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

February 6, 2004

Bradley T. Dixon, PE
Bohannan Huston, Inc
7500 Jefferson NE
Albuquerque, NM 87109

Re: Ventana Ranch West Subdivision Drainage Management Plan, Addendum 1
Engineer's Stamp dated 12-24-03, (B8/D1)

Dear Mr. Dixon,

Based upon the information provided in your submittal dated 12-24-03, the above referenced addendum to Master Plan cannot be approved until the following comments are addressed

- Please address the area just west of Basin 601 and north of Paseo del Norte. This area must drain through your site as well.
- Please include any existing platting within the boundaries of your upstream basin and include any tract bisected by your developed-basin boundary line in its entirety. It is possible that the offsite runoff may increase.
- The design of your proposed pipe should be for the 944 cfs planned for at eastern edge of the Tracts 1 and 3, not 811 as shown.

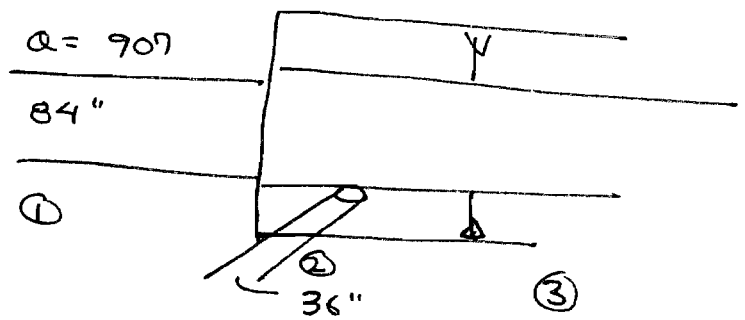
If you have any questions, you can contact me at 924-3986.

Sincerely,

Bradley L. Bingham, PE
City Hydrologist

C: Lynn Mazur, AMAFCA
file

North Branch
Piedras Marcedes Arroyo
84" Storm Drain
+ 36" SD Side Flow



Q = 53
Y = 45"

Evaluate the affect of the 36" SD on the channel hydraulics

1) The straight Momentum Balance

$$M_1 + M_2 \cos\theta = M_3$$

$$M_1 = \frac{Q^2}{gA} + A\bar{Y} \qquad \text{(At exit of 84")}$$

$$= \frac{907^2}{(32.2)(38.5)} + (38.5)(7/2)$$

$$= 801 \text{ ft}^3$$

$$M_2 = \frac{Q^2}{gA} + A\bar{Y}$$

D = 22"
A = 4.53 ft²
V = 11.7 fps @ 22"

PROJECT NAME
PROJECT NO.
SUBJECT

SHEET 1 OF 3
BY
CH'D
DATE 11/14/04
DATE

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ADVANCED TECHNOLOGIES

$$M_2 = \frac{53^3}{(32.2)(4.58)} + (4.58)\left(\approx (1.8)\left(\tfrac{2}{3}\right)\right)$$

$$= 19.2 + 5.5$$

$$= 24.7$$

Solve for M_3

$$M_3 = M_1 + M_2 \cos\theta$$

$$= 801 + 17.5$$

$$= 818 \text{ ft}^3$$

From M_3 Rating Curve (loc 3. out)

818 would occur above 8.0' depth channel However slope of channel (1.67%) and lack of downstream control indicates no hydraulic jump would occur

Try analysis assuming 36" flow creates a "hydraulic" block across bottom of channel to mimick effect of 45° "spout".

① ② ③

PROJECT NAME
PROJECT NO.
SUBJECT

SHEET 2 OF 3
BY DATE
CH'D DATE

$M_1 = P_2 + M_3$

$M_1 = 801 \text{ ft}^3$

$P_2 = \frac{1}{2}(1.83)[(2)(7 - 1.83)]\ 24.48$

(Eq. from Chow Pg. 52

$P_2 = 232 \text{ ft}^3$

$M_3 = M_1 - P_2$

$= 801 - 232$

$= 569 \text{ ft}^3$

From M Rating Curve

Depth $\approx$ 3.3'

Manning's Depth = 2.95'

