Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

2600 PROSPECT N.E. - ALBUQUERQUE, N.M. 87107
TELEPHONE (505) 884-2215

February 23, 1999

Kim Kemper, P.E.
Kemper-Vaughan
3700 Coors Road NW
Albuquerque, NM 87120

RE: DEL PASEO BUSINESS PARK (ZAP D16). ENGINEER'S STAMP DATED FEBRUARY 1, 1999.

Dear Mr. Kemper:

Based on the information provided on your February 3, 1993 submittal, the above referenced project is acceptable.

If I can be of further assistance, please call me at 884-2215

Sincerely,
AMAFCA

Lisa Ann Manwill, P.E.
Development Review Engineer

c: File

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

February 22, 1999

Kim Kemper, P.E.
Kemper-Vaughan
3700 Coors Road NW
Albuquerque, NM 87120

RE: DEL PASEO BUSINESS PARK (D16-D7). GRADING AND DRAINAGE PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED FEBRUARY 1, 1999.

Dear Mr. Kemper:

Based on the information provided on your February 3,1999 submittal, the above referenced project is approved for Building Permit.

Add the executed signature block by AMAFCA to this approved plan and attach the plan to the construction sets prior to sign-off by Hydrology.

Prior to Certificate of Occupancy approval, an Engineer's Certification per the DPM will be required.

If I can be of further assistance, please feel free to contact me at 924-3984.

Sincerely,

John P. Murray, P.E.
Hydrology

c: Andrew Garcia
File

DEL PASEO BUSINESS PARK

GRADING PLAN & DRAINAGE REPORT

February 1999

Prepared for:

K_2M Ltd. Company.

11500 Carmel N.E.

Albuquerque, New Mexico 87122

Prepared by:

KEMPER-VAUGHAN CONSULTING ENGINEERS

3700 Coors Road NW

Albuquerque, New Mexico 87120

PROJECT OVERVIEW

The site is located is located approximately 800 ft. south of Paseo Del Norte immediate east of the North Diversion Channel right-of-way. As shown on FIRM Panel 136, the site is not within a designated 100-yr flood hazard area. The site contains 2.56 acres in total. The property is currently has two (2) structures and a trailer which are scheduled to be removed. The lot has generally been used to store construction materials & equipment. The proposed site improvements include the construction of three (3) new office/warehouse buildings and related parking and landscaping.

LEGAL DESCRIPTION

Lot B of the lands of Kuidis, Bernalillo County, New Mexico, as the same is shown and designated on the replat filed in the office of the County Clerk, Bernalillo County, New Mexico on February 19, 1986, in map Bk. C29, Folio 134.

DRAINAGE PLAN

In its current state drainage "sheet flows" overland and enters the existing side channel immediately adjacent to the AMAFCA North Diversion Channel. Storm waters then flow both north and south to existing side inlets of the Diversion Channel. The planned improvements include collecting site storm waters in concrete inlets and piping runoff beneath the access road through the side of the side channel. Erosion control improvements are proposed within the side channel as shown on sheet C2 of the grading plan.

