DRAINAGE REPORT
FOR

Tract 14A and 14B
Black Ranch

Prepared by:

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Prepared for:
John Black

October, 2003

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

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Job No 220097

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Section I

Report

Prelude

This report is being prepared at the request of the current owner, John Black, who proposes to develop a small commercial center containing three restaurants and three office buildings.

Location

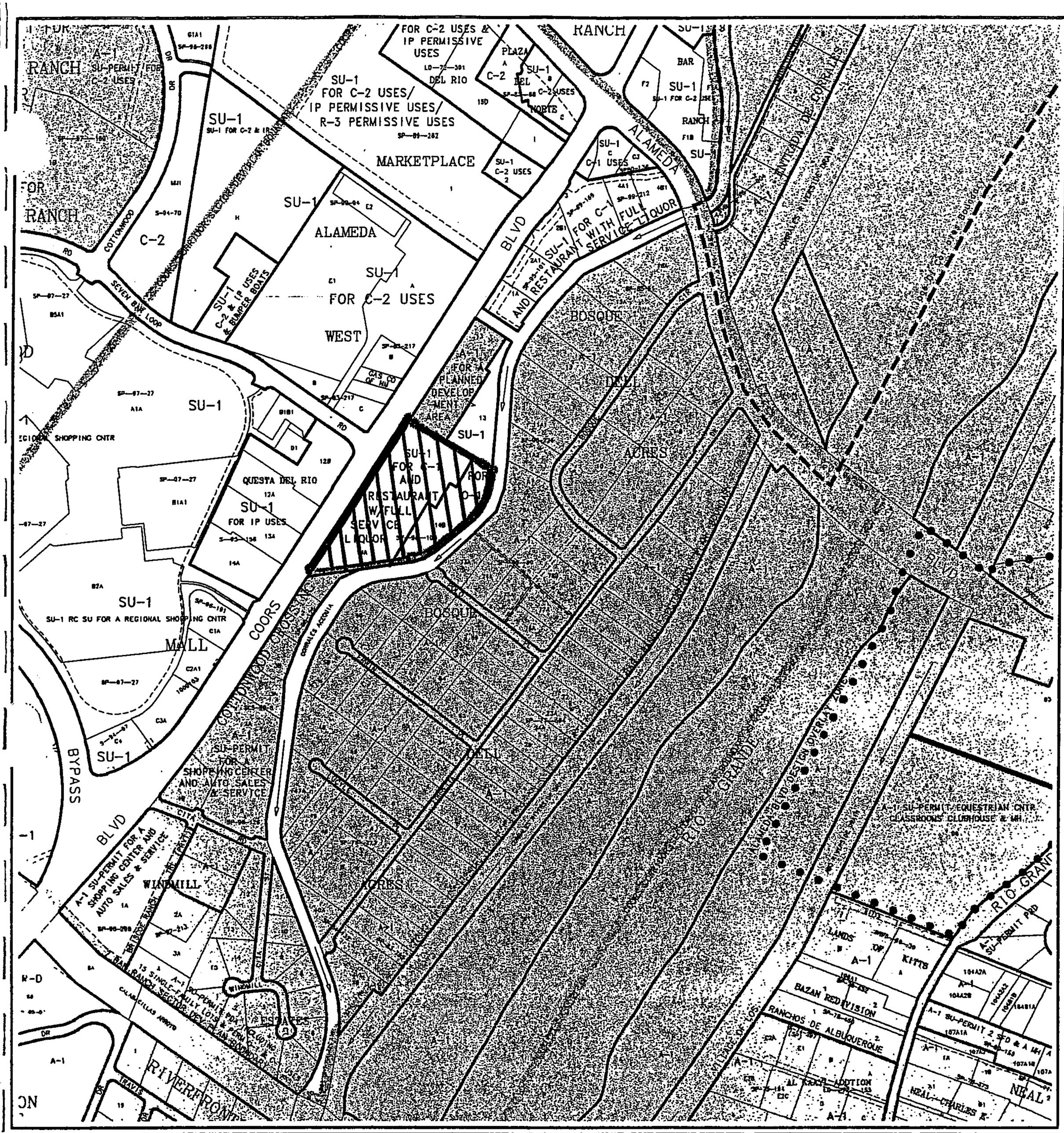
The subject site is located just east of the intersection of Coors Road NW and Seven Bar Loop in Northwest Albuquerque and consists of Tract 14-A and 14-B, Black Ranch. The exact location of the site is shown highlighted on the enclosed Zone Atlas page number B-14. The site will be built in one phase and contains 9.40 acres more or less.

