2005P007

OPTIMUS
CIVIL DESIGN GROUP

FINAL DRAINAGE REPORT
for
Tempe Marketplace

Optimus Project #041050
November 1, 2004

Registered Professional Engineer (Civil)
CERTIFICATE NO.
38600
ADAM J.
RAUSCHER
Date Signed 11/1/04
ARIZONA, U.S.A.

Prepared by:

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1.0 Scope

The objectives of this preliminary drainage report are:

1. To research and identify the current offsite drainage impacts associated with the property.

2. To determine the hydrologic and hydraulic conditions for the proposed development.

3. To create a preliminary drainage scheme which adequately conveys site-generated discharges and offsite flow through and/or around the parcel in accordance with City of Phoenix and Maricopa County drainage design standards.

This study has been performed utilizing an aerial-generated topography map and field reconnaissance conducted by Optimus Civil Design staff. This preliminary drainage report was prepared in accordance with the current City of Tempe and Maricopa County Floodplain Ordinance, design criteria, regulations and policies.

2.0 Site Location

The project site is located in the southwest corner of The Loop 101 and Loop 202 Freeways in the City of Tempe, Arizona (see Figure 1).

More specifically, the project site is located within the north half of Section 13, Township 1 North, Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

3.0 Description And Proposed Development

The project site is currently consists of multi-use industrial parcels and various use landfills (see Figure 2). Prior to the landfills and existing development the land was used for mining. Due to the existing development, the existing topography is nonuniform and varies from 1171 to 1178 except for the existing landfill at the east and northeast portion of the proposed parcel. The import of undocumented debris material into the landfills over the years has raised this region approximately 20 feet from the surrounding terrain.

The proposed commercial project site has a total gross area of approximately 117 Acres. It is proposed to be developed into a commercial center by Vestar Development Company (see Figure 4). Miravista Holdings is currently working with The City of Tempe to acquire the existing property from the landowners. Upon successful acquisition, Miravista Holdings will perform a complete demolition and environmental remediation of the existing site prior to Vestar purchasing the land and starting construction.

The drainage design associated with this site includes conveying and retaining onsite discharges associated with the development of the site. The proposed procedures and methodologies used within this report are consistent with the latest rules and regulations adopted by the City of Tempe and Maricopa County.

4.0 FIRM Classification

The Maricopa County, Arizona and Incorporated Area Flood Insurance Rate Map (FIRM) map number 04013C2170 F, panel 2170 of 4350, dated July 19, 2001 shows that the project site is located within flood hazard Zone "X" (shaded) (see Figure. 3). The site is protected from the 100-year flood waters of the Salt River (Zone "AE") by an earthen levee. The 100-year high water elevations are shown on the Grading and Drainage Plan and Figure 4 for reference.

Zone "X" (shaded) is defined by FEMA as: areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage area less than 1 square mile and areas protected by levees from 100-year flood.

5.0 Offsite Drainage

The site is relatively unaffected by offsite runoff in the existing condition. Both Rio Salado Parkway and McClintock Drive drain via catch basins and an underground stormdrain system, so their associated runoff does not impact the site. The stormdrain main passes runoff from east to west along Rio Salado Parkway and extends north along McClintock Drive. The ultimate outfall for this runoff is the Salt River. The pipe gradually enlarges from a 36" pipe near the site eastern boundary to 72" along McClintock Drive.

The surrounding land to the west, south and east of the site are developed. Except for a few exceptions, the 100-year retention requirements are provided onsite within the parcels. Runoff generated north of the site is contained within the Salt River channel walls. An earthen levee has been constructed along the northern boundary to contain the 100-year flood within the channel. 100-year Flood high water elevations for the Salt River taken from the F.E.M.A. Map are shown on the Grading and Drainage Plan and on Figure 4. The proposed building finish floor elevations are a minimum of 1 foot above the high water surface elevations at all site locations.

6.0 Onsite Drainage

Stormdrain networks A, B and C are designed to convey runoff to the onsite retention/detention basins and are sized for the 10-year event. Stormdrain networks D, E and F are utilized as bleedoff pipes into the salt river and are sized to carry the 100-year storm event in excess of the first flush detention storage volume (see Appendix C & D). The proposed stormdrain pipes will be sized under a pressure flow situation because most of the stormdrain pipes outlet into the basin via a bubbleup structure and rarely flow via gravity. The pipes were sized using a friction slope analysis and incorporate junction losses to ensure that the upstream hydraulic grade line does not exceed 1 foot of depth above the proposed catch basins (see Appendix D). All onsite overland drainage facilities will be sized for the 10-year event per the rational method except for the curb inlets which are sized for the 100-year storm. Depressed curb inlets will be used wherever possible to reduce construction and maintenance costs.

All retention basin areas will be covered in turf to assist in natural cleansing of the runoff. All of the basins except retention basin E are designed to drain within the required 36 hour time period by means of natural infiltration (see Appendix A). Retention basin E will be receiving runoff from a future gas station, so an Envibro Drywell System will be constructed to reduce potential groundwater contamination.

Drainage areas B, D, E and F are designed to retain the 100-year, 1-hour storm per The City of Tempe requirements (see Figure 4 and Appendix A). Runoff is designed to pass overland via sheet flow into the retention basins through a series of curb openings with riprap erosion protection. Temporary parking lot ponding was utilized wherever possible to increase the retention capacity. The design high water elevation does not exceed 1 foot deep at all pavement areas per the requirements of the City of Tempe.

Retention storage is provided for the first flush storm per the requirements of Maricopa County for Drainage Areas A and C (see Figure 4 and Appendix A). The runoff in excess of the first flush storm will pass into the Salt River via stormdrains. The pipes and inlets are sized for the 100-year storm per the rational method with the time of concentration of 50 minutes (see Appendix D). This is the amount of time at which the detention basins fill up and begin to overflow into the outlet pipes. The reduction in retention requirements has been preliminarily accepted by The Flood Control District of Maricopa County. A formal final approval of the proposed drainage system will be procured from The Flood Control District of Maricopa County during the final construction plan preparation.

The runoff within Drainage Area A will travel both overland and underground within stormdrains to the proposed Retention Basins 1A, 1B and 1C. Runoff in excess of the first flush storm will outlet from Basin 1A into The Salt River through two controlled bleedoff pipes with backflow prevention devices. The pipes were sized for a pressure flow situation assuming that the Salt River water surface elevation is at the 100-year storm event (see Appendix C). The pipe inlet structures weir elevation is set at 2.5' above the basin floor and is designed to hold 100% of the first flush storm within the retention basin prior to allowing runoff to outlet the basin (see Appendix B). The effective storage depth of Retention Basin 1 is 2.5'. However, the depth will reach 3' during the 100-year event in order to produce enough head to transfer the runoff over the inlet structure. In any case, the ponding depth does not exceed 1' within the pavement at any time.

Drainage Area C will be collected in Basins along Rio Salado Parkway and runoff in excess of the first flush storm will outlet to the Salt River within a storm drain system connecting through the southern Salt River embankment. The outlet stormdrain system has been designed for a pressure flow situation assuming that the Salt River water surface elevation is at the 100-year event (see Appendix C). The stormdrain is sized for the 100-year discharge per the rational method in excess of the first flush depth (see Appendix D). The effective storage depth of Retention Basin 3 is 1.5'. However, the depth will reach 2' during the 100-year event in order to produce enough head to transfer the runoff over the inlet catch basins. In any case, the ponding depth does not exceed 1' within the pavement at any time.

The Arizona Department of Environmental Quality has issued a letter indicating that the first flush method of storm water discharge is not subject to AZPDES or APP permitting requirements (see Appendix D) Special construction provisions will be made to keep the disturbance of the levee to a minimum, so a 404 Jurisdictional Water permit will not be required. Per The City of Tempe requirements, all proposed finish floor elevations are more than a foot above the adjacent retention basin high water elevations (see Figure 4).

7.0 References

1. City of Tempe Pubic Works Department Engineering Design Criteria, March 2000.

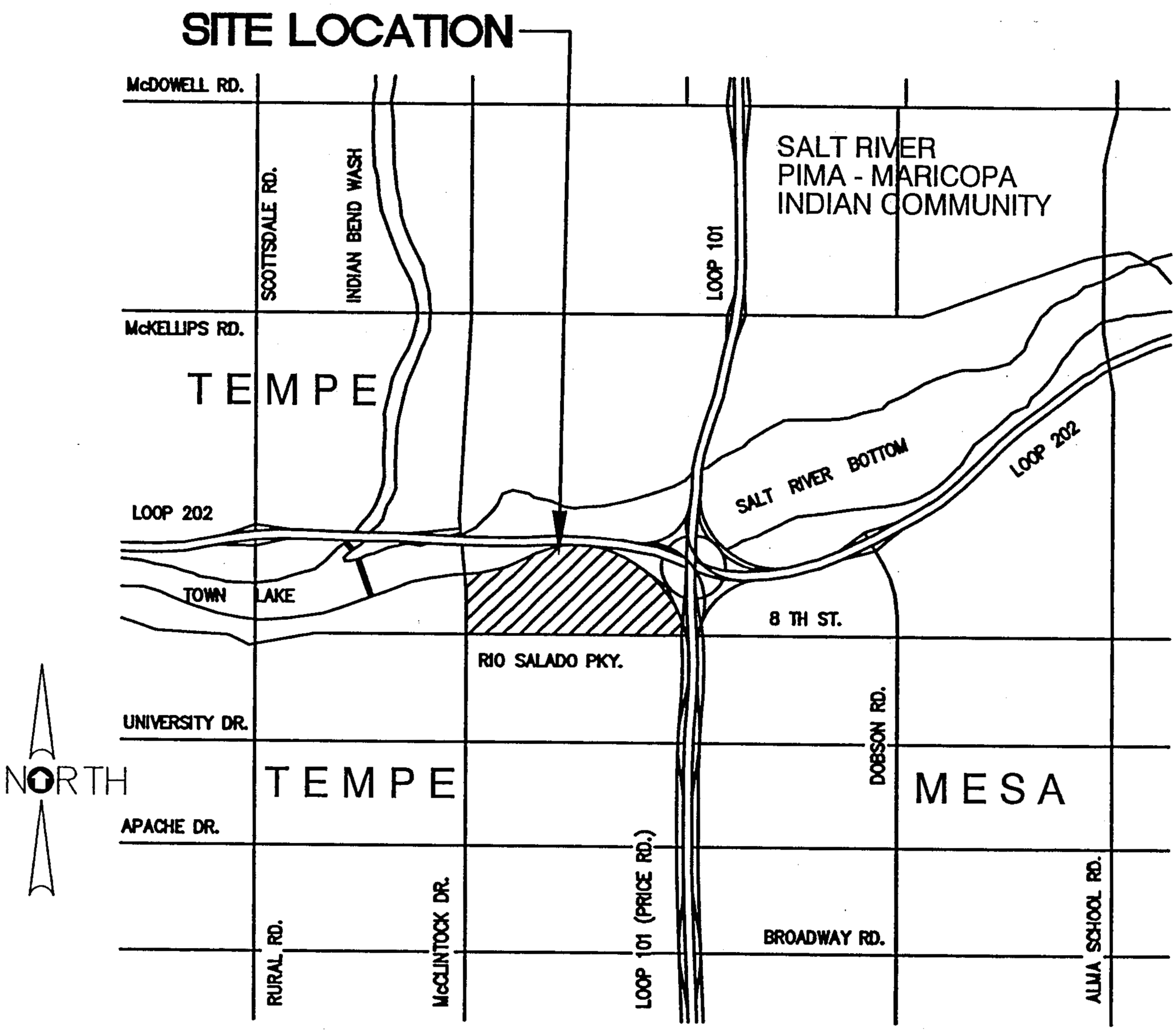
2. Drainage Design Manual for Maricopa County, Arizona, Volume 1 Hydrology, January 1, 1995.