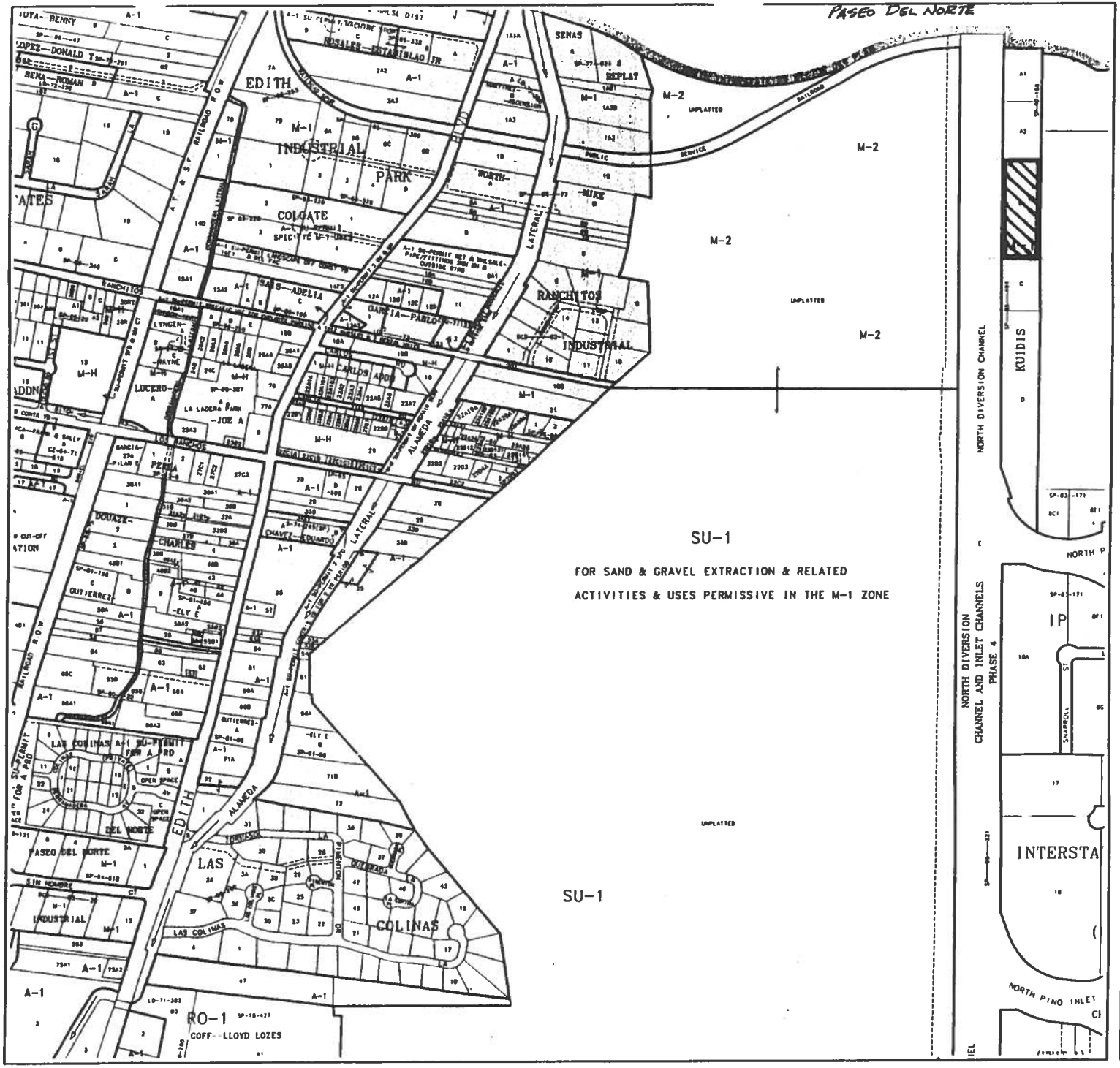
No offsite flows enter the subject site. Most are captured by PNM ponding facilities and the balance generally flow north. The property north of the subject parcel is current developed. An approved grading and drainage plan for that site is on file at the City offices, File D16-004.

The site was defined into six (6) separate basins. Graphic delineation of those basins is attached. Subsurface conduits were designed to convey waters internal to the site as well as to the AMAFCA channel. All areas within the proposed development (five of the defined basins) will be collected and piped to the side channel. The existing access road currently has a slight super elevation and "sheet flows" directly into the side channel. This condition will remain unchanged.

The site information shown on the grading plans was prepared from a field survey performed by Rio Grande Surveying Co., Inc. in January of 1999. A subsequent field inspection by this office revealed that the data shown is consistent with the actual conditions and that no grading of filling has been done.

Attachments to this plan include the following:

1. Copy of Zone Atlas D-16-Z
2. Copy of FIRM panel 136
3. Sub-basin delineation drawing
4. Basin A-1 Drainage Calculations
5. Basin A-2 Drainage Calculations
6. Basin B Drainage Calculations
7. Basin C Drainage Calculations
8. Basin D Drainage Calculations
9. Roadway Drainage Calculations
10. Rating Curve Computations for onsite constructed swales
11. Performance Curves for Culvert Designs.
12. Grading Plans – Sheets C1 and C2