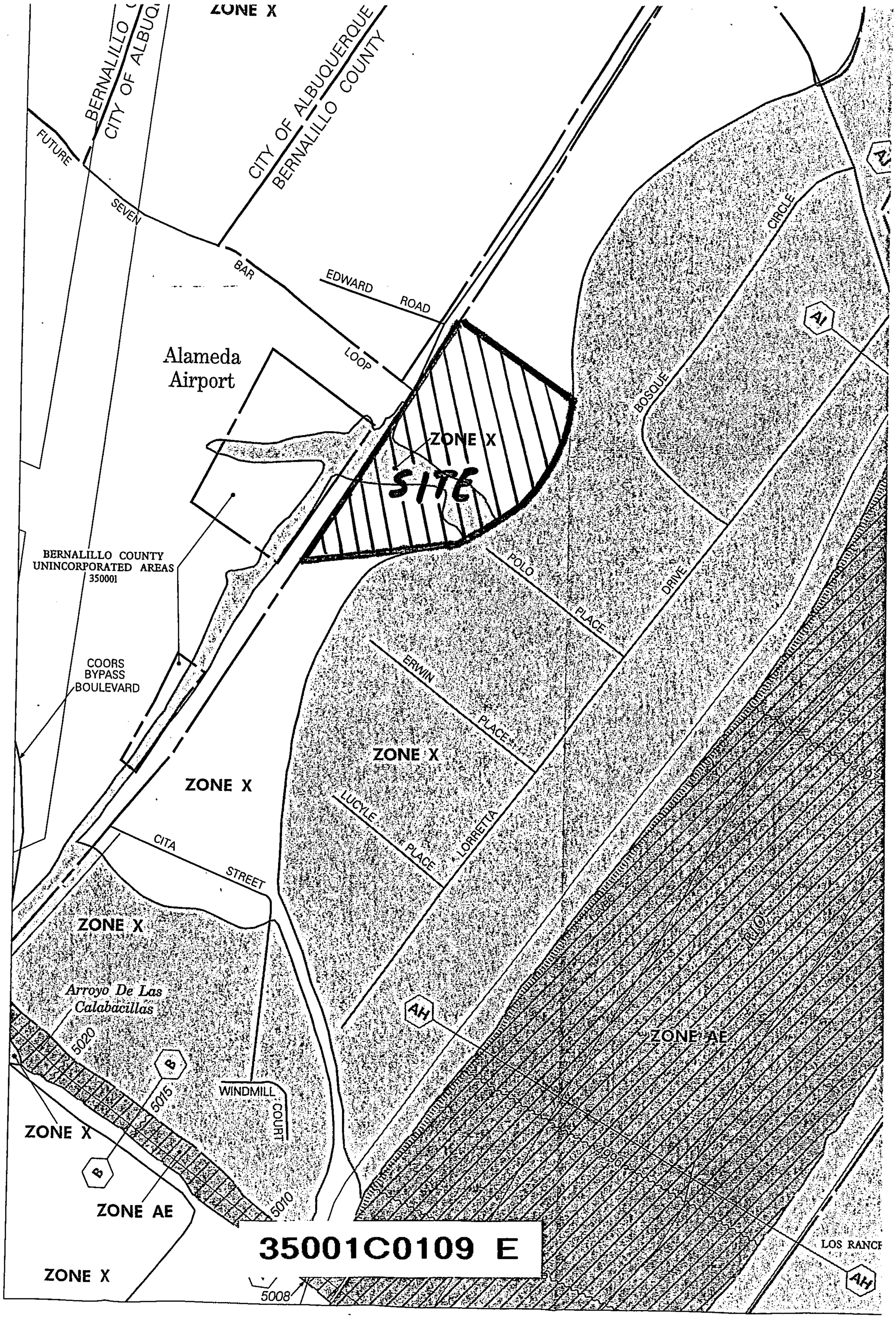
Purpose

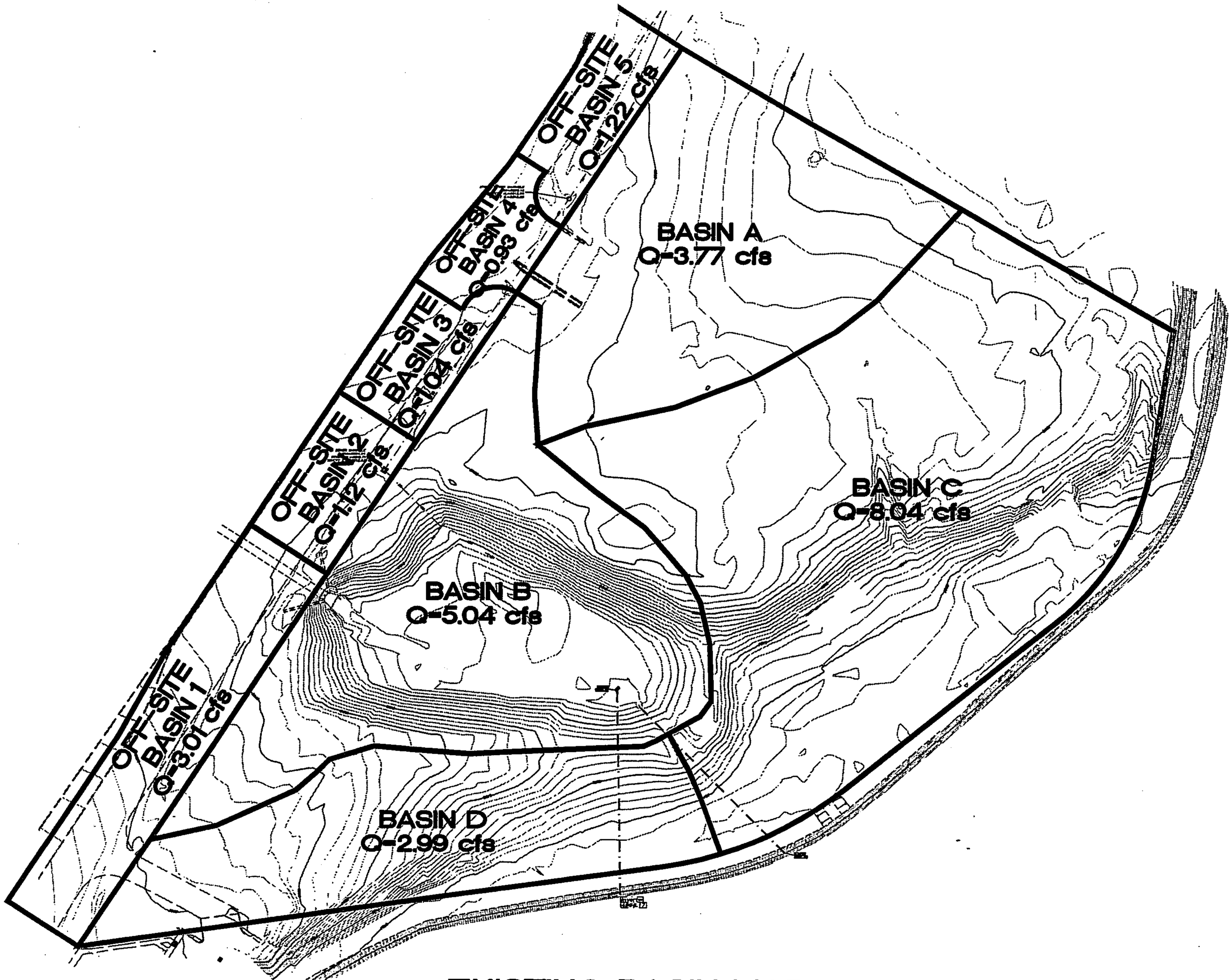
The purpose of this drainage report is to present a final grading and drainage solution for the proposed commercial center as well as deal with the off-site flows entering the site. The current pond is detention and is limiting the discharge. This report will also seek to discharge more flows into the Corrales Main Canal to the design capacity of that facility there by reducing the existing detention pond.

Existing Drainage Conditions

The site is currently undeveloped and existed, in the past, as a dairy farm with corrals and barns. Also, a portion of Tract 14 A and B consists of an archeological site believed to be an ancient pueblo.


SU-1 FOR C-2 USES/ IP PERMISSIVE USES/ R-3 PERMISSIVE USES
MARKETPLACE
ALAMEDA BLVD
COTTONWOOD
COORS BYPASS BLVD
QUESTA DEL RIO
SU-1 FOR IP USES
SU-1 RC SU FOR A REGIONAL SHOPPING CNTR
MALL
SU-1 FOR C-2 USES
WEST
BOSQUE
ACRES
RIO GRANDE
WINDMILL
ESTATES
RIVERFRONT
A-1 SU-PERMIT FOR A SHOPPING CENTER AND AUTO SALES & SERVICE
A-1 SU-PERMIT EQUESTRIAN CNTR CLASSROOMS CLUBHOUSE & MH
LANDS OF KITTS
BAZAN RED DIVISION
RANCHOS DE ALBUQUERQUE
AL KAM ADDITION
NEAL CHARLES E
Interstate 40
Interstate 25
NOTE: GREY SHADING REPRESENTS AREA OUTSIDE OF THE CITY LIMITS
CITY OF Albuquerque
Albuquerque Geographic Information System
PLANNING DEPARTMENT
© Copyright 2000
GRAPHIC SCALE IN FEET
250 0 750 1000
Zone Atlas Page
B-14-Z
Map Amended through July 27, 2000


ZONE X
BERNALILLO
CITY OF ALBUQ
CITY OF ALBUQUERQUE
BERNALILLO COUNTY
FUTURE
SEVEN
BAR
EDWARD
ROAD
LOOP
Alameda
Airport
ZONE X
SITE
CIRCLE
BOSQUE
AI
POLO
PLACE
DRIVE
ERWIN
PLACE
ZONE X
LUCYLE
PLACE
LORRETTA
BERNALILLO COUNTY
UNINCORPORATED AREAS
350001
COORS
BYPASS
BOULEVARD
ZONE X
CITA
STREET
ZONE X
Arroyo De Las
Calabacillas
5020
B
5015
WINDMILL
COURT
ZONE X
B
ZONE AE
5010
AH
ZONE AE
35001C0109 E
ZONE X
5008
LOS RANCH
AH
35°11'15"



EXISTING BASIN MAP

The site currently receives storm runoff from four off-site areas through various storm sewer pipes ranging in size from 18 inches to 60 inches. The offsite drainage area consists of fourteen (14) sub-basins as outlined in the Alameda West Shopping Center Drainage Report, the Questa Del Rio Drainage Management Plan and the North Coors Drainage Management Plan. Exhibits 1 and 2 in Appendix C delineate these basins. All of the flows from the off-site drainage area are subsequently routed to a detention pond on Tract 14 via a storm sewer system. Nearly half of the off-site flows are collected in a detention pond located in the Alameda West Shopping Center where it is released into the existing storm sewer system at a controlled flow rate of 42.14 cfs. This flow then combines with the peak flow of 66.14 cfs generated by Questa Del Rio and the adjacent sub-basins. The combined peak flow is then routed to Tract 14 for a resulting flow of 103.59 cfs. These flow are then contained in a detention pond where the outflow is controlled to release 14 cfs into the Corrales Main Canal. The size of the existing pond is approximately 4.3 acre-feet.