PROJECT NAME
PROJECT NO.
SUBJECT

SHEET 3 OF 3
BY DATE
CH'D DATE

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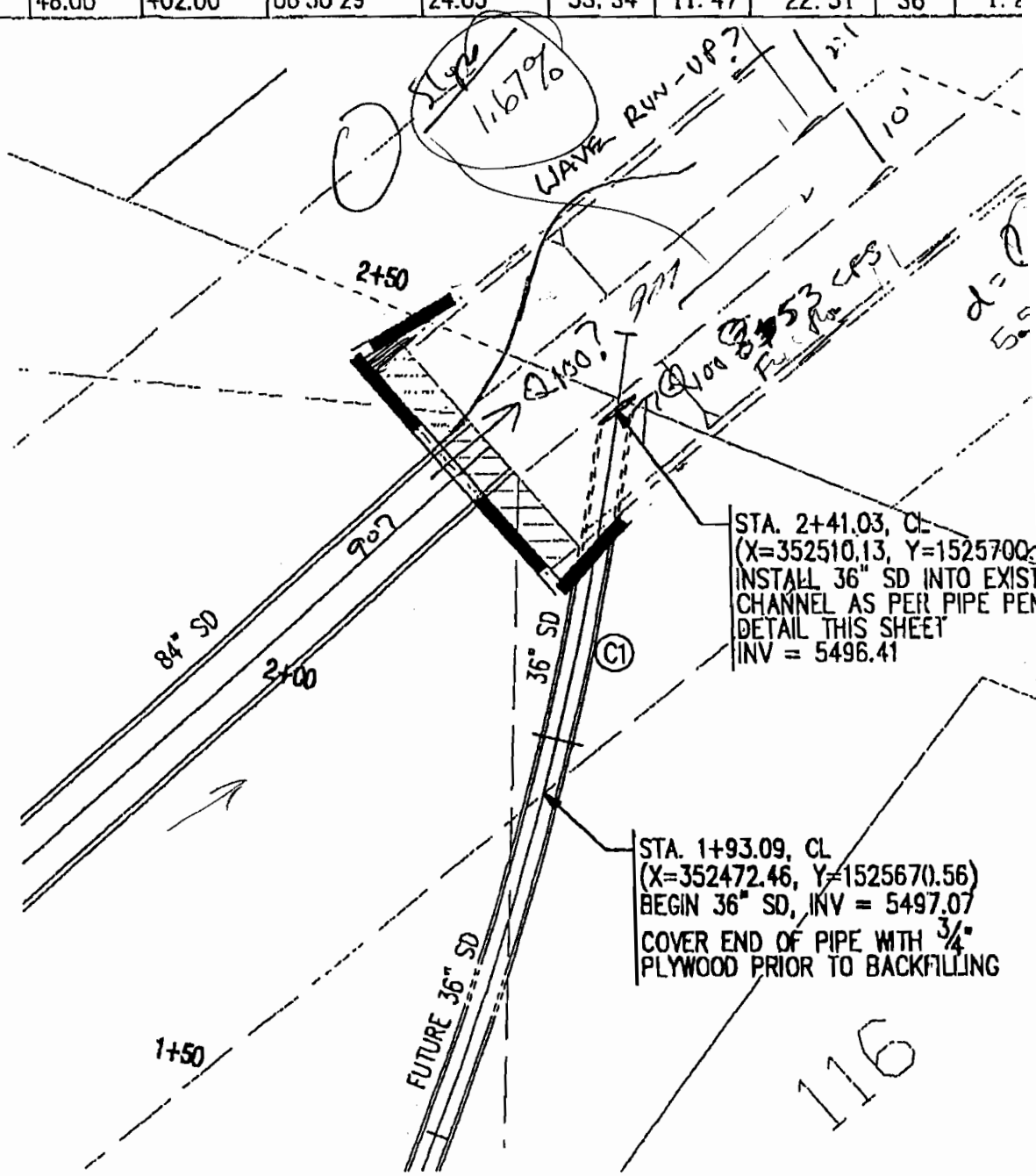
ADVANCED TECHNOLOGIES

STORM DRAIN Curve Table									
ID	ARC	RADIUS	DELTA	TANGENT	Q(cfs)	V(cfs)	DEPTH	SIZE	SLOP
C1	48.00'	402.00'	06°50'29"	24.03'	53.34	11.47	22.51"	36"	1.2



N

20 10 0

STORM DRAIN EASEMENT

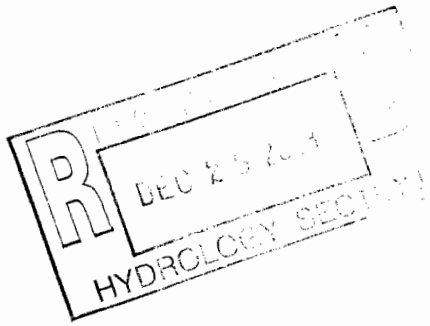
ADDENDUM NO. 1

FOR THE

VENTANA RANCH WEST SUBDIVISION

DRAINAGE MANANAGEMENT PLAN

I, Bradley T. Dixon, hereby certify that I am a Registered Professional Engineer, registered in the state of New Mexico, and that the following report was prepared under my direction and is true and correct to the best of my knowledge and belief.