3. Drainage Design Manual for Maricopa County, Arizona, Volume 2 Hydraulics, January 28, 1996.

FIGURES

Subject: TEMPE MARKETPLACE

Job No: 041050



VICINITY MAP

N.T.S.

OPTIMUS

CIVIL DESIGN GROUP

2323 E. MAGNOLIA STREET

SUITE 107

PHOENIX, AZ 85034

PH: (602) 286-9300 FAX: (602) 286-9400

FIGURE 1 VICINITY MAP

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Prepared By: DBS | Date: 11/01/04 | Checked By: AJR | Sheet No: 1 Of 1

Subject: TEMPE MARKETPLACE **Job No:** 041050

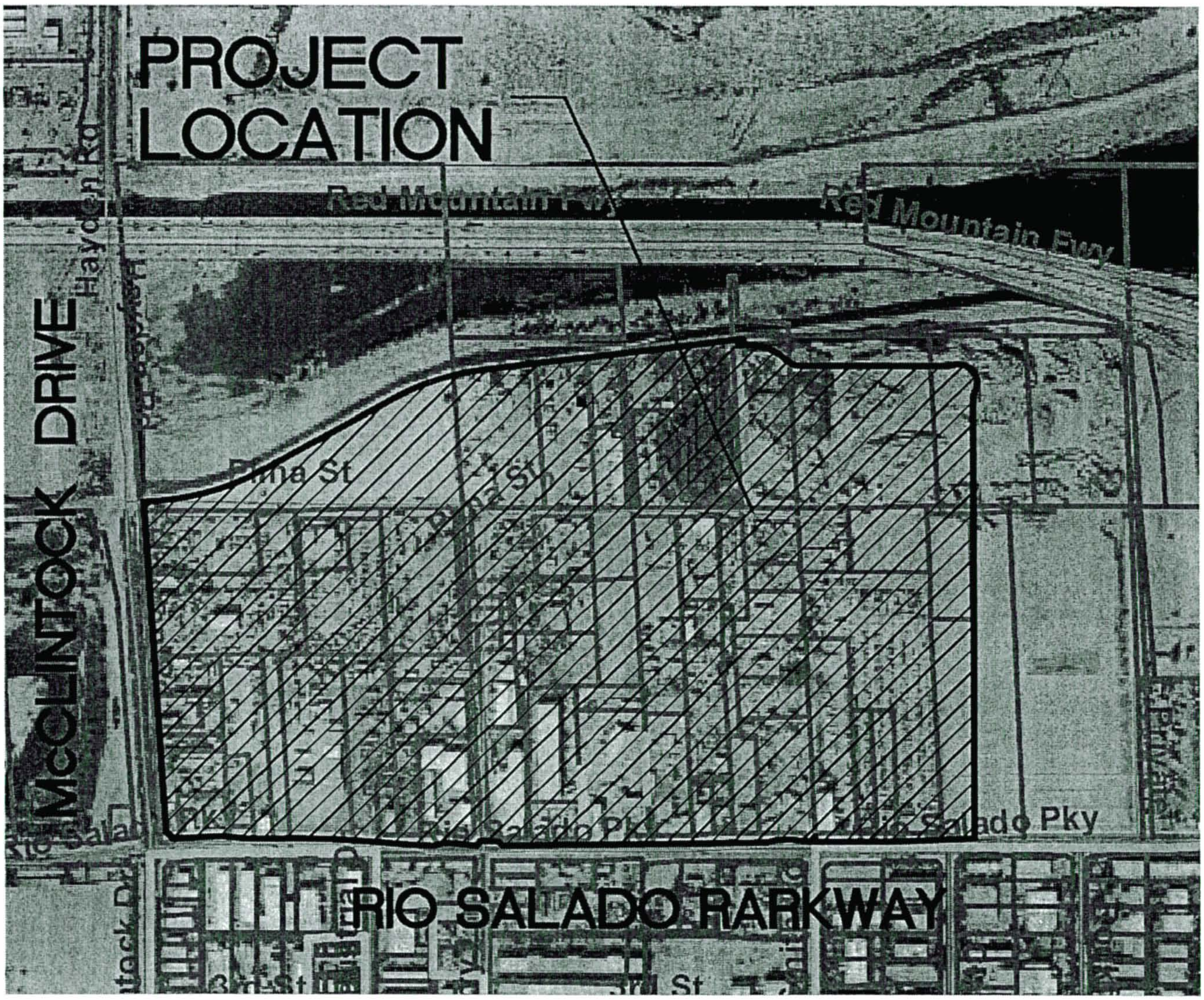

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FIGURE 2
AERIAL PHOTO MAP

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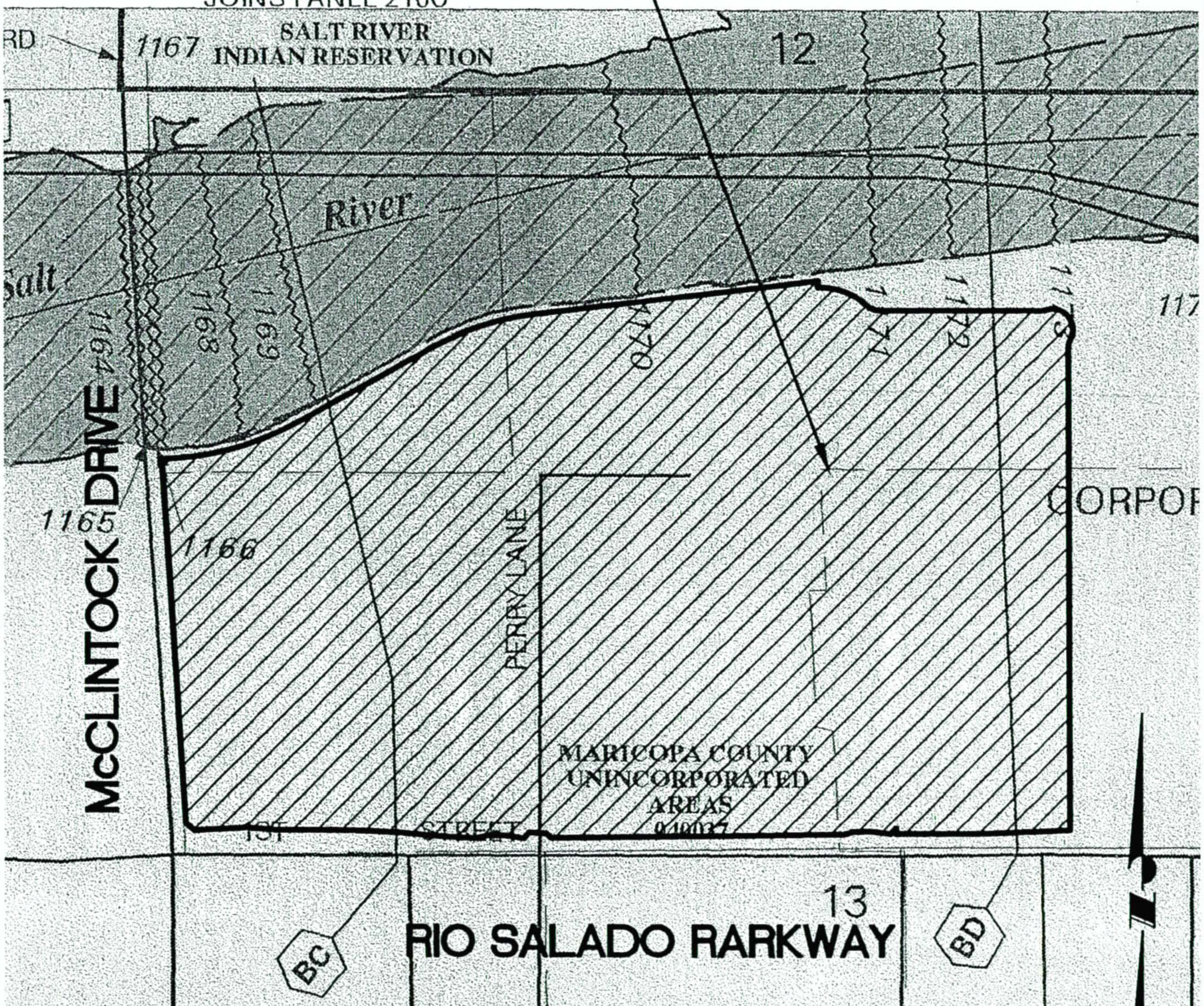
Prepared By: DEB **Date:** 11/01/04 **Checked By:** JDB **Sheet No:** 1 **Of** 1