The on-site drainage area consists of Tract 14 with most of the tract sheet flowing into the Corrales Main Canal and the rest draining to the existing pond.

Flood Plain

The site is located on FEMA Map 35001C0109 E as shown on the attached excerpt. The map shows that the site lies in a Zone X shaded area which is defined as areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood. However, the flows that dictate this area are now contained in a pipe and distributed to a new detention pond located on the east side of the property. A LOMR will be completed to revise the flood plain.

Proposed Conditions and On-Site Drainage Management Plan

The original detention pond on Tract 14 was required to release only 14 cfs into the canal based on calculations provided in the North Coors Drainage Management Plan (NCDMP) revised September 11, 1992 by Wilson & Co. However, this report will demonstrate that the original drainage solutions changed allowing for a greater discharge rate from Tract 14.

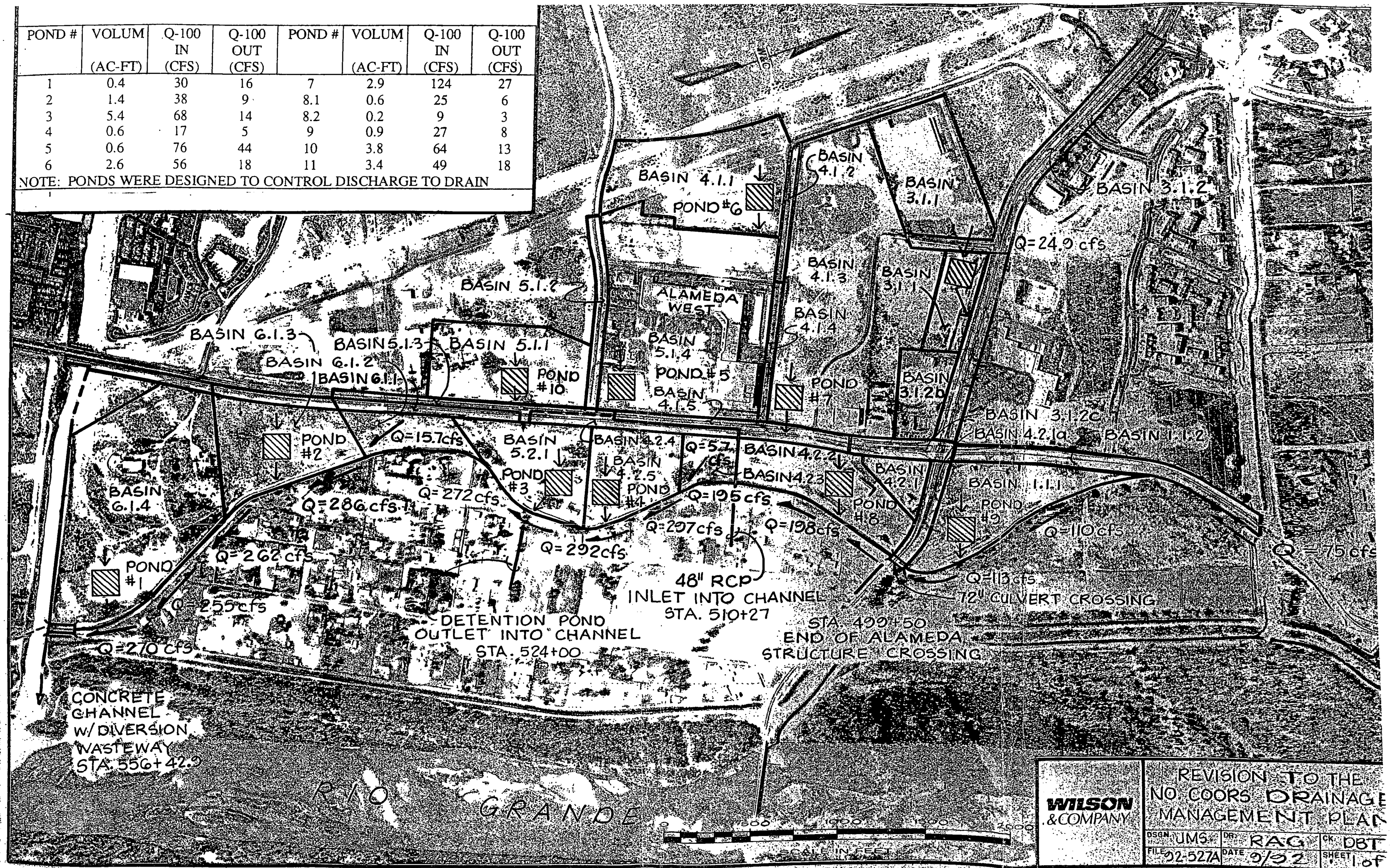
The NCDMP analyzed all of the areas contributing storm runoff to the Corrales Main Canal and assigned developed land treatments of 15% land area "B" and 85% land area "D." Since the report was completed, several of the basins were developed and the individual drainage solutions are different than what was proposed in the North Coors Drainage Management Plan.