Bradley T. Dixon, P.E., CFM
NMPE No. 16163

TABLE OF CONTENTS

Appendices

I. INTRODUCTION

This report constitutes Addendum No. 1 for the Ventana Ranch West Drainage Management Plan, Bohannan Huston, October 10, 2003 (DMP), which was prepared for Sandia Properties Limited Company. It proposes the use of a 96-inch reinforced concrete storm drain pipe (RCP) instead of open channel for the extension of Tributary B of the North Branch of the Piedras Marcadas Arroyo through Ventana Ranch West (VRW), a proposed subdivision in northwest Albuquerque (Figure 1). This storm drain extension will be similar to the West Branch Calabacillas Storm Drain Diversion, an 84" – 96" storm drain in Ventana Ranch that drains into Las Ventanas Dam, and the 84" storm drain through the West Pointe subdivision in Ventana Ranch, which discharges into Tributary A of the North Branch of the Piedras Marcadas Arroyo.

Tributary B currently exists as a concrete-lined open channel within Ventana Ranch, which bounds VRW to the east. The DMP proposed that Tributary B be extended as a grouted basalt channel through VRW to its western boundary. This would have required the construction of a 2-barrell 10'x7' concrete box culvert for the north-south entrance road into VRW from Paseo del Norte. It also would have complicated the grading of the adjacent tracts, Tracts 1, 2, 2A, and 3, where significant fill is proposed to avoid trenching through underlying basalt bedrock. By extending Tributary B as an RCP, these shortcomings are avoided. Also, vehicular access into Tracts 1, 2, 2A, and 3 can be improved by consolidating their entrance roads along the alignment of the previously proposed open channel.

II. HYDROLOGY

Because an open channel was proposed as the extension of Tributary B, the hydrologic models that were presented in the DMP accounted for fully developed conditions within the watershed upstream of VRW. In this condition, the 100-year peak discharge rate entering the channel would be 811 cfs. However, for the design of an RCP rather than an open channel, there are two conditions to consider. In the first condition, VRW will be constructed, with the RCP in place, and the land in the upstream watershed will be undeveloped. In this case, the headwater at the inlet to the RCP should not cause a backwater effect that would impact the upstream property. In the second condition, the

upstream property will also be developed, and the RCP through VRW will presumably be extended to the west as additional RCP. In this case (fully developed conditions), the hydraulic grade line (HGL) for the RCP through VRW should be below finished ground elevations. For these two conditions, the flows from the upstream watershed were modeled using undeveloped and developed land treatments, respectively. The two AHYMO models are shown herein in Appendices B and C. The first model reflects undeveloped conditions in the Tributary B watershed upstream from VRW and developed conditions within VRW. The flow rate entering Ventana Ranch West is approximately 311 cfs. The second model reflects developed conditions throughout, and the flow rate at the VRW boundary is approximately 811 cfs. Figure 2 shows the drainage basins as well as the 100-year peak discharge rates for both of the models.

III. HYDRAULIC ANALYSIS

Schematic plan and profile views of the 96-inch RCP are shown in Figure 3. Based upon these schematics, the pipe will be approximately 1110 feet long and have a slope of approximately 1.2%. Please note that the inlet to the pipe has been depressed approximately 6 feet below existing ground to 1) allow additional headwater depth at the inlet to the pipe before water backs up onto the upstream property and 2) provide flexibility for the vertical alignment of the pipe should it be extended into the upstream property in the future. It is anticipated that the design for the pipe will include a concrete lined transition from the upstream arroyo to prohibit headcutting upstream from the pipe and/or silt deposition at the pipe inlet.

