflow to the Lower Corrales Riverside Drain. Pond 2 will have a 9.50 foot emergency

overflow and Pond 3 will have an 8.50 foot emergency overflow.

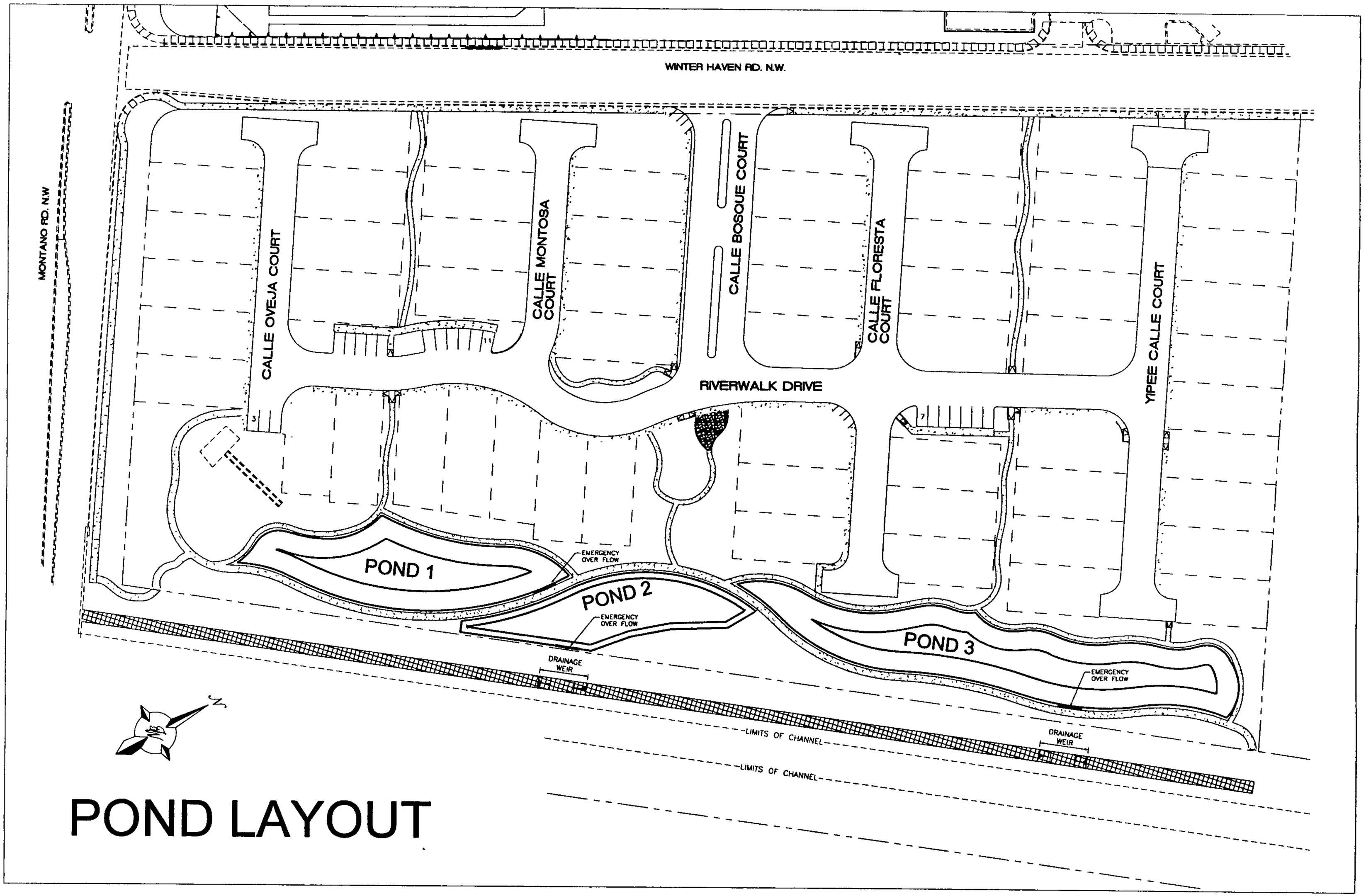
Winter Haven Road was constructed with the Riverside Plaza project located north of Bosque Montano. No flows from the Bosque Montano site enter Winter Haven Road. The street section for Winter Haven was specially designed (E12/D14) to carry the flows from the Riverside Plaza project located at Coors and Montano Plaza Drive. The analysis and capacity of Winter Haven Road has been provided on page --- of this report. A more detailed analysis of Winter Haven Road can been found in the drainage report for Riverside Plaza (E12/D14). A standard one foot water block has been provided at the entrances to Bosque Montano subdivision to keep flows in Winter Haven from entering the site.

