CITY OF ALBUQUERQUE

PLANNING DEPARTMENT – Development Review Services

Richard J. Berry, Mayor

December 17, 2015

Hugh Floyd, P.E.
Floyd Development Services, LLC
918 Pinehurst Rd. SE Suite 101
Rio Rancho, NM, 87124

RE: **Tracts A and B of Black Development One**
Larry H. Miller (Coors @ NM 448)
Conceptual Grading & Drainage Plan / Drainage Summary
Engineer's Stamp Date 10-9-15 (File: ~~J19D081~~) B14D017

Dear Mr. Floyd:

Based upon the information provided in your submittal received 12/8/2015, the above referenced Conceptual Grading and Drainage Plan appears to be an acceptable approach for the management of storm water. This would constitute an approval for platting actions.

We understand that the intent of this submittal is to investigate the feasibility of the proposed roadway alignment, so the above referenced plan cannot be approved for Work Order until a completed Grading and Drainage Plan is submitted (A separate SO-19 permit is not required, since all of the work in the right of way is expected to be shown on the DRC Set). The revised Grading and Drainage Plan will need to address the following items:

1. We understand that the grading and drainage of the Tracts will be reviewed by Bernalillo County since the property is outside the City's limits. However, general flow patterns and basin limits should be shown on the plan.
    a. The calculations imply that Tracts B (NE) and A drain to the proposed storm drain system, but it is not clear that the SE tract line of Tract B is a basin limit.
2. The wye connection upstream of "Point 1" should be a manhole instead, since it is expected to ultimately be in City right of way.
3. Consider a valley gutter across the entrance from Coors Blvd; elevations suggest that flows will cross the driveway heading south.
4. It is assumed that the access road basin limit is to the high point just north of the T-intersection. According to the calculations, this area generates 1.3 cfs, but it is not clear if that flow is included in the peak flow calculation of Tract B, or if it needs to be added to the total entering the 84 in pipe (181 cfs).
5. Label "Point 1", "Point 2" and the approximate location of the inlet that feeds into the 24" pipe to better relate the exhibit to the as-built drawings for SAD 223.

PO Box 1293

Albuquerque

New Mexico 87103

www.cabq.gov

CITY OF ALBUQUERQUE

Richard J. Berry, Mayor

6. There is an inlet drawn in the middle of Tract B; is there an intended internal pipe network that is not yet designed?

7. Since the alignment of the access road might change after further design and coordination with other City departments, additional comments may be generated if substantial revisions are made to the plan.

If you have any questions you can contact me at 924-3986.

Sincerely,

Abiel Carrillo, P.E.
Principal Engineer, Planning Dept.
Development Review Services

PO Box 1293

Albuquerque

New Mexico 87103

www.cabq.gov

City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 09/2015)

Project Title: Frontage Road through Tract B of Lands of Black Development One Building Permit #: _____ City Drainage #: _____

DRB#: 14 DRB-70286 EPC#: 14EPC-40085 Work Order#: _____

Legal Description: Tracts A and B of Lands of Black Development One

City Address: _____

Engineering Firm: Floyd Development Services, LLc Contact: Hugh Floyd

Address: 918 Pinehurst Rd. SE Suite 101, Rio Rancho, NM 87124

Phone#: 505-366-4187 Fax#: _____ E-mail: Hugh@dwevelopnm.com

Owner: Greg Flint Contact: _____

Address: 9350 South 150 East, Suite 1000 Sandy, Utah 84070

Phone#: 1-801-563-4176 Fax#: _____ E-mail: greg.flint@lhm.com

Architect: _____ Contact: _____

Address: _____

Phone#: _____ Fax#: _____ E-mail: _____

Other Contact: _____ Contact: _____

Address: _____

Phone#: _____ Fax#: _____ E-mail: _____

Check all that Apply:

DEPARTMENT:

x HYDROLOGY/ DRAINAGE

_____ TRAFFIC/ TRANSPORTATION

_____ MS4/ EROSION & SEDIMENT CONTROL

TYPE OF SUBMITTAL:

_____ ENGINEER/ ARCHITECT CERTIFICATION

_____ CONCEPTUAL G & D PLAN

_____ GRADING PLAN

_____ DRAINAGE MASTER PLAN

x DRAINAGE REPORT

_____ CLOMR/LOMR

_____ TRAFFIC CIRCULATION LAYOUT (TCL)

_____ TRAFFIC IMPACT STUDY (TIS)

_____ EROSION & SEDIMENT CONTROL PLAN (ESC)

_____ OTHER (SPECIFY) _____

CHECK TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

_____ BUILDING PERMIT APPROVAL

_____ CERTIFICATE OF OCCUPANCY

_____ PRELIMINARY PLAT APPROVAL

_____ SITE PLAN FOR SUB'D APPROVAL

_____ SITE PLAN FOR BLDG. PERMIT APPROVAL

_____ FINAL PLAT APPROVAL

x SIA/ RELEASE OF FINANCIAL GUARANTEE

_____ FOUNDATION PERMIT APPROVAL

_____ GRADING PERMIT APPROVAL

x SO-19 APPROVAL

_____ PAVING PERMIT APPROVAL

_____ GRADING/ PAD CERTIFICATION

_____ WORK ORDER APPROVAL

_____ CLOMR/LOMR

x PRE-DESIGN MEETING

_____ OTHER (SPECIFY) _____

IS THIS A RESUBMITTAL?: _____ Yes x No

DATE SUBMITTED: 12-8-15 By: Hugh Floyd

COA STAFF: ELECTRONIC SUBMITTAL RECEIVED: ___

Floyd Development Services, _LLC_

918 Pinehurst Road SE, Suite 101
Rio Rancho, NM 87124

Phone (505) 366-4187

December 08, 2015

Abiel Carrillo
Plaza del Sol
600 Second Street NW
Albuquerque, NM 87102

Re: Coors/Coors-By-Pass, Drainage Report for Frontage Road Realignment and Tracts A&B

Floyd Development Services LLC, agent for Larry H. Miller and Black Development One, is requesting the review of this Drainage Report/Sheet in support of a DRC submittal for the roadway itself. A TCL submittal will be submitted for the proposed parking on Tract B in a separate submittal and a detailed Grading and Drainage Plan will accompany that plan. This current submittal is intended to show the detailed drainage plan for the roadway itself and establish the viability of the overall conceptual plan. Our intention is to dedicate Right-Of-Way to the city for the proposed realignment of the frontage road. Thank you for your attention to this matter.

Sincerely,

Hugh W. Floyd, PE
Project Engineer

Enclosures

INTRODUCTION

The purpose of this report is to provide a drainage plan for the proposed roadway through Tracts A and B of Lands of Black Development One and a conceptual drainage plan for the expansion of display parking for Larry H. Miller Hyundai car dealership. This plan is in accordance with the regulations set by the City of Albuquerque.

BACKGROUND AND EXISTING CONDITIONS

Tracts A and B are two small parcels of land about 1.795 acres and 0.557 acres respectively located just east of the Coors Boulevard and Coors Boulevard By-Pass. There is an existing access road east of Tracts A and B and west of the commercial buildings. The existing access road allows vehicles to exit Coors Boulevard By-Pass on the south end of Tract B and directs traffic north, through Tract B to connect with Cita Road, and eventually Coors Boulevard. Toward the south end of the existing access road there is a turn off into the car dealership. Ponding occurs on Tracts A and B, which prevents most flows from entering the commercial buildings downstream. The southern portion of Tract B does let some water flow onto the Hyundai car dealership site.

Currently there is a 24 inch diameter storm drain underneath Coors Boulevard Right of Way, which takes storm water south and connects to an 84 inch pipe near Coors Boulevard By Pass. According to sheets 54 and 62 of the SAD 223 Coors By Pass Improvements signed 5/8/1997, the 24 inch pipe carries 9.4 cfs and the 84 inch pipe carries 174.4 cfs during the 100 year storm event. The contents of this storm drain system flow into the Arroyo De Las Calabacillas.

METHODOLOGY

The developed runoff rate was found by using Table A-9 of the Albuquerque Development Process Manual (DPM) Section 22.3. The weighted runoff rate was calculated as 15% Treatment Type B and 85% Treatment Type D.

The downstream capacity was analyzed using Manning's equation and Bernoulli's equation based on the City of Albuquerque DPM Section 22.3. The Bernoulli equation was used to determine the amount of head needed to send the runoff from Tract A and northeast portion of Tract B through the 24 inch pipe. Once the runoff reaches the 84 inch pipe the Manning's equation was used to evaluate the effects from the additional flow.

PROPOSED CONDITIONS

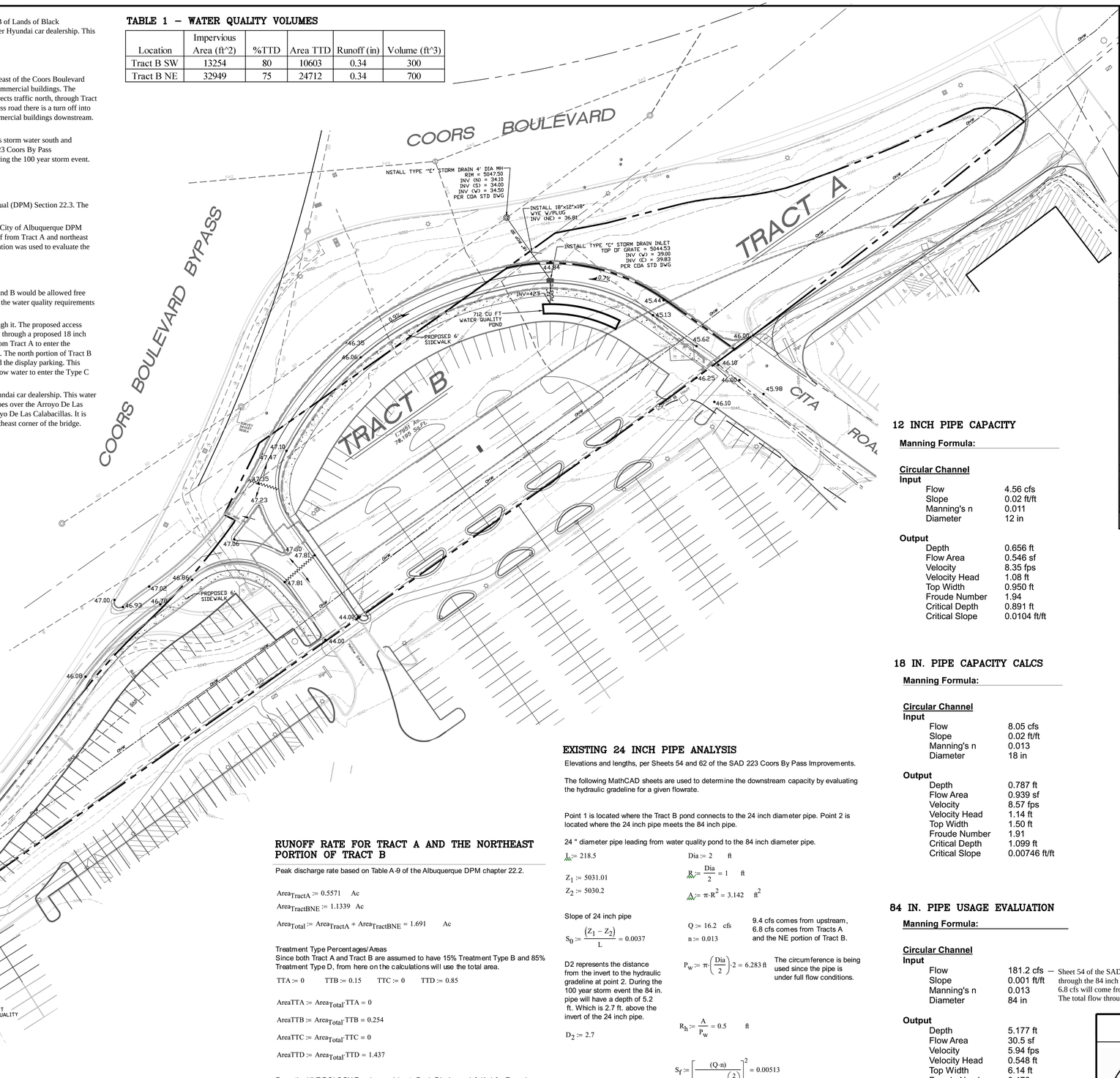
A pre-design meeting was held with Curtis Cherne on 1/16/2015, where it was agreed that the Tracts A and B would be allowed free discharge providing that the existing 24 inch diameter pipe has capacity for the site to drain into and that the water quality requirements are met.

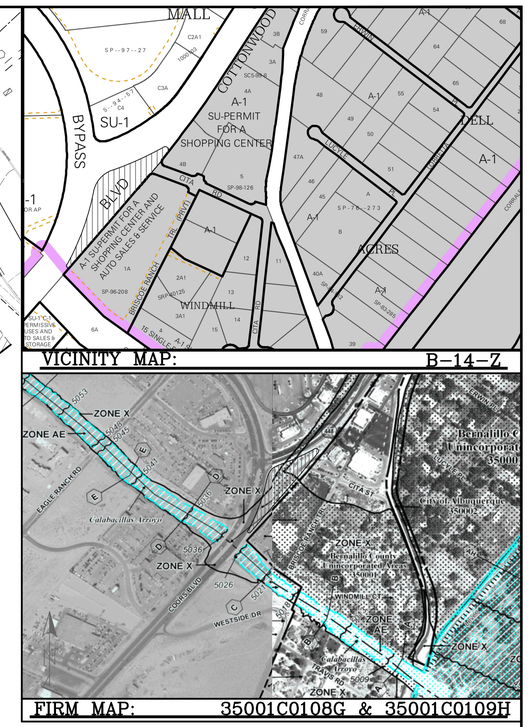
It is proposed to relocate the existing access road so that it curves to the west of Tract B rather than through it. The proposed access road will have a Type C inlet that allows runoff to enter the existing 24 inch storm drain to the northwest through a proposed 18 inch reinforced concrete pipe. 25 ft from the inlet there will be an 18 inch Y connection to allow the runoff from Tract A to enter the proposed pipe. It is also proposed to use Tract B for more display parking for the Hyundai car dealership. The north portion of Tract B will drain to a water quality pond that is located in the landscaping between the proposed access road and the display parking. This water quality pond will have a minimum volume of about 700 cubic feet. An 18 inch plastic pipe will allow water to enter the Type C inlet in the proposed access road and from there enter the existing storm drain system.