InRoads Storm and Sanitary's Drainage Structure Analyzer was used to determine the headwater depth for the pipe under each of the hydrologic scenarios described above (Appendix D). For the first scenario, in which the upstream watershed is undeveloped, the headwater depth is 6.6 feet, and the headwater elevation is approximately 5516.10'. The existing ground elevation at the VRW property line is approximately 5516.50'. Therefore, the backwater created by the pipe dissipates before the VRW property line. In the second scenario, the headwater depth is 15.7 feet. This means that, while the pipe is under pressure throughout VRW, the HGL will stay well below the proposed ground surface.

IV. DESIGN AND CONSTRUCTION CONSIDERATIONS

Currently, it is assumed that the proposed RCP will run within the rights-of-way for the entrance roads into Tracts 1, 2, 2A, and 3. This will provide the City of Albuquerque with access for maintenance of the pipe. If the pipe does not follow a roadway alignment, a drainage easement will be granted to the City with an access road that meets the City's requirements.

Because of the proposed depth of fill over the RCP, it is likely that some or all of the pipe will have to be Class IV. The extent of Class IV pipe will be determined at the time of final design.

During final design, the flow rates through the RCP will be updated, and the pipe's velocities and hydraulic grade line will be determined. Also, the design ground surface elevations along the alignment of the RCP will be finalized. At that time, the size of the RCP will be reevaluated to confirm that the pipe size is minimized while keeping the HGL below finished ground.

V. CONCLUSIONS AND RECOMMENDATIONS

Based on the analyses described herein, the open channel extension of Tributary B of the North Branch of the Piedras Marcadas Arroyo, which was proposed in the Ventana Ranch West Drainage Management Plan, could be replaced by a 96-inch RCP without causing storm water to back up onto the upstream property prior to its development and without the HGL for the RCP through VRW being higher than proposed finished ground elevations. This would result in lower capital costs, facilitate grading of the adjacent tracts in Ventana Ranch West, and improve vehicular ingress and egress for the tracts.

APPENDIX A

FIGURES

Bohannan ▲ Huston INC.

Courtyard I 7500 Jefferson St. NE Albuquerque, NM 87109-4335

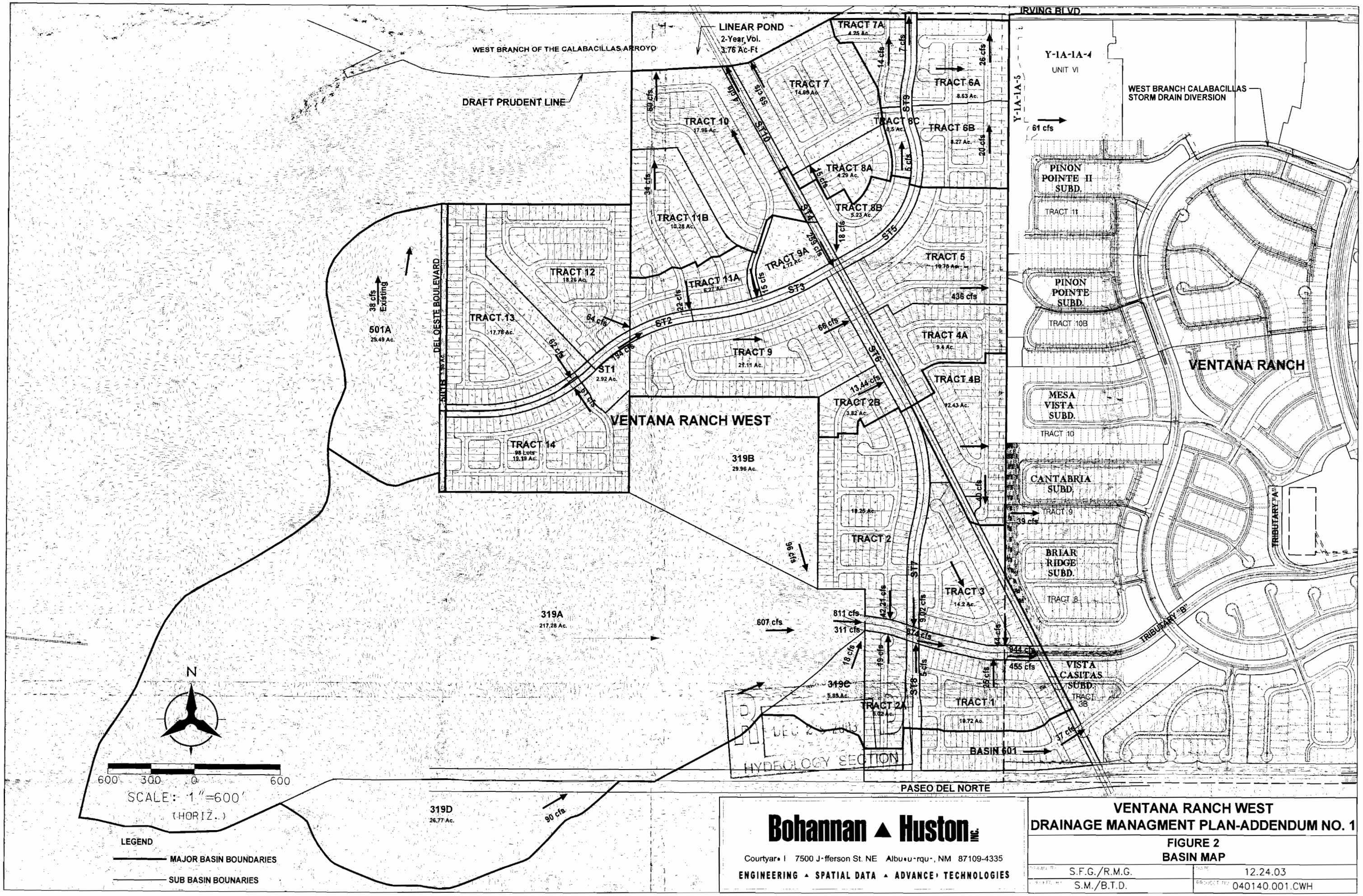
ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