Summary

The five basins will discharge a total developed flow of 32.78 cfs into three proposed retention ponds on the east side of the site. Curb openings in the stub streets and sidewalk culverts will allow the developed discharge from the site to drain to the proposed pond. Emergency spillways will be provided on the east side of the ponds to the Lower Corrales Riverside Drain



PROPOSED BASIN LAYOUT


WINTER HAVEN RD. N.W.
MONTANO RD. N.W
CALLE OVEJA COURT
CALLE MONTOSA COURT
CALLE BOSQUE COURT
CALLE FLORESTA COURT
YIPEE CALLE COURT
RIVERWALK DRIVE
POND 1
POND 2
POND 3
EMERGENCY OVER FLOW
EMERGENCY OVER FLOW
EMERGENCY OVER FLOW
DRAINAGE WEIR
DRAINAGE WEIR
LIMITS OF CHANNEL
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POND LAYOUT

Weighted E Method

Existing On-Site Basins

Basin	Area (sf)	Area (acres)	Treatment A		Treatment B		Treatment C		Treatment D	
			%	(acres)	%	(acres)	%	(acres)	%	(acres)
1	443,927	10.19	0%	0	100%	10.19	0%	0	0%	0.00

	100-Year			10-Year			10-Day	
Basin	Weighted E (ac-ft)	Volume (ac-ft)	Flow (cfs)	Weighted E (ac-ft)	Volume (ac-ft)	Flow (cfs)	Volume (ac-ft)	Volume (sf)
1	0.670	0.569	20.69	0.220	0.187	7.75	0.569	24785.92

60% D

Developed On-Site Basins

Basin	Area (sf)	Area (acres)	Treatment A		Treatment B		Treatment C		Treatment D	
			%	(acres)	%	(acres)	%	(acres)	%	(acres)
1	64,382	1.48	0%	0	20%	0.30	20%	0.2956	60%	0.89
2	92,282	2.12	0%	0	20%	0.42	20%	0.4237006	60%	1.27
3	83,063	1.91	0%	0	20%	0.38	20%	0.3813742	60%	1.14
4	95,203	2.19	0%	0	20%	0.44	20%	0.437114	60%	1.31
5	108,997	2.50	0%	0	100%	2.50	0%	0	0%	0.00
Total	443,927	10.19		0		4.04		1.5377888		4.61

	100-Year			10-Year			10-Day	
Basin	Weighted E (ac-ft)	Volume (ac-ft)	Flow (cfs)	Weighted E (ac-ft)	Volume (ac-ft)	Flow (cfs)	Volume (ac-ft)	Volume (sf)
1	1.514	0.186	5.32	0.876	0.108	3.23	0.295	12854.87
2	1.514	0.267	7.63	0.876	0.155	4.63	0.423	18425.64
3	1.514	0.241	6.87	0.876	0.139	4.16	0.381	16584.97
4	1.514	0.276	7.87	0.876	0.160	4.77	0.436	19008.95
5	0.670	0.140	5.08	0.220	0.046	1.90	0.140	6085.65
Total		1.110	32.78		0.607	18.69	1.675	72960.09

Equations:

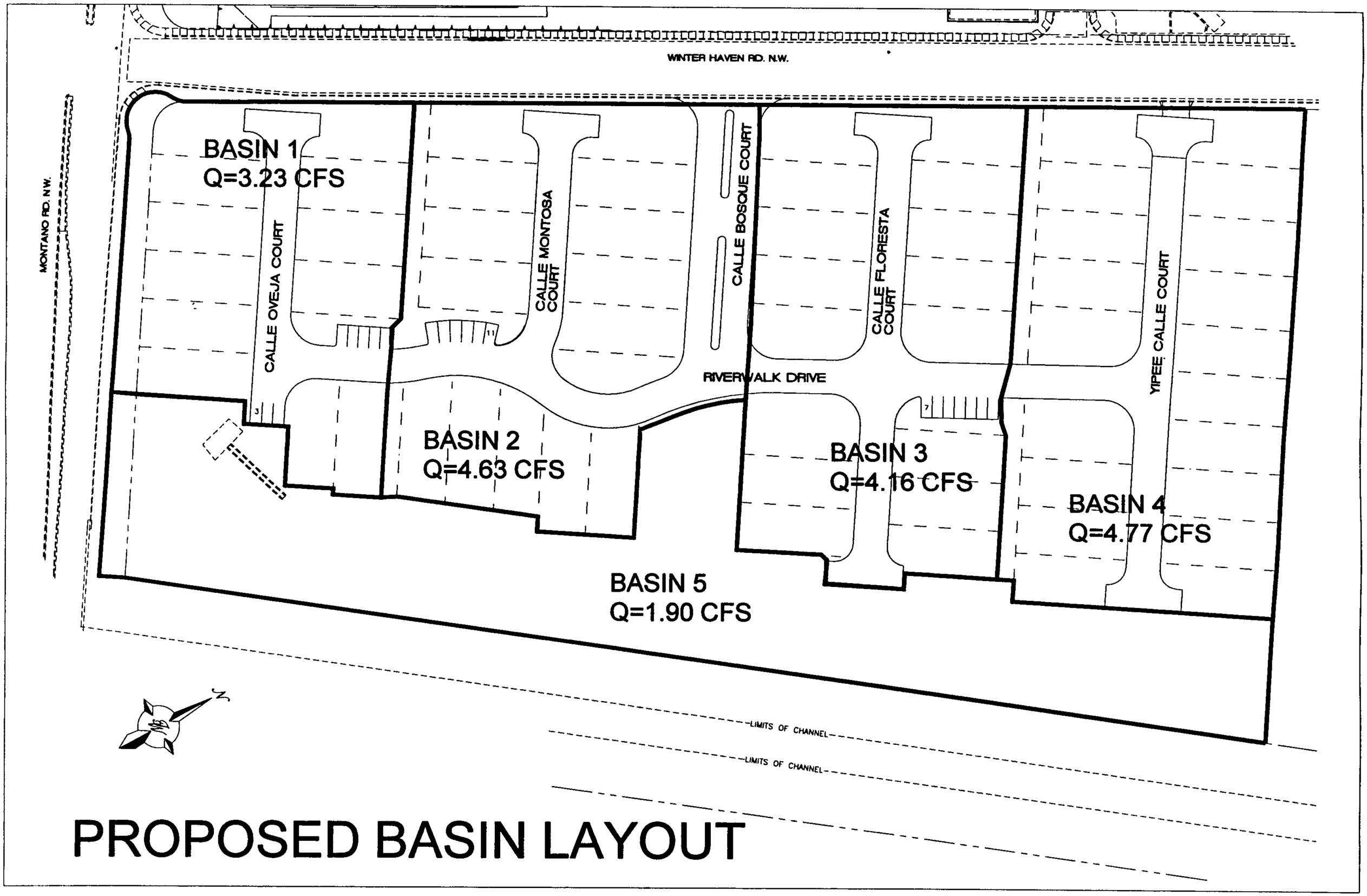
Weighted E = Ea*Aa + Eb*Ab + Ec*Ac + Ed*Ad / (Total Area)

Volume = Weighted D * Total Area

Flow = Qa * Aa + Qb * Ab + Qc * Ac + Qd * Ad

Excess Precipitation, E (inches)		
Zone 1	100-Year	10 - Year
E_a	0.44	0.08
E_b	0.67	0.22
E_c	0.99	0.44
E_d	1.97	1.24

Peak Discharge (cfs/acre)		
Zone 1	100-Year	10 - Year
Q_a	1.29	0.24
Q_b	2.03	0.76
Q_c	2.87	1.49
Q_d	4.37	2.89



PROPOSED BASIN LAYOUT

Assumes 0.5' freeboard.