The southern portion of Tract B will drain to the proposed water quality pond to the south end of the Hyundai car dealership. This water quality pond will have a minimum volume of 300 cubic feet. There are several inlets in the bridge that goes over the Arroyo De Las Calabacillas. These inlets are 24 inch in diameter and they allow runoff from the bridge to enter the Arroyo De Las Calabacillas. It is proposed to have a pipe connect the proposed southern water quality pond to the 24 inch inlet on the northeast corner of the bridge.

TABLE 1 – WATER QUALITY VOLUMES

Location	Impervious Area (ft^2)	%TTD	Area TTD	Runoff (in)	Volume (ft^3)
Tract B SW	13254	80	10603	0.34	300
Tract B NE	32949	75	24712	0.34	700





RUNOFF RATE FOR PROPOSED ACCESS ROAD

Peak discharge rate based on Table A-9 of the Albuquerque DPM.

$Area_{Road} := 0.206531$ Ac

$Area_{Landscaping} := 0.037039$ Ac

$Area_{Sidewalk} := 0.060686$ Ac

$Area_{Total} := Area_{Road} + Area_{Landscaping} + Area_{Sidewalk} = 0.304$ Ac

Treatment Type Percentages/Areas

$AreaTTA := 0$

$AreaTTB := 0.5 \cdot Area_{Landscaping} = 0.019$

$AreaTTC := 0.5 \cdot Area_{Landscaping} = 0.019$

$AreaTTD := Area_{Road} + Area_{Sidewalk} = 0.267$

Table A-9, Peak Discharge (cfs/Ac) for Zone 1.

100 YEAR PEAK DISCHARGE - LOOKUP TABLE				
ZONE	A	B	C	D
1	1.290	2.030	2.870	4.370
2	1.560	2.280	3.140	4.700
3	1.870	2.600	3.450	5.020
4	2.200	2.920	3.730	5.250

$Q_w := 1.29 \cdot AreaTTA + 2.030 \cdot AreaTTB + 2.87 \cdot AreaTTC + 4.37 \cdot AreaTTD = 1.258$ cfs

RUNOFF RATE FOR TRACT A AND THE NORTHEAST PORTION OF TRACT B

Peak discharge rate based on Table A-9 of the Albuquerque DPM chapter 22.2.

$Area_{TractA} := 0.5571$ Ac

$Area_{TractBNE} := 1.1339$ Ac

$Area_{Total} := Area_{TractA} + Area_{TractBNE} = 1.691$ Ac

Treatment Type Percentages/Areas
Since both Tract A and Tract B are assumed to have 15% Treatment Type B and 85% Treatment Type D, from here on the calculations will use the total area.

$TTA := 0$ $TTB := 0.15$ $TTC := 0$ $TTD := 0.85$

$AreaTTA := Area_{Total} \cdot TTA = 0$

$AreaTTB := Area_{Total} \cdot TTB = 0.254$

$AreaTTC := Area_{Total} \cdot TTC = 0$

$AreaTTD := Area_{Total} \cdot TTD = 1.437$

From the HYDROLOGY Excel spreadsheet, Peak Discharge (cfs/Ac) for Zone 1.

100 YEAR PEAK DISCHARGE - LOOKUP TABLE				
ZONE	A	B	C	D
1	1.290	2.030	2.870	4.370
2	1.560	2.280	3.140	4.700
3	1.870	2.600	3.450	5.020
4	2.200	2.920	3.730	5.250

$Q_w := 1.29 \cdot AreaTTA + 2.030 \cdot AreaTTB + 2.87 \cdot AreaTTC + 4.37 \cdot AreaTTD = 6.796$ cfs

EXISTING 24 INCH PIPE ANALYSIS

Elevations and lengths, per Sheets 54 and 62 of the SAD 223 Coors By Pass Improvements.

The following MathCAD sheets are used to determine the downstream capacity by evaluating the hydraulic gradeline for a given flowrate.

Point 1 is located where the Tract B pond connects to the 24 inch diameter pipe. Point 2 is located where the 24 inch pipe meets the 84 inch pipe.

24 " diameter pipe leading from water quality pond to the 84 inch diameter pipe.

$L := 218.5$

$Dia := 2$ ft

$Z_1 := 5031.01$

$R := \frac{Dia}{2} = 1$ ft

$Z_2 := 5030.2$

$A := \pi \cdot R^2 = 3.142$ ft^2

Slope of 24 inch pipe

$S_0 := \frac{(Z_1 - Z_2)}{L} = 0.0037$

$Q := 16.2$ cfs — 9.4 cfs comes from upstream, 6.8 cfs comes from Tracts A and the NE portion of Tract B.

$n := 0.013$

D2 represents the distance from the invert to the hydraulic gradeline at point 2. During the 100 year storm event the 84 in. pipe will have a depth of 5.2 ft. Which is 2.7 ft. above the invert of the 24 inch pipe.

$P_w := \pi \cdot \left(\frac{Dia}{2}\right) \cdot 2 = 6.283$ ft — The circumference is being used since the pipe is under full flow conditions.

$D_2 := 2.7$

$R_h := \frac{A}{P_w} = 0.5$ ft

$S_f := \left[\frac{(Q \cdot n)}{1.486 \cdot A \cdot R_h^{\left(\frac{2}{3}\right)}}\right]^2 = 0.00513$

D1 represents the calculated difference between top of water elevation and pipe invert.

$D_1 := D_2 - S_0 \cdot L + S_f \cdot L = 3.01$

Actual difference between top of proposed pond and invert at point 1 = 12.49 ft

12 INCH PIPE CAPACITY

Manning Formula:

Circular Channel

Input

Flow	4.56 cfs
Slope	0.02 ft/ft
Manning's n	0.011
Diameter	12 in

Output

Depth	0.656 ft
Flow Area	0.546 sf
Velocity	8.35 fps
Velocity Head	1.08 ft
Top Width	0.950 ft
Froude Number	1.94
Critical Depth	0.891 ft
Critical Slope	0.0104 ft/ft

18 IN. PIPE CAPACITY CALCS

Manning Formula:

Circular Channel

Input

Flow	8.05 cfs
Slope	0.02 ft/ft
Manning's n	0.013
Diameter	18 in

Output

Depth	0.787 ft
Flow Area	0.939 sf
Velocity	8.57 fps
Velocity Head	1.14 ft
Top Width	1.50 ft
Froude Number	1.91
Critical Depth	1.099 ft
Critical Slope	0.00746 ft/ft

84 IN. PIPE USAGE EVALUATION

Manning Formula:

Circular Channel

Input

Flow	181.2 cfs
Slope	0.001 ft/ft
Manning's n	0.013
Diameter	84 in

– Sheet 54 of the SAD 223 document indicates that 174.4 cfs flows through the 84 inch diameter pipe during a 100 year storm. 6.8 cfs will come from Tracts A and the northern portion of Tract B. The total flow through the 84 inch pipe is equal to 181.2 cfs.

Output

Depth	5.177 ft
Flow Area	30.5 sf
Velocity	5.94 fps
Velocity Head	0.548 ft
Top Width	6.14 ft
Froude Number	0.470
Critical Depth	3.502 ft
Critical Slope	0.00321 ft/ft

GRATE CAPACITY FOR PROPOSED ROADWAY CALCULATIONS

The plan is to build a road near the Coors and Coors By Pass intersection. This road will have Type C inlet in sump conditions. This sheet is used to determine if a Double C is required.

The grate has four sides. Two sides are 25" long with 13 bearing bars (0.5" x 3.5" x 39"). The other two sides are 40" long with 2 end bars (0.5" x 3" x 25") and seven cross bars (0.5" dia. x 24")

$L_{inches} := 2 \cdot (25 - 13 \cdot 0.5) + 1 \cdot (40 - 2 \cdot 0.5 - 7 \cdot 0.5) = 72.5$ in

$L_{ft} := \frac{L_{inches}}{12} = 6.042$ ft

$Area_{inches} := (25 - 13 \cdot 0.5)(40 - 2 \cdot 0.5 - 7 \cdot 0.5) = 656.75$ in^2

$Area_{ft} := Area_{inches} \cdot \left(\frac{1}{12}\right)^2 = 4.561$ ft^2

1) Top of Curb = h1
2) Top of RoW = h2

h1 := 0.5 ft
h2 := 0.87 ft

Grate Calculations

Weir Grate Opening, Q=CwLH^1.5
Cw := 3
Lw := 6.042

Orifice Grate Opening, Qorif=CA(2GH)^0.5
C := 0.6
A := 5.56

$Q1 := Cw \cdot L \cdot (h1)^{1.5} = 6.409$ cfs

$Q2 := Cw \cdot L \cdot (h2)^{1.5} = 14.709$ cfs

$Qorif1 := C \cdot A \cdot (2 \cdot 32.2 \cdot h1)^{0.5} = 18.93$ cfs

$Qorif2 := C \cdot A \cdot (2 \cdot 32.2 \cdot h2)^{0.5} = 24.971$ cfs

Since the weir equation produced the smallest results it is the governing equation. The flowrate coming to the inlet is 1.258 cfs, which is less than 6.409 cfs. Therefore only a Single Type C inle is required.

This inlet can handle more than what is seen on this sheet because the throat and one side of the grate is ignored.

LEGEND

- PROPERTY BOUNDARY
- SUBBASIN BOUNDARY
- MAJOR CONTOURS PER SURV-TEK SURVEY 2015
- MINOR CONTOURS PER SURV-TEK SURVEY 2015
- PROPOSED POND CONTOURS
- HIGH PRESSURE GAS LINE

GRAPHIC SCALE

40 0 10 40 80 160

(IN FEET)
1 inch = 40 ft.

ENGINEER'S SEAL

HUGH W. FLOYD
NEW MEXICO
16633
12-07-15
LICENSED PROFESSIONAL ENGINEER

HUGH W. FLOYD
P.E. 16633

TRACTS A AND B
LANDS OF BLACK DEVELOPMENT ONE

EXHIBIT 1
DRAINAGE PLAN

FLOYD DEVELOPMENT SERVICES, LLC
DEVELOPMENT, ENGINEERING, & WATERSHED CONSULTING
918 PINEHURST RD SE, SUITE 102
RIO RANCHO, NM 87124
HUGH@DEVELOPNM.COM
505-366-4187

DRAWN BY SMT

DATE 12-07-15

Coors-CoorsByPass.dwg

SHEET # 1 of 1

JOB # 001-14-100

1-16-15

pre design mtg with Hugh Floyd

Curtis Chene, Shannon Turpin.

Tract A + B of Black development

(Located corner Row West of Curry H. Hwy)

1. drain site east down County Rd. Get Bianco approval.

2. drain into 24" SD or SD manhole on site. (if turns into 24" prove capacity) in 24" so that the inlet in corner can drain. (SD-19) HF cc

3. Retain the first flush

Curtis Chene 1-16-15

1-16-15

HUGH FLOYD

DRAINAGE REPORT

FOR

"COTTONWOOD CROSSING"

Prepared by

Tierra West Development Management Services
4421 McLeod Road NE, Suite D
Albuquerque, New Mexico 87109

Prepared for

Las Colinas Realty
10200 Corrales, NW
Albuquerque, New Mexico 87048

&

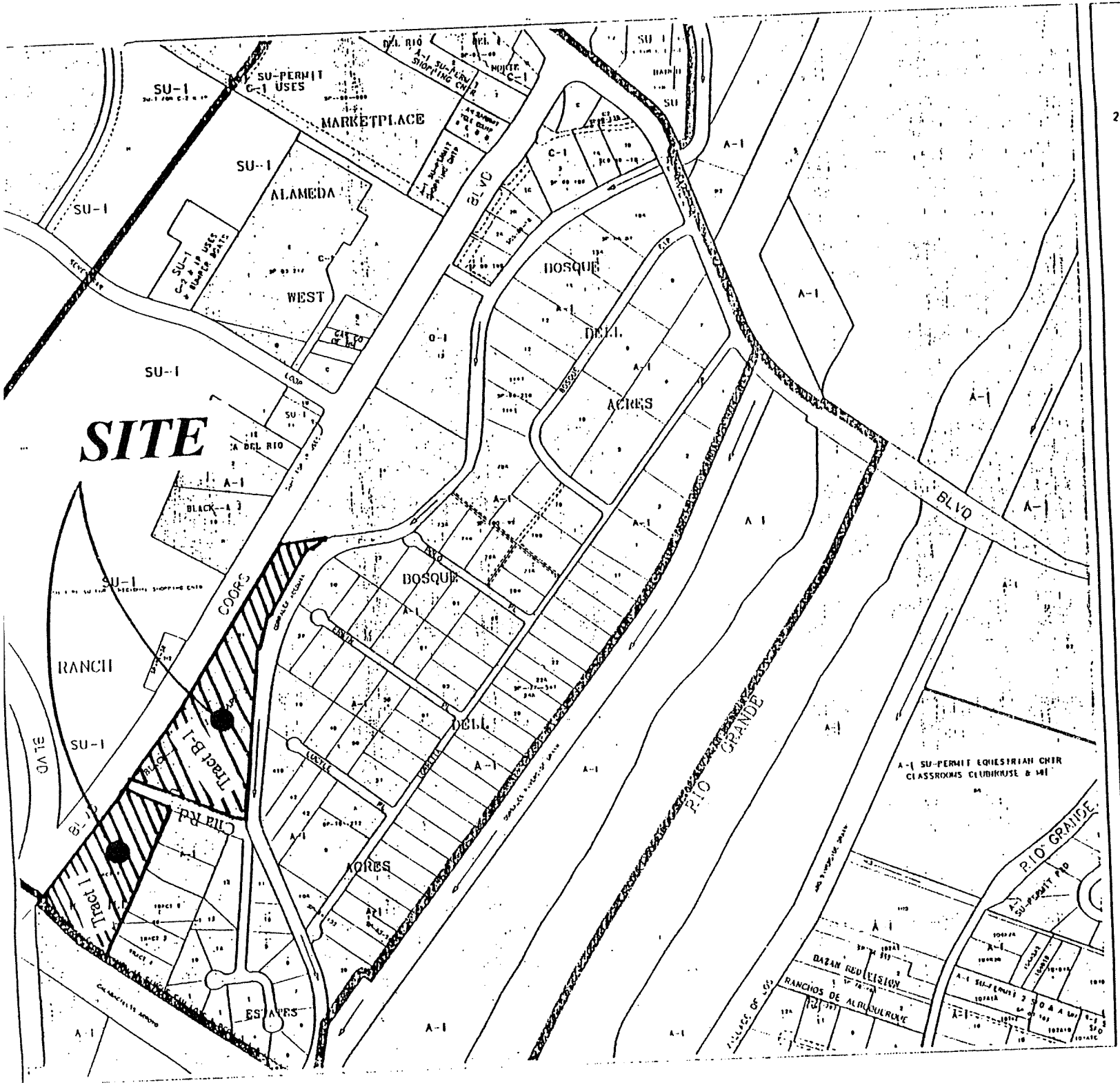
H. Davidson and Associates, Inc.
124 Tenth Street, Northwest
Albuquerque, New Mexico 87102