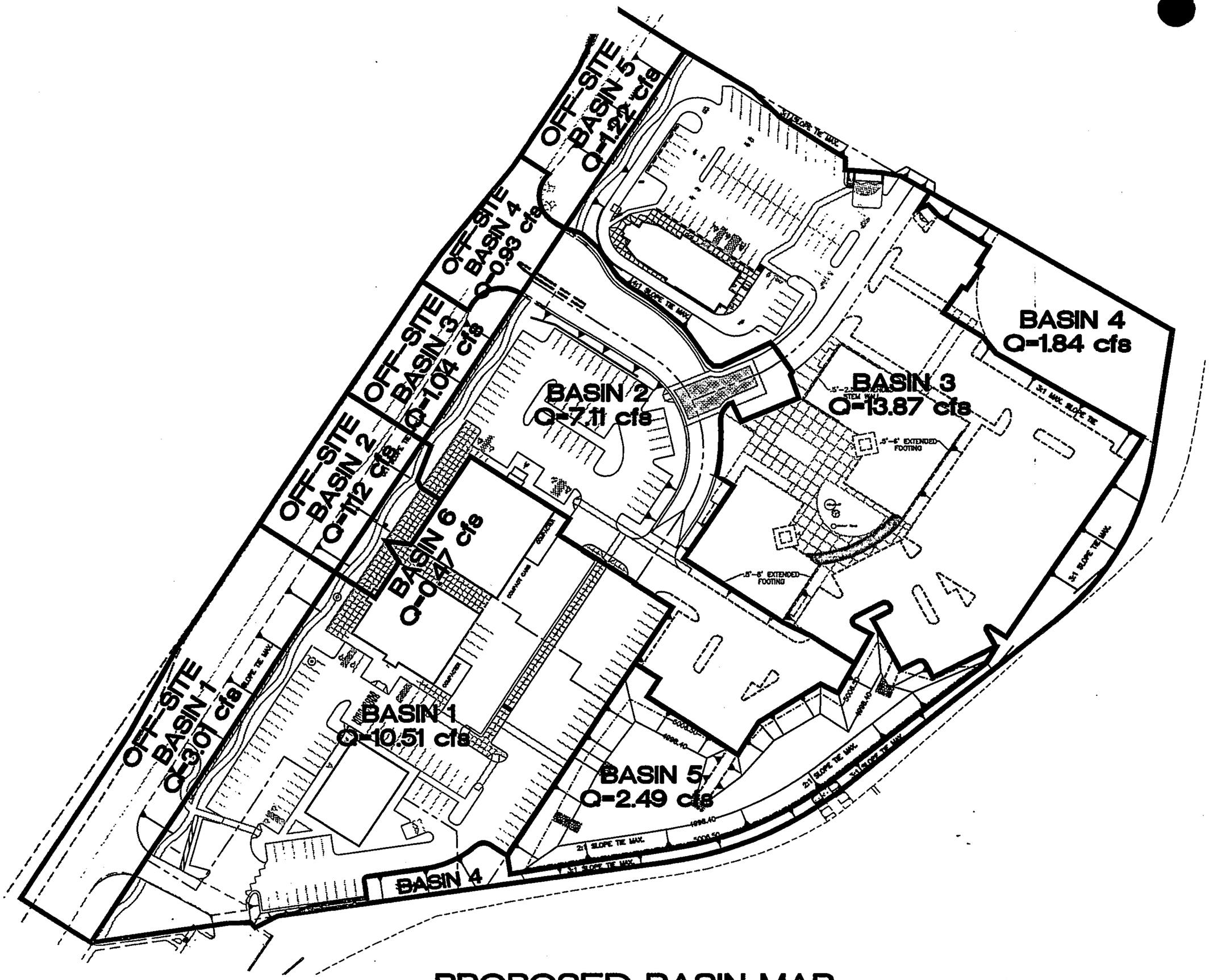
According to the NCDMP, Tract 14 falls with in Basin 5.2.1 as well as a portion (approximately one-third) of Basin 4.2.5 as shown on the attached exhibit. Basin 5.2.1 is allowed a discharge rate of 14 cfs while Basin 4.2.5 is allowed a discharge rate of 5 cfs. This combination should allow Tract 14 a combined discharge rate of 15.67 cfs.

Also, the NCDMP shows Basin 6.1.2 and Basin 6.1.3 were allowed to contribute a combined total of 24.7 cfs to the Corrales Main Canal. Basin 6.1.2 was allowed to freely discharge 15.4 cfs directly to the canal while Basin 6.1.3 was allowed to discharge 9 cfs to the canal by way of a detention pond. These basins consist of the Cottonwood Corners commercial center, which was constructed in 1997. According to the approved drainage report completed by Tierra West Development Management Services in January 1996, all of the flows from these basins were captured in a storm sewer and directed to the Calabacillas Arroyo. This would allow for 24.7 cfs assigned to the Corrales Main Canal to be released from another site up stream.

POND #	VOLUM (AC-FT)	Q-100 IN (CFS)	Q-100 OUT (CFS)	POND #	VOLUM (AC-FT)	Q-100 IN (CFS)	Q-100 OUT (CFS)
1	0.4	30	16	7	2.9	124	27
2	1.4	38	9	8.1	0.6	25	6
3	5.4	68	14	8.2	0.2	9	3
4	0.6	17	5	9	0.9	27	8
5	0.6	76	44	10	3.8	64	13
6	2.6	56	18	11	3.4	49	18

NOTE: PONDS WERE DESIGNED TO CONTROL DISCHARGE TO DRAIN





PROPOSED BASIN MAP

With the assigned discharge of 15.67 cfs for Tract 14 and the 24.7 cfs from Basins 6.1.2 and 6.1.3 Tract 14 should be allowed to discharge 40.37 cfs. A check of the irrigation structure down stream of the site shows there is an additional capacity of 101.33 cfs available, far exceeding the additional 24.7 cfs proposed to pass through the structure. The additional 24.7 cfs only raises the flood elevation six inches.

There is currently an existing 30" RCP stubbed into Tract 14 from the Corrales Main Canal that has capacity for this amount of discharge. The existing canal will not need to be modified in any way to release a higher discharge from Tract 14.

The proposed site is divided into six basins with Basins 1-3 sheet flowing to the new detention pond, which consists of Basin 5. Basin 4 sheet flows into the Corrales Main Canal. A large portion of Basin 4 consists on an archeological site that will be left undisturbed from its present state. Basin 6 is a small Basin along Coors Boulevard that consists of a landscape area that will drain to an area drain and be routed through the storm sewer system to the retention pond. The total developed discharge into the pond from all six basins is 36.29 cfs.

The off-site flows will be collected into one storm sewer pipe and routed to the new detention pond. The new detention pond is sized to contain all of the off-site flows as well as the flows generated on site. The discharge to the Corrales Main Canal will be controlled to release at a rate of approximately 40.31 cfs.

Summary

There are six drainage basins for this tract with the storm runoff being directed to a detention pond on-site. The pond is sized to accept the on-site flows as well as the off-site flows and discharge at a rate of 40.31 cfs into the Corrales Main Canal. Based on the findings of this report

port, and the drainage reports mentioned previously, the pond on Tract 14 should be allowed an increased discharge rate from 14 cfs to 40.37 cfs.

Calculations

The weighted E method from the "City of Albuquerque Development Process Manual Volume 11 – Design Criteria, 1997 Revision" was used to calculate the runoff and volume for the site.

Section II

Runoff Calculations

Weigh E Method

Existing O.. ..e Basins

Basin	Area (sf)	Area (acres)	Treatment A %	Treatment A (acres)	Treatment B %	Treatment B (acres)	Treatment C %	Treatment C (acres)	Treatment D %	Treatment D (acres)	100-Year Weighted E (ac-ft)	100-Year Volume (ac-ft)	100-Year Flow cfs	10-Year Weighted E (ac-ft)	10-Year Volume (ac-ft)	10-Year Flow cfs
A	80,957	1.86	0%	0	100%	1.86	0%	0.00	0%	0.00	0.670	0.104	3.77	0.220	0.034	1.41
B	108,049	2.48	0%	0	100%	2.48	0%	0.00	0%	0.00	0.670	0.138	5.04	0.220	0.045	1.89
C	172,441	3.96	0%	0	100%	3.96	0%	0.00	0%	0.00	0.670	0.221	8.04	0.220	0.073	3.01
D	64,201	1.47	0%	0	100%	1.47	0%	0.00	0%	0.00	0.670	0.082	2.99	0.220	0.027	1.12
Total	425,648	9.77		0		9.77		0.00		0.00		0.546	19.84		0.179	7.43