POND SUMMARY

	Pond 1	Pond 2	Pond 1 and 2	Pond 3
Area of Pond Top (SF)	11704.64	8434.92		18188.53
Area of Pond Bottom (SF)	4092.18	6463.12		5972.14
Depth of Pond (FT)	3.50	1.00		3.50
Volume (CF)	27644.44 ✓	7449.02 ✓		42281.17
Volume (AC-FT)	0.6346	0.1710		0.9706
Volume Required (CF)			34325.28	38627.72
Volume Required (AC-FT)			**0.7880** *	**0.8868**
Volume Provided (CF)	27644.44	7449.02	35093.46	42281.17
Volume Provided (AC-FT)	**0.6346** ✓	**0.1710**	**0.8056** ✓	**0.9706**

EMERGENCY OVERFLOW

	Flow	Height	Length
Pond 1	9.88	0.5	9.47
Pond 2	9.88	0.5	9.47
Pond 3	8.81	0.5	8.45

Volume Equation: (At + Ab)/2 * Depth
Weir Equation: Q = CLH^(3/2)

* incl. ½(Basins) + B1 + B2

SIDEWALK CULVERTS

Orifice Equation:

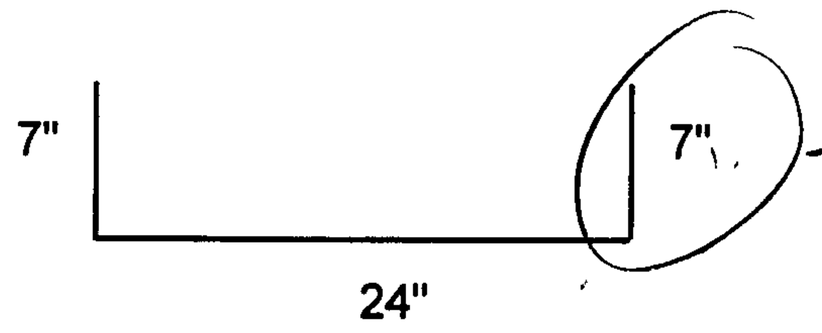
$$Q = CA\sqrt{2gH}$$

Where:
C = 0.6
A = 0.5833*2 = 1.167 ft^2
g = 32.2
H = Height of water measured from center of orifice

$$Q = 0.6 * 1.1678\sqrt{2 * 32.2 * 0.2917}$$

Q=3.035 cfs

Basin 1 and 2
9.11 cfs > 7.86 cfs
Use three 24" sidewalk culverts



only 4" curb?

Curb Cuts

Weir Equation:

$$Q=CLH^{3/2}$$

Basin 3
Q= 4.16 cfs
C = 2.95
H = 0.33 ft
L = Length of weir

$$L=\frac{4.16}{2.95(0.33)^{3/2}}$$

L = 7.44 ft
Use 7.50 feet for length of weir

Basin 4
Q= 4.77 cfs
C = 2.95
H = 0.33 ft
L = Length of weir

$$L=\frac{4.77}{2.95(0.33)^{3/2}}$$

L = 8.53 ft
Use 8.50 feet for length of weir

Street Capacity Calculations

Calle Oveja Court

28' F-F Street Section with 4" curb

Slope= 0.01

For water depths less than 0.0625 feet

Y= Water depth
Area = 16*Y^2
P= SQRT(1025*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)
0.010	0.0016	0.33	0.00	0.00	0.00	0.25	0.00	0.44	0.0030
0.020	0.0064	0.66	0.01	0.00	0.01	0.40	0.01	0.50	0.0072
0.025	0.0100	0.83	0.01	0.00	0.01	0.46	0.01	0.51	0.0096
0.035	0.0196	1.16	0.02	0.01	0.02	0.58	0.02	0.54	0.0146
0.045	0.0324	1.49	0.02	0.02	0.04	0.68	0.03	0.57	0.0200
0.052	0.0433	1.72	0.03	0.03	0.07	0.75	0.04	0.58	0.0240
0.060	0.0576	1.98	0.03	0.05	0.10	0.83	0.05	0.59	0.0287
0.063	0.0625	2.06	0.03	0.05	0.11	0.85	0.05	0.60	0.0302

For water depths greater than 0.0625 ft but less than 0.3025 ft

Y1= Y-0.0625
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.063	0.0635	2.09	0.03	0.05	0.11	0.85	0.05	0.60	0.0304
0.100	0.1727	3.98	0.04	0.19	0.37	1.08	0.11	0.60	0.0487
0.130	0.3114	5.51	0.06	0.40	0.80	1.29	0.17	0.63	0.0677
0.160	0.4952	7.04	0.07	0.74	1.48	1.49	0.24	0.66	0.0887
0.200	0.8102	9.08	0.09	1.41	2.83	1.75	0.35	0.69	0.1188
0.207	0.8735	9.43	0.09	1.56	3.13	1.79	0.37	0.69	0.1242
0.209	**0.8958**	**9.56**	**0.09**	**1.62**	**3.23**	**1.80**	**0.38**	**0.69**	**0.1261**
0.303	1.9825	14.31	0.14	4.64	9.28	2.34	0.71	0.75	0.2035

For water depths greater than 0.3025 ft but less than 0.333 ft

Y2= Y - 0.3025
A3= A2 + Y2*14
P3= P2 + Y2

6.5.