January, 1996

Ronald R. Bohannan P.E. No. 7868

RONALD RAY BOHANNAN REGISTERED NEW MEXICO 7868 PROFESSIONAL ENGINEER

9-5-96



SCALE IN FEET

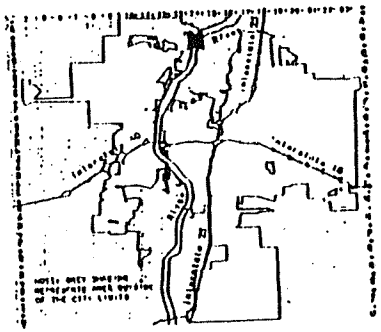
250 0 500 1000

PHOTOCOPY--NOT TO SCALE

North

AGIS

Map Amended through June 14, 1994



LEGAL DESCRIPTION

T11N

R3E

SEC 8

UNIFORM PROPERTY CODE

1-014-048

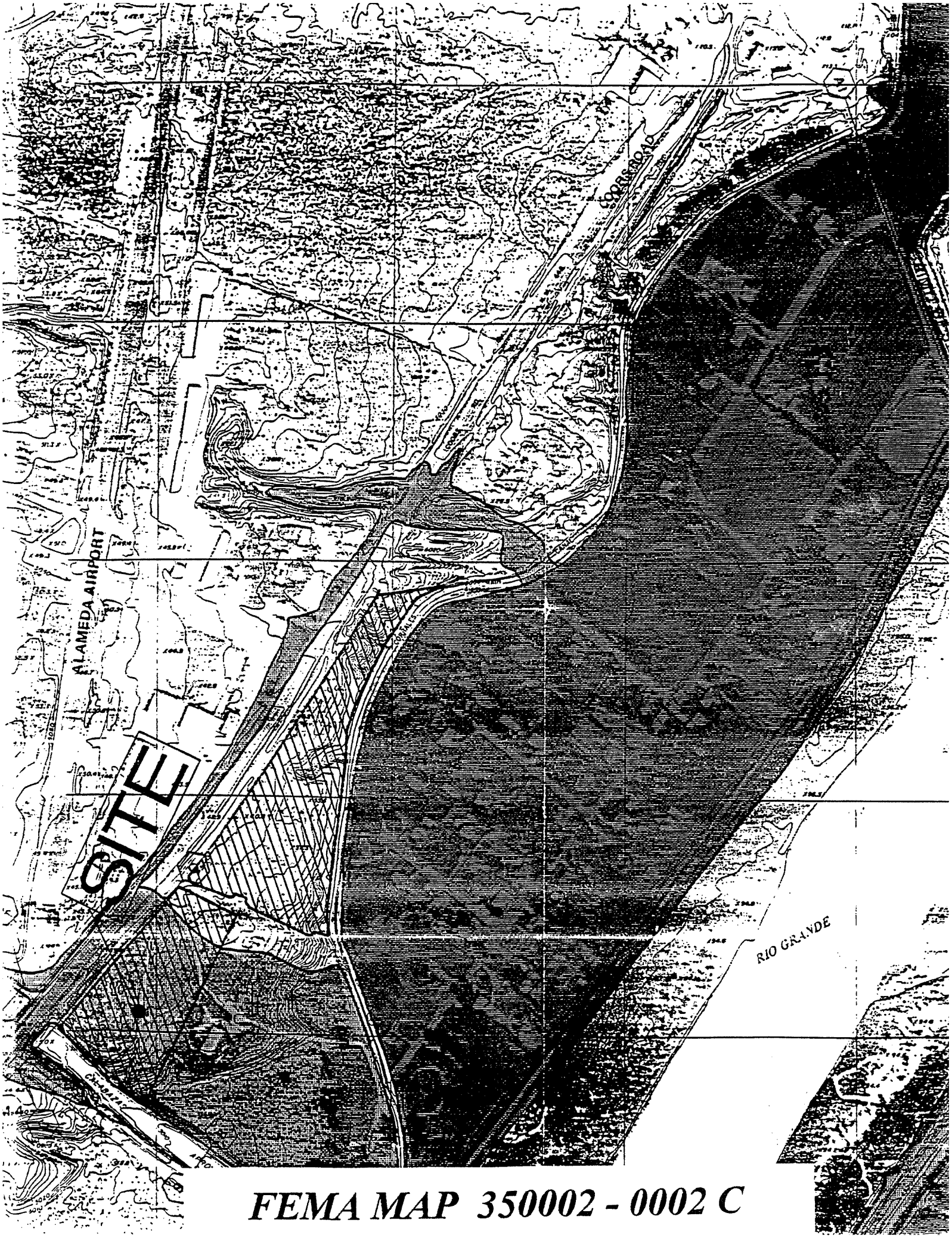
B-14-Z

INTRODUCTION/LOCATION

Tierra West Development Management Services on behalf of Las Colinas Realty and H. Davidson and Associates Inc. has prepared this drainage report. The purpose of this submittal is to provide the drainage analysis for the referenced commercial site. We are requesting that this report, in connection with the application for establishment of SU for C2 uses from SU-C1 and A1, be reviewed for approval of the Grading and Drainage Plan. Cottonwood Crossing commercial site is Tract 1 of Windmill Estates and Tract B-1 of the Lands of John Black. Both tracts lie East of Coors Boulevard with Tract 1 lying on the South side of Cita Road and Tract B-1 lying on the North side of Cita Road. See attached Vicinity Map (Z-B-14) for site location. Site area totals to 17.56 acres with Tract 1 containing 7.21 acres and Tract B-1 containing 10.37 acres.

EXISTING CONDITIONS

The site is currently undeveloped. Tract 1 slopes West to East and then South. The runoff on this tract drains to an existing drop inlet on the Southeast side of the site. Tract B-1 drains from Coors Road to Corrales Main Canal at a slope varying from 1 to 30 percent. The slope drains at a relatively low grade until it reaches the top of the plateau. This property then drops sharply to the Corrales Main Canal. All runoff from this tract drains to the Corrales Main Canal. The entrances to the site are being built as part of Coors Road construction under SAD-223. There is no offsite runoff entering the site. On the West side the offsite runoff is intercepted by Coors Road, and on the South side by the Arroyo de Las Calabacillas. The historical undeveloped flow rate from both Tracts is 34.06 cfs. The site is located within FEMA MAP panel # 350002-0002 C and does not fall within an existing 100-year flood plain.



FEMA MAP 350002 - 0002 C

ON-SITE DRAINAGE MANAGEMENT PLAN

Developed flows will be routed to drop inlets within the project. These flows that are collected in catch basins will be conveyed in a storm sewer pipe South to the existing storm drain and then discharges to the Arroyo de Las Calabacillas.

This existing storm drain line discharging to the Arroyo de Las Calabacillas has limited capacity. The capacity was developed under the old hydrology for the area. In order to control the runoff rate to this storm sewer line all the runoff will be ponded on site and drained at a controlled flow rate less than the capacity of the existing drop inlet (42.0 cfs) at the Southeast side of the site. This existing double D drop inlet was built as part of Windmill Estates subdivision in 1991.

The site is broken into multiple subbasins and ponding areas in order to detail the water and discharge it at flow rate of 40.29 cfs (less than existing capacity of 42.0 cfs). During the events larger than the 100 year storm, the runoff on Tract B-1 overflows to the Corrales Main Canal through an emergency spillway and Tract 1 overflows to the Arroyo de Las Calabacillas. See Grading and Drainage Plan for pond locations and drainage patterns as well as emergency spillway detail.

CONDITIONS	Q-100	Q-10	Q-2
UNDER PROPOSED	69.50	44.99	27.77
UNDER EXISTING	34.06	12.87	0.30

RUNOFF CALCULATIONS

Runoff calculations were performed using Albuquerque Metropolitan Arroyo Flood Control

Authority's Hydrological Modeling and Drainage Criteria (AHYMO). See the following sheet for drainage input information and summary runoff tables for the 100-year, 10-year, and 2-year 6-hour storm under proposed and existing conditions. Also see the AHYMO input files and summary output as well as output file for runoff routing and ponding calculations.

RUNOFF

CALCULATIONS

DRAINAGE BASINS

SUB-BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
TRACT B-1			
A	53376.04	1.2253	0.001915
B	94762.48	2.1754	0.003399
C	141303.94	3.2439	0.005069
D	131292.55	3.0141	0.004709
TRACT 1			
E	167532.76	3.8460	0.006009
F	65146.55	1.4956	0.002337
G	26487.27	0.6081	0.000950
H	48831.98	1.1210	0.001752

BASINS RUNOFF CALCULATION RESULTS (UNDER PROPOSED CONDITIONS)

BASIN	Q-100 CFS	Q-10 CFS
TRACT B-1		
A	5.08	3.29
B	9.01	5.83
C	13.43	8.69
D	12.48	8.08
TOTAL	40.00	25.89

OUTFLOW FROM TRACT B-1 TO TRACT 1 IS 21.03 CFS

TRACT 1		
E	15.91	10.31
F	6.20	4.01
G	2.53	1.64
H	4.65	3.01
TOTAL	29.29	18.97

OUTFLOW FROM TRACT 1 ALONG WITH INFLOW FROM TRACT B-1 IS 28.71 CFS

BASINS RUNOFF CALCULATION RESULTS (UNDER EXISTING CONDITIONS)

BASIN	Q-100 CFS	Q-10 CFS
TRACT B-1		
A	2.49	0.94
B	4.42	1.67
C	6.58	2.49
D	6.12	2.31
TOTAL	19.61	7.41

TRACT 1		
EXISTING	14.43	5.45

CALCULATION TABLE OF CONTENTS

SECTION I - RUNOFF CALCULATIONS

Runoff Summary Table
Drainage Basins
Runoff Calculations

SECTION II - STORM SEWER

Flow Path (Flows, Velocities, & Pipe Sizes)
Storm Sewer Layout
Storm Drop Inlet SGL & DBL "D" Effective Area (@ The Grate) & Orifice Calculation
Water Depth Sample Calculation (For Basin C) Based On The Type Of Inlet Used

SECTION III - PONDING CALCULATIONS

Pond Location
Typical Pond Calculation
Orifice Equation (Outflow Calc. From Each Drop Inlet)
Ponding Table Spreadsheet (Basin A)
Ponding Table Spreadsheet (Basin C)
Ponding Table Spreadsheet (Basin E)
Ponding Table Spreadsheet (Basin F)
Ponding Table Spreadsheet (Basin G)
Ponding Table Spreadsheet (Basin H)
Ponding Table Spreadsheet (Basin I)

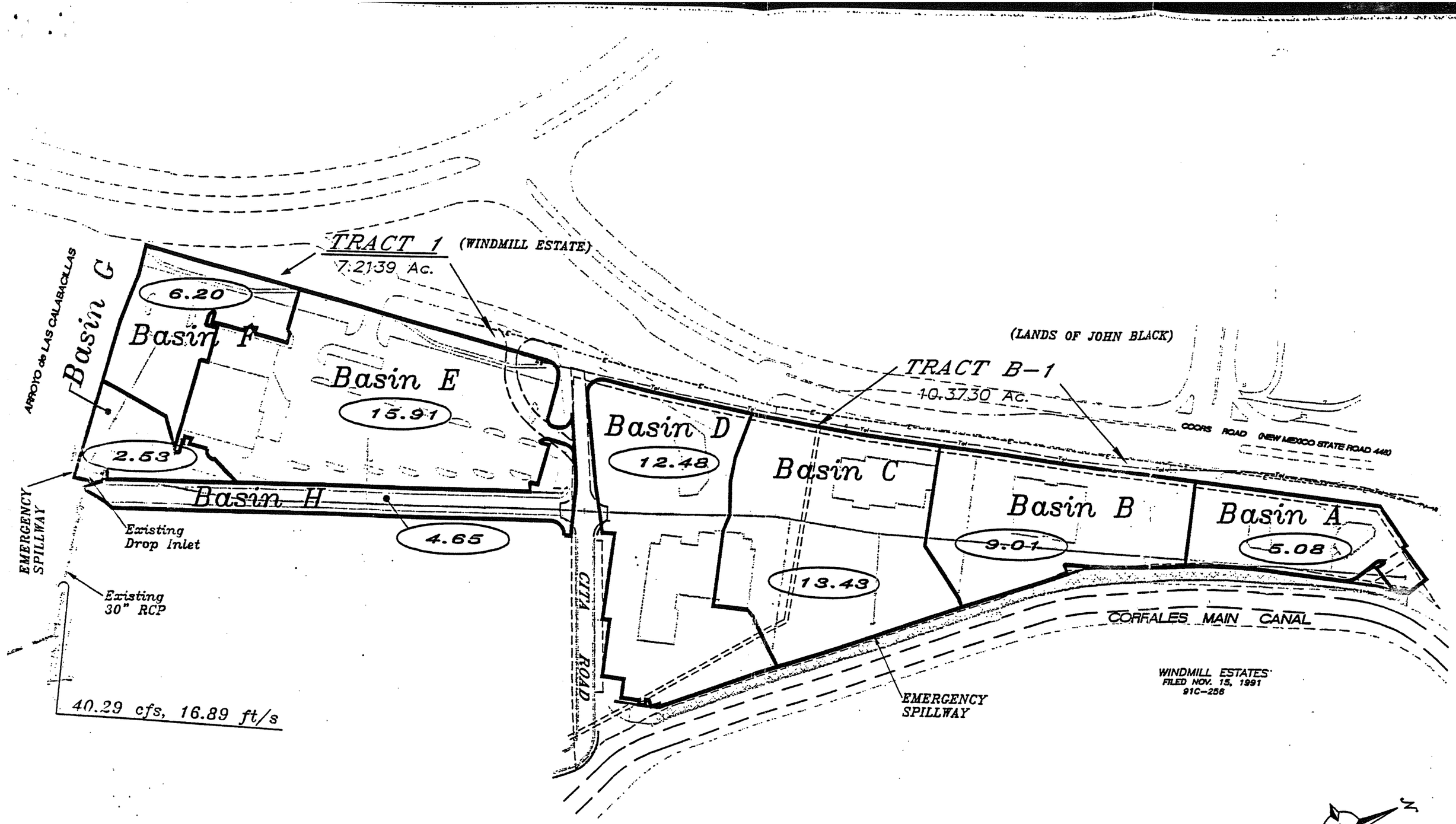
SECTION IV - EMERGENCY SPILLWAY

Emergency Spillway Calculation
Emergency Spillway Location

SECTION V - AHYMO FILES

AHYMO Input File For The Pond
AHYMO Summary Output File For The Pond
AHYMO Output File For The Pond