Existing Off-Site Basins

Basin	Area (sf)	Area (acres)	Treatment A %	Treatment A (acres)	Treatment B %	Treatment B (acres)	Treatment C %	Treatment C (acres)	Treatment D %	Treatment D (acres)	100-Year Weighted E (ac-ft)	100-Year Volume (ac-ft)	100-Year Flow cfs	10-Year Weighted E (ac-ft)	10-Year Volume (ac-ft)	10-Year Flow cfs
1	33,559	0.77	0%	0	20%	0.15	0%	0.00	80%	0.62	1.710	0.110	3.01	1.036	0.067	1.90
2	12,478	0.29	0%	0	20%	0.06	0%	0.00	80%	0.23	1.710	0.041	1.12	1.036	0.025	0.71
3	11,646	0.27	0%	0	20%	0.05	0%	0.00	80%	0.21	1.710	0.038	1.04	1.036	0.023	0.66
4	9,287	0.21	0%	0	0%	0.00	0%	0.00	100%	0.21	1.970	0.035	0.93	1.240	0.022	0.62
5	13,614	0.31	0%	0	20%	0.06	0%	0.00	80%	0.25	1.710	0.045	1.22	1.036	0.027	0.77
Total	80,584	1.85		0		0.33		0.00		1.52		0.268	7.32		0.163	4.65

Developed On-Site Sub-Basins

Basin	Area (sf)	Area (acres)	Treatment A %	Treatment A (acres)	Treatment B %	Treatment B (acres)	Treatment C %	Treatment C (acres)	Treatment D %	Treatment D (acres)	100-Year Weighted E (ac-ft)	100-Year Volume (ac-ft)	100-Year Flow cfs	10-Year Weighted E (ac-ft)	10-Year Volume (ac-ft)	10-Year Flow cfs
1	113,877	2.61	0%	0	15%	0.39	0%	0.00	85%	2.22	1.775	0.387	10.51	1.087	0.237	6.72
2	77,101	1.77	0%	0	15%	0.27	0%	0.00	85%	1.50	1.775	0.262	7.11	1.087	0.160	4.55
3	150,335	3.45	0%	0	15%	0.52	0%	0.00	85%	2.93	1.775	0.510	13.87	1.087	0.313	8.87
4	39,456	0.91	0%	0	100%	0.91	0%	0.00	0%	0.00	0.670	0.051	1.84	0.220	0.017	0.69
5	39,676	0.91	0%	0	70%	0.64	0%	0.00	30%	0.27	1.060	0.080	2.49	0.526	0.040	1.27
6	5,103	0.12	0%	0	15%	0.02	0%	0.00	85%	0.10	1.775	0.017	0.47	1.087	0.011	0.30
Total	425,548	9.77		0		2.74		0.00		7.03		1.307	36.29		0.777	22.40

Developed On-Site Sidewalk Culvert Basin

Basin	Area (sf)	Area (acres)	Treatment A %	Treatment A (acres)	Treatment B %	Treatment B (acres)	Treatment C %	Treatment C (acres)	Treatment D %	Treatment D (acres)	100-Year Weighted E (ac-ft)	100-Year Volume (ac-ft)	100-Year Flow cfs	10-Year Weighted E (ac-ft)	10-Year Volume (ac-ft)	10-Year Flow cfs
SW	31,330	0.72	0%	0	0%	0.00	0%	0.00	100%	0.72	1.970	0.118	3.14	1.240	0.074	2.08

Equations:

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

Volume = Weighted D * Total Area

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

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

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

VOLUME CALCULATIONS
POND

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

Ab = 15,208.96
At = 30,100.00
Dt = 8.10
C = 1838.40

ACTUAL ELEV.	DEPTH (FT)	VOLUME (AC-FT)	Q (CFS)
5000.00	0.00	0.00	0.0000
5003.00	3.00	1.0474	21.3924
5004.00	4.00	1.4177	26.2002
5005.00	5.00	1.8302	30.2534
5006.00	6.00	2.2848	33.8243
5007.00	7.00	2.7817	37.0527
5008.10	8.10	3.3770	40.3063

<u>Orifice Equation</u>
Q = CA SQRT(2gH)