Subject: TEMPE MARKETPLACE

Job No.: 041050



MAP NO. 04013C2170 F PANEL 2170 OF 4350

N.T.S

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FIGURE 3
FIRM MAP

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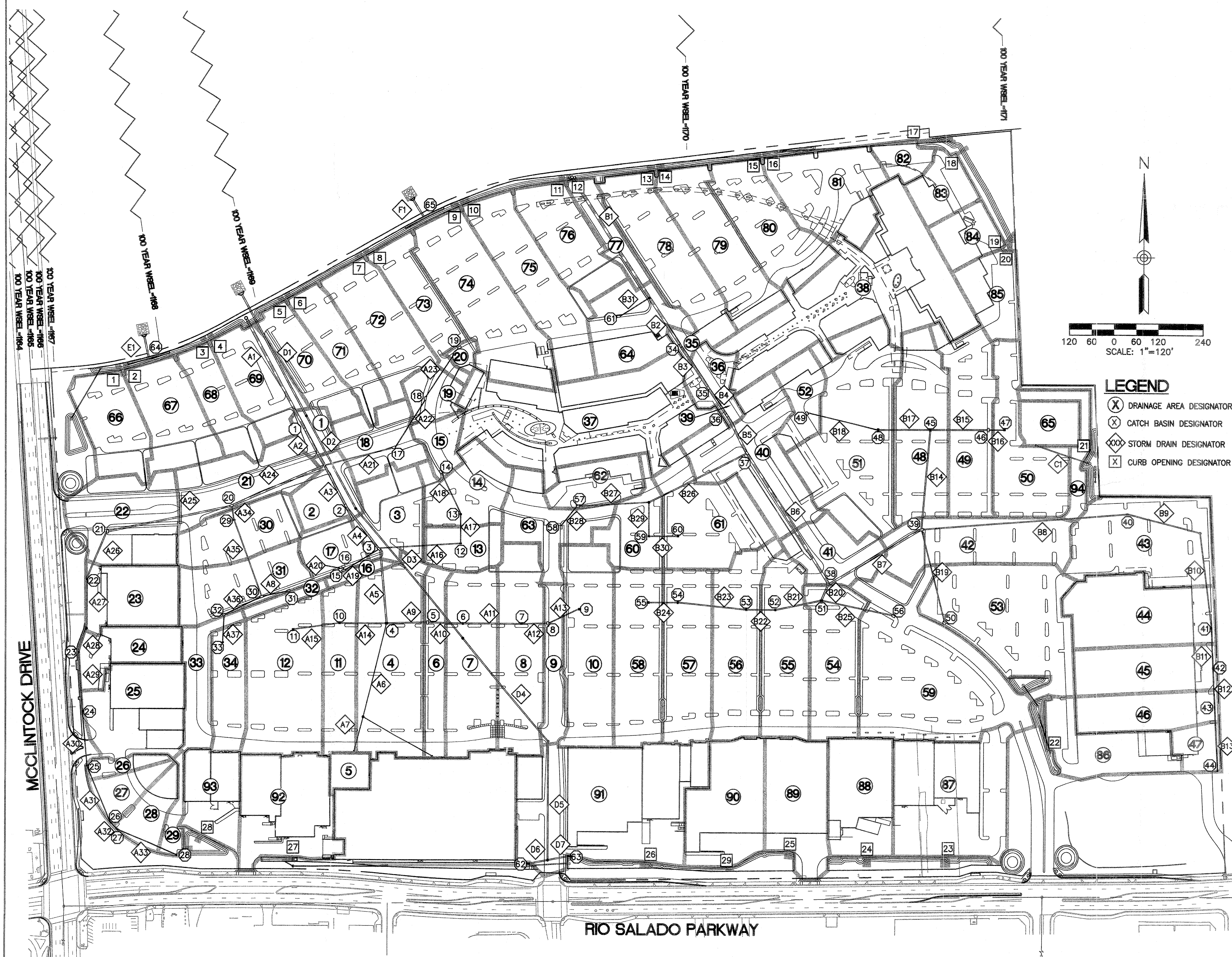
Prepared By: DEB | Date: 11/01/04 | Checked By: JDB | Sheet No.: 1 Of 1



DRAINAGE AREA INFORMATION

DRAINAGE AREA	AREA
1	0.28 A.C.
2	0.80 A.C.
3	0.92 A.C.
4	2.10 A.C.
5	0.25 A.C.
6	0.69 A.C.
7	1.56 A.C.
8	1.55 A.C.
9	0.54 A.C.
10	1.64 A.C.
11	0.95 A.C.
12	1.89 A.C.
13	0.55 A.C.
14	0.95 A.C.
15	0.35 A.C.
16	0.12 A.C.
17	0.50 A.C.
18	0.80 A.C.
19	0.42 A.C.
20	0.11 A.C.
21	1.18 A.C.
22	1.50 A.C.
23	0.94 A.C.
24	0.69 A.C.
25	1.42 A.C.
26	0.20 A.C.
27	0.40 A.C.
28	0.44 A.C.
29	0.21 A.C.
30	0.98 A.C.
31	1.05 A.C.
32	0.16 A.C.
33	0.64 A.C.
34	0.70 A.C.
35	0.10 A.C.
36	0.40 A.C.
37	3.29 A.C.
38	3.43 A.C.
39	0.08 A.C.
40	1.74 A.C.
41	0.80 A.C.
42	1.50 A.C.
43	1.93 A.C.
44	1.53 A.C.
45	1.07 A.C.
46	0.88 A.C.
47	0.36 A.C.
48	1.58 A.C.
49	1.43 A.C.
50	1.37 A.C.
51	2.67 A.C.
52	0.55 A.C.
53	2.27 A.C.
54	1.26 A.C.
55	1.38 A.C.
56	1.52 A.C.
57	1.39 A.C.
58	1.42 A.C.
59	3.17 A.C.
60	0.74 A.C.
61	1.51 A.C.
62	0.65 A.C.
63	0.98 A.C.
64	1.10 A.C.
65	0.44 A.C.
66	1.00 A.C.
67	1.12 A.C.
68	0.70 A.C.
69	1.03 A.C.
70	0.84 A.C.
71	0.82 A.C.
72	1.23 A.C.
73	0.86 A.C.
74	2.00 A.C.
75	1.59 A.C.
76	1.11 A.C.
77	0.47 A.C.
78	1.53 A.C.
79	1.42 A.C.
80	1.32 A.C.
81	1.39 A.C.
82	0.30 A.C.
83	0.54 A.C.
84	0.51 A.C.
85	0.70 A.C.
86	1.09 A.C.
87	2.25 A.C.
88	1.27 A.C.
89	1.31 A.C.
90	1.44 A.C.
91	3.41 A.C.
92	1.88 A.C.
93	0.83 A.C.

NO.	REVISION	DATE

TEMPE MARKETPLACE
PEAK FLOW EXHIBIT

PREPARED FOR
VESTAR DEVELOPMENT COMPANY
2425 E. CAMELBACK ROAD, SUITE 750
PHOENIX, ARIZONA 85016

OPTIMUS
CIVIL DESIGN GROUP

DESIGNED:	AJR,CDU
DRAWN:	JBS
CHECKED:	JDB
DATE:	11/01/04
JOB NO.:	041050

DRAWING NO

FIGURE 4

1 OF 1

REQUIRED RETENTION CALCULATIONS

CITY OF TEMPE 100-YEAR, 1-HOUR STORM
VOMUME REQUIRED = A * D/12 * C
= AREA * (2.40/12) * 0.95

M.C.F.C.D. FIRST FLUSH
VOMUME REQUIRED = A * D/12 * C
= AREA * (0.5/12) * 1.00

AREA A (M.C.F.C.D. FIRST FLUSH)
VOLUME REQUIRED = 4,036,270 * (0.5/12) * 1.00
= 168,178 CF

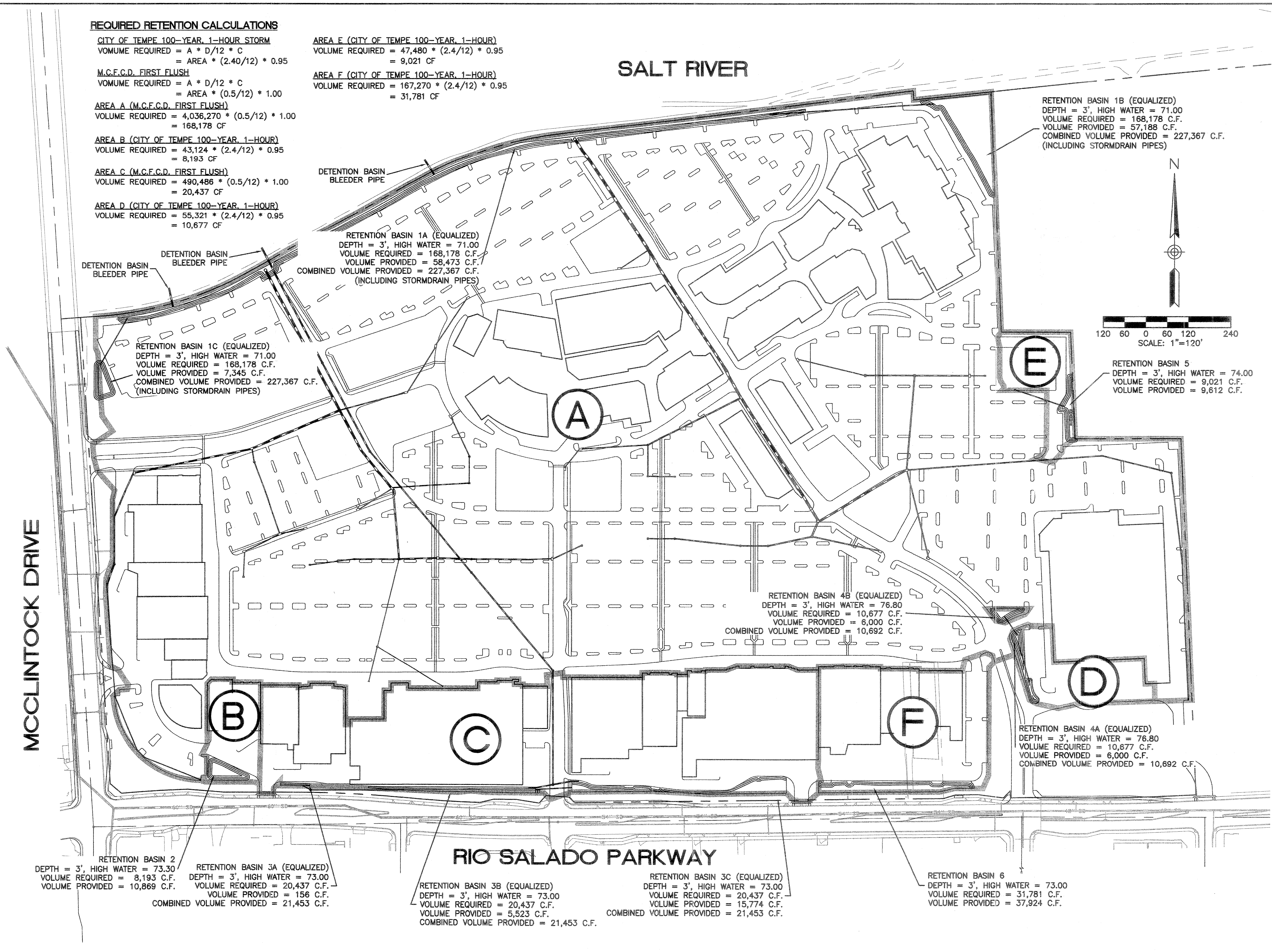
AREA B (CITY OF TEMPE 100-YEAR, 1-HOUR)
VOLUME REQUIRED = 43,124 * (2.4/12) * 0.95
= 8,193 CF