AHYMO Input File Subbasins (for 100-year, 10-year, & 2-year runoff)
AHYMO Summary Output (for 100-year & 10-year runoff)



DRAINAGE BASINS

STORM

SEWER

RUNOFF CALCULATIONS

The site is @ Zone 1

LAND TREATMENT

Treatment D:

D = 10 %

Treatment B:

B = 90.00 %

DEPTH (INCHES) @ 100-YEAR STORM

P_{60} = 1.87 inches

P_{360} = 2.20 inches

P_{1440} = 2.66 inches

DEPTH (INCHES) @ 10-YEAR STORM

P_{60} = 1.87 x 0.667
= 1.25 inches

P_{360} = 1.47

P_{1440} = 1.77

DEPTH (INCHES) @ 2-YEAR STORM

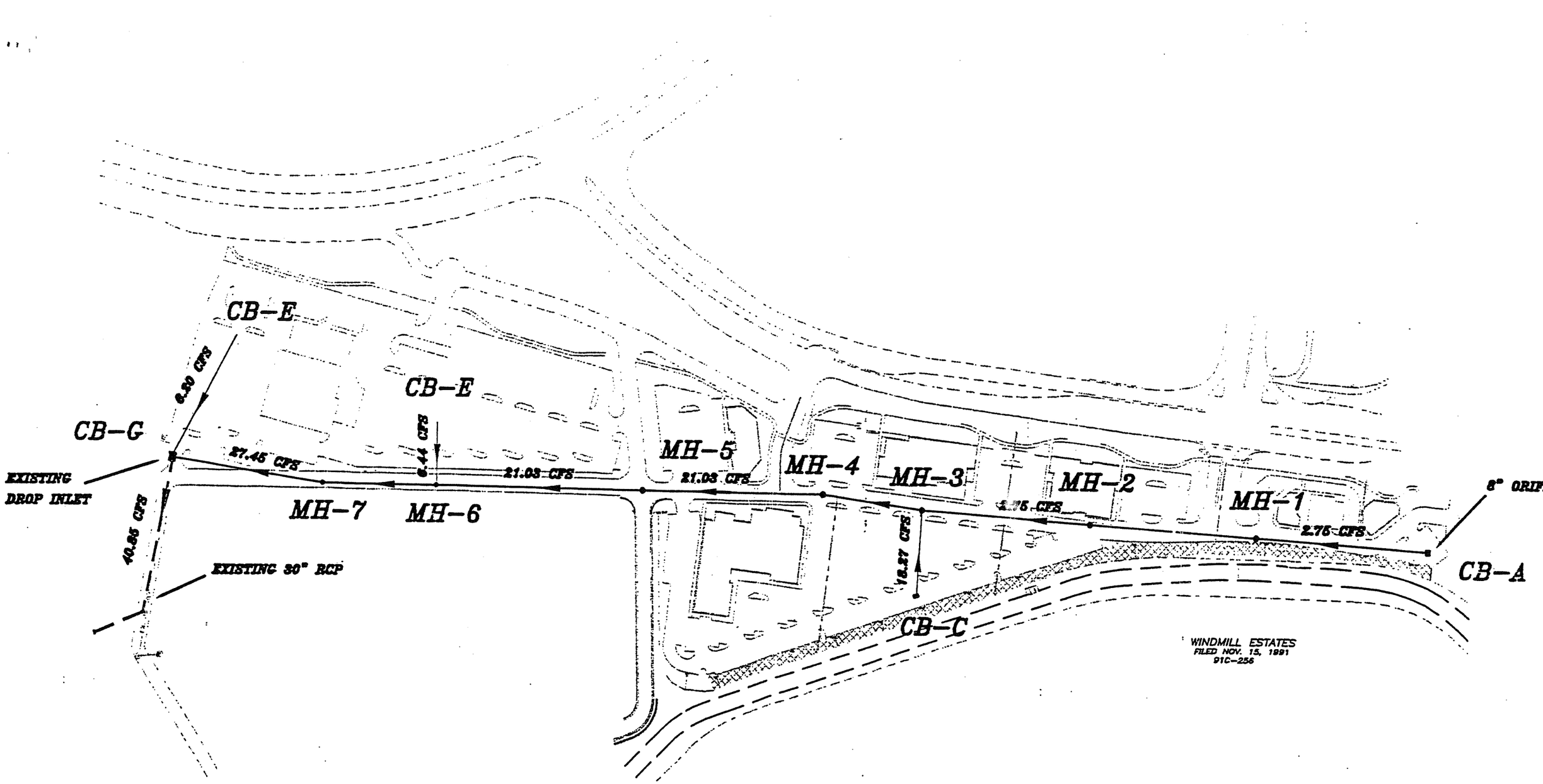
P_{60} = 1.87 x 0.434
= 0.81 inches

P_{360} = 0.95

P_{1440} = 1.15

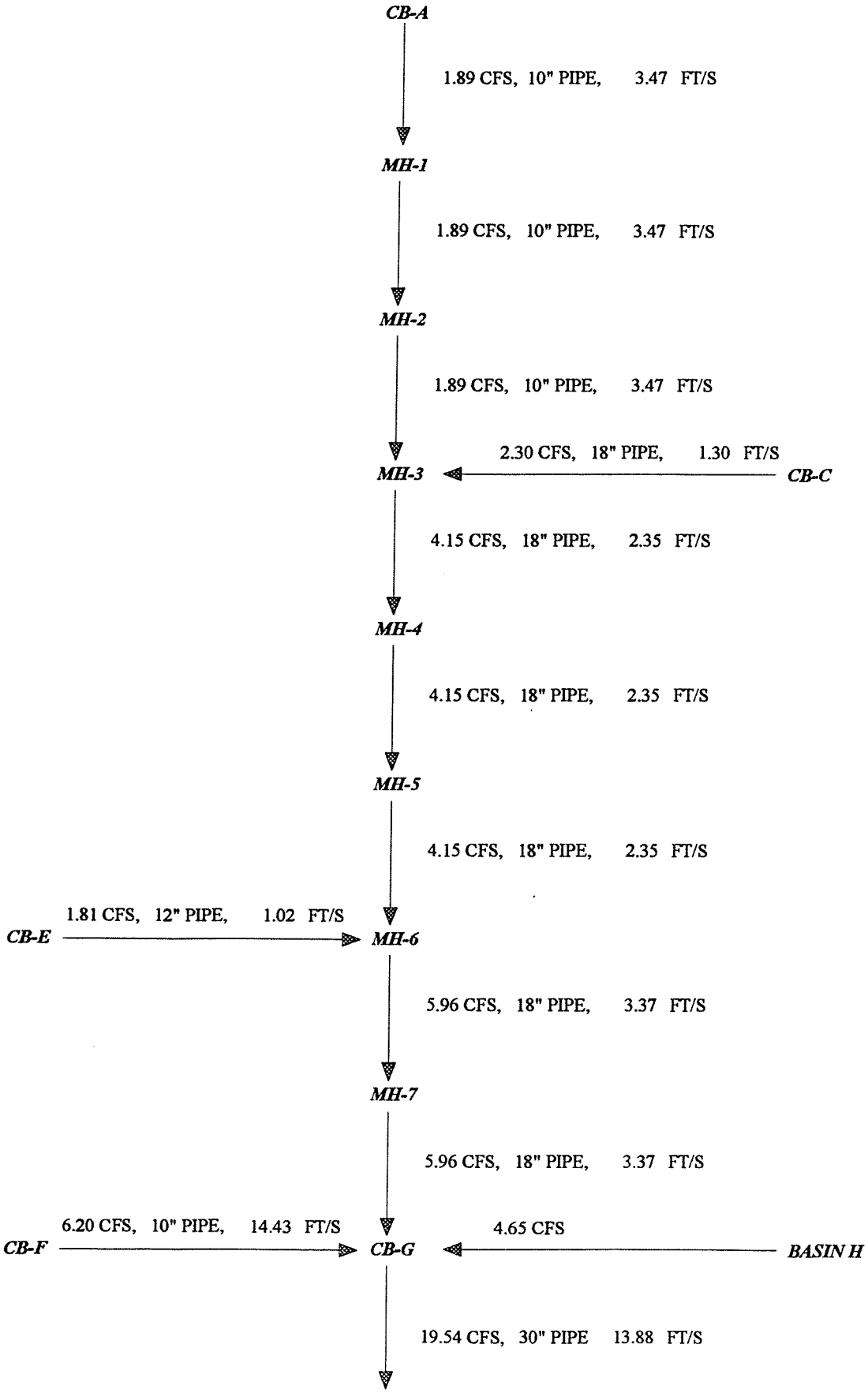
See the summary output from AHYMO calculations.

Also see the following summary tables.



STORM SEWER LAYOUT

RUNOFF FLOW PATH



STORM DROP INLET (EFFECTIVE AREA-IN PONDING SECTION)
(DBL-D @ the ponding section)

Area @ the Grate:

L = 92 ¾" - 2 (8"$_{ENDS}$) - 6"$_{CENTER\ PIECE}$ - 14 (½"$_{MIDDLE\ BARS}$)

= 63 ¾" = 5.3125'

W = 25 ½" - 13 (½"$_{MIDDLE\ BARS}$)

= 19" = 1.5833'

Area = 5.3125 x 1.5833

= 8.41 SF

Effective are = 8.41 - .5 (8.41)$_{Clogging\ Factor}$

= 4.21 SF @ the Grate

STORM DROP INLET (EFFECTIVE AREA-IN PONDING SECTION)
(Single-D @ the ponding section)

Area @ the Grate:

L = 40" - 2 (½"$_{ENDS}$) - 14 (½"$_{CROSS\ BARS}$)

= 35 ½"

W = 25 ½" - 13 (½"$_{MIDDLE\ BARS}$)

= 19"

Area = (35.5 x 19)/144

= 4.68 SF

Effective are = 4.68 - .5 (4.68)$_{Clogging\ Factor}$

= 3.24 SF @ the Grate

ORIFICE EQUATION

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

C = 0.6
A = 4.21 SF (Double Grate) or 3.24 (Single Grate)
g = 32.2
H = Water Depth
Q = Runoff (CFS)

ORIFICE EQUATION (OUTFLOW CALC. FROM EACH DROP INLET)

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

$C = 0.6$
$A = \pi r^2$, r = radius of the pipe out of each drop inlet
$g = 32.2$
H = Water Depth
Q = Flow

See the following tables for calculations.

DROP INLET CALCULATIONS

ORIFICE EQUATION

Q = CA sqrt(2gH)

C = 0.6

g = 32.2

POND	TYPE OF INLET	AREA (SF)	Q (CFS)	H (FT)	H ALLOW (FT)
A	SINGLE 'D'	2.30	5.08	0.2104	1.5
C	2 SINGLE 'D'	4.60	34.92	2.4857	3.33
E	DOUBLE 'D'	4.21	15.91	0.6160	1.5
F	SINGLE 'D'	2.30	6.2	0.3134	1.5
G	DOUBLE 'D'	4.21	2.53	0.0156	0.6

SAMPLE VELOCITY CALCULATIONS

All storm drain lines are assumed to be running full.