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.303	1.9895	14.31	0.14	4.67	9.34	2.35	0.71	0.75	0.2042
0.304	2.0021	14.31	0.14	4.72	9.43	2.36	0.72	0.75	0.2056
0.306	2.0343	14.31	0.14	4.84	9.69	2.38	0.73	0.76	0.2092
0.310	2.0875	14.31	0.15	5.06	10.11	2.42	0.75	0.77	0.2151
0.313	2.1225	14.32	0.15	5.20	10.39	2.45	0.77	0.77	0.2190
0.320	2.2275	14.32	0.16	5.63	11.26	2.53	0.81	0.79	0.2306
0.332	2.3913	14.34	0.17	6.33	12.67	2.65	0.88	0.81	0.2490
0.333	2.4095	14.34	0.17	6.41	12.83	2.66	0.89	0.81	0.2510

Street Capacity Calculations

Calle Montosa Court

28' F-F Street Section with 4" curb

Slope= 0.01

For water depths less than 0.0625 feet

Y= Water depth
Area = 16*Y^2
P= SQRT(1025*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)
0.010	0.0016	0.33	0.00	0.00	0.00	0.25	0.00	0.44	0.0030
0.020	0.0064	0.66	0.01	0.00	0.01	0.40	0.01	0.50	0.0072
0.025	0.0100	0.83	0.01	0.00	0.01	0.46	0.01	0.51	0.0096
0.035	0.0196	1.16	0.02	0.01	0.02	0.58	0.02	0.54	0.0146
0.045	0.0324	1.49	0.02	0.02	0.04	0.68	0.03	0.57	0.0200
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For water depths greater than 0.0625 ft but less than 0.3025 ft

Y1= Y-0.0625
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.063	0.0635	2.09	0.03	0.05	0.11	0.85	0.05	0.60	0.0304
0.100	0.1727	3.98	0.04	0.19	0.37	1.08	0.11	0.60	0.0487
0.130	0.3114	5.51	0.06	0.40	0.80	1.29	0.17	0.63	0.0677
0.160	0.4952	7.04	0.07	0.74	1.48	1.49	0.24	0.66	0.0887
0.200	0.8102	9.08	0.09	1.41	2.83	1.75	0.35	0.69	0.1188
0.237	**1.1738**	**10.97**	**0.11**	**2.31**	**4.63**	**1.97**	**0.47**	**0.71**	**0.1483**
0.261	1.4469	12.20	0.12	3.05	6.11	2.11	0.55	0.73	0.1682
0.303	1.9825	14.31	0.14	4.64	9.28	2.34	0.71	0.75	0.2035

For water depths greater than 0.3025 ft but less than 0.333 ft

Y2= Y - 0.3025
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0.306	2.0343	14.31	0.14	4.84	9.69	2.38	0.73	0.76	0.2092
0.310	2.0875	14.31	0.15	5.06	10.11	2.42	0.75	0.77	0.2151
0.313	2.1225	14.32	0.15	5.20	10.39	2.45	0.77	0.77	0.2190
0.320	2.2275	14.32	0.16	5.63	11.26	2.53	0.81	0.79	0.2306
0.332	2.3913	14.34	0.17	6.33	12.67	2.65	0.88	0.81	0.2490
0.333	2.4095	14.34	0.17	6.41	12.83	2.66	0.89	0.81	0.2510

Street Capacity Calculations

Calle Floresta Court

28' F-F Street Section with 4" curb

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0.010	0.0016	0.33	0.00	0.00	0.00	0.21	0.00	0.37	0.0022
0.020	0.0064	0.66	0.01	0.00	0.00	0.33	0.01	0.41	0.0054
0.025	0.0100	0.83	0.01	0.00	0.01	0.39	0.01	0.43	0.0072
0.035	0.0196	1.16	0.02	0.01	0.02	0.48	0.02	0.45	0.0110
0.045	0.0324	1.49	0.02	0.02	0.04	0.57	0.03	0.47	0.0151
0.052	0.0433	1.72	0.03	0.03	0.05	0.63	0.03	0.49	0.0182
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0.063	0.0625	2.06	0.03	0.04	0.09	0.71	0.04	0.50	0.0229