AREA C (M.C.F.C.D. FIRST FLUSH)
VOLUME REQUIRED = 490,486 * (0.5/12) * 1.00
= 20,437 CF

AREA D (CITY OF TEMPE 100-YEAR, 1-HOUR)
VOLUME REQUIRED = 55,321 * (2.4/12) * 0.95
= 10,677 CF

AREA E (CITY OF TEMPE 100-YEAR, 1-HOUR)
VOLUME REQUIRED = 47,480 * (2.4/12) * 0.95
= 9,021 CF

AREA F (CITY OF TEMPE 100-YEAR, 1-HOUR)
VOLUME REQUIRED = 167,270 * (2.4/12) * 0.95
= 31,781 CF



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NO.	REVISION	DATE

TEMPE MARKETPLACE
PROPOSED RETENTION MAP

PREPARED FOR
VESTAR DEVELOPMENT COMPANY
2425 E. CAMELBACK ROAD, SUITE 750
PHOENIX, ARIZONA 85016

OPTIMUS
CIVIL DESIGN GROUP

DESIGNED:	AJR,CDU
DRAWN:	JBS
CHECKED:	JDB
DATE:	07/27/04
JOB NO.:	041050

DRAWING NO

FIGURE 5

1 OF 1

APPENDIX A

Onsite Retention and Infiltration Calculations

PROPOSED RETENTION BASIN SUMMARY

DATE: NOV. '04
DESIGN: AJR
JOB #: 31050
PROJECT: TEMPE MARKETPLACE

V_{REQ} =A*D/12*C

CITY OF TEMPE 100-YEAR, 1-HOUR STORM
WHERE:
C = RUNOFF COEFFICIENT = 0.95
D = 100-YR., 1-HOUR RAINFALL DEPTH = 2.4" IN
A = DRAINAGE AREA IN SQUARE FEET

M.C.F.C.D. FIRST FLUSH
WHERE:
C = RUNOFF COEFFICIENT = 1.00
D = FIRST FLUSH RAINFALL DEPTH = 0.5"
A = DRAINAGE AREA IN SQUARE FEET

V_{PROV} =1/2*H*(A1+A2)
WHERE:
H = BASIN CONTOUR INCREMENT
A1 = LOWER CONTOUR AREA
A2 = UPPER CONTOUR AREA

RETENTION BASIN #1
CONTRIBUTING AREA:A
RETENTION BASIN VOLUME REQUIRED:
M.C.F.C.D. FIRST FLUSH
V_{REQ} =A*D/12*C
= 4,036,270 * 0.5/12 * 1.00
= 168,178 Cu.Ft.

RETENTION BASIN VOLUME PROVIDED:
V_{PROV} = 1/2*H(A1 + A2)

BASIN 1A

Elevation (ft)	Area (sf)	Elevation Increment (ft)	Volume Increment (cf)
1170.5	69640		
		0.50	23817
1170	25628		
		1.00	21466
1169	17304		
		1.00	13190
1168	9076		

VOLUME PROVIDED: 58,473 Cu.Ft.

BASIN 1B

Elevation (ft)	Area (sf)	Elevation Increment (ft)	Volume Increment (cf)
1170.5	24678		
		0.50	12156
1170	23947		
		1.00	23229
1169	22510		
		1.00	21804
1168	21097		

VOLUME PROVIDED: 57,188 Cu.Ft.

BASIN 1C

Elevation (ft)	Area (sf)	Elevation Increment (ft)	Volume Increment (cf)
1170.5	4204		
		0.50	1965
1170	3657		
		1.00	3161
1169	2665		
		1.00	2219
1168	1773		

VOLUME PROVIDED: 7,345 Cu.Ft.

COMBINED VOLUME PROVIDED: 227,367 Cu.Ft.
VOLUME REQUIRED: 168,178 Cu.Ft.

UNDERGROUND STORMDRAIN STORAGE:

1,980 L.F. OF 18" PIPE = 3,497 C.F.
2,275 L.F. OF 24" PIPE = 7,144 C.F.
1,005 L.F. OF 30" PIPE = 4,931 C.F.
1,545 L.F. OF 36" PIPE = 10,915 C.F.
585 L.F. OF 48" PIPE = 7,348 C.F.
831 L.F. OF 60" PIPE = 16,308 C.F.
1,060 L.F. OF 72" PIPE = 29,956 C.F.
285 L.F. OF 78" PIPE = 9,452 C.F.
385 L.F. OF 84" PIPE = 14,809 C.F.

RETENTION BASIN #2
CONTRIBUTING AREA:B
RETENTION BASIN VOLUME REQUIRED:
CITY OF TEMPE 100-YEAR, 1-HOUR STORM
V_{REQ} =A*D/12*C
=43,124 * 2.4/12 * 0.95
= 8,193 Cu.Ft.

RETENTION BASIN VOLUME PROVIDED:
V_{PROV} = 1/2*H(A1 + A2)
BASIN 2

Elevation (ft)	Area (sf)	Elevation Increment (ft)	Volume Increment (cf)
1173.3	6545		
		1.00	5211
1172.3	3876		
		1.00	3337
1171.3	2798		
		1.00	2321
1170.3	1844		

VOLUME PROVIDED: 10,869 Cu.Ft.
VOLUME REQUIRED: 8,193 Cu.Ft.

RETENTION BASIN #4
CONTRIBUTING AREA:D
RETENTION BASIN VOLUME REQUIRED:
CITY OF TEMPE 100-YEAR, 1-HOUR STORM
V_{REQ} =A*D/12*C
=55,321 * 2.4/12 * 0.95
= 10,677 Cu.Ft.

RETENTION BASIN VOLUME PROVIDED:
V_{PROV} = 1/2*H(A1 + A2)

BASIN 4A

Elevation (ft)	Area (sf)	Elevation Increment (ft)	Volume Increment (cf)
1176.8	6843		
		1.00	4378
1175.8	1912		
		1.00	1255
1174.8	597		
		1.00	368
1173.8	138		

VOLUME PROVIDED: 6,000 Cu.Ft.

BASIN 4B

Elevation (ft)	Area (sf)	Elevation Increment (ft)	Volume Increment (cf)
1176.8	2275		
		1.00	2024
1175.8	1772		
		1.00	1547
1174.8	1322		
		1.00	1122
1173.8	921		

VOLUME PROVIDED: 4,692 Cu.Ft.

COMBINED VOLUME PROVIDED: 10,692 Cu.Ft.
VOLUME REQUIRED: 10,677 Cu.Ft.

RETENTION BASIN #5
CONTRIBUTING AREA:E
RETENTION BASIN VOLUME REQUIRED:
CITY OF TEMPE 100-YEAR, 1-HOUR STORM
V_{REQ} =A*D/12*C
=47,480 * 2.4/12 * 0.95
= 9,021 Cu.Ft.

RETENTION BASIN VOLUME PROVIDED:
V_{PROV} = 1/2*H(A1 + A2)
BASIN 5

Elevation (ft)	Area (sf)	Elevation Increment (ft)	Volume Increment (cf)
1174	4613		
		1.00	4120
1173	3627		
		1.00	3176
1172	2724		
		1.00	2316
1171	1908		

VOLUME PROVIDED: 9,612 Cu.Ft.
VOLUME REQUIRED: 9,021 Cu.Ft.

RETENTION BASIN #6
CONTRIBUTING AREA:F
RETENTION BASIN VOLUME REQUIRED:
CITY OF TEMPE 100-YEAR, 1-HOUR STORM
V_{REQ} =A*D/12*C
=167,270 * 2.4/12 * 0.95
= 31,781 Cu.Ft.

RETENTION BASIN VOLUME PROVIDED:
V_{PROV} = 1/2*H(A1 + A2)
BASIN 6

Elevation (ft)	Area (sf)	Elevation Increment (ft)	Volume Increment (cf)
1173	27468		
		1.00	19303
1172	11137		
		1.00	10219
1171	9300		
		1.00	8403
1170	7505		

VOLUME PROVIDED: 37,924 Cu.Ft.
VOLUME REQUIRED: 31,781 Cu.Ft.