Storm drain line between MH-3 and MH-4:
Q = 21.03 cfs (from AHYMO ponding output)
A = 1.767 ft^2

V = Q/A
V = 21.03/1.767
V = 11.90 ft/s

FLOW CONDITIONS IN MANHOLES 3 AND 6

MH-3:

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

Solve for H
Q = 21.03 cfs
C = 0.6
A = 1.767 ft^2
g = 32.2
H = 6.12 ft

$22.40_{\text{invert out}}$ ft + 6.12 ft = 28.52 ft
28.52 ft < 32.20_{grate} ft

MH-6:

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

Solve for H
Q = 22.26 cfs
C = 0.6
A = 1.767 ft^2
g = 32.2
H = 6.84 ft

$18.53_{\text{invert out}}$ ft + 6.84 ft = 25.37 ft
25.37 ft < 34.81_{grate} ft

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: MH-7 TO MH-6

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0040 ft/ft
Manning's n.....	0.013
Discharge.....	5.96 cfs

Computed Results:

Depth.....	1.11 ft
Velocity.....	4.25 fps
Flow Area.....	1.40 sf
Critical Depth....	0.94 ft
Critical Slope....	0.0062 ft/ft
Percent Full.....	73.97 %
Full Capacity.....	6.64 cfs
QMAX @.94D.....	7.15 cfs
Froude Number.....	0.73 (flow is Subcritical)

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: CB-G TO MH-7

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0040 ft/ft
Manning's n.....	0.013
Discharge.....	5.96 cfs

Computed Results:

Depth.....	1.11 ft
Velocity.....	4.25 fps
Flow Area.....	1.40 sf
Critical Depth....	0.94 ft
Critical Slope....	0.0062 ft/ft
Percent Full.....	73.97 %
Full Capacity.....	6.64 cfs
QMAX @.94D.....	7.15 cfs
Froude Number.....	0.73 (flow is Subcritical)

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: MH-6 TO MH-5, 4, 3

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0040 ft/ft
Manning's n.....	0.013
Discharge.....	4.15 cfs

Computed Results:

Depth.....	0.86 ft
Velocity.....	3.97 fps
Flow Area.....	1.05 sf
Critical Depth....	0.78 ft
Critical Slope....	0.0055 ft/ft
Percent Full.....	57.26 %
Full Capacity.....	6.64 cfs
QMAX @.94D.....	7.15 cfs
Froude Number.....	0.83 (flow is Subcritical)

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: MH-3 TO MH-2, 1, CB-A

Solve For Actual Depth

Given Input Data:

Diameter.....	0.83 ft
Slope.....	0.0040 ft/ft
Manning's n.....	0.013
Discharge.....	1.89 cfs

Computed Results:

Worksheet does not have calculated results...

PONDING

CALCULATIONS

STORM DRAIN INLET

EFFECTIVE AREA ASSUMING A 50% CLOGGING FACTOR

SINGLE 'D':

Area at the grate:

L = 38.375" - 7 (1/2" $_{\text{middle bars}}$)
= 34.875"
= 2.906'

W = 25.5" - 13 (1/2" $_{\text{middle bars}}$)
= 19"
= 1.583'

Area = 1.583 x 2.906
= 4.601 ft^2

Effective Area = 4.601- .5 (4.601) $_{\text{Clogging Factor}}$
= 2.30 ft^2 at the grate

DOUBLE 'D':

Area at the grate:

L = 76.75" - 14 (1/2" $_{\text{middle bars}}$) - 6" $_{\text{center piece}}$
= 63.75"
= 5.3125'

W = 25.5" - 13 (1/2 $_{\text{middle bars}}$)
= 19"
= 1.583'

Area = 1.583' x 5.3125'
= 8.410 ft^2

Effective Area = 8.410 - .5 (8.410)
= 4.205 ft^2

TYPICAL POND CALCULATION

BASIN A:

CATCH BASIN CROSS-SECTION AREA = 6.94 SF

VOLUME @ ELEV. 28.75' (V_1) = 6.94(28.75-26.55)
= 15.27 CF = 0.000351 AC-FT

SURFACE AREA @ ELEV. 29.00' = 3,267.59 SF

CHANGE IN SURFACE AREA FROM ELEVATION 28.75' TO 29.00':

(3267.59 - 6.94) / (29.00 - 28.75) = 13,042.60 SF/LF-DEPTH

VOLUME AT A GIVEN ELEVATION D FORM 28.75' TO 29.00' (V_2):

$V_2 = [(13042.60*H + 6.94) + 6.94] / 2 * H = 6521.30\ H^2 + 6.94\ H + V_1$

VOLUME @ ELEV. 29.00 $= 6521.30\ (29.00-28.75)^2 + 6.94\ (29.00-28.75) + 15.27$
= 424.58 CF = 0.009747 AC-FT

SURFACE AREA @ ELEV. 29.50' = 5,282.55 SF

CHANGE IN SURFACE AREA FROM ELEVATION 29.00' TO 29.50':

(5285.55 - 3267.59) / (29.50 - 29.00) = 4,035.92 SF/LF-DEPTH

VOLUME AT A GIVEN ELEVATION D FORM 29.00' TO 29.50' (V_3):

$V_3 = [(4035.92*H + 3267.59) + 3267.59] / 2 * H = 2017.96\ H^2 + 3267.59\ H + V_2$

VOLUME @ ELEV. 29.50' $= 4035.92\ (29.50-29.00)^2 + 32667.59\ (29.50-29.00) + 424.58$
= 2,562.87 CF = 0.058835 AC-FT

See Grading and Drainage Plan for pond location.

BASIN A

				ORIFICE (IN) 6.5
ELEV.	WT. ELEV.	V (CF)	V (AC-FT)	OUT-FLOW (CFS)
26.55	0.00	0.00	0.00000	0.00
26.65	0.10	0.69	0.000016	0.35
26.75	0.20	1.39	0.000032	0.50
27.25	0.70	4.86	0.000112	0.93
27.75	1.20	8.33	0.000191	1.22
28.25	1.70	11.80	0.000271	1.45
28.75	2.20	15.27	0.000351	1.65
28.85	2.30	81.18	0.001864	1.68
28.95	2.40	277.51	0.006371	1.72
29.00	2.45	424.58	0.009747	1.74
29.10	2.55	771.52	0.017712	1.77
29.20	2.65	1158.82	0.026603	1.81
29.30	2.75	1586.48	0.036421	1.84
29.40	2.85	2054.49	0.047165	1.87
29.50	2.95	2562.87	0.058835	1.91

CATCH BASIN CROSS-SECTION AREA = 6.94 SF

SURFACE AREA AT ELEVATION 29.00' = 3,267.59 SF

SURFACE AREA AT ELEVATION 29.50' = 5,285.55 SF

SEE TYPICAL POND CALCULATIONS

BASIN C POND VOLUME CALCULATIONS

Ab - Bottom Of The Pond Surface Area
At - Top Of The Pond Surface Area
D - Water Depth
Dt - Total Pond Depth
C - Change In Surface Area / Water Depth

Volume = $Ab * D + 0.5 * C * D^2$

C = (At - Ab) / Dt

Volume between elevation 23.67 and 26.67 = 6.94 (Area of drop inlet) * depth of drop inlet

Catch basin Cross-section Area =	6.94 SF
Surface Area at Elevation 27.00' =	1818.58 SF
Surface Area at Elevation 28.00' =	9362.31 SF
Surface Area at Elevation 29.00' =	25855.01 SF
Surface Area at Elevation 30.00' =	50290.23 SF
Surface Area at Elevation 31.00' =	93004.41 SF

	WATER SURFACE ELEVATION BETWEEN				
	26.67-27	27-28	28-29	29-30	30-31
Ab =	6.94	1,818.58	9,362.31	25,855.01	50,290.23
At =	1,818.58	9,362.31	25,855.01	50,290.23	93,004.41
Dt =	0.33	1.00	1.00	1.00	1.00
C =	5489.82	7543.73	16492.70	24435.22	42714.18

ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	Q (CFS)
23.67	0	0	0.00
24.17	0.5	0.0001	0.67
24.67	1	0.0002	0.95
25.17	1.5	0.0002	1.16
25.67	2	0.0003	1.34
26.17	2.5	0.0004	1.49
26.67	3	0.0005	1.64
26.77	3.1	0.0011	1.66
26.87	3.2	0.0030	1.69
26.97	3.3	0.0062	1.72
27.00	3.33	0.0074	1.73
27.50	3.83	0.0499	1.85
28.00	4.33	0.1357	1.97
28.50	4.83	0.2905	2.08
29.00	5.33	0.5400	2.18
29.50	5.83	0.9069	2.28
30.00	6.33	1.4140	2.38
30.50	6.83	2.1138	2.47
31.00	7.33	3.0588	2.56

Orifice Equation
Q = CA SQRT(2gH)

C = 0.6
Diameter (in) = 6
Area (ft^2)= 0.19634954
g = 32.2
H (ft) = Depth of water
Q (cfs)= Flow

VOLUME CALCULATIONS

POND E

Ab - Bottom Of The Pond Surface Area
At - Top Of The Pond Surface Area
D - Water Depth
Dt - Total Pond Depth
C - Change In Surface Area / Water Depth

Volume = $Ab * D + 0.5 * C * D^2$

Volume @ elevation 34.50 = 6.80*2.50 (depth of drop inlet)

C = (At - Ab) / Dt

Ab =	6.80	(@ elevation 34.50)
At =	27,202.70	(@ elevation 36.00)
Dt =	1.50	
C =	18130.60	

ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	Q (CFS)
32	0	0	0.0000
34.50	2.5	0.0004	1.4181
34.70	2.7	0.0087	1.4798
34.90	2.9	0.0338	1.5390
35.10	3.1	0.0754	1.5961
35.30	3.3	0.1337	1.6511
35.50	3.5	0.2087	1.7044
35.70	3.7	0.3003	1.7560
35.90	3.9	0.4085	1.8062
36.00	4	0.4689	1.8308

Orifice Equation
Q = CA SQRT(2gH)

C =	0.6
Diameter (in) =	6
Area (ft^2)=	0.1963495
g =	32.2
H (ft) =	Depth of water above center of orifice
Q (cfs) =	Flow

EMERGENCY

SPILLWAY

EMERGENCY SPILLWAY CALCULATIONS

Width required for the emergency spillways:

Tract B-1 emergency spillway (Basins B, C, and D)

$Q = CLH^{3/2}$
$Q = 34.92$
H = assuming a depth of 0.5'
C = 2.95
L = ? (Width of the emergency spillway)

$L = Q/CH^{3/2}$
$= 34.92/(2.95*0.5^{3/2})$
$= 33.48'$

we will use a 33.50' wide emergency spillway.

Tract B-1 Basin A:

Basin A, in case of an emergency or events larger than a 100-year storm , will flow over the curb on the east side and then into the Corrales Main Canal.

Tract 1:

Tract 1, in case of an emergency or events larger than 100-year storm, will flow out the entrance at the east side of the tract.

AHYMO

FILES

AHYMO
Runoff Input
and
Summary Output
for
Proposed and Existing
Drainage Basins

```
**********                                    **********
*                    COTTONWOOD CROSSING                    *
*****************************************************************
*       100-YEAR, 24-HR STORM  (UNDER PROPOSED CONDITIONS)      *
*****************************************************************
*
START                TIME=0.0
*
* BASIN A
*
RAINFALL             TYPE=1 RAIN QUARTER=0.0 IN
                     RAIN ONE=1.87 IN RAIN SIX=2.20 IN
                     RAIN DAY=2.66 IN DT=0.03333 HR
COMPUTE NM HYD       ID=1 HYD NO=100.1 AREA=0.001915 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
* BASIN B
*
COMPUTE NM HYD       ID=1 HYD NO=100.2 AREA=0.003399 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
* BASIN C
*
COMPUTE NM HYD       ID=1 HYD NO=100.3 AREA=0.005069 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
* BASIN D
*
COMPUTE NM HYD       ID=1 HYD NO=100.4 AREA=0.004709 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
*
*****************************************************************
*       10-YEAR, 24-HR STORM   (UNDER PROPOSED CONDITIONS)      *
*****************************************************************
*
START                TIME=0.0
*
* BASIN A
*
RAINFALL             TYPE=1 RAIN QUARTER=0.0 IN
                     RAIN ONE=1.25 IN RAIN SIX=1.47 IN
                     RAIN DAY=1.77 IN DT=0.03333 HR
COMPUTE NM HYD       ID=1 HYD NO=110.1 AREA=0.001915 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
* BASIN B
*
COMPUTE NM HYD       ID=1 HYD NO=110.2 AREA=0.003399 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
```

```
                    TP=-0.1333 HR MASS RA...ALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN C
*
COMPUTE NM HYD      ID=1 HYD NO=110.3 AREA=0.005069 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN D
*
COMPUTE NM HYD      ID=1 HYD NO=110.4 AREA=0.004709 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
*
*
*****************************************************************
*       100-YEAR, 24-HR STORM  (UNDER EXISTING CONDITIONS)      *
*****************************************************************
*
START               TIME=0.0
*
* BASIN A
*
RAINFALL            TYPE=1 RAIN QUARTER=0.0 IN
                    RAIN ONE=1.87 IN RAIN SIX=2.20 IN
                    RAIN DAY=2.66 IN DT=0.03333 HR
COMPUTE NM HYD      ID=1 HYD NO=100.1 AREA=0.001915 SQ MI
                    PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN B
*
COMPUTE NM HYD      ID=1 HYD NO=100.2 AREA=0.003399 SQ MI
                    PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN C
*
COMPUTE NM HYD      ID=1 HYD NO=100.3 AREA=0.005069 SQ MI
                    PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN D
*
COMPUTE NM HYD      ID=1 HYD NO=100.4 AREA=0.004709 SQ MI
                    PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
*
*****************************************************************
*       10-YEAR, 24-HR STORM   (UNDER EXISTING CONDITIONS)      *
*****************************************************************
```

```
*
START                TIME=0.0
*
* BASIN A
*
RAINFALL             TYPE=1 RAIN QUARTER=0.0 IN
                     RAIN ONE=1.25 IN RAIN SIX=1.47 IN
                     RAIN DAY=1.77 IN DT=0.03333 HR
COMPUTE NM HYD       ID=1 HYD NO=110.1 AREA=0.001915 SQ MI
                     PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                     TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
* BASIN B
*
COMPUTE NM HYD       ID=1 HYD NO=110.2 AREA=0.003399 SQ MI
                     PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                     TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
* BASIN C
*
COMPUTE NM HYD       ID=1 HYD NO=110.3 AREA=0.005069 SQ MI
                     PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                     TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
* BASIN D
*
COMPUTE NM HYD       ID=1 HYD NO=110.4 AREA=0.004709 SQ MI
                     PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                     TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD            ID=1 CODE=1
*
**********************************************************************
FINISH
```