C =	0.6
Diameter (in)	24
Area (ft^2)=	3.142
g =	32.2
H (Ft) =	Depth of water above center of orifice
Q (CFS)=	Flow

```
*****************************************************************
*                                                               *
*        TRACT 14 BLACK RANCH STORM DRAINAGE ANALYSIS           *
*              FOR ON-SITE DETENTION POND                       *
*           PROPOSED CONDITIONS (100-YEAR STORM)                *
*                                                               *
*****************************************************************
*
START                   TIME=0.0 HR
RAINFALL                TYPE=1 RAIN QUARTER=0.0 IN
                        RAIN ONE=1.87 IN RAIN SIX=2.20 IN
                        RAIN DAY=0.00 IN DT=0.05 HR
*
*****************************************************************
*                        DEVELOPED CONDITION                    *
*****************************************************************
*
**********BASIN 4B ALAMEDA WEST*********************************
*
COMPUTE LT TP           LCODE=1  NK=0  ISLOPE=-1
                        LENGTH=750 FT        SLOPE=0.015      K=2.0
                        KN=0.033     CENTROID RATIO=0.50
COMPUTE NM HYD          ID=2  HYD NO=102 AREA=0.005359 SQ MI
                        PER A=0 PER B=15.00 PER C=0.00 PER D=85.00
                        TP=0 HR MASS RAINFALL=-1
PRINT HYD               ID=2  CODE=1
*
**********BASIN 4C ALAMEDA WEST*********************************
*
COMPUTE LT TP           LCODE=1      NK=0     ISLOPE=-1
                        LENGTH=950 FT        SLOPE=0.013      K=1.0
                        KN=0.033     CENTROID RATIO=0.50
COMPUTE NM HYD          ID=3  HYD NO=103 AREA=0.005359 SQ MI
                        PER A=0 PER B=15.00 PER C=0.00 PER D=85.00
                        TP=0 HR MASS RAINFALL=-1
PRINT HYD               ID=3  CODE=1
*
**********BASIN 4E ALAMEDA WEST*********************************
*
COMPUTE LT TP           LCODE=1      NK=0     ISLOPE=-1
                        LENGTH=385ft         SLOPE=0.028      K=3.0
                        KN=0.021     CENTROID RATIO=0.50
COMPUTE NM HYD          ID=4  HYD NO=104 AREA=0.001016 SQ MI
                        PER A=0 PER B=5.00 PER C=0.00 PER D=95.00
                        TP=0 HR MASS RAINFALL=-1
PRINT HYD               ID=4  CODE=1
*
**********BASIN 4F ALAMEDA WEST*********************************
*
COMPUTE LT TP           LCODE=1      NK=0     ISLOPE=-1
                        LENGTH=1070 FT       SLOPE=0.007      K=3.0
                        KN=0.021     CENTROID RATIO=0.50
COMPUTE NM HYD          ID=5  HYD NO=105 AREA=0.005531 SQ MI
                        PER A=0 PER B=5.00 PER C=0.00 PER D=95.00
                        TP=0 HR MASS RAINFALL=-1
PRINT HYD               ID=5  CODE=1
*
**********BASIN 4G ALAMEDA WEST*********************************
*
COMPUTE LT TP           LCODE=1      NK=0     ISLOPE=-1
                        LENGTH=1220 FT       SLOPE=0.016      K=3.0
                        KN=0.021     CENTROID RATIO=0.50
COMPUTE NM HYD          ID=6  HYD NO=106 AREA=0.012547 SQ MI
```

```
                                        TRACT14
                        PER A=0 PER B=5.00 PER C=0.00 PER D=95.00
                        TP=0 HR MASS RAINFALL=-1
PRINT HYD               ID=6  CODE=1
*
**********BASIN 4H ALAMEDA WEST*********************************
*
COMPUTE LT TP           LCODE=1      NK=0     ISLOPE=-1
                        LENGTH=850 FT         SLOPE=0.012      K=3.0
                              KN=0.021        CENTROID RATIO=0.50
COMPUTE NM HYD          ID=7  HYD NO=107 AREA=0.012375 SQ MI
                        PER A=0 PER B=5.00 PER C=0.00 PER D=95.00
                        TP=0 HR MASS RAINFALL=-1
PRINT HYD               ID=7  CODE=1
*
**********BASIN 4I ALAMEDA WEST*********************************
*
COMPUTE LT TP           LCODE=1      NK=0     ISLOPE=-1
                        LENGTH=280 FT         SLOPE=0.024      K=0.7
                              KN=0.025        CENTROID RATIO=0.50
COMPUTE NM HYD          ID=8  HYD NO=108 AREA=0.001313 SQ MI
                        PER A=0 PER B=100.00 PER C=0.00 PER D=0.00
                        TP=0 HR MASS RAINFALL=-1
PRINT HYD               ID=8  CODE=1
*
**********BASIN 4K ALAMEDA WEST*********************************
*
COMPUTE LT TP           LCODE=1      NK=0     ISLOPE=-1
                        LENGTH=320 FT         SLOPE=0.018      K=2.0
                              KN=0.025        CENTROID RATIO=0.50
COMPUTE NM HYD          ID=9  HYD NO=109 AREA=0.000938 SQ MI
                        PER A=0 PER B=46.00 PER C=0.00 PER D=54.00
                        TP=0 HR MASS RAINFALL=-1
PRINT HYD               ID=9  CODE=1
*
**********BASIN 4N ALAMEDA WEST*********************************
*
COMPUTE LT TP           LCODE=1      NK=0     ISLOPE=-1
                        LENGTH=500 FT         SLOPE=0.028      K=2.0
                              KN=0.025        CENTROID RATIO=0.50
COMPUTE NM HYD          ID=10  HYD NO=110 AREA=0.002422 SQ MI
                        PER A=0 PER B=46.00 PER C=0.00 PER D=54.00
                        TP=0 HR MASS RAINFALL=-1
PRINT HYD               ID=10  CODE=1
*
**********ADD HYDROGRAPHS FOR 4B AND 4E*************************
*
ADD HYD                 ID=11  HYD=301 ID=2 ID=4
*
PRINT HYD                      ID=11  CODE=1
*
**********ROUTE 301 THROUGH PIPE********************************
*
COMPUTE RATING CURVE CID=1 VS NO=101 CODE=-1 SLP=0.005
                           DIA=1.5 FT N=0.013
*
COMPUTE TRAVEL TIME  ID=12  REACH=1 NO VS=1 L=755 SLP=0.005
*
ROUTE                      ID=12  HYD NO=302 INFLOW ID=11   DT=0.0333
*
PRINT HYD                  ID=12  CODE=1
*
**********ADD HYDROGRAPHS FOR 302 AND 4G************************
*
```

```
ADD HYD              ID=13  HYD=303 ID=12 ID=6
*
PRINT HYD            ID=13  CODE=1
*
**********POND 5 ROUTING*************************************
*
ROUTE RESERVOIR      ID=14 HYD NO=304 INFLOW ID=13 CODE=6
                     OUTFLOW(CFS)       STORAGE(AC-FT)  ELEVATION(FT)
                         0.00               0.000           5024.30
                         1.05               0.100           5025.00
                         2.03               0.301           5026.00
                         2.67               0.648           5027.00
                         3.19               1.016           5028.00
                         3.87               1.690           5029.60
PRINT HYD            ID=14  CODE=1
*
**********ROUTE 4C THROUGH 4F*********************************
*
COMPUTE RATING CURVE CID=1 VS NO=101 NO SEGS=1
                           MIN ELEV=5031.0 MAX ELEV=5031.63
                           CH SLP=0.005 FP SLP=0.005 N=0.015
                           DIST=65
                           DIST          ELEV
                            0            5031.63
                           32.5          5031.00
                           65.0          5031.63
*
COMPUTE TRAVEL TIME  ID=15  REACH=4 NO VS=1 L=870 SLP=0.005
*
ROUTE                      ID=15  HYD NO=401 INFLOW ID=3 DT=0.0
*
PRINT HYD                  ID=15  CODE=1
*
**********ADD HYDROGAPHS FOR 401 AND 4F*********************
*
ADD HYD              ID=16  HYD=402 ID=15 ID=5
*
PRINT HYD                  ID=16  CODE=1
*
**********ROUTE 402 THROUGH PIPE******************************
*
COMPUTE RATING CURVE CID=1 VS NO=101 CODE=-1 SLP=0.005
                           DIA=2.25  FT  N=0.013
*
COMPUTE TRAVEL TIME  ID=17  REACH=5  NO VS=1  L=593 SLP=0.005
*
ROUTE                ID=17 HYD NO=403 INFLOW ID=16  DT=0.0
*
PRINT HYD            ID=17 CODE=1
*
*THIS IS WHERE BASIN 4H IS ROUTED THROUGH THE PARKING POND***
*BEFORE IT IS COMBINED WITH THE FLOWS FROM 4C AND 4F*********
*
**********PARKING LOT POND ROUTING****************************
*
ROUTE RESERVOIR      ID=18  HYD NO=501 INFLOW ID=7 CODE=4
                     OUTFLOW(CFS)       STORAGE(AC-FT)  ELEVATION(FT)
                         0.00               0.00000         5028.00
                         4.70               0.07202         5028.50
                         18.0               0.43354         5029.00
                         37.0               1.04375         5029.60
*
*PRINT HYD           ID=18  CODE=1
```

```
*
**********ADD HYDROGRAPHS FOR PARKING POND AND 403***********
*
ADD HYD            ID=19  HYD=601  ID=17  ID=18
*
PRINT HYD          ID=19  CODE=1
*
**********ADD HYDROGRAPHS FOR 4I AND 601*********************
*
ADD HYD            ID=20  HYD=701  ID=8  ID=19
*
PRINT HYD                 ID=20  CODE=1
*
**********ADD HYDROGRAPHS FOR 304 AND 701*******************
*
ADD HYD            ID=21  HYD=801  ID=14  ID=20
*
PRINT HYD          ID=21  CODE=1
*
*THIS MARKS THE END OF THE ALAMEDA WEST FLOWS THAT CONTRIBUTE
*TO THE DETENTION POND IN TRACT 14***************************
*
**********BEGINNING OF QUESTA DEL RIO HYDROLOGY**************
*
**********QUESTA DEL RIO*************************************
*
COMPUTE NM HYD      ID=22  HYD NO=111 AREA=0.015627 SQ MI
                    PER A=0 PER B=19.00 PER C=12.00 PER D=69.00
                    TP=0.13333 HR MASS RAINFALL=-1
PRINT HYD           ID=22  CODE=1
*
**********SEVEN BAR LOOP ROAD********************************
*FROM SEVEN BAR/COORS INTERSECTION TO 1520' WEST OF COORS CL
*
COMPUTE NM HYD      ID=23  HYD NO=112 AREA=0.004828 SQ MI
                    PER A=0 PER B=8.00 PER C=0.00 PER D=92.00
                    TP=0.13333 HR MASS RAINFALL=-1
PRINT HYD           ID=23  CODE=1
*
**********MONTGOMERY WARD AUTO CENTER************************
**********COTTONWOOD MALL BASINS D-1, D-2, D-3***************
*
COMPUTE NM HYD      ID=24  HYD NO=113 AREA=0.004300 SQ MI
                    PER A=0 PER B=15.00 PER C=0.00 PER D=85.00
                    TP=0.13333 HR MASS RAINFALL=-1
PRINT HYD           ID=24  CODE=1
*
**********FLOWS CONVEYED BY MALL TO QUESTA DEL RIO***********
*
COMPUTE NM HYD      ID=25 HYD NO=114 AREA=0.000203 SQ MI
                    PER A=0 PER B=15.00 PER C=0.00 PER D=85.00
                    TP=0.13333 HR MASS RAINFALL=-1
PRINT HYD           ID=25 CODE=1
*
**********ADD AUTO CENTER AND SEVEN BAR FLOWS****************
*
ADD HYD            ID=26  HYD=201 ID=24 ID=23
*
PRINT HYD                 ID=26  CODE=1
*
**********ADD FLOWS FROM MALL TO SEVEN BAR FLOWS*************
*
ADD HYD            ID=27  HYD=202 ID=25 ID=26
```

```
*
PRINT HYD                    ID=17  CODE=1
*
***ROUTE 202 THROUGH STORM DRAIN TO 60" RCP UNDER COORS******
*
COMPUTE RATING CURVE CID=1 VS NO=101 CODE=-1 SLP=0.010
                           DIA=2.0 FT  N=0.013
*
COMPUTE TRAVEL TIME  ID=28  REACH=2 NO VS=1 L=38- SLP=0.10
*
ROUTE                        ID=28  HYD NO=203 INFLOW ID=27 DT=0.0333
*
PRINT HYD                    ID=28  CODE=1
*
**********ADD SD FLOWS (203) TO QUESTA DEL RIO***************
*
ADD HYD             ID=29  HYD=204  ID=28  ID=22
*
PRINT HYD                    ID=29  CODE=1
*
**********STREET FLOWS FROM COORS BLVD**********************
*
COMPUTE NM HYD       ID=30  HYD NO=115 AREA=0.002266 SQ MI
                     PER A=0 PER B=26.00 PER C=0.00 PER D=74.00
                     TP=0.13333 HR MASS RAINFALL=-1
PRINT HYD            ID=30  CODE=1
*
*****ADD STREET FLOWS FROM COORS TO FLOWS ENTERING 60" SD****
*
ADD HYD             ID=31  HYD=205  ID=30  ID=29
*
PRINT HYD                    ID=31 CODE=1
*
*****THIS IS THE EXTENT OF THE FLOWS GENERATED BY LANDS******
*****SURROUNDING QUESTA DEL RIO******************************
*
**********ADD QUESTA DEL RIO AND ALEMEDA WEST FLOWS**********
*
ADD HYD             ID=32  HYD=206  ID=31  ID=21
*
PRINT HYD                    ID=32 CODE=1
*
**********PROPOSED TRACT 14 FLOW****************************
*
COMPUTE LT TP        LCODE=1     NK=0    ISLOPE=-1
                     LENGTH=180ft  SLOPE=0.010   K=2.0
                     KN=0.033    CENTROID RATIO=0.50
COMPUTE NM HYD       ID=33  HYD NO=207 AREA=0.015375 SQ MI
                     PER A=0 PER B=15.00 PER C=0.00 PER D=85.00
                     TP=0 HR MASS RAINFALL=-1
PRINT HYD            ID=33  CODE=1
*
**********ADD TRACT 14 FLOWS TO OFF SITE FLOWS***************
*
ADD HYD              ID=34 HYD=208  ID=33  ID=32
*
PRINT HYD            ID=34 CODE=1
*
**********POND 3 (TRACT 14)*********************************
*
ROUTE RESERVOIR      ID=35  HYD NO=1 INFLOW ID=34 CODE=6
                     OUTFLOW(CFS)      STORAGE(AC-FT)  ELEVATION(FT)
                         0.00              0.00          5000.00
```

```
                                        TRACT14
                    21.3924                 1.0474          5003.00
                    26.2002                 1.4177          5004.00
                    30.2534                 1.8302          5005.00
                    33.8243                 2.2848          5006.00
                    37.0527                 2.7817          5007.00
                    40.3063                 3.3770          5008.10

PRINT HYD           ID=35 CODE=1
*
*
*
*
FINISH
```