VENTANA RANCH WEST
DRAINAGE MANAGMENT PLAN-ADDENDUM NO. 1

FIGURE 1
VICINITY MAP

DRAWN BY:	S.F.G./R.M.G.	DATE:	12.24.03
CHECKED BY:	S.M./B.T.D.	PROJECT NO.	040140.001.CWH

P:\040140\Hydro\reports\Figures\Addendum No 1\ADDENDUM1.040140parcel.dwg
Dec 24, 2003 - 10:42am



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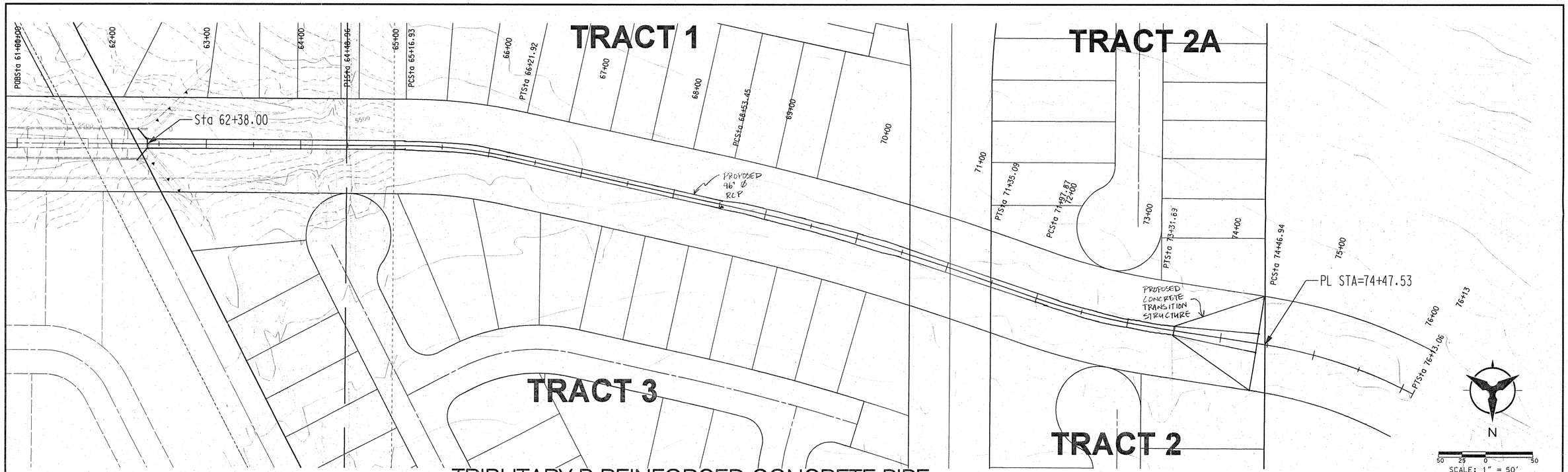
ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