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =07/10/1996
INPUT FILE = A:D.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.200
COMPUTE NM HYD	100.10	-	1	.00192	5.08	.187	1.83567	1.500	4.148	PER IMP= 90.00
COMPUTE NM HYD	100.20	-	1	.00340	9.01	.333	1.83567	1.500	4.142	PER IMP= 90.00
COMPUTE NM HYD	100.30	-	1	.00507	13.43	.496	1.83567	1.500	4.139	PER IMP= 90.00
COMPUTE NM HYD	100.40	-	1	.00471	12.48	.461	1.83567	1.500	4.140	PER IMP= 90.00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.470
COMPUTE NM HYD	110.10	-	1	.00192	3.29	.116	1.13650	1.500	2.685	PER IMP= 90.00
COMPUTE NM HYD	110.20	-	1	.00340	5.83	.206	1.13650	1.500	2.681	PER IMP= 90.00
COMPUTE NM HYD	110.30	-	1	.00507	8.69	.307	1.13650	1.500	2.680	PER IMP= 90.00
COMPUTE NM HYD	110.40	-	1	.00471	8.08	.285	1.13650	1.500	2.680	PER IMP= 90.00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.200
COMPUTE NM HYD	100.10	-	1	.00192	2.49	.068	.66738	1.533	2.032	PER IMP= .00
COMPUTE NM HYD	100.20	-	1	.00340	4.42	.121	.66738	1.533	2.030	PER IMP= .00
COMPUTE NM HYD	100.30	-	1	.00507	6.58	.180	.66738	1.533	2.029	PER IMP= .00
COMPUTE NM HYD	100.40	-	1	.00471	6.12	.168	.66738	1.533	2.029	PER IMP= .00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.470
COMPUTE NM HYD	110.10	-	1	.00192	.94	.023	.22437	1.533	.769	PER IMP= .00
COMPUTE NM HYD	110.20	-	1	.00340	1.67	.041	.22437	1.533	.767	PER IMP= .00
COMPUTE NM HYD	110.30	-	1	.00507	2.49	.061	.22437	1.533	.767	PER IMP= .00
COMPUTE NM HYD	110.40	-	1	.00471	2.31	.056	.22437	1.533	.767	PER IMP= .00
FINISH										

```
**********************************************.   **********
*            MILLER AUTO PARK (COTTONWOOD CROSSING)            *
*****************************************************************
*       100-YEAR, 24-HR STORM  (UNDER EXISTING CONDITIONS)      *
*****************************************************************
*
START               TIME=0.0
*
* BASIN 1
*
RAINFALL            TYPE=2 RAIN QUARTER=0.0 IN
                    RAIN ONE=1.87 IN RAIN SIX=2.20 IN
                    RAIN DAY=2.66 IN DT=0.03333 HR
COMPUTE NM HYD      ID=1 HYD NO=100.1 AREA=0.011116 SQ MI
                    PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
*
*****************************************************************
*        10-YEAR, 24-HR STORM  (UNDER EXISTING CONDITIONS)      *
*****************************************************************
*
START               TIME=0.0
*
* BASIN 1
*
RAINFALL            TYPE=2 RAIN QUARTER=0.0 IN
                    RAIN ONE=1.25 IN RAIN SIX=1.47 IN
                    RAIN DAY=1.77 IN DT=0.03333 HR
COMPUTE NM HYD      ID=1 HYD NO=110.1 AREA=0.011116 SQ MI
                    PER A=0.00 PER B=100.00 PER C=0.00 PER D=0.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
*
FINISH
```

AHYMO SUMMARY TABLE (AHYMO194) - AMAFL ..ydrologic Model - January, 1994 ... DATE (MON/DAY/YR) =06/25/1996
INPUT FILE = A:E.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										
RAINFALL TYPE= 2										TIME= .00
										RAIN24= 2.660
COMPUTE NM HYD	100.10	-	1	.01112	14.43	.396	.66738	1.533	2.028	PER IMP= .00
START										TIME= .00
RAINFALL TYPE= 2										RAIN24= 1.770
COMPUTE NM HYD	110.10	-	1	.01112	5.45	.133	.22437	1.533	.767	PER IMP= .00
FINISH										

```
**********************************************  **********
*            MILLER AUTO PARK (COTTONWOOD CROSSING)           *
*****************************************************************
*       100-YEAR, 24-HR STORM  (UNDER PROPOSED CONDITIONS)     *
*****************************************************************
*
START               TIME=0.0
*
* BASIN E
*
RAINFALL            TYPE=2 RAIN QUARTER=0.0 IN
                    RAIN ONE=1.87 IN RAIN SIX=2.20 IN
                    RAIN DAY=2.66 IN DT=0.03333 HR
COMPUTE NM HYD      ID=1 HYD NO=100.1 AREA=0.006009 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN F
*
COMPUTE NM HYD      ID=1 HYD NO=100.2 AREA=0.002337 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN G
*
COMPUTE NM HYD      ID=1 HYD NO=100.3 AREA=0.000950 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN H
*
COMPUTE NM HYD      ID=1 HYD NO=100.4 AREA=0.001752 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
*
*
*
*****************************************************************
*        10-YEAR, 24-HR STORM  (UNDER PROPOSED CONDITIONS)      *
*****************************************************************
*
START               TIME=0.0
*
* BASIN E
*
RAINFALL            TYPE=2 RAIN QUARTER=0.0 IN
                    RAIN ONE=1.25 IN RAIN SIX=1.47 IN
                    RAIN DAY=1.77 IN DT=0.03333 HR
COMPUTE NM HYD      ID=1 HYD NO=110.1 AREA=0.006009 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN F
*
```

```
COMPUTE NM HYD      ID=1 HYD NO=110.2 AREA=0.002337 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN G
*
COMPUTE NM HYD      ID=1 HYD NO=110.3 AREA=0.000950 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
* BASIN H
*
COMPUTE NM HYD      ID=1 HYD NO=110.4 AREA=0.001752 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
PRINT HYD           ID=1 CODE=1
*
*
FINISH
```

AHYMO SUMMARY TABLE (AHYMO194) - AMAFC Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =06/27/1996
INPUT FILE = a:p.dat USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
START										
RAINFALL TYPE= 2										TIME= .00
										RAIN24= 2.660
COMPUTE NM HYD	100.10	-	1	.00601	15.91	.698	2.17736	1.500	4.138	PER IMP= 90.00
COMPUTE NM HYD	100.20	-	1	.00234	6.20	.271	2.17738	1.500	4.144	PER IMP= 90.00
COMPUTE NM HYD	100.30	-	1	.00095	2.53	.110	2.17742	1.500	4.160	PER IMP= 90.00
COMPUTE NM HYD	100.40	-	1	.00175	4.65	.203	2.17739	1.500	4.148	PER IMP= 90.00
START										
RAINFALL TYPE= 2										TIME= .00
										RAIN24= 1.770
COMPUTE NM HYD	110.10	-	1	.00601	10.31	.436	1.35927	1.500	2.680	PER IMP= 90.00
COMPUTE NM HYD	110.20	-	1	.00234	4.01	.169	1.35928	1.500	2.683	PER IMP= 90.00
COMPUTE NM HYD	110.30	-	1	.00095	1.64	.069	1.35930	1.500	2.691	PER IMP= 90.00
COMPUTE NM HYD	110.40	-	1	.00175	3.01	.127	1.35928	1.500	2.685	PER IMP= 90.00
FINISH										

AHYMO
Input and Output
for
Ponding

```
**********************************************************************
*                    COTTONWOOD CROSSING                             *
**********************************************************************
*       100-YEAR, 6-HR STORM  (UNDER PROPOSED CONDITIONS)            *
**********************************************************************
*
START               TIME=0.0
*
* SUBBASIN A
*
RAINFALL            TYPE=1 RAIN QUARTER=0.0 IN
                    RAIN ONE=1.87 IN RAIN SIX=2.20 IN
                    RAIN DAY=2.66 IN DT=0.03333 HR
COMPUTE NM HYD      ID=1 HYD NO=100.1 AREA=0.001915 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
*
* CHECKING FOR THE WATER HEIGHT AND OUTFLOW FOR POND A
*
ROUTE RESERVOIR     ID=2 HYD NO=501.1 INFLOW ID=1 CODE=24
                    OUTFLOW(CFS)      STORAGE(AC-FT)  ELEVATION(FT)
                        0.00              0.000000          26.55
                        0.35              0.000016          26.65
                        0.50              0.000032          26.75
                        0.93              0.000112          27.25
                        1.22              0.000191          27.75
                        1.45              0.000271          28.25
                        1.65              0.000351          28.75
                        1.68              0.001864          28.85
                        1.72              0.006371          28.95
                        1.74              0.009747          29.00
                        1.77              0.017712          29.10
                        1.81              0.026603          29.20
                        1.84              0.036421          29.30
                        1.87              0.047165          29.40
                        1.91              0.058835          29.50
*
* SUBBASIN B
*
COMPUTE NM HYD      ID=3 HYD NO=100.2 AREA=0.003399 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
*
* SUBBASIN D
*
COMPUTE NM HYD      ID=1 HYD NO=100.3 AREA=0.004709 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
*
ADD HYD             ID=4 HYD NO=100.31 ID=1 ID=3
*
* SUBBASIN C
*
COMPUTE NM HYD      ID=1 HYD NO=100.4 AREA=0.005069 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
*
ADD HYD             ID=3 HYD NO=100.41 ID=1 ID=4
*
```

```
* CHECKING FOR THE WATER HEIGHT AND OUTFLOW FOR POND C
*
ROUTE RESERVOIR     ID=5 HYD NO=501.4 INFLOW ID=3 CODE=24
                    OUTFLOW(CFS)      STORAGE(AC-FT)  ELEVATION(FT)
                        0.00              0.0000          23.67
                        0.67              0.0001          24.17
                        0.95              0.0002          24.67
                        1.16              0.0002          25.17
                        1.34              0.0003          25.67
                        1.49              0.0004          26.17
                        1.64              0.0005          26.67
                        1.66              0.0011          26.77
                        1.69              0.0030          26.87
                        1.72              0.0062          26.97
                        1.73              0.0074          27.00
                        1.85              0.0499          27.50
                        1.97              0.1357          28.00
                        2.08              0.2905          28.50
                        2.18              0.5400          29.00
                        2.28              0.9069          29.50
                        2.38              1.4140          30.00
                        2.47              2.1138          30.50
                        2.56              3.0588          31.00
*
ADD HYD             ID=6 HYD NO=100.42 ID=2 ID=5
*
* SUBBASIN E
*
COMPUTE NM HYD      ID=1 HYD NO=100.5 AREA=0.006376 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
*
* CHECKING FOR THE WATER HEIGHT AND OUTFLOW FOR POND E
*
ROUTE RESERVOIR     ID=2 HYD NO=501.5 INFLOW ID=1 CODE=24
                    OUTFLOW(CFS)      STORAGE(AC-FT)  ELEVATION(FT)
                        0.0000            0.0000          32.00
                        1.4181            0.0004          34.50
                        1.4798            0.0087          34.70
                        1.5390            0.0338          34.90
                        1.5961            0.0754          35.10
                        1.6511            0.1337          35.30
                        1.7044            0.2087          35.50
                        1.7560            0.3003          35.70
                        1.8062            0.4085          35.90
                        1.8308            0.4689          36.00
*
ADD HYD             ID=3 HYD NO=100.51 ID=2 ID=6
*
* SUBBASIN F
*
COMPUTE NM HYD      ID=4 HYD NO=100.6 AREA=0.001965 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
*
*
* SUBBASIN G
*
COMPUTE NM HYD      ID=1 HYD NO=100.7 AREA=0.000950 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
```

```
                    TP=-0.1333 HR MASS RAINFALL=-1
*
*
ADD HYD             ID=3 HYD NO=100.71 ID=4 ID=3
*
ADD HYD             ID=1 HYD NO=100.71 ID=1 ID=3
*
* SUBBASIN H
*
COMPUTE NM HYD      ID=2 HYD NO=100.8 AREA=0.001752 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1
*
*
ADD HYD             ID=1 HYD NO=100.81 ID=1 ID=2
*
*
**********************************************************************
FINISH
```