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02d RUN DATE (MON/DAY/YR) =06/13/2003
INPUT FILE = C:\AHYMOW~1\TRACT14.txt USER NO.= AHYMO-S-9702d1TierraW-AH

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	102.00	-	2	.00536	13.58	.507	1.77241	1.500	3.958	PER IMP=	85.00
COMPUTE NM HYD	103.00	-	3	.00536	13.58	.507	1.77241	1.500	3.958	PER IMP=	85.00
COMPUTE NM HYD	104.00	-	4	.00102	2.73	.103	1.90254	1.500	4.205	PER IMP=	95.00
COMPUTE NM HYD	105.00	-	5	.00553	14.82	.561	1.90254	1.500	4.186	PER IMP=	95.00
COMPUTE NM HYD	106.00	-	6	.01255	33.60	1.273	1.90254	1.500	4.184	PER IMP=	95.00
COMPUTE NM HYD	107.00	-	7	.01238	33.14	1.256	1.90254	1.500	4.184	PER IMP=	95.00
COMPUTE NM HYD	108.00	-	8	.00131	1.70	.047	.66636	1.500	2.022	PER IMP=	.00
COMPUTE NM HYD	109.00	-	9	.00094	1.96	.068	1.36903	1.500	3.270	PER IMP=	54.00
COMPUTE NM HYD	110.00	-	10	.00242	5.05	.177	1.36903	1.500	3.255	PER IMP=	54.00
ADD HYD	301.00	2& 4	11	.00638	16.31	.610	1.79306	1.500	3.998		
ROUTE	302.00	11	12	.00638	14.82	.610	1.79311	1.532	3.632		
ADD HYD	303.00	12& 6	13	.01892	47.34	1.883	1.86561	1.499	3.909		
ROUTE RESERVOIR	304.00	13	14	.01892	3.65	1.883	1.86559	2.264	.301	AC-FT=	1.468
ROUTE	401.00	3	15	.00536	10.40	.507	1.77251	1.550	3.032		
ADD HYD	402.00	15& 5	16	.01089	23.55	1.068	1.83845	1.500	3.379		
ROUTE	403.00	16	17	.01089	23.30	1.068	1.83852	1.550	3.343		
ROUTE RESERVOIR	501.00	7	18	.01238	16.71	1.256	1.90251	1.650	2.110	AC-FT=	.398
ADD HYD	601.00	17&18	19	.02327	37.90	2.323	1.87251	1.550	2.546		
ADD HYD	701.00	8&19	20	.02458	39.51	2.370	1.80807	1.550	2.512		
ADD HYD	801.00	14&20	21	.04350	42.14	4.253	1.83306	1.565	1.514		
COMPUTE NM HYD	111.00	-	22	.01563	36.93	1.333	1.59944	1.500	3.692	PER IMP=	69.00
COMPUTE NM HYD	112.00	-	23	.00483	12.73	.480	1.86350	1.500	4.119	PER IMP=	92.00
COMPUTE NM HYD	113.00	-	24	.00430	10.90	.406	1.77241	1.500	3.959	PER IMP=	85.00
COMPUTE NM HYD	114.00	-	25	.00020	.53	.019	1.77241	1.500	4.056	PER IMP=	85.00
ADD HYD	201.00	24&23	26	.00913	23.62	.886	1.82053	1.500	4.044		
ADD HYD	202.00	25&26	27	.00933	24.15	.905	1.81946	1.500	4.044		
ROUTE	203.00	27	28	.00933	23.99	.905	1.81949	1.499	4.016		
ADD HYD	204.00	28&22	29	.02496	60.77	2.238	1.68167	1.499	3.805		
COMPUTE NM HYD	115.00	-	30	.00227	5.38	.197	1.62928	1.500	3.713	PER IMP=	74.00
ADD HYD	205.00	30&29	31	.02722	66.14	2.435	1.67729	1.499	3.796		
ADD HYD	206.00	31&21	32	.07072	103.59	6.688	1.77310	1.499	2.289		
COMPUTE NM HYD	207.00	-	33	.01538	38.92	1.453	1.77242	1.500	3.955	PER IMP=	85.00
ADD HYD	208.00	33&32	34	.08610	142.37	8.141	1.77297	1.499	2.584		
ROUTE RESERVOIR	1.00	34	35	.08610	40.05	8.141	1.77297	2.098	.727	AC-FT=	3.330
FINISH											