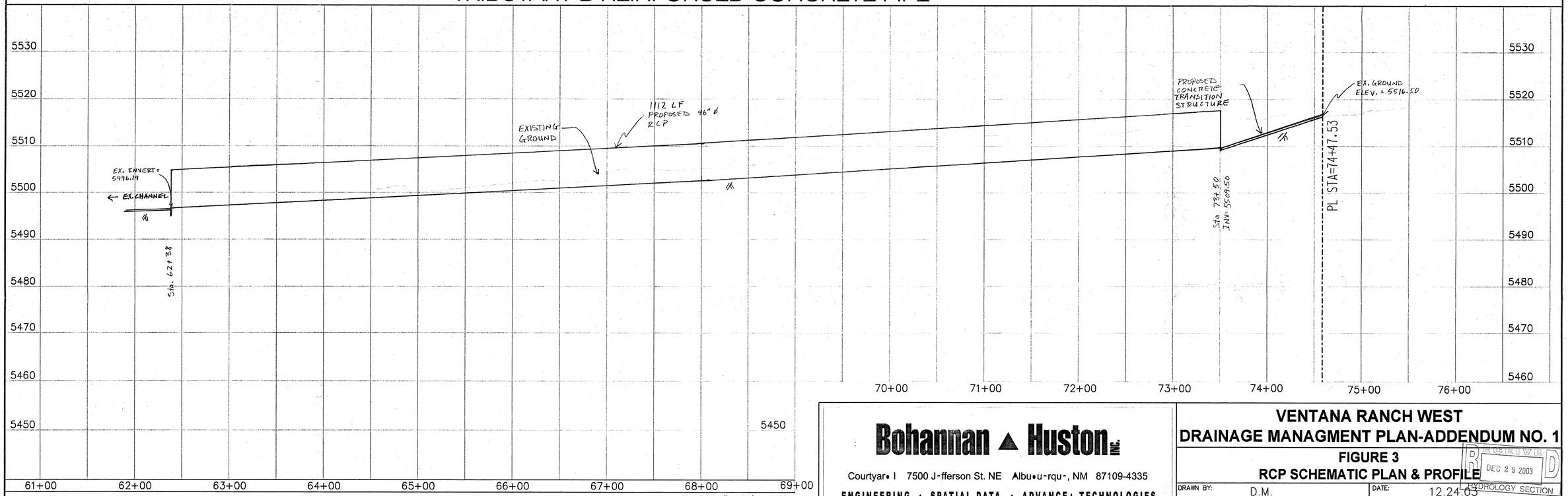
VENTANA RANCH WEST
DRAINAGE MANAGMENT PLAN-ADDENDUM NO. 1

FIGURE 2
BASIN MAP

S.F.G./R.M.G.	12.24.03
S.M./B.T.D.	040140.001.CWH



TRIBUTARY B REINFORCED CONCRETE PIPE



24-DEC-2003
P:\030045\cdp\pnp\V030045HydroDMP-pnp.dgn

BHI JOB NO. 040140

Bohannan ▲ Huston INC.