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =09/11/1996

INPUT FILE = A:POND.DAT USER NO.= R_BOHANN.101

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION	
START										TIME=	.00
RAINFALL TYPE= 1										RAIN6=	2.200
COMPUTE NM HYD	100.10	-	1	.00192	5.08	.187	1.83567	1.500	4.148	PER IMP=	90.00
ROUTE RESERVOIR	501.10	1	2	.00192	1.89	.187	1.83553	1.766	1.544	AC-FT=	.054
COMPUTE NM HYD	100.20	-	3	.00340	9.01	.333	1.83567	1.500	4.142	PER IMP=	90.00
COMPUTE NM HYD	100.30	-	1	.00471	12.48	.461	1.83567	1.500	4.140	PER IMP=	90.00
ADD HYD	100.31	1& 3	4	.00811	21.49	.794	1.83561	1.500	4.140		
COMPUTE NM HYD	100.40	-	1	.00507	13.43	.496	1.83567	1.500	4.139	PER IMP=	90.00
ADD HYD	100.41	1& 4	3	.01318	34.91	1.290	1.83561	1.500	4.140		
ROUTE RESERVOIR	501.40	3	5	.01318	2.30	1.291	1.83765	2.266	.272	AC-FT=	.987
ADD HYD	100.42	2& 5	6	.01509	4.15	1.479	1.83738	1.966	.430		
COMPUTE NM HYD	100.50	-	1	.00638	16.89	.624	1.83567	1.500	4.138	PER IMP=	90.00
ROUTE RESERVOIR	501.50	1	2	.00638	1.81	.624	1.83563	2.166	.444	AC-FT=	.424
ADD HYD	100.51	2& 6	3	.02147	5.96	2.103	1.83686	2.033	.434		
COMPUTE NM HYD	100.60	-	4	.00197	5.21	.192	1.83567	1.500	4.146	PER IMP=	90.00
COMPUTE NM HYD	100.70	-	1	.00095	2.53	.093	1.83567	1.500	4.160	PER IMP=	90.00
ADD HYD	100.71	4& 3	3	.02343	10.76	2.295	1.83675	1.500	.717		
ADD HYD	100.71	1& 3	1	.02438	13.29	2.388	1.83670	1.500	.852		
COMPUTE NM HYD	100.80	-	2	.00175	4.65	.172	1.83567	1.500	4.148	PER IMP=	90.00
ADD HYD	100.81	1& 2	1	.02614	17.94	2.560	1.83662	1.500	1.073		
FINISH											

```
    AHYMO PROGRAM (AHYMO194) - AMAFCA Hydrologic Model - January, 1994
         RUN DATE (MON/DAY/YR) = 09/11/1996
         START TIME (HR:MIN:SEC) = 13:16:33     USER NO.= R_BOHANN.I01
         INPUT FILE = A:POND.DAT

**********************************************************************
*                    COTTONWOOD CROSSING                             *
**********************************************************************
*       100-YEAR, 6-HR STORM  (UNDER PROPOSED CONDITIONS)            *
**********************************************************************
*
START               TIME=0.0
*
* SUBBASIN A
*
RAINFALL            TYPE=1 RAIN QUARTER=0.0 IN
                    RAIN ONE=1.87 IN RAIN SIX=2.20 IN
                    RAIN DAY=2.66 IN DT=0.03333 HR

               COMPUTED 6-HOUR RAINFALL DISTRIBUTION BASED ON NOAA ATLAS 2 - PEAK AT 1.40 HR.
               DT =    .033330 HOURS       END TIME =     5.999400 HOURS
                  .0000   .0016   .0033   .0050   .0067   .0085   .0103
                  .0122   .0141   .0160   .0180   .0201   .0222   .0243
                  .0266   .0289   .0312   .0337   .0362   .0388   .0415
                  .0443   .0472   .0502   .0534   .0567   .0601   .0637
                  .0675   .0715   .0758   .0809   .0865   .0924   .1050
                  .1334   .1771   .2398   .3254   .4379   .5814   .7600
                  .9780  1.1804  1.2649  1.3363  1.3997  1.4575  1.5106
                 1.5600  1.6061  1.6493  1.6900  1.7284  1.7646  1.7989
                 1.8314  1.8623  1.8915  1.9193  1.9456  1.9518  1.9576
                 1.9630  1.9682  1.9732  1.9780  1.9825  1.9869  1.9912
                 1.9953  1.9993  2.0031  2.0068  2.0104  2.0140  2.0174
                 2.0207  2.0240  2.0272  2.0303  2.0333  2.0363  2.0392
                 2.0420  2.0448  2.0475  2.0502  2.0528  2.0554  2.0580
                 2.0605  2.0629  2.0653  2.0677  2.0700  2.0723  2.0746
                 2.0768  2.0790  2.0812  2.0833  2.0855  2.0875  2.0896
                 2.0916  2.0936  2.0956  2.0976  2.0995  2.1014  2.1033
                 2.1051  2.1070  2.1088  2.1106  2.1124  2.1141  2.1159
                 2.1176  2.1193  2.1210  2.1227  2.1244  2.1260  2.1276
                 2.1292  2.1308  2.1324  2.1340  2.1355  2.1371  2.1386
                 2.1401  2.1416  2.1431  2.1446  2.1460  2.1475  2.1489
                 2.1504  2.1518  2.1532  2.1546  2.1560  2.1573  2.1587
                 2.1600  2.1614  2.1627  2.1640  2.1654  2.1667  2.1680
                 2.1692  2.1705  2.1718  2.1731  2.1743  2.1756  2.1768
                 2.1780  2.1792  2.1804  2.1817  2.1829  2.1840  2.1852
                 2.1864  2.1876  2.1887  2.1899  2.1910  2.1922  2.1933
                 2.1944  2.1956  2.1967  2.1978  2.1989  2.2000

COMPUTE NM HYD      ID=1 HYD NO=100.1 AREA=0.001915 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1

   K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
   UNIT PEAK =   6.8045    CFS   UNIT VOLUME =    .9976       B =   526.28      P60 = 1.8700
   AREA =      .001724 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
   RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330


   K =   .130992HR    TP =   .133300HR    K/TP RATIO =   .982685     SHAPE CONSTANT, N =  3.593448
```

```
    UNIT PEAK =   .46990    CFS   UNIT VOLUME =    .9700       B =   327.09      P60 = 1.8700
    AREA =      .000192 SQ MI    IA =    .50000 INCHES    INF =   1.25000 INCHES PER HOUR
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330

*
* CHECKING FOR THE WATER HEIGHT AND OUTFLOW FOR POND A
*
ROUTE RESERVOIR     ID=2 HYD NO=501.1 INFLOW ID=1 CODE=24
                    OUTFLOW(CFS)      STORAGE(AC-FT)  ELEVATION(FT)
                        0.00             0.000000          26.55
                        0.35             0.000016          26.65
                        0.50             0.000032          26.75
                        0.93             0.000112          27.25
                        1.22             0.000191          27.75
                        1.45             0.000271          28.25
                        1.65             0.000351          28.75
                        1.68             0.001864          28.85
                        1.72             0.006371          28.95
                        1.74             0.009747          29.00
                        1.77             0.017712          29.10
                        1.81             0.026603          29.20
                        1.84             0.036421          29.30
                        1.87             0.047165          29.40
                        1.91             0.058835          29.50

  * * * * * * * * * * * * * * * * * * *

    TIME      INFLOW    ELEV      VOLUME    OUTFLOW
    (HRS)     (CFS)     (FEET)    (AC-FT)   (CFS)

     .00        .00     26.55       .000       .00
     .80        .00     26.55       .000       .00
    1.60       3.51     29.38       .045      1.86
    2.40        .21     28.95       .006      1.72
    3.20        .04     26.56       .000       .04
    4.00        .03     26.56       .000       .03
    4.80        .03     26.56       .000       .03
    5.60        .03     26.56       .000       .03
    6.40        .00     26.55       .000       .00
 PEAK DISCHARGE =        1.892 CFS - PEAK OCCURS AT HOUR    1.77
 MAXIMUM WATER SURFACE ELEVATION =       29.454
 MAXIMUM STORAGE =         .0535 AC-FT      INCREMENTAL TIME=     .033330HRS

*
* SUBBASIN B
*
COMPUTE NM HYD      ID=3 HYD NO=100.2 AREA=0.003399 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1

   K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
   UNIT PEAK =   12.077    CFS   UNIT VOLUME =    .9984       B =   526.28      P60 = 1.8700
   AREA =      .003059 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
   RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330


   K =   .130992HR    TP =   .133300HR    K/TP RATIO =   .982685     SHAPE CONSTANT, N =  3.593448
   UNIT PEAK =   .83404    CFS   UNIT VOLUME =    .9836       B =   327.09      P60 = 1.8700
   AREA =      .000340 SQ MI    IA =    .50000 INCHES    INF =   1.25000 INCHES PER HOUR
   RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330
```

```
*
* SUBBASIN D
*
COMPUTE NM HYD       ID=1 HYD NO=100.3 AREA=0.004709 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.1333 HR MASS RAINFALL=-1

    K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
    UNIT PEAK =   16.732    CFS   UNIT VOLUME =    .9987       B =   526.28      P60 = 1.8700
    AREA =      .004238 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330


    K =   .130992HR    TP =   .133300HR    K/TP RATIO =   .982685     SHAPE CONSTANT, N =  3.593448
    UNIT PEAK =   1.1555    CFS   UNIT VOLUME =    .9884       B =   327.09      P60 = 1.8700
    AREA =      .000471 SQ MI    IA =    .50000 INCHES    INF =   1.25000 INCHES PER HOUR
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330

*
ADD HYD              ID=4 HYD NO=100.31 ID=1 ID=3
*
* SUBBASIN C
*
COMPUTE NM HYD       ID=1 HYD NO=100.4 AREA=0.005069 SQ MI
                     PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                     TP=-0.1333 HR MASS RAINFALL=-1

    K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
    UNIT PEAK =   18.011    CFS   UNIT VOLUME =    .9988       B =   526.28      P60 = 1.8700
    AREA =      .004562 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330


    K =   .130992HR    TP =   .133300HR    K/TP RATIO =   .982685     SHAPE CONSTANT, N =  3.593448
    UNIT PEAK =   1.2438    CFS   UNIT VOLUME =    .9894       B =   327.09      P60 = 1.8700
    AREA =      .000507 SQ MI    IA =    .50000 INCHES    INF =   1.25000 INCHES PER HOUR
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330

*
ADD HYD              ID=3 HYD NO=100.41 ID=1 ID=4
*
*
* CHECKING FOR THE WATER HEIGHT AND OUTFLOW FOR POND C
*
ROUTE RESERVOIR      ID=5 HYD NO=501.4 INFLOW ID=3 CODE=24
                     OUTFLOW(CFS)      STORAGE(AC-FT)  ELEVATION(FT)
                        0.00              0.0000          23.67
                        0.67              0.0001          24.17
                        0.95              0.0002          24.67
                        1.16              0.0002          25.17
                        1.34              0.0003          25.67
                        1.49              0.0004          26.17
                        1.64              0.0005          26.67
                        1.66              0.0011          26.77
                        1.69              0.0030          26.87
                        1.72              0.0062          26.97
                        1.73              0.0074          27.00
                        1.85              0.0499          27.50
                        1.97              0.1357          28.00
```

```
                    2.08          0.2905          28.50
                    2.18          0.5400          29.00
                    2.28          0.9069          29.50
                    2.38          1.4140          30.00
                    2.47          2.1138          30.50
                    2.56          3.0588          31.00

  * * * * * * * * * * * * * * * * * * *

    TIME      INFLOW    ELEV      VOLUME    OUTFLOW
    (HRS)     (CFS)     (FEET)    (AC-FT)   (CFS)

     .00        .00     23.67       .000       .00
     .80        .00     23.67       .000       .00
    1.60      24.08     29.02       .557      2.18
    2.40       1.47     29.57       .982      2.29
    3.20        .29     29.45       .874      2.27
    4.00        .19     29.27       .740      2.23
    4.80        .19     29.09       .606      2.20
    5.60        .22     28.87       .475      2.15
    6.40        .02     28.61       .346      2.10
    7.20        .00     28.24       .209      2.02
    8.00        .00     27.67       .079      1.89
 PEAK DISCHARGE =        2.296 CFS - PEAK OCCURS AT HOUR    2.27
 MAXIMUM WATER SURFACE ELEVATION =       29.579
 MAXIMUM STORAGE =         .9871 AC-FT      INCREMENTAL TIME=     .033330HRS

*
ADD HYD             ID=6 HYD NO=100.42 ID=2 ID=5
*
* SUBBASIN E
*
COMPUTE NM HYD      ID=1 HYD NO=100.5 AREA=0.006376 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1

   K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
   UNIT PEAK =   22.656    CFS   UNIT VOLUME =    .9988       B =   526.28      P60 = 1.8700
   AREA =      .005738 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
   RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330


   K =   .130992HR    TP =   .133300HR    K/TP RATIO =   .982685     SHAPE CONSTANT, N =  3.593448
   UNIT PEAK =   1.5645    CFS   UNIT VOLUME =    .9918       B =   327.09      P60 = 1.8700
   AREA =      .000638 SQ MI    IA =    .50000 INCHES    INF =   1.25000 INCHES PER HOUR
   RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330

*
* CHECKING FOR THE WATER HEIGHT AND OUTFLOW FOR POND E
*
ROUTE RESERVOIR     ID=2 HYD NO=501.5 INFLOW ID=1 CODE=24
                    OUTFLOW(CFS)      STORAGE(AC-FT)  ELEVATION(FT)
                       0.0000            0.0000          32.00
                       1.4181            0.0004          34.50
                       1.4798            0.0087          34.70
                       1.5390            0.0338          34.90
                       1.5961            0.0754          35.10
                       1.6511            0.1337          35.30
                       1.7044            0.2087          35.50
                       1.7560            0.3003          35.70
```

```
                    1.8062          0.4085          35.90
                    1.8308          0.4689          36.00

  * * * * * * * * * * * * * * * * * * * *

    TIME      INFLOW    ELEV      VOLUME    OUTFLOW
    (HRS)     (CFS)     (FEET)    (AC-FT)   (CFS)

     .00        .00     32.00       .000       .00
     .80        .00     32.00       .000       .00
    1.60      11.65     35.59       .251      1.73
    2.40        .71     35.90       .411      1.81
    3.20        .14     35.72       .313      1.76
    4.00        .09     35.49       .206      1.70
    4.80        .09     35.19       .102      1.62
    5.60        .11     34.63       .006      1.46
    6.40        .01     32.02       .000       .01
 PEAK DISCHARGE =        1.813 CFS - PEAK OCCURS AT HOUR    2.17
 MAXIMUM WATER SURFACE ELEVATION =       35.926
 MAXIMUM STORAGE =         .4242 AC-FT      INCREMENTAL TIME=     .033330HRS

*
ADD HYD             ID=3 HYD NO=100.51 ID=2 ID=6
*
* SUBBASIN F
*
COMPUTE NM HYD      ID=4 HYD NO=100.6 AREA=0.001965 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1

   K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
   UNIT PEAK =   6.9821    CFS   UNIT VOLUME =    .9978       B =   526.28      P60 = 1.8700
   AREA =      .001769 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
   RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330


   K =   .130992HR    TP =   .133300HR    K/TP RATIO =   .982685     SHAPE CONSTANT, N =  3.593448
   UNIT PEAK =   .48217    CFS   UNIT VOLUME =    .9725       B =   327.09      P60 = 1.8700
   AREA =      .000197 SQ MI    IA =    .50000 INCHES    INF =   1.25000 INCHES PER HOUR
   RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330

*
*
* SUBBASIN G
*
COMPUTE NM HYD      ID=1 HYD NO=100.7 AREA=0.000950 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1

   K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
   UNIT PEAK =   3.3756    CFS   UNIT VOLUME =    .9961       B =   526.28      P60 = 1.8700
   AREA =      .000855 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
   RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330


   K =   .130992HR    TP =   .133300HR    K/TP RATIO =   .982685     SHAPE CONSTANT, N =  3.593448
   UNIT PEAK =   .23311    CFS   UNIT VOLUME =    .9406       B =   327.09      P60 = 1.8700
   AREA =      .000095 SQ MI    IA =    .50000 INCHES    INF =   1.25000 INCHES PER HOUR
   RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330
```