APPENDIX B

Onsite Overland Flow System

CURB OPENINGS IN GUTTER DEPRESSION

DATE: NOVEMBER '04
DESIGN: AJR
JOB #: 31050
PROJECT: TEMPE MARKETPLACE

DEPRESSED CURB CAPACITY (PER 3 FOOT OPENING):

$Q_{CAPACITY} = 0.8*CW(L + 1.8W)d^{1.5}$

where:

Q = DISCHARGE RATE (CFS)

C_W = WEIR COEFFICIENT = 2.3

L = CURB OPENING LENGTH (FT) = 3'

W = WIDTH OF GUTTER (FT) = 1.5'

REDUCTION FACTOR = 0.8

d = MAXIMUM PONDING DEPTH (FT) = 0.5'

$Q_{CAPACITY} = 0.8*2.3*(3 + 1.8*1.5)*0.5^{1.5}$

= 3.7 c.f.s. (PER 3' OPENING)

100-YEAR DISCHARGE (RATIONAL METHOD)

$Q_{100} = C*I*A$

where:

Q_{100} = 100-YEAR DISCHARGE (CFS)

C = RUNOFF COEFFICIENT = 0.95

I = 100-YEAR RAINFALL INTENSITY (IN/HR) = 6.7 (ASSUMED 10 MIN Tc)

A = DRAINAGE AREA (ACRES)

CURB OPENING #1

A= 1.00 Ac.

Q_{100}= 6.37 c.f.s.

2 CURB INLETS REQUIRED

CURB OPENING #2

A= 1.12 Ac.

Q_{100}= 7.13 c.f.s.

2 CURB INLETS REQUIRED

CURB OPENING #3

A= 0.70 Ac.

Q_{100}= 4.46 c.f.s.

2 CURB INLETS REQUIRED

CURB OPENING #4

A= 1.03 Ac.

Q_{100}= 6.56 c.f.s.

2 CURB INLETS REQUIRED

CURB OPENING #5

A= 0.84 Ac.

Q_{100}= 5.35 c.f.s.

2 CURB INLETS REQUIRED

CURB OPENING #6

A= 0.82 Ac.

Q_{100}= 5.22 c.f.s.

2 CURB INLETS REQUIRED

CURB OPENING #7
A= 1.23 Ac.
Q_{100}= 7.83 c.f.s.
3 CURB INLETS REQUIRED

CURB OPENING #8
A= 0.86 Ac.
Q_{100}= 5.47 c.f.s.
2 CURB INLETS REQUIRED

CURB OPENING #9
A= 2.00 Ac.
Q_{100}= 12.73 c.f.s.
4 CURB INLETS REQUIRED

CURB OPENING #10
A= 1.59 Ac.
Q_{100}= 10.12 c.f.s.
3 CURB INLETS REQUIRED

CURB OPENING #11
A= 1.11 Ac.
Q_{100}= 7.07 c.f.s.
2 CURB INLETS REQUIRED

CURB OPENING #12
A= 0.47 Ac.
Q_{100}= 2.99 c.f.s.
1 CURB INLET REQUIRED

CURB OPENING #13
A= 1.53 Ac.
Q_{100}= 9.74 c.f.s.
3 CURB INLETS REQUIRED

CURB OPENING #14
A= 1.42 Ac.
Q_{100}= 9.04 c.f.s.
3 CURB INLETS REQUIRED

CURB OPENING #15
A= 1.32 Ac.
Q_{100}= 8.40 c.f.s.
3 CURB INLETS REQUIRED

CURB OPENING #16
A= 1.39 Ac.
Q_{100}= 8.85 c.f.s.
3 CURB INLETS REQUIRED

CURB OPENING #17
A= 0.30 Ac.
Q_{100}= 1.91 c.f.s.
1 CURB INLET REQUIRED

CURB OPENING #18
A= 0.54 Ac.
Q_{100}= 3.44 c.f.s.
1 CURB INLET REQUIRED

CURB OPENING #19
A= 0.51 Ac.
Q_{100}= 3.25 c.f.s.
1 CURB INLET REQUIRED

CURB OPENING #20
A= 0.70 Ac.
Q_{100}= 4.46 c.f.s.
2 CURB INLETS REQUIRED

CURB OPENING #21
A= 0.42 Ac.
Q_{100}= 2.67 c.f.s.
1 CURB INLET REQUIRED

CURB OPENING #22
A= 1.09 Ac.
Q_{100}= 6.94 c.f.s.
2 CURB INLETS REQUIRED

CURB OPENING #23
A= 2.25 Ac.
Q_{100}= 14.32 c.f.s.
4 CURB INLETS REQUIRED

CURB OPENING #24
A= 1.27 Ac.
Q_{100}= 8.08 c.f.s.
3 CURB INLETS REQUIRED

CURB OPENING #25
A= 1.31 Ac.
Q_{100}= 8.34 c.f.s.
3 CURB INLETS REQUIRED

CURB OPENING #26
A= 3.41 Ac.
Q_{100}= 21.70 c.f.s.
6 CURB INLETS REQUIRED

CURB OPENING #27

A= 1.88 Ac.

Q_{100}= 11.97 c.f.s.

4 CURB INLETS REQUIRED

CURB OPENING #28

A= 0.83 Ac.

Q_{100}= 5.28 c.f.s.

2 CURB INLETS REQUIRED

CURB OPENING #29

A= 1.44 Ac.

Q_{100}= 9.17 c.f.s.

3 CURB INLETS REQUIRED

ONSITE CATCH BASIN IN SAG

DATE: NOVEMBER '04
DESIGN: AJR
JOB #: 31050
PROJECT: TEMPE MARKETPLACE

TYPICAL GRATE CATCH BASIN CAPACITY:

$Q_{CAPACITY} = C_F*C_W*P*d^{1.5}$
where:
C_F = REDUCTION FACTOR = 0.5
C_W = WEIR COEFFICIENT = 3
P = GRATE PERIMETER (Ft)
d = MAXIMUM PONDING DEPTH (FT) = 0.67'

SINGLE TYPE "F" CATCH BASIN:
P = 11.67'
$Q_{CAPACITY} = 0.5*3*11.67*.67^{1.5}$ = 9.6 c.f.s.

DOUBLE TYPE "F" CATCH BASIN:
P = 18.33'
$Q_{CAPACITY} = 0.5*3*18.33*.67^{1.5}$ = 15.1 c.f.s.

SINGLE TYPE "H" CATCH BASIN:
P = 9.67'
$Q_{CAPACITY} = 0.5*3*9.67*.67^{1.5}$ = 8.0 c.f.s.

DOUBLE TYPE "H" CATCH BASIN:
P = 13.67'
$Q_{CAPACITY} = 0.5*3*13.67*.67^{1.5}$ = 11.3 c.f.s.

TYPICAL CURB INLET CATCH BASIN CAPACITY:

$Q_{CAPACITY} = 0.8*C_W(L + 1.8W)d^{1.5}$
where:
C_W = WEIR COEFFICIENT = 2.3
L = CURB OPENING LENGTH (FT) = 8'
W = WIDTH OF GUTTER (FT) = 1.5'
REDUCTION FACTOR = 0.8
d = MAXIMUM PONDING DEPTH (FT) = 0.67'

TYPE "C" CATCH BASIN (8' OPENING):
$Q_{CAPACITY} = 0.8*2.3*(8 + 1.8*1.5)*0.67*^{1.5}$ = 10.8 c.f.s.

10-YEAR DISCHARGE (RATIONAL METHOD)

$Q_{10} = C*I*A$

where:
Q_{10} = 10-YEAR DISCHARGE (CFS)
C = RUNOFF COEFFICIENT = 0.9
I = 10-YEAR RAINFALL INTENSITY (IN/HR) = 3.8 (ASSUMED 5 MIN Tc)
A = DRAINAGE AREA (ACRES)

CATCH BASIN #1
A= 0.28 Ac.
Q_{10}= 1.09 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #2
A= 0.80 Ac.
Q_{10}= 3.12 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #3
A= 0.92 Ac.
Q_{10}= 3.58 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #4
A= 2.10 Ac.
Q_{10}= 8.18 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #5
A= 0.69 Ac.
Q_{10}= 2.69 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #6
A= 1.56 Ac.
Q_{10}= 6.08 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #7
A= 1.55 Ac.
Q_{10}= 6.04 c.f.s.
SINGLE TYPE "H" REQUIRED

CATCH BASIN #8
A= 0.54 Ac.
Q_{10}= 2.10 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #9
A= 1.64 Ac.
Q_{10}= 6.39 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #10
A= 0.95 Ac.
Q_{10}= 3.70 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #11
A= 1.89 Ac.
Q_{10}= 7.36 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #12
A= 0.55 Ac.
Q_{10}= 2.14 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #13
A= 0.95 Ac.
Q_{10}= 3.70 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #14
A= 0.35 Ac.
Q_{10}= 1.36 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #15
A= 0.12 Ac.
Q_{10}= 0.47 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #16
A= 0.50 Ac.
Q_{10}= 1.95 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #17
A= 0.80 Ac.
Q_{10}= 3.12 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #18
A= 0.42 Ac.
Q_{10}= 1.64 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #19

$A=$ 0.11 Ac.

$Q_{10}=$ 0.43 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #20

$A=$ 1.18 Ac.

$Q_{10}=$ 4.60 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #21

$A=$ 1.50 Ac.

$Q_{10}=$ 5.84 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #22

$A=$ 0.94 Ac.

$Q_{10}=$ 3.66 c.f.s.

SINGLE TYPE "H" REQUIRED

CATCH BASIN #23

$A=$ 0.69 Ac.

$Q_{10}=$ 2.69 c.f.s.

SINGLE TYPE "H" REQUIRED

CATCH BASIN #24

$A=$ 1.42 Ac.

$Q_{10}=$ 5.53 c.f.s.

SINGLE TYPE "H" REQUIRED

CATCH BASIN #25

$A=$ 0.20 Ac.

$Q_{10}=$ 0.78 c.f.s.

SINGLE TYPE "H" REQUIRED

CATCH BASIN #26

$A=$ 0.40 Ac.

$Q_{10}=$ 1.56 c.f.s.

SINGLE TYPE "H" REQUIRED

CATCH BASIN #27

$A=$ 0.44 Ac.

$Q_{10}=$ 1.71 c.f.s.

SINGLE TYPE "H" REQUIRED

CATCH BASIN #28

$A=$ 0.21 Ac.

$Q_{10}=$ 0.82 c.f.s.

SINGLE TYPE "H" REQUIRED

CATCH BASIN #29

$A=$ 0.98 Ac.

$Q_{10}=$ 3.82 c.f.s.

SINGLE TYPE "F" REQUIRED

CATCH BASIN #30

$A=$ 1.05 Ac.