Courtyard 7500 Jefferson St. NE Albuquerque, NM 87109-4335

ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

VENTANA RANCH WEST
DRAINAGE MANAGMENT PLAN-ADDENDUM NO. 1

FIGURE 3
RCP SCHEMATIC PLAN & PROFILE

DRAWN BY:	D.M.	DATE:	12.24.03
CHECKED BY:	B.D.	PROJECT NO.	040140.001.CWH

APPENDIX B

AHYMO MODEL

EXISTING CONDITIONS UPSTREAM

DEVELOPED CONDITIONS IN VENTANA RANCH WEST

```
    AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) -                              - VERSION:
1997.02c      RUN DATE (MON/DAY/YR) =12/12/2003
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         USER NO.= AHYMO-S-9702c1BohanHu-AH

                                    FROM  TO                      PEAK          RUNOFF
          TIME TO    CFS       PAGE =   1
                     HYDROGRAPH   ID    ID          AREA      DISCHARGE       VOLUME
  RUNOFF      PEAK     PER
    COMMAND        IDENTIFICATION   NO.  NO.       (SQ MI)       (CFS)        (AC-FT)
 (INCHES)   (HOURS)    ACRE      NOTATION

    *S*                  PROJECT NAME:  VENTANA WEST, ALBUQUERQUE, NM
    *S*                  JOB NO. 040140
    *S*                  DATE: August 2003
    *S*
    *S*                  INPUT FILE NAME: VWEST319.HYM
    *S*                  OUTPUT FILE NAME:  VWEST319.OUT
    *S*                  FILES LOCATION: BHI-MAIN\040140\HYDRO\STUDIES\AHYMO\
    *S*   COMMENTS:
    *S*
    *S*                  RENAMED VW319EX.HYM TO REFLECT UNDEVELOPED CONDITIONS
    *S*     IN SUB-BASIN 319.
    *S*
    *S*                  Each sub-basin is repesented like this: PD.319
    *S*                  C stands for Piedras Marcadas Arroyo
    *S*
    *S*                  d Mannings n Calculated with procedure outlined in ALB. DPM.
    *S*
    *S*   Percent impervious determine utilizing Albuquerque DPM procedures.
    *S*
    *S*                  rges into the Tributary B for the North Piedras Marcadas Nor
    *S*                  ---------------------------------------------------------
    *S*
    RAINFALL  TYPE= 2
                            RAIN24=   2.660
    SEDIMENT BULK
                            PK BF =    1.02
    *S**** COMPUTE BASIN 319D****
    COMPUTE NM HYD        PD.319D   -     1        .04183        33.83        1.077
   .48262    1.550    1.264 PER IMP=     .00
    *S*ROUTE C0.319D THROUGH CHANNEL SEG 1
    ROUTE                  319.30    1    2        .04183        34.74        1.077
   .48265    1.550    1.298
    *S**** COMPUTE BASIN 319A****
    COMPUTE NM HYD        PD.319A   -     3        .33950       239.94        8.739
   .48262    1.600    1.104 PER IMP=     .00
    *S**** COMPUTE BASIN 319B****
    COMPUTE NM HYD        PD.319B   -     4        .04700        35.23        1.210
   .48262    1.550    1.171 PER IMP=     .00
    *S**** ADD 319A AND 319B ****
    ADD HYD                 PD.319  4& 3   5        .38650       272.58        9.948
   .48262    1.600    1.102
    *S**** COMPUTE BASIN 319C****
    COMPUTE NM HYD        PD.319C   -     6        .00910         6.47         .234
   .48262    1.550    1.112 PER IMP=     .00
    *S**** ADD 319A/B AND 319C ****
    ADD HYD                 PD.319  5& 6   7        .39560       278.76       10.183
   .48262    1.600    1.101
    *S**** ADD 319A/B/C AND 319D ****
    ADD HYD                 PD.319  7& 2   8        .43743       310.50       11.259
   .48262    1.600    1.109
    *S*ROUTE C0.319 THROUGH CHANNEL SEG 1
```

```
  ROUTE                  319.10    8    9        .43743        314.54       11.259
 .48263    1.600    1.124
  *S**** COMPUTE TRACT 2A****
  COMPUTE NM HYD           T2A   -    10        .00780         18.56         .777
1.86682    1.500    3.718 PER IMP=  62.00
  *S**** ADD TRACT 2A TO BASIN 319****
  ADD HYD                PD.319  9&10  11        .44523        327.32       12.036
 .50687    1.600    1.149
  *S**** COMPUTE TRACT 2****
  COMPUTE NM HYD           T2    -    12        .02852         42.21        2.693
1.77035    1.650    2.312 PER IMP=  56.00
  *S**** ADD BASIN 2 TO BASIN 319****