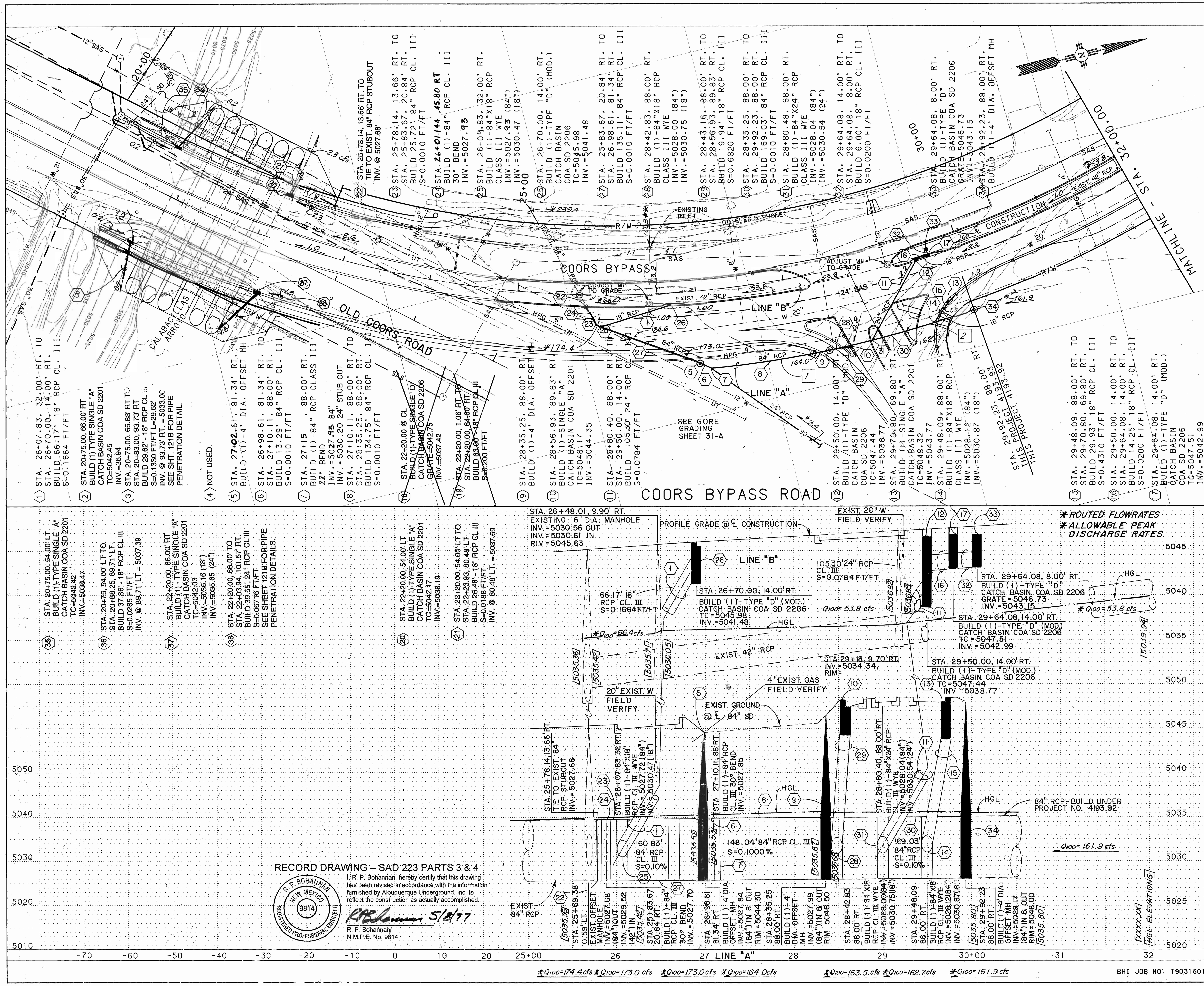
```
*
*
ADD HYD             ID=3 HYD NO=100.71 ID=4 ID=3
*
ADD HYD             ID=1 HYD NO=100.71 ID=1 ID=3
*
* SUBBASIN H
*
COMPUTE NM HYD      ID=2 HYD NO=100.8 AREA=0.001752 SQ MI
                    PER A=0.00 PER B=10.00 PER C=0.00 PER D=90.00
                    TP=-0.1333 HR MASS RAINFALL=-1

    K =   .072649HR    TP =   .133300HR    K/TP RATIO =   .545000     SHAPE CONSTANT, N =  7.106420
    UNIT PEAK =   6.2253    CFS   UNIT VOLUME =    .9976       B =   526.28      P60 = 1.8700
    AREA =      .001577 SQ MI    IA =    .10000 INCHES    INF =    .04000 INCHES PER HOUR
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330


    K =   .130992HR    TP =   .133300HR    K/TP RATIO =   .982685     SHAPE CONSTANT, N =  3.593448
    UNIT PEAK =   .42990    CFS   UNIT VOLUME =    .9673       B =   327.09      P60 = 1.8700
    AREA =      .000175 SQ MI    IA =    .50000 INCHES    INF =   1.25000 INCHES PER HOUR
    RUNOFF COMPUTED BY INITIAL ABSTRACTION/INFILTRATION NUMBER METHOD - DT =   .033330

*
*
ADD HYD             ID=1 HYD NO=100.81 ID=1 ID=2
*
*
**********
FINISH

    NORMAL PROGRAM FINISH          END TIME (HR:MIN:SEC) = 13:16:35
```



RECORD DRAWING – SAD 223 PARTS 3 & 4

I, R. P. Bohannan, hereby certify that this drawing has been revised in accordance with the information furnished by Albuquerque Underground, Inc. to reflect the construction as actually accomplished.

R. P. BOHANNAN NEW MEXICO 9814 REGISTERED PROFESSIONAL ENGINEER

R. P. Bohannan 5/8/97

R. P. Bohannan
N.M.P.E. No. 9814

CURVE NO.	R	L	Δ	T
1	1234.00'	134.75'	6°15'24"	67.44
2	1234.00'	169.03'	7°05'36"	84.65

AS BUILT INFORMATION
CONTRACTOR
WORK STAKED BY — DATE
INSPECTOR'S ACCEPTANCE BY — DATE
FIELD VERIFICATION BY — DATE
DRAWINGS CORRECTED BY — DATE
MICRO-FILM INFORMATION
RECORDED BY — DATE
NO.

BENCH MARKS
NMSHC STATION NM448-N2, ELEVATION 5023.411. BRASS TABLET SET IN A CONCRETE TABLET PROJECTING 0.3 FT. ABOVE GROUND. LOCATED 9.30 MILES NORTH OF THE INTERSECTION OF COORS RD. & CENTRAL AVE., ON THE WEST SIDE OF COORS RD. AT A MT. BELL SUB-STATION SOUTH OF CORRALES (ALAMEDA) RD.

SURVEY INFORMATION
FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL
CO#1 3-31-95
TED F. GREEN NEW MEXICO 10146 REGISTERED — 3/18/92 — 8/4/94

NO.	DATE	REMARKS	BY
1	2-15-95	CHANGE ORDER #1, INLETS @ ARROYO	TG
		REVISIONS	
		DESIGN	

DESIGNED BY — DATE
DRAWN BY — DATE
CHECKED BY — DATE

RECORD DRAWINGS
DATE

SCALE: HORIZ. 1"=50'
VERT. 1"= 5'

BOHANNAN HUSTON INC.

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING GROUP

SAD 223

TITLE: COORS BYPASS IMPROVEMENTS
STORM DRAIN STA. 20+00 TO 32+00

APPROVALS	ENGINEER	DATE	APPROVALS	ENGINEER	DATE
DRC CHAIRMAN			WATER		
TRANSPORTATION			WASTE WATER		
HYDROLOGY			AMAFCA	John Kelly	3-27-95

APPROVED — CITY ENGINEER

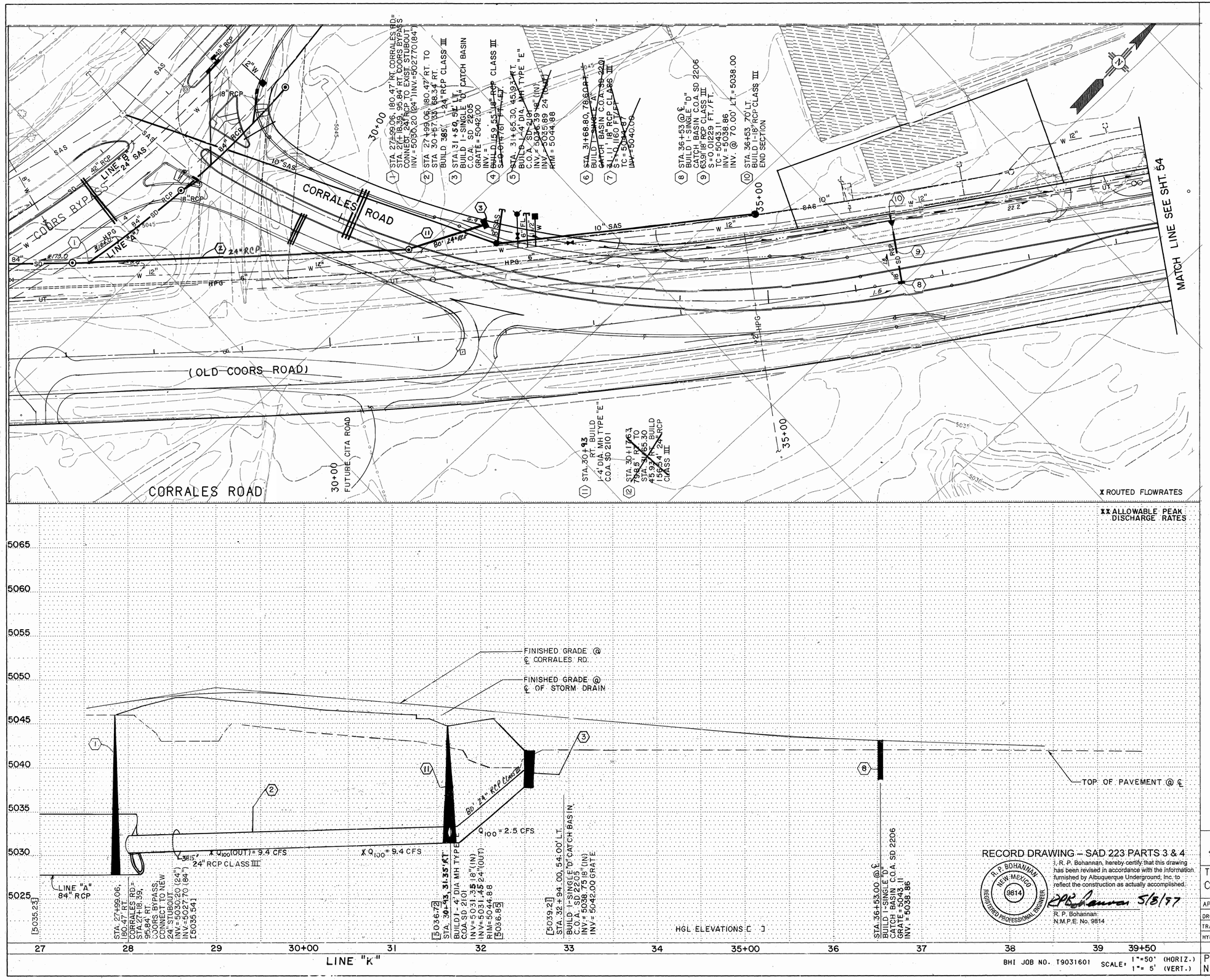
BHI JOB NO. T9031601

PROJECT NO. 4193.93 | MAP NO. B-14 | SHEET 54 OF 174

USERNAME: TRANS:[T9031601.PAD]
FILENAME: STORM1.GRF

26-4193.93 5497

REFER TO SHEET 20A REVISED 8/4/95



SCANNED BY MEGA ReProG

AS BUILT INFORMATION	
CONTRACTOR	
WORK STARTED BY	
INSPECTOR'S ACCEPTANCE BY	DATE
FIELD VERIFICATION BY	DATE
DRAWING BY	DATE
CORRECTED BY	DATE
MICRO-FILM INFORMATION	
RECORDED BY	DATE
NO.	

BENCH MARKS

NMSHC STATION NM448-N2. ELEVATION 5023.411.
BRASS TABLET SET IN A CONCRETE TABLET PROJECTING 0.3 FT. ABOVE GROUND. LOCATED 9.30 MILES NORTH OF THE INTERSECTION OF COORS RD. & CENTRAL AVE., ON THE WEST SIDE OF COORS RD. AT A MT. BELL SUB-STATION SOUTH OF CORRALES (ALAMEDA) RD.

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

SEAL

ENGINEER'S SEAL

STATE OF NEW MEXICO — PAUL E. GREEN — 9794 — REGISTERED PROFESSIONAL ENGINEER
8/9/95 Paul E. Green
3-18-92

NO.	DATE	REMARKS	BY
		REVISIONS	
		DESIGN	

DESIGNED BY DATE
DRAWN BY DATE
CHECKED BY DATE

RECORD DRAWINGS
DATE _____

RECORD DRAWING -- SAD 223 PARTS 3 & 4

I, R. P. Bohannan, hereby certify that this drawing has been revised in accordance with the information furnished by Albuquerque Underground, Inc. to reflect the construction as actually accomplished.

R. P. BOHANNAN NEW MEXICO 9814 REGISTERED PROFESSIONAL ENGINEER

R. P. Bohannan 5/8/97
R. P. Bohannan
N.M.P.E. No. 9814

BOHANNAN HUSTON INC.

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING GROUP

SAD 223

TITLE: COORS BYPASS IMPROVEMENTS
CORRALES STORM DRAIN STA 27+00 TO 39+50

APPROVALS	ENGINEER	DATE
DRC CHAIRMAN		
TRANSPORTATION		
HYDROLOGY		

SEP 9 1994
TRAFFIC ENGINEERING
REVIEW COMMITTEE

APPROVALS	ENGINEER	DATE
WATER		
WASTE WATER		

BHI JOB NO. T9031601 SCALE: 1"=50' (HORIZ.) 1"= 5' (VERT.)

PROJECT NO. 4193.93 MAP NO. B-14 SHEET 62 OF 174

USERNAME= TRANS<T9031601.PADJ
FILENAME= STORM3.GRF

26-A1193.93 62.4'

REFER TO SHEET 20A REVISED 8/2/95