Channel Inlet Capacity

Weir Equation:

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

Q= Flow
C = 2.95
L= Length of weir
H = Height of Weir

Irrigation Structure (Corrales Main Canal)

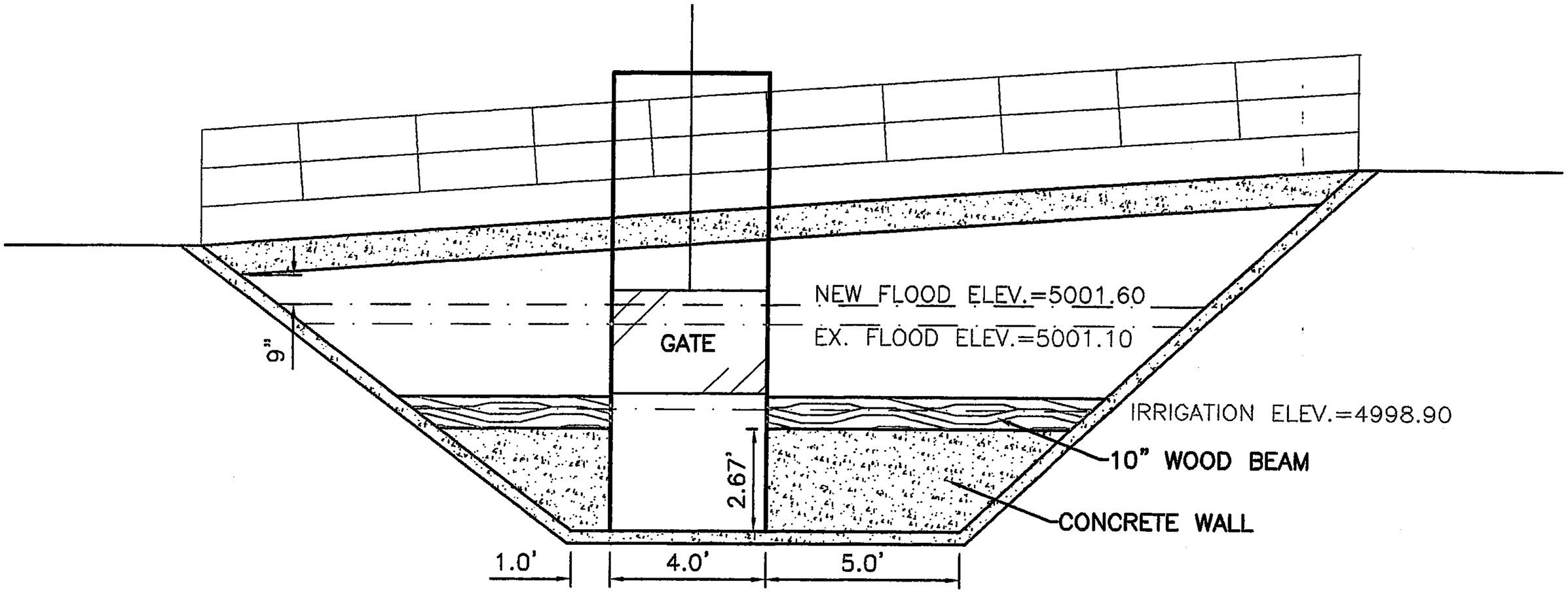
$$Q = 2.95 * 24 * 1.27^{3/2}$$

Q = 101.33 cfs
101.33 cfs > 24.70 cfs
Structure has capacity

Emergency Overflow

$$Q = 2.95 * 100 * 1.0^{3/2}$$

Q = 295.00 cfs
295.00 cfs > 284.74 cfs
Overflow has capacity



CHECK STRUCTURE CAPACITY ANALYSIS

SCALE: NTS

Channel Capacity

	Top Width	Bottom Width	Depth	Area	WP	R	Slope	Q Provided	Q Required	Velocity
	(ft)	(ft)	(ft)	(ft^2)	(ft)		(%)	(cfs)	(cfs)	(ft/s)
Basin 1	4	4	0.5	2.00	5.00	0.4000	50	88.00	13.52	6.76
Basin 2	10	10	0.5	5.00	11.00	0.4545	15	131.21	9.08	1.82
Basin 3	4	4	0.5	2.00	5.00	0.4000	50	88.00	15.09	7.55

<u>Manning's Equation:</u>

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

A = Area

R = D/4

S = Slope

n = 0.013

Pipe Capacity

Pipe	D	Slope	Area	R	Q Provided	Q Required	Velocity
	(in)	(%)	(ft^2)		(cfs)	(cfs)	(ft/s)
1	48	1.28	12.57	1.000	162.95	103.59	8.24
2	18	2	1.77	0.375	14.90	13.52	7.65

Manning's Equation:

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

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

Drop Inlet Calculations

Basin	TYPE OF INLET	AREA (SF)	Q (CFS)	H (FT)	H ALLOW (FT)
1	Single D	4.21	13.52	0.4459	0.67
2	Single C	4.36	9.08	0.1871	0.67
3	Single C	4.36	15.09	0.5167	0.67
6	Grate	0.81	1.59	0.1652	0.92

ORIFICE EQUATION

Q = CA sqrt(2gH)

C = 0.6

g = 32.2

STORM DRAIN INLET

EFFECTIVE AREA ASSUMING A 50% CLOGGING FACTOR

DOUBLE D:

Area at the grate:

L = 76.75" - 14 (1/2" middle bars) - 6" center piece
= 63.75"
= 5.3125'

W = 25.5" - 13 (1/2 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

Single 'C" Drop Inlet
EFFECTIVE AREA

Area at the grate:

L = 38.375" - 7(2@ middle bars)
= 34.875"
= 2.906'

W = 25.5" - 13(2@ middle bars)
= 19"
= 1.583'

Area = 1.583' x 2.906'
= 4.601 ft^2

Effective Area: = 4.601- 4.601 (0.5 clogging factor)
= 2.30 ft^2 at the grate

Area at the throat:

L = 47.375@
= 3.95'

H = 10:@ - 42@
= 63@
= 0.5208'

Area = 3.95' x 0.5208'
= 2.06 ft^2 at the throat

Total Area:

Area = $2.30_{grate} + 2.06_{throat}$
= 4.36 ft^2