$Q_{10}=$ 4.09 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #31

$A=$ 0.16 Ac.

$Q_{10}=$ 0.62 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #32

$A=$ 0.64 Ac.

$Q_{10}=$ 2.49 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #33

$A=$ 0.70 Ac.

$Q_{10}=$ 2.73 c.f.s.

SINGLE TYPE "F" REQUIRED

CATCH BASIN #34

$A=$ 0.10 Ac.

$Q_{10}=$ 0.39 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #35

$A=$ 0.40 Ac.

$Q_{10}=$ 1.56 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #36

$A=$ 0.08 Ac.

$Q_{10}=$ 0.31 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #37
A= 1.74 Ac.
Q_{10}= 6.78 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #38
A= 0.80 Ac.
Q_{10}= 3.12 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #39
A= 1.50 Ac.
Q_{10}= 5.84 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #40
A= 1.93 Ac.
Q_{10}= 7.52 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #41
A= 1.53 Ac.
Q_{10}= 5.96 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #42
A= 1.07 Ac.
Q_{10}= 4.17 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #43
A= 0.88 Ac.
Q_{10}= 3.43 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #44
A= 0.36 Ac.
Q_{10}= 1.40 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #45
A= 1.58 Ac.
Q_{10}= 6.15 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #46
A= 1.43 Ac.
Q_{10}= 5.57 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #47
A= 1.37 Ac.
Q_{10}= 5.34 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #48
A= 2.67 Ac.
Q_{10}= 10.40 c.f.s.
DOUBLE TYPE "F" REQUIRED

CATCH BASIN #49
A= 0.55 Ac.
Q_{10}= 2.14 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #50
A= 2.27 Ac.
Q_{10}= 8.84 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #51
A= 1.26 Ac.
Q_{10}= 4.91 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #52
A= 1.38 Ac.
Q_{10}= 5.38 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #53
A= 1.52 Ac.
Q_{10}= 5.92 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #54
A= 1.39 Ac.
Q_{10}= 5.41 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #55
A= 1.42 Ac.
Q_{10}= 5.53 c.f.s.
SINGLE TYPE "F" REQUIRED

CATCH BASIN #56
A= 3.17 Ac.
Q_{10}= 12.35 c.f.s.
SINGLE TYPE "C" REQUIRED

CATCH BASIN #57

A= 0.65 Ac.

Q_{10}= 2.53 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #58

A= 0.98 Ac.

Q_{10}= 3.82 c.f.s.

SINGLE TYPE "C" REQUIRED

CATCH BASIN #59

A= 0.74 Ac.

Q_{10}= 2.88 c.f.s.

SINGLE TYPE "F" REQUIRED

CATCH BASIN #60

A= 1.51 Ac.

Q_{10}= 5.88 c.f.s.

SINGLE TYPE "F" REQUIRED

CATCH BASIN #61

A= 1.10 Ac.

Q_{10}= 4.28 c.f.s.

SINGLE TYPE "C" REQUIRED

FIRST FLUSH BASIN OVERFLOW CATCH BASIN

DATE: NOVEMBER '04
DESIGN: AJR
JOB #: 31050
PROJECT: TEMPE MARKETPLACE

TYPICAL GRATE CATCH BASIN CAPACITY:

$Q_{CAPACITY} = C_F*C_W*P*d^{1.5}$
where:
C_F = REDUCTION FACTOR = 0.5 (FOR GRATED ONLY)
C_W = WEIR COEFFICIENT = 3
P = GRATE PERIMETER (Ft)
d = MAXIMUM PONDING DEPTH (FT) = 0.5'

FOUR TYPE "F" CATCH BASINS:
P = 32.33'
$Q_{CAPACITY} = 0.5*3*32.33*0.5^{1.5}$ = 17.1 c.f.s.

OPEN RECTANGULAR INLET STRUCTURE
P = 125.0'
$Q_{CAPACITY} = 0.5*3*125.0*0.5^{1.5}$ = 133 c.f.s.

100-YEAR POST FIRST FLUSH DISCHARGE (RATIONAL METHOD)

$Q_{100} = C*I*A$

where:
Q_{100} = 100-YEAR DISCHARGE (CFS)
C = RUNOFF COEFFICIENT = 1.0 (MARICOPA COUNTY FLOOD CONTROL DISTRICT)
I = 100-YEAR RAINFALL INTENSITY (IN/HR) = 2.8 (50 MIN Tc, SEE ATTACHED CALCULATIONS)
A = DRAINAGE AREA (ACRES)

CATCH BASIN #62
A= 5.63 Ac.
Q_{10}= 16 c.f.s.
16 C.F.S. < 17.1, THEREFORE O.K.

CATCH BASIN #63
A= 5.63 Ac.
Q_{10}= 16 c.f.s.
16 C.F.S. < 17.1, THEREFORE O.K.

CATCH BASIN #64
A= 46.33 Ac.
Q_{10}= 130 c.f.s.
130 C.F.S. < 133, THEREFORE O.K.

CATCH BASIN #65
A= 46.33 Ac.
Q_{10}= 130 c.f.s.
130 C.F.S. < 133, THEREFORE O.K.

APPENDIX C

Onsite Storm Drain System Calculations

STORM DRAIN SYSTEM (LINE-A)

PIPE SECTION	CONTRIBUTING BASIN AREAS	Q10 CUMULATIVE (CFS)	LENGTH OF PIPE (FT)	SIZE OF PIPE (IN)	FLOW VELOCITY (FT/SEC)	NUMBER OF PIPES	Sf (FT/S)	Hf (FT)	JUNCTION LOSS (FT)	HGL (FT)	CATCH BASIN ELEVATION (FT)
L-A37	34	2.73	69	18	1.54	1	0.0007	0.05	0.019	73.52	73.00
L-A36	33,34	5.22	112	18	2.96	1	0.0025	0.28	0.068	73.45	73.40
L-A35	31-34	9.93	217	24	3.16	1	0.0019	0.42	0.078	73.11	72.15
L-A34	30-34	13.75	44	24	4.38	1	0.0037	0.16	0.149	72.61	71.75
L-A33	29	0.82	177	18	0.46	1	0.0001	0.01	0.002	73.09	72.95
L-A32	28,29	2.53	24	18	1.43	1	0.0006	0.01	0.016	73.08	73.00
L-A31	27-29	4.09	165	18	2.32	1	0.0015	0.25	0.042	73.05	73.00
L-A30	26-29	4.87	151	18	2.76	1	0.0022	0.32	0.059	72.75	73.00
L-A29	25-29	10.40	151	24	3.31	1	0.0021	0.32	0.085	72.37	71.70
L-A28	24-29	13.09	65	36	1.85	1	0.0004	0.03	0.027	71.97	71.30
L-A27	24-29	13.09	128	36	1.85	1	0.0004	0.05	0.027	71.91	72.05
L-A26	23-29	16.75	139	36	2.37	1	0.0006	0.09	0.044	71.84	71.00
L-A25	22-29	22.59	338	48	1.80	1	0.0002	0.08	0.025	71.71	71.40
L-A24	21-34	40.94	272	60	2.09	1	0.0002	0.07	0.034	71.60	72.05
L-A23	20	0.43	163	18	0.24	1	0.0000	0.00	0.000	71.69	73.30
L-A22	19,20	2.06	156	18	1.17	1	0.0004	0.06	0.011	71.69	73.30
L-A21	18-20	5.18	195	24	1.65	1	0.0005	0.10	0.021	71.62	73.10
L-A20	17	1.95	13	18	1.10	1	0.0003	0.00	0.009	71.85	72.10
L-A19	16,17	2.41	112	18	1.37	1	0.0005	0.06	0.015	71.84	72.75
L-A18	15	1.36	125	18	0.77	1	0.0002	0.02	0.005	72.30	73.10
L-A17	14,15	5.06	79	18	2.87	1	0.0023	0.18	0.064	72.28	72.70
L-A16	13-15	7.21	219	24	2.29	1	0.0010	0.22	0.041	72.03	72.75
L-A15	12	7.36	127	24	2.34	1	0.0011	0.13	0.043	72.35	71.60
L-A14	11,12	11.06	126	30	2.25	1	0.0007	0.09	0.039	72.17	71.52
L-A13	10	6.39	92	24	2.03	1	0.0008	0.07	0.032	72.78	72.65
L-A12	9,10	8.49	70	24	2.70	1	0.0014	0.10	0.057	72.68	73.00
L-A11	8-10	14.53	158	36	2.06	1	0.0005	0.08	0.033	72.52	71.93
L-A10	7-10	20.60	95	36	2.92	1	0.0010	0.09	0.066	72.41	71.50
L-A9	6-10	23.29	110	36	3.30	1	0.0012	0.13	0.084	72.26	71.63
L-A8	32	0.62	74	18	0.35	1	0.0000	0.00	0.001	72.15	72.75
L-A7	5	0.97	99	12	1.24	1	0.0007	0.07	0.012	72.33	F.F.E. 78.00
L-A6	5	0.97	253	12	1.24	1	0.0007	0.19	0.012	72.24	76.05
L-A5	4-12	43.51	196	48	3.46	1	0.0009	0.18	0.093	72.04	71.05
L-A4	3-17	56.71	146	60	2.89	1	0.0005	0.07	0.065	71.77	72.20
L-A3	2-17	59.09	124	60	3.01	1	0.0005	0.06	0.070	71.63	73.00
L-A2	2-34	105.20	109	72	3.72	1	0.0006	0.07	0.108	71.50	74.65
L-A1	1-34	106.29	336	72	3.76	1	0.0006	0.21	0.110	71.32	73.70

TAIL WATER ELEVATION DURING THE 100 YEAR EVENT = 71.00

DESIGNER: AJR LOCATION: TEMPE MARKETPLACE

DESIGN EVENT: 10 YEAR DESIGN ASSUMPTIONS: Tc - 10 MINUTES (MINIMUM)

STORM DRAIN SYSTEM (LINE-B)