CITY OF
Albuquerque

A Albuquerque G Geographic I Information S System

PLANNING DEPARTMENT

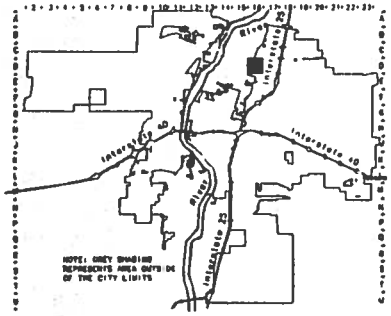
N

W E

S

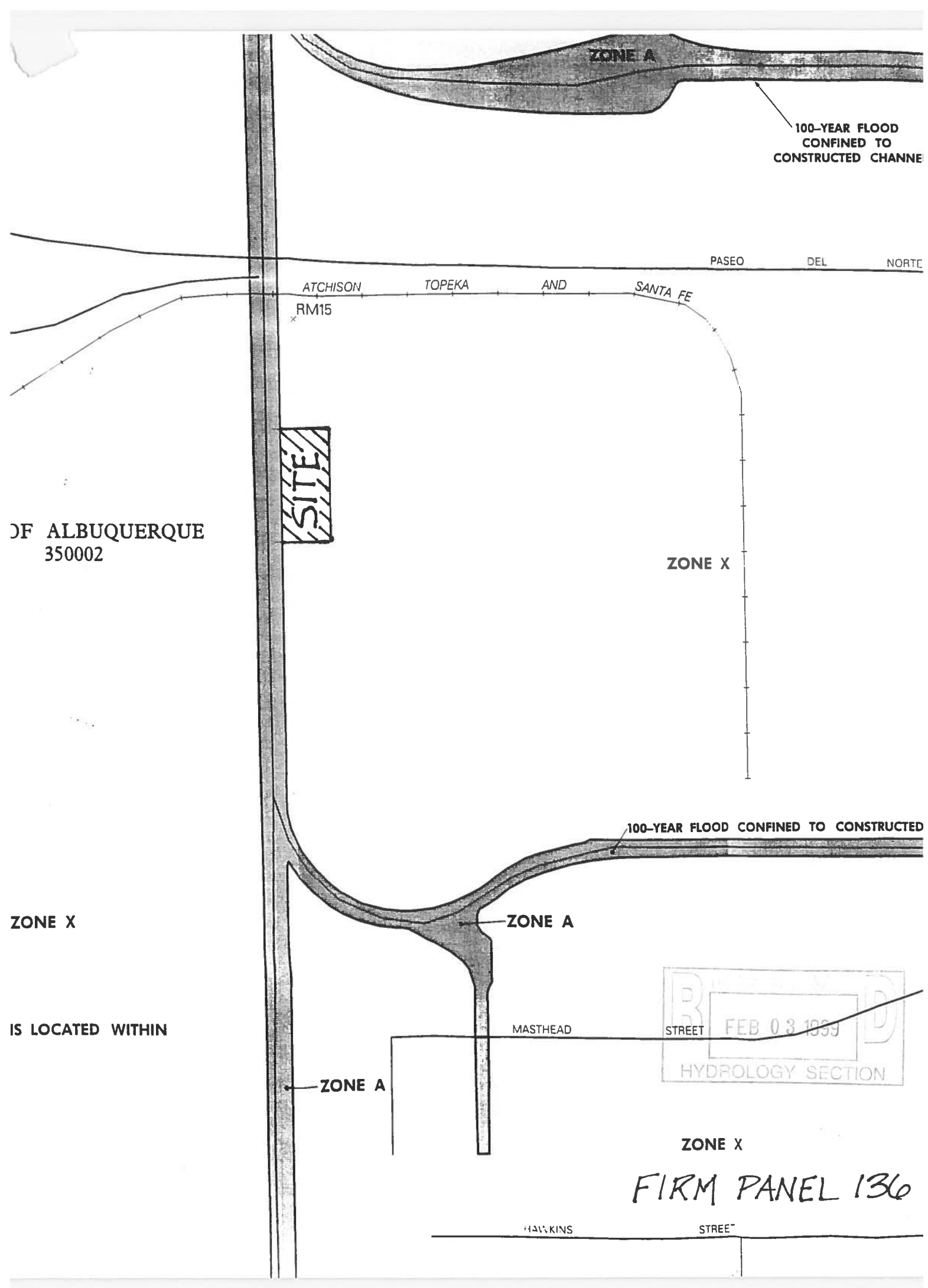
GRAPHIC SCALE IN FEET

250 0 500 1000



Zone Atlas Page
D-16-Z

Map Amended through
February 26, 1998



OF ALBUQUERQUE
350002

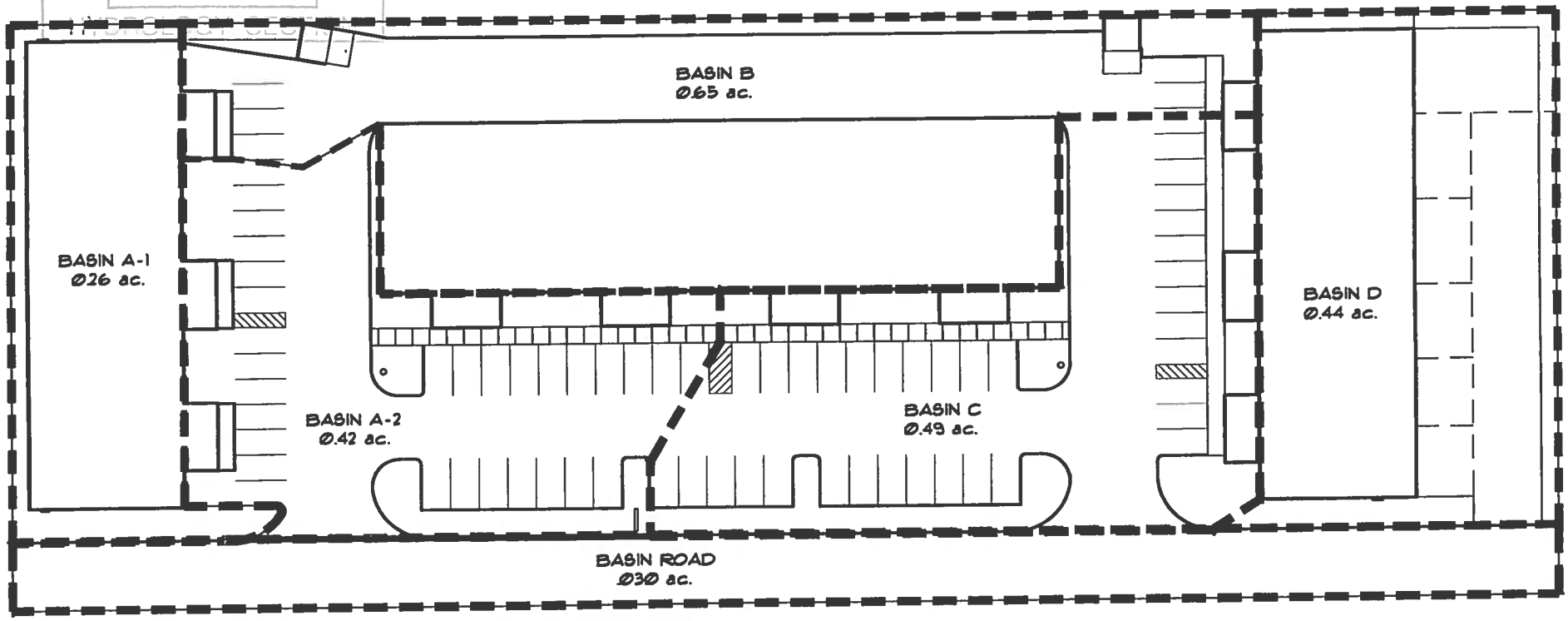
ZONE X

IS LOCATED WITHIN

FIRM PANEL 136

SUB-BASINS INTERNAL TO THE SITE AS PROVIDED IN ATTACH CALCULATIONS

NO SCALE



BASIN A-1 AREA = 0.26 ac.

DRAINAGE ZONE 2
PRECIPITATION: 360 = 2.35 in.
1140 = 2.75 in.
10day = 3.95 in.

	EXCESS PRECIPITATION:	PEAK DISCHARGE:	
TREATMENT A	0.53 in.	1.56	cfs/ac.
TREATMENT B	0.78 in.	2.28	cfs/ac.
TREATMENT C	1.13 in.	3.14	cfs/ac.
TREATMENT D	2.12 in.	4.70	cfs/ac.

EXISTING CONDITIONS:	AREA	PROPOSED CONDITIONS: AREA
TREATMENT A	0 ac.	0 ac.
TREATMENT B	0 ac.	0.04 ac.
TREATMENT C	0.26 ac.	0 ac.
TREATMENT D	0 ac.	0.22 ac.