For water depths greater than 0.0625 ft but less than 0.3025 ft

Y1= Y-0.0625
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.063	0.0635	2.09	0.03	0.05	0.09	0.71	0.04	0.50	0.0231
0.100	0.1727	3.98	0.04	0.16	0.31	0.90	0.09	0.50	0.0370
0.130	0.3114	5.51	0.06	0.34	0.67	1.08	0.14	0.53	0.0516
0.160	0.4952	7.04	0.07	0.62	1.23	1.25	0.20	0.55	0.0678
0.200	0.8102	9.08	0.09	1.18	2.37	1.46	0.29	0.58	0.0911
0.243	**1.2391**	**11.28**	**0.11**	**2.08**	**4.16**	**1.68**	**0.41**	**0.60**	**0.1178**
0.261	1.4469	12.20	0.12	2.55	5.11	1.77	0.46	0.61	0.1294
0.303	1.9825	14.31	0.14	3.88	7.77	1.96	0.59	0.63	0.1569

For water depths greater than 0.3025 ft but less than 0.333 ft

Y2= Y - 0.3025
A3= A2 + Y2*14
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)
0.303	1.9895	14.31	0.14	3.91	7.81	1.96	0.59	0.63	0.1575
0.304	2.0021	14.31	0.14	3.95	7.89	1.97	0.60	0.63	0.1586
0.306	2.0343	14.31	0.14	4.05	8.11	1.99	0.61	0.63	0.1614
0.310	2.0875	14.31	0.15	4.23	8.46	2.03	0.63	0.64	0.1661
0.313	2.1225	14.32	0.15	4.35	8.70	2.05	0.64	0.65	0.1691
0.320	2.2275	14.32	0.16	4.71	9.42	2.11	0.68	0.66	0.1784
0.332	2.3913	14.34	0.17	5.30	10.60	2.22	0.74	0.68	0.1929
0.333	2.4095	14.34	0.17	5.37	10.73	2.23	0.74	0.68	0.1945

Street Capacity Calculations

Yipee Calle Court

28' F-F Street Section with 4" curb

Slope= 0.015

For water depths less than 0.0625 feet

Y=	Water depth
Area =	16*Y^2
P=	SQRT(1025*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)
0.010	0.0016	0.33	0.00	0.00	0.00	0.31	0.00	0.54	0.0041
0.020	0.0064	0.66	0.01	0.00	0.01	0.49	0.01	0.61	0.0099
0.025	0.0100	0.83	0.01	0.01	0.01	0.56	0.01	0.63	0.0130
0.035	0.0196	1.16	0.02	0.01	0.03	0.71	0.02	0.67	0.0198
0.045	0.0324	1.49	0.02	0.03	0.05	0.84	0.04	0.69	0.0271
0.052	0.0433	1.72	0.03	0.04	0.08	0.92	0.05	0.71	0.0324
0.060	0.0576	1.98	0.03	0.06	0.12	1.01	0.06	0.73	0.0387
0.063	0.0625	2.06	0.03	0.07	0.13	1.04	0.07	0.73	0.0407

For water depths greater than 0.0625 ft but less than 0.3025 ft

Y1=	Y-0.0625
A2=	A1 + 2*Y1 + 25*Y1^2
P2=	P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.063	0.0635	2.09	0.03	0.07	0.13	1.04	0.07	0.73	0.0409
0.100	0.1727	3.98	0.04	0.23	0.46	1.32	0.13	0.74	0.0656
0.130	0.3114	5.51	0.06	0.49	0.98	1.58	0.21	0.77	0.0909
0.160	0.4952	7.04	0.07	0.90	1.81	1.82	0.29	0.80	0.1187
0.200	0.8102	9.08	0.09	1.73	3.46	2.14	0.43	0.84	0.1584
0.223	**1.0315**	**10.27**	**0.10**	**2.39**	**4.77**	**2.31**	**0.52**	**0.86**	**0.1828**
0.261	1.4469	12.20	0.12	3.74	7.48	2.58	0.68	0.89	0.2235
0.303	1.9825	14.31	0.14	5.68	11.37	2.87	0.87	0.92	0.2698