PIPE SECTION	CONTRIBUTING BASIN AREAS	Q10 CUMULATIVE (CFS)	LENGTH OF PIPE (FT)	SIZE OF PIPE (IN)	FLOW VELOCITY (FT/SEC)	NUMBER OF PIPES	Sf (FT/S)	Hf (FT)	JUNCTION LOSS (FT)	HGL (FT)	CATCH BASIN ELEVATION (FT)
L-B31	64	4.28	98	18	2.43	1	0.0017	0.16	0.046	71.61	73.10
L-B30	61	5.88	78	24	1.87	1	0.0007	0.05	0.027	73.02	72.25
L-B29	60,61	8.76	92	24	2.79	1	0.0015	0.14	0.060	72.94	72.50
L-B28	63	3.82	73	18	2.16	1	0.0013	0.10	0.036	73.06	72.40
L-B27	62,63	6.35	190	24	2.02	1	0.0008	0.15	0.032	72.92	72.45
L-B26	60-63	15.11	297	36	2.14	1	0.0005	0.15	0.036	72.74	73.75
L-B25	59	12.35	196	30	2.52	1	0.0009	0.18	0.049	73.28	72.30
L-B24	58	5.53	78	24	1.76	1	0.0006	0.05	0.024	73.62	72.65
L-B23	57,58	10.94	187	30	2.23	1	0.0007	0.13	0.039	73.55	72.55
L-B22	56-58	11.45	78	30	2.33	1	0.0008	0.06	0.042	73.38	72.75
L-B21	55-58	22.24	126	36	3.15	1	0.0011	0.14	0.077	73.27	72.80
L-B20	54-59	39.50	47	48	3.14	1	0.0008	0.04	0.077	73.06	72.75
L-B19	53	8.84	252	24	2.82	1	0.0015	0.39	0.062	73.67	73.20
L-B18	52	2.14	194	18	1.21	1	0.0004	0.08	0.011	73.55	73.45
L-B17	51,52	12.54	140	30	2.56	1	0.0009	0.13	0.051	73.46	72.50
L-B16	50	5.34	43	18	3.02	1	0.0026	0.11	0.071	73.52	72.55
L-B15	49,50	10.91	155	36	1.54	1	0.0003	0.04	0.019	73.34	72.50
L-B14	48-52	8.30	270	36	1.17	1	0.0002	0.04	0.011	73.28	72.30
L-B13	47	1.40	176	18	0.79	1	0.0002	0.03	0.005	79.45	78.70
L-B12	46,47	4.83	103	18	2.73	1	0.0021	0.22	0.058	79.42	78.50
L-B11	45-47	9.00	103	18	5.09	1	0.0073	0.76	0.201	79.14	78.50
L-B10	44-47	14.96	253	24	4.76	1	0.0044	1.11	0.176	78.18	78.50
L-B9	43-47	22.47	203	30	4.58	1	0.0030	0.61	0.163	76.90	77.70
L-B8	42-47	28.32	554	30	5.77	1	0.0048	2.64	0.259	76.13	75.40
L-B7	42-53	66.76	290	60	3.40	1	0.0007	0.19	0.090	73.23	73.55
L-B6	41-59	109.37	413	72	3.87	1	0.0007	0.28	0.116	72.94	72.50
L-B5	40-63	131.26	115	72	4.64	1	0.0010	0.11	0.167	72.55	72.50
L-B4	39-63	131.57	89	72	4.66	1	0.0010	0.09	0.168	72.27	74.20
L-B3	36-63	159.31	134	78	4.80	1	0.0009	0.12	0.179	72.02	73.70
L-B2	35-63	159.70	152	78	4.81	1	0.0009	0.14	0.180	71.72	74.20
L-B1	35-64	163.98	387	84	4.26	1	0.0007	0.26	0.141	71.40	74.50

TAIL WATER ELEVATION DURING THE 100 YEAR EVENT = 71.00

DESIGNER: AJR LOCATION: TEMPE MARKETPLACE

DESIGN EVENT: 10 YEAR DESIGN ASSUMPTIONS: Tc - 10 MINUTES (MINIMUM)

STORM DRAIN SYSTEM (LINE-C)

PIPE SECTION	CONTRIBUTING BASIN AREAS	Q10 CUMULATIVE (CFS)	LENGTH OF PIPE (FT)	SIZE OF PIPE (IN)	FLOW VELOCITY (FT/SEC)	NUMBER OF PIPES	Sf (FT/S)	Hf (FT)	JUNCTION LOSS (FT)	HGL (FT)	CATCH BASIN ELEVATION (FT)
L-C1	65	1.71	150	18	0.97	1	0.0003	0.04	0.007	74.05	N/A STUB

TAIL WATER ELEVATION DURING THE 100 YEAR EVENT = 74.00

DESIGNER: AJR LOCATION: TEMPE MARKETPLACE

DESIGN EVENT: 10 YEAR DESIGN ASSUMPTIONS: Tc - 10 MINUTES (MINIMUM)

STORM DRAIN SYSTEM (LINE-D)

PIPE SECTION	CONTRIBUTING BASIN AREAS	Q10 CUMULATIVE (CFS)	LENGTH OF PIPE (FT)	SIZE OF PIPE (IN)	FLOW VELOCITY (FT/SEC)	NUMBER OF PIPES	Sf (FT/S)	Hf (FT)	JUNCTION LOSS (FT)	HGL (FT)	CATCH BASIN ELEVATION (FT)
L-D7	1/2 DRAINAGE AREA C	15.77	57	36	2.23	1	0.0006	0.03	0.039	72.85	HWSEL 73.00
L-D6	1/2 DRAINAGE AREA C	15.77	52	36	2.23	1	0.0006	0.03	0.039	72.85	HWSEL 73.00
L-D5	DRAINAGE AREA C	31.53	318	36	4.46	1	0.0022	0.71	0.155	72.78	72.50
L-D4	DRAINAGE AREA C	31.53	455	36	4.46	1	0.0022	1.02	0.155	71.91	72.40
L-D3	DRAINAGE AREA C	31.53	350	36	4.46	1	0.0022	0.78	0.155	70.74	72.45
L-D2	DRAINAGE AREA C	31.53	284	42	3.28	1	0.0010	0.28	0.083	69.80	73.75
L-D1	DRAINAGE AREA C	31.53	362	42	3.28	1	0.0010	0.36	0.083	69.44	72.30

TAIL WATER ELEVATION DURING THE 100 YEAR EVENT = 69.00

DESIGNER: AJR LOCATION: TEMPE MARKETPLACE

DESIGN EVENT: 100 YEAR (POST FIRST FLUSH) DESIGN ASSUMPTIONS: Tc - 10 MINUTES (MINIMUM)

STORM DRAIN SYSTEM (LINE-E)

PIPE SECTION	CONTRIBUTING BASIN AREAS	Q10 CUMULATIVE (CFS)	LENGTH OF PIPE (FT)	SIZE OF PIPE (IN)	FLOW VELOCITY (FT/SEC)	NUMBER OF PIPES	Sf (FT/S)	Hf (FT)	JUNCTION LOSS (FT)	HGL (FT)	CATCH BASIN ELEVATION (FT)
L-E	1/2 DRAINAGE AREA A	130.00	64	48	10.35	1	0.0082	0.52	0.832	70.26	HWSEL 71.00

TAIL WATER ELEVATION DURING THE 100 YEAR EVENT = 68.90

DESIGNER: AJR LOCATION: TEMPE MARKETPLACE

DESIGN EVENT: 100 YEAR (POST FIRST FLUSH) DESIGN ASSUMPTIONS: Tc - 10 MINUTES (MINIMUM)

STORM DRAIN SYSTEM (LINE-F)

PIPE SECTION	CONTRIBUTING BASIN AREAS	Q10 CUMULATIVE (CFS)	LENGTH OF PIPE (FT)	SIZE OF PIPE (IN)	FLOW VELOCITY (FT/SEC)	NUMBER OF PIPES	Sf (FT/S)	Hf (FT)	JUNCTION LOSS (FT)	HGL (FT)	CATCH BASIN ELEVATION (FT)
L-F	1/2 DRAINAGE AREA A	130.00	61	48	10.35	1	0.0082	0.50	0.832	70.84	HWSEL 71.00