EXISTING EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.00)+(1.13)x(0.26)+(2.12)x(0.00)/ 0.26 ac.
= 1.13 in.
V100-360 = (1.13)x(0.26)/ 12 = 0.024483 ac-ft = 1066 cf

EXISTING PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.00)+(3.14)x(0.26)+(4.70)x(0.00)= 0.82 cfs

PROPOSED EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.04)+(1.13)x(0.00)+(2.12)x(0.22)/ 0.26 ac.
= 1.91 in.
V100-360 = (1.91)x(0.26)/ 12.0 = 0.041467 ac-ft = 1806 cf

V100-1440 = (0.04)+(0.22)x(2.75 - 2.35)/ 12 = 0.048800 ac-ft = 2126 cf

V100-10day = (0.04)+(0.22)x(3.95 - 2.35)/ 12 = 0.070800 ac-ft = 3084 cf

PROPOSED PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.04)+(3.14)x(0.00)+(4.70)x(0.22)= 1.13 cfs

BASIN A-2 AREA = 0.42 ac.

DRAINAGE ZONE 2
PRECIPITATION: 360 = 2.35 in.
1140 = 2.75 in.
10day = 3.95 in.

	EXCESS PRECIPITATION:	PEAK DISCHARGE:	
TREATMENT A	0.53 in.	1.56	cfs/ac.
TREATMENT B	0.78 in.	2.28	cfs/ac.
TREATMENT C	1.13 in.	3.14	cfs/ac.
TREATMENT D	2.12 in.	4.70	cfs/ac.

EXISTING CONDITIONS:	AREA	PROPOSED CONDITIONS: AREA
TREATMENT A	0 ac.	0 ac.
TREATMENT B	0 ac.	0.07 ac.
TREATMENT C	0.42 ac.	0 ac.
TREATMENT D	0 ac.	0.35 ac.

EXISTING EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.00)+(1.13)x(0.42)+(2.12)x(0.00)/ 0.42 ac.
= 1.13 in.
V100-360 = (1.13)x(0.42)/ 12 = 0.039550 ac-ft = 1723 cf

EXISTING PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.00)+(3.14)x(0.42)+(4.70)x(0.00)= 1.32 cfs

PROPOSED EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.07)+(1.13)x(0.00)+(2.12)x(0.35)/ 0.42 ac.
= 1.90 in.
V100-360 = (1.90)x(0.42)/ 12.0 = 0.066383 ac-ft = 2892 cf

V100-1440 = (0.07)+(0.35)x(2.75 - 2.35)/ 12 = 0.078050 ac-ft = 3400 cf

V100-10day = (0.07)+(0.35)x(3.95 - 2.35)/ 12 = 0.113050 ac-ft = 4924 cf

PROPOSED PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.07)+(3.14)x(0.00)+(4.70)x(0.35)= 1.80 cfs

BASIN B AREA = 0.65 ac.

DRAINAGE ZONE 2
PRECIPITATION: 360 = 2.35 in.
1140 = 2.75 in.
10day = 3.95 in.

	EXCESS PRECIPITATION:	PEAK DISCHARGE:	
TREATMENT A	0.53 in.	1.56	cfs/ac.
TREATMENT B	0.78 in.	2.28	cfs/ac.
TREATMENT C	1.13 in.	3.14	cfs/ac.
TREATMENT D	2.12 in.	4.70	cfs/ac.

	EXISTING CONDITIONS: AREA	PROPOSED CONDITIONS: AREA
TREATMENT A	0 ac.	0 ac.
TREATMENT B	0 ac.	0.05 ac.
TREATMENT C	0.65 ac.	0 ac.
TREATMENT D	0 ac.	0.60 ac.

EXISTING EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.00)+(1.13)x(0.65)+(2.12)x(0.00)/ 0.65 ac.
= 1.13 in.
V100-360 = (1.13)x(0.65)/ 12 = 0.061208 ac-ft = 2666 cf

EXISTING PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.00)+(3.14)x(0.65)+(4.70)x(0.00)= 2.04 cfs

PROPOSED EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.05)+(1.13)x(0.00)+(2.12)x(0.60)/ 0.65 ac.
= 2.02 in.
V100-360 = (2.02)x(0.65)/ 12.0 = 0.109250 ac-ft = 4759 cf

V100-1440 = (0.11)+(0.60)x(2.75 - 2.35)/ 12 = 0.129250 ac-ft = 5630 cf

V100-10day = (0.11)+(0.60)x(3.95 - 2.35)/ 12 = 0.189250 ac-ft = 8244 cf

PROPOSED PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.05)+(3.14)x(0.00)+(4.70)x(0.60)= 2.93 cfs

BASIN C AREA = 0.49 ac.