For water depths greater than 0.3025 ft but less than 0.333 ft

Y2=	Y - 0.3025
A3=	A2 + Y2*14
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)
0.303	1.9895	14.31	0.14	5.72	11.43	2.87	0.87	0.92	0.2708
0.304	2.0021	14.31	0.14	5.78	11.55	2.89	0.88	0.92	0.2726
0.306	2.0343	14.31	0.14	5.93	11.86	2.92	0.89	0.93	0.2772
0.310	2.0875	14.31	0.15	6.19	12.38	2.97	0.92	0.94	0.2848
0.313	2.1225	14.32	0.15	6.37	12.73	3.00	0.94	0.95	0.2898
0.320	2.2275	14.32	0.16	6.90	13.79	3.10	0.99	0.96	0.3049
0.332	2.3913	14.34	0.17	7.76	15.52	3.24	1.08	0.99	0.3285
0.333	2.4095	14.34	0.17	7.86	15.71	3.26	1.09	1.00	0.3311

Street Capacity Calculations

WINTER HAVEN RD - WITH 3/4% SLOPE TO GUTTER

48' F-F Street Section with 8" curb

Slope= 0.004

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)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.010	0.0008	0.1703	0.0047	0.0001	0.1551	0.0016	0.2733	0.0013
0.040	0.0128	0.6812	0.0188	0.0050	0.3907	0.0156	0.3443	0.0079
0.070	0.0392	1.1922	0.0329	0.0222	0.5674	0.0397	0.3779	0.0162
0.100	0.08	1.7031	0.0470	0.0576	0.7197	0.0720	0.4011	0.0256
0.125	0.125	2.1289	0.0587	0.1044	0.8352	0.1044	0.4163	0.0340

For water depths greater than 0.125 ft but less than 0.455 ft

Y1= Y-0.125

A2= A1 + 2*Y1 + 66.67*Y1^2

P2= P1 + SQRT(17778.78*Y1^2) +Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.125	0.1250	2.1289	0.0587	0.1044	0.8352	0.1044	0.4163	0.0340
0.210	0.7767	13.5476	0.0573	0.6384	0.8220	0.1726	0.3161	0.0358
0.295	2.3918	24.9662	0.0958	2.7684	1.1575	0.3415	0.3756	0.0677
0.380	4.9702	36.3849	0.1366	7.2881	1.4663	0.5572	0.4192	0.1047
0.455	8.0454	46.4601	0.1732	13.8183	1.7176	0.7815	0.4487	0.1401

For water depths greater than 0.470 ft but less than 0.580 ft

Y2= Y - 0.455

A3= A2 + Y2 * 46 + 8 * Y2^2

P3= P2 + SQRT(257 * Y2^2) + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.455	8.0454	46.4601	0.1732	13.8183	1.7176	0.7815	0.4487	0.1401
0.500	10.1316	47.2265	0.2145	20.0726	1.9812	0.9906	0.4938	0.1794
0.530	11.5404	47.7375	0.2417	24.7586	2.1454	1.1371	0.5193	0.2059
0.560	12.9636	48.2484	0.2687	29.8413	2.3019	1.2891	0.5421	0.2326
0.580	13.9204	48.5890	0.2865	33.4445	2.4026	1.3935	0.5559	0.2504

For water depths greater than 0.580 ft but less than 0.667 ft

Y3= Y - 0.580

A4= A3 + 48 * Y3

P4= P3 + 2 * Y3

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.580	13.9204	48.5890	0.2865	33.4445	2.4026	1.3935	0.5559	0.2504
0.620	15.8404	48.6690	0.3255	41.4356	2.6158	1.6218	0.5854	0.2897
0.640	16.8004	48.7090	0.3449	45.6798	2.7190	1.7401	0.5989	0.3095
0.650	17.2804	48.7290	0.3546	47.8626	2.7698	1.8003	0.6054	0.3195
0.667	18.0964	48.7630	0.3711	51.6644	2.8550	1.9043	0.6160	0.3365

For water depths greater than 0.667 ft but less than 0.787 ft

Y4= Y - 0.667

A5= A4 + Y4 * 48 + 25 * Y4^2

P5= P4 + SQRT(2501 * Y4^2) + Y4

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.667	18.0964	48.7630	0.3711	51.6644	2.8550	1.9043	0.6160	0.3365
0.683	18.8903	49.5996	0.3809	54.8713	2.9047	1.9851	0.6192	0.3474
0.717	20.5589	51.3135	0.4007	61.7699	3.0045	2.1543	0.6253	0.3699
0.742	21.8370	52.5888	0.4152	67.1932	3.0770	2.2832	0.6295	0.3866
0.787	24.2164	54.8842	0.4412	77.5919	3.2041	2.5216	0.6365	0.4169