TAIL WATER ELEVATION DURING THE 100 YEAR EVENT = 69.50

DESIGNER: AJR

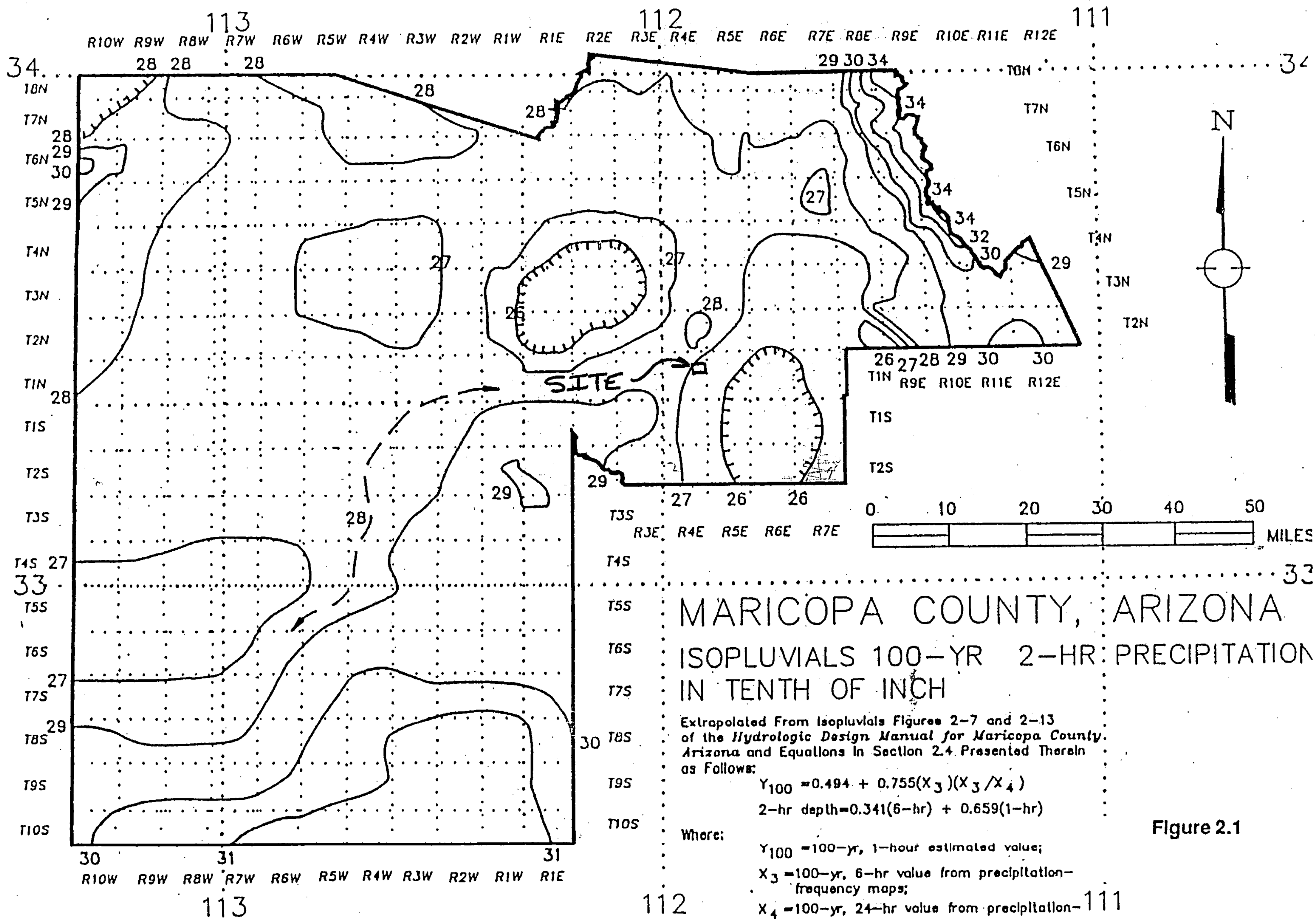
LOCATION: TEMPE MARKETPLACE

DESIGN EVENT: 100 YEAR (POST FIRST FLUSH)

DESIGN ASSUMPTIONS: Tc - 10 MINUTES (MINIMUM)

APPENDIX D

M.C.F.C.D. First Flush Hydrology Documentation



MARICOPA COUNTY, ARIZONA

ISOPLUVIALS 100-YR 2-HR PRECIPITATION IN TENTH OF INCH

Extrapolated From Isopluvials Figures 2-7 and 2-13 of the *Hydrologic Design Manual for Maricopa County, Arizona* and Equations in Section 2.4 Presented Therein as Follows:

$$Y_{100} = 0.494 + 0.755(X_3)(X_3/X_4)$$

$$\text{2-hr depth} = 0.341(\text{6-hr}) + 0.659(\text{1-hr})$$

Where:

Y_{100} = 100-yr, 1-hour estimated value;

X_3 = 100-yr, 6-hr value from precipitation-frequency maps;

X_4 = 100-yr, 24-hr value from precipitation-frequency maps;

6-hr = isopluvial values from figure 2.7;

1-hr = Y_{100} value as computed above.

Figure 2.1

2. Calculate the point rainfall depth, or the areally-averaged point rainfall depth, from Figures 2.2 through 2.7 depending on the desired rainfall frequency.

3. Use either Figure 2.14 or Table 2.2 to determine the depth-area reduction factor.

4. Multiply the point rainfall depth by the appropriate depth-area reduction factor. This is the equivalent uniform depth of rainfall that is to be applied to the entire watershed.

2.4 Design Storm Distributions

According to Table 2.1, three types of design storm distributions are to be used in Maricopa County. This Manual contains information for two of those design storm distributions; the 2-hour storm for the design of retention/detention basins, and the 6-hour local storm. Information for the SCS Type II 24-hour storm has been encoded in the MCUHP programs. Otherwise data regarding the SCS 24-hour storm is generally available elsewhere. Distributions for other general storms for larger watersheds will need to be developed on a case-by-case basis based on appropriate meteorologic and hydrologic factors.

2.4.1 2-hour Storm Distribution

The 2-hour storm distribution is to be used for the design of retention/detention basins (see Table 2.1). The 2-hour distribution shown in Figure 2.15 and Table 2.3 is a dimensionless form of the 2-hour hypothetical distribution for the Phoenix Sky Harbor Airport location. This distribution can be applied throughout Maricopa County for the design of retention/detention facilities.

Table 2.3
2-Hour Storm Distribution for Retention Design

Time (minutes)	% Rainfall Depth	Time (minutes)	% Rainfall Depth
0	0.0		
5	1.1	65	60.1
10	1.8	70	74.3
15	2.3	75	86.3
20	2.8	80	90.1
25	3.2	85	93.0
30	4.6	90	95.4
35	7.1	95	96.2
40	10.0	100	97.0
45	13.7	105	97.7
50	17.6	110	98.2
55	23.2	115	99.2
60	32.7	120	100.0

18.5% →
T_c = 50 min.

First flush depth = 0.5"
100-YR, 2-HR STORM depth = 2.7"
First flush depth % of 100-year depth = 0.5"/2.7" = 18.5%

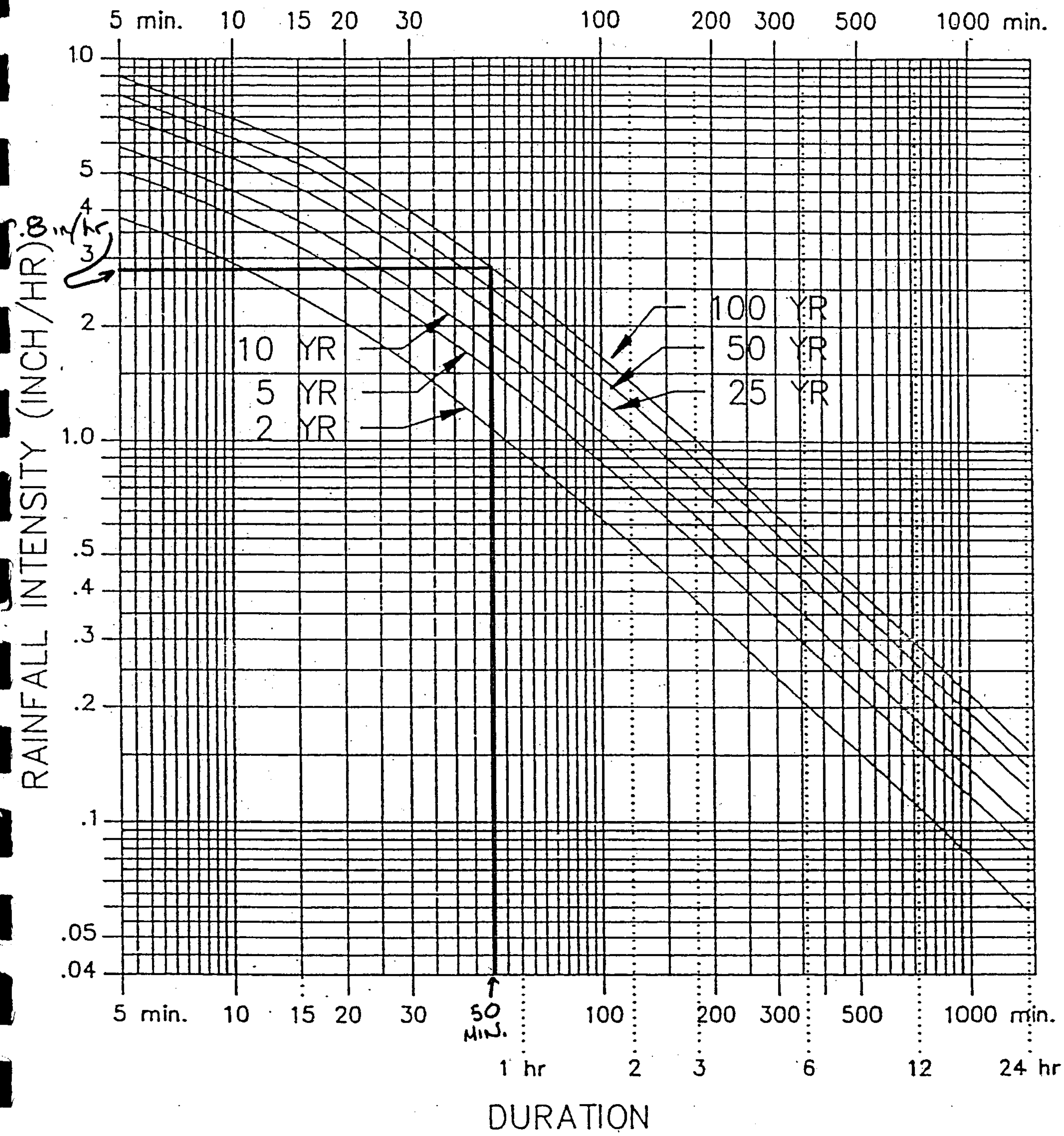


Figure 3.2
Rainfall Intensity-Duration-Frequency Relation
(Phoenix Metro Area)

APPENDIX E

Arizona Department of Environmental Quality Letter

Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.adeq.state.az.us

Stephen A. Owens
Director

March 9, 2004

Ms. Karen Gaylord
Salmon, Lewis & Weldon, PLC
2855 E Camelback Rd, Suite 200
Phoenix, AZ 85016

Re: Permit Determination for Phase I of the Tempe Brownfield Remediation and Redevelopment Project

Dear Ms. Gaylord:

We have considered the permitting issues for the Tempe Brownfield Remediation and Redevelopment Project described in your letter of March 3, 2004. You requested a determination from the Department about the applicability of Aquifer Protection Program (APP) and Arizona Pollutant Discharge Elimination System (AZPDES) permitting requirements for post-construction stormwater discharges associated with this site.

Your letter described the plan to construct a retention basin that will collect stormwater runoff from retail and commercial building space and associated parking areas at the site. During a large storm event, overflow from the retention basin to the Salt River may occur. The Department has determined that neither the seepage from the retention basin nor the overflow from the basin to the Salt River are subject to AZPDES or APP permitting requirements.

Thank you for bringing this matter to our attention.

Sincerely,

Michele Robertson

Michele Robertson
Water Permits Section Manager

Cc: Phil Lagas, Brown and Caldwell
Chris Varga, Surface Water Permits Unit Manager
Jim DuBois, Senior Hydrologist

AU04:0006