DRAINAGE ZONE 2
PRECIPITATION: 360 = 2.35 in.
1140 = 2.75 in.
10day = 3.95 in.

	EXCESS PRECIPITATION:	PEAK DISCHARGE:	
TREATMENT A	0.53 in.	1.56	cfs/ac.
TREATMENT B	0.78 in.	2.28	cfs/ac.
TREATMENT C	1.13 in.	3.14	cfs/ac.
TREATMENT D	2.12 in.	4.70	cfs/ac.

EXISTING CONDITIONS:	AREA	PROPOSED CONDITIONS: AREA
TREATMENT A	0 ac.	0 ac.
TREATMENT B	0 ac.	0.10 ac.
TREATMENT C	0.44 ac.	0 ac.
TREATMENT D	0.05 ac.	0.39 ac.

EXISTING EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.00)+(1.13)x(0.44)+(2.12)x(0.05)/ 0.49 ac.
= 1.23 in.
V100-360 = (1.23)x(0.49)/ 12 = 0.050267 ac-ft = 2190 cf

EXISTING PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.00)+(3.14)x(0.44)+(4.70)x(0.05)= 1.62 cfs

PROPOSED EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.10)+(1.13)x(0.00)+(2.12)x(0.39)/ 0.49 ac.
= 1.85 in.
V100-360 = (1.85)x(0.49)/ 12.0 = 0.075400 ac-ft = 3284 cf

V100-1440 = (0.08)+(0.39)x(2.75 - 2.35)/ 12 = 0.088400 ac-ft = 3851 cf

V100-10day = (0.08)+(0.39)x(3.95 - 2.35)/ 12 = 0.127400 ac-ft = 5550 cf

PROPOSED PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.10)+(3.14)x(0.00)+(4.70)x(0.39)= 2.06 cfs

BASIN D AREA = 0.44 ac.

DRAINAGE ZONE 2
PRECIPITATION:
360 = 2.35 in.
1140 = 2.75 in.
10day = 3.95 in.

	EXCESS PRECIPITATION:	PEAK DISCHARGE:	
TREATMENT A	0.53 in.	1.56	cfs/ac.
TREATMENT B	0.78 in.	2.28	cfs/ac.
TREATMENT C	1.13 in.	3.14	cfs/ac.
TREATMENT D	2.12 in.	4.70	cfs/ac.

	EXISTING CONDITIONS: AREA	PROPOSED CONDITIONS: AREA
TREATMENT A	0 ac.	0 ac.
TREATMENT B	0 ac.	0.03 ac.
TREATMENT C	0.38 ac.	0 ac.
TREATMENT D	0.06 ac.	0.41 ac.

EXISTING EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.00)+(1.13)x(0.38)+(2.12)x(0.06)/ 0.44 ac.
= 1.27 in.
V100-360 = (1.27)x(0.44)/ 12 = 0.046383 ac-ft = 2020 cf

EXISTING PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.00)+(3.14)x(0.38)+(4.70)x(0.06)= 1.48 cfs

PROPOSED EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.03)+(1.13)x(0.00)+(2.12)x(0.41)/ 0.44 ac.
= 2.03 in.
V100-360 = (2.03)x(0.44)/ 12.0 = 0.074383 ac-ft = 3240 cf

V100-1440 = (0.07)+(0.41)x(2.75 - 2.35)/ 12 = 0.088050 ac-ft = 3835 cf

V100-10day = (0.07)+(0.41)x(3.95 - 2.35)/ 12 = 0.129050 ac-ft = 5621 cf

PROPOSED PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.03)+(3.14)x(0.00)+(4.70)x(0.41)= 2.00 cfs

BASIN ROAD AREA = 0.30 ac.

DRAINAGE ZONE 2
PRECIPITATION: 360 = 2.35 in.
1140 = 2.75 in.
10day = 3.95 in.