For water depths greater than 0.787 ft but less than 1.247 ft

Y5= Y - 0.787

A6= A5 + 54 * Y5

P6= P5 + 2 * Y5

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.935	32.1868	55.1794	0.5833	124.2254	3.8595	3.6071	0.7035	0.5734
1.000	35.7184	55.3102	0.6458	147.5306	4.1304	4.1304	0.7279	0.6444
1.040	37.8622	55.3896	0.6836	162.4264	4.2899	4.4602	0.7414	0.6879
1.189	45.9460	55.6890	0.8250	223.4424	4.8632	5.7842	0.7858	0.8547
1.247	49.0564	55.8042	0.8791	248.8746	5.0732	6.3263	0.8006	0.9199

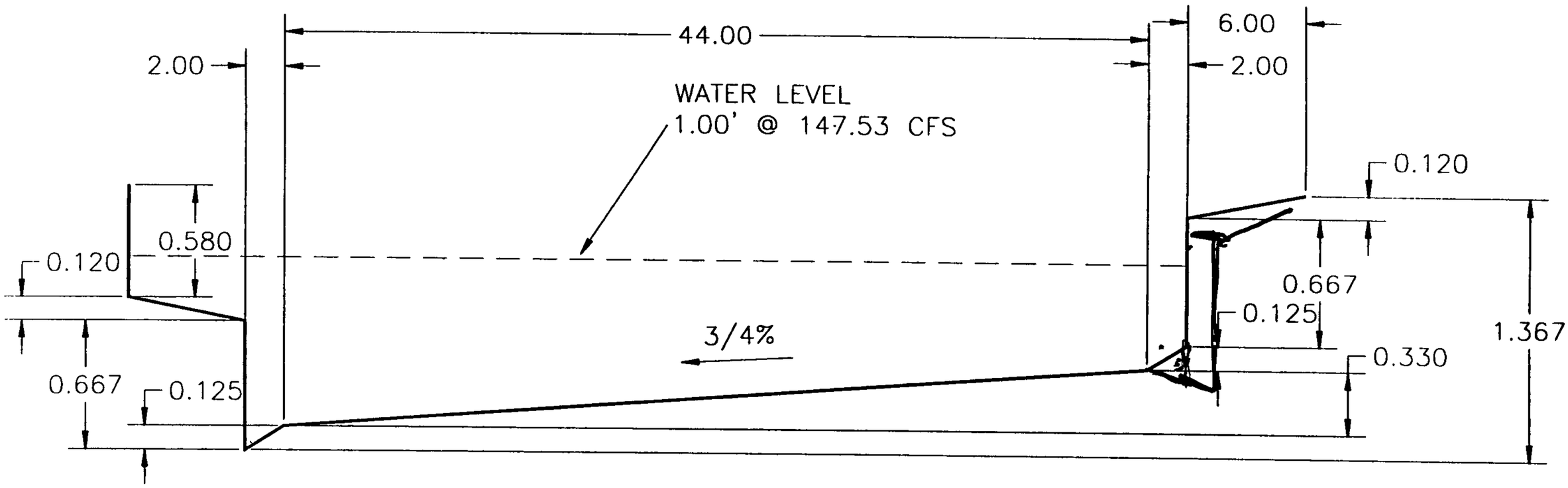
For water depths greater than 1.247 ft but less than 1.367 ft

Y6= Y - 1.247

A7= A6 + 54 * Y6 + 25 * Y6^2

P7= P6 + Y6 * SQRT(2501 * Y6^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
1.247	49.0564	55.8042	0.8791	248.8746	5.0732	6.3263	0.8006	0.9199
1.273	50.4883	57.1407	0.8836	257.0126	5.0905	6.4813	0.7950	0.9301
1.301	52.0679	58.5792	0.8888	266.1062	5.1107	6.6511	0.7895	0.9414
1.337	54.1189	60.3951	0.8961	278.0863	5.1384	6.8701	0.7831	0.9562
1.367	55.8964	61.9254	0.9026	288.6200	5.1635	7.0585	0.7783	0.9690



PROPOSED STREET SECTION FOR WINTERHAVEN ROAD