	EXCESS PRECIPITATION:	PEAK DISCHARGE:	
TREATMENT A	0.53 in.	1.56	cfs/ac.
TREATMENT B	0.78 in.	2.28	cfs/ac.
TREATMENT C	1.13 in.	3.14	cfs/ac.
TREATMENT D	2.12 in.	4.70	cfs/ac.

EXISTING CONDITIONS:	AREA	PROPOSED CONDITIONS: AREA
TREATMENT A	0 ac.	0 ac.
TREATMENT B	0 ac.	0 ac.
TREATMENT C	0.30 ac.	0.30 ac.
TREATMENT D	0 ac.	0.00 ac.

EXISTING EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.00)+(1.13)x(0.30)+(2.12)x(0.00)/ 0.30 ac.
= 1.13 in.
V100-360 = (1.13)x(0.30)/ 12 = 0.028250 ac-ft = 1231 cf

EXISTING PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.00)+(3.14)x(0.30)+(4.70)x(0.00)= 0.94 cfs

PROPOSED EXCESS PRECIPITATION:

Weighted E = (0.53)x(0.00)+(0.78)x(0.00)+(1.13)x(0.30)+(2.12)x(0.00)/ 0.30 ac.
= 1.13 in.
V100-360 = (1.13)x(0.30)/ 12.0 = 0.028250 ac-ft = 1231 cf

V100-1440 = (0.03)+(0.00)x(2.75 - 2.35)/ 12 = 0.028250 ac-ft = 1231 cf

V100-10day = (0.03)+(0.00)x(3.95 - 2.35)/ 12 = 0.028250 ac-ft = 1231 cf

PROPOSED PEAK DISCHARGE:

Q100 = (1.56)x(0.00)+(2.28)x(0.00)+(3.14)x(0.30)+(4.70)x(0.00)= 0.94 cfs

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

January 28, 1999
CONSTRUCTED SWALE
BEHIND BLDG. A (NORTH)
DESIGN FLOWRATE 1.13 cfs (max)

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Channel Bottom Slope (feet per foot).....	0.0060
Manning`s Roughness Coefficient (n-value).....	0.0450
Channel Side Slope - Left Side (horizontal/vertical)....	2.00
Channel Side Slope - Right Side (horizontal/vertical)...	2.00
Channel Bottom Width (feet).....	1.0

==========

PROGRAM RESULTS:

Depth (ft)	Flow Rate (cfs)	Velocity (fps)	Froude Number	Velocity Head(ft)	Energy Head(ft)	Flow Area (sq ft)	Top Width (ft)
0.1	0.1	0.49	0.293	0.004	0.104	0.1	1.4
0.2	0.2	0.72	0.319	0.008	0.208	0.3	1.8
0.3	0.4	0.89	0.335	0.012	0.312	0.5	2.2
0.4	0.7	1.04	0.347	0.017	0.417	0.7	2.6
→ 0.5	1.2	1.17	0.357	0.021	0.521	1.0	3.0
0.6	1.7	1.29	0.365	0.026	0.626	1.3	3.4
0.7	2.4	1.40	0.372	0.031	0.731	1.7	3.8
0.8	3.1	1.51	0.379	0.035	0.835	2.1	4.2
0.9	4.1	1.61	0.384	0.040	0.940	2.5	4.6
1.0	5.1	1.71	0.390	0.046	1.046	3.0	5.0

==========

TRAPEZOIDAL CHANNEL ANALYSIS
RATING CURVE COMPUTATION

January 28, 1999
CONSTRUCTED SWALE
WEST SIDE OD BLDG. A
DESIGN FLOWRATE 1.13 cfs

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Channel Bottom Slope (feet per foot).....	0.0060
Manning`s Roughness Coefficient (n-value).....	0.0450
Channel Side Slope - Left Side (horizontal/vertical)....	4.00
Channel Side Slope - Right Side (horizontal/vertical)...	4.00
Channel Bottom Width (feet).....	2.0

==========

PROGRAM RESULTS:

Depth (ft)	Flow Rate (cfs)	Velocity (fps)	Froude Number	Velocity Head(ft)	Energy Head(ft)	Flow Area (sq ft)	Top Width (ft)
0.1	0.1	0.49	0.298	0.004	0.104	0.2	2.8
0.2	0.4	0.73	0.328	0.008	0.208	0.6	3.6
0.3	0.9	0.92	0.346	0.013	0.313	1.0	4.4
0.4	1.5	1.07	0.359	0.018	0.418	1.4	5.2
0.5	2.4	1.21	0.370	0.023	0.523	2.0	6.0
0.6	3.5	1.34	0.380	0.028	0.628	2.6	6.8
0.7	4.9	1.46	0.388	0.033	0.733	3.4	7.6
0.8	6.6	1.58	0.395	0.039	0.839	4.2	8.4
0.9	8.5	1.69	0.401	0.044	0.944	5.0	9.2
1.0	10.7	1.79	0.407	0.050	1.050	6.0	10.0

==========

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

January 28, 1999
18" CMP
BASINS A-1, A-2, & B
DESIGN FLOWRATE 5.86 cfs

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet)	1.50
FHWA Chart Number (1,2 or 3)	2
Scale Number on Chart (Type of Culvert Entrance)	1
Manning`s Roughness Coefficient (n-value)	0.0250
Entrance Loss Coefficient of Culvert Opening	0.50
Culvert Length (feet)	60.0
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)
1.0	0.00	0.51	0.66	0.52	0.37	0.37	2.91
2.0	0.00	0.74	0.82	0.77	0.53	0.53	3.58
3.0	0.00	0.93	1.03	0.99	0.66	0.66	4.02
4.0	0.00	1.11	1.27	1.29	0.77	0.77	4.41
5.0	0.00	1.28	1.57	1.50	0.86	0.86	4.77
→ 5.9	0.00	1.42	1.86	1.50	0.93	0.93	5.06
6.0	0.00	1.44	1.91	1.50	0.95	0.95	5.11

==========

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

January 28, 1999
12" PVC
BASIN B
DESIGN FLOWRATE 2.93 cfs

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet)	1.00
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	0.50
Culvert Length (feet)	170.0
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)
0.5	0.00	0.40	-0.16	0.29	0.29	0.29	2.65
1.0	0.00	0.60	0.01	0.42	0.42	0.42	3.21
1.5	0.00	0.76	0.25	0.53	0.52	0.53	3.56
2.0	0.00	0.92	0.56	0.64	0.60	0.64	3.79
2.5	0.00	1.08	0.93	0.75	0.68	0.75	3.94
→ 3.0	0.00	1.28	1.38	1.00	0.74	0.74	4.80
3.5	0.00	1.46	1.90	1.00	0.80	0.80	5.20

==========

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

January 28, 1999
12" CMP
BASIN C
DESIGN FLOWRATE 2.06 cfs

==========

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet)	1.00
FHWA Chart Number (1,2 or 3)	2
Scale Number on Chart (Type of Culvert Entrance)	1
Manning`s Roughness Coefficient (n-value)	0.0250
Entrance Loss Coefficient of Culvert Opening	0.50
Culvert Length (feet)	75.0
Culvert Slope (feet per foot)	0.0100

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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)
0.5	0.00	0.40	-0.04	0.35	0.29	0.35	2.00
1.0	0.00	0.59	0.22	0.52	0.42	0.52	2.43
1.5	0.00	0.75	0.58	0.68	0.52	0.68	2.63
2.0	0.00	0.91	1.07	1.00	0.60	0.60	4.04
→ 2.1	0.00	0.92	1.14	1.00	0.61	0.61	4.08
2.5	0.00	1.06	1.68	1.00	0.68	0.68	4.41
3.0	0.00	1.26	2.42	1.00	0.74	0.74	4.80

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PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

January 28, 1999
12" CMP
BASIN D
DESIGN FLOWRATE 2.00 cfs

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PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet)	1.00
FHWA Chart Number (1,2 or 3)	2
Scale Number on Chart (Type of Culvert Entrance)	1
Manning`s Roughness Coefficient (n-value)	0.0250
Entrance Loss Coefficient of Culvert Opening	0.50
Culvert Length (feet)	80.0
Culvert Slope (feet per foot)	0.0100

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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)
0.5	0.00	0.40	-0.09	0.35	0.29	0.35	2.00
1.0	0.00	0.59	0.18	0.52	0.42	0.52	2.43
1.5	0.00	0.75	0.57	0.68	0.52	0.68	2.63
→ 2.0	0.00	0.91	1.08	1.00	0.60	0.60	4.04
2.5	0.00	1.06	1.72	1.00	0.68	0.68	4.41
3.0	0.00	1.26	2.50	1.00	0.74	0.74	4.80

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