□
                                    FROM  TO                    PEAK         RUNOFF
          TIME TO    CFS       PAGE =   2
                     HYDROGRAPH   ID    ID         AREA      DISCHARGE       VOLUME
 RUNOFF      PEAK     PER
  COMMAND        IDENTIFICATION   NO.   NO.       (SQ MI)      (CFS)        (AC-FT)
(INCHES)   (HOURS)    ACRE      NOTATION

  ADD HYD                PD.319 12&11  13        .47375        366.55       14.729
 .58293    1.600    1.209
  *S*ROUTE C0.319 THROUGH CHANNEL SEG 2
  ROUTE                  319.20   13   14        .47375        365.17       14.729
 .58294    1.600    1.204
  *S**** COMPUTE STREET 8****
  COMPUTE NM HYD           ST8   -    15        .00220          5.09         .208
1.77357    1.500    3.618 PER IMP=  56.20
  *S**** COMPUTE STREET 7****
  COMPUTE NM HYD           ST7   -    16        .00475          9.02         .473
1.86682    1.550    2.968 PER IMP=  62.00
  *S**** ADD STREET 7 AND 8****
  ADD HYD              PD.319.2 15&16  17        .00695         13.53         .681
1.83720    1.550    3.042
  *S**** ADD STREET 7 AND 8 TO BASIN 319****
  ADD HYD                PD.319 17&14  18        .48070        377.59       15.410
 .60107    1.600    1.227
  *S*ROUTE C0.319 THROUGH CHANNEL SEG 3
  ROUTE                  319.20   18   19        .48070        393.36       15.410
 .60107    1.600    1.279
  *S**** COMPUTE TRACT 1****
  COMPUTE NM HYD           T1    -    20        .01680         25.22        1.621
1.80894    1.650    2.345 PER IMP=  58.40
  *S**** COMPUTE TRACT 3****
  COMPUTE NM HYD           T3    -    21        .02220         43.60        1.986
1.67710    1.550    3.068 PER IMP=  50.20
  *S**** ADD TRACT 1 AND 3****
  ADD HYD              PD.319.3 21&20  22        .03900         63.00        3.606
1.73387    1.550    2.524
  *S**** ADD TRACT 1 AND 3 TO BASIN 319****
  ADD HYD                PD.319 22&19  23        .51970        455.28       19.016
 .68608    1.600    1.369
  FINISH
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APPENDIX C

AHYMO MODEL

DEVELOPED CONDITIONS UPSTREAM

DEVELOPED CONDITIONS IN VENTANA RANCH WEST

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =10/09/2003

INPUT FILE = vwest319.hym

USER NO.= AHYMO-S-9702c1BohanHu-AH

COMMAND	IDENTIFICATION	HYDROGRAPH ID	FROM ID	TO ID	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	TIME TO PEAK (HOURS)	RUNOFF PEAK PER ACRE	RUNOFF (INCHES)
S	PROJECT NAME: VENTANA WEST, ALBUQUERQUE, NM									
S	JOB NO. 040140									
S	DATE: August 2003									
S										
S	INPUT FILE NAME: VWEST319.HYM									
S	OUTPUT FILE NAME: VWEST319.OUT									
S	FILES LOCATION: BHI-MAIN\040140\HYDRO\STUDIES\AHYMO\									
S	COMMENTS:									
S										
S	Each sub-basin is repesented like this: PD.319									
S	C stands for Piedras Marcadas Arroyo									
S										
S	d Mannings n Calculated with procedure outlined in ALB. DPM.									
S										
S	Percent impervious determine utilizing Albuquerque DPM procedures.									
S										
S	rges into the Tributary B for the North Piedras Marcadas Nor									
S										
S										
RAINFALL TYPE= 2	RAIN24= 2.660									
SEDIMENT BULK	PK BF = 1.02									
*S**** COMPUTE BASIN 319D****										
COMPUTE NM HYD	PD.319D -			1	.04183	89.88	4.004	1.79460	1.500	3.358 PER IMP= 59.00
*S*ROUTE C0.319D THROUGH CHANNEL SEG 1										
ROUTE	319.30	1		2	.04183	89.88	4.004	1.79461	1.550	3.357
*S**** COMPUTE BASIN 319A****										
COMPUTE NM HYD	PD.319A -			3	.33950	607.30	32.494	1.79460	1.600	2.795 PER IMP= 59.00
*S**** COMPUTE BASIN 319B****										
COMPUTE NM HYD	PD.319B -			4	.04700	95.67	4.498	1.79460	1.550	3.180 PER IMP= 59.00
*S**** ADD 319A AND 319B ****										
ADD HYD	PD.319	4& 3		5	.38650	702.52	36.993	1.79460	1.550	2.840
*S**** COMPUTE BASIN 319C****										
COMPUTE NM HYD	PD.319C -			6	.00910	18.18	.871	1.79460	1.550	3.122 PER IMP= 59.00
*S**** ADD 319A/B AND 319C ****										
ADD HYD	PD.319	5& 6		7	.39560	720.70	37.864	1.79460	1.550	2.847
*S**** ADD 319A/B/C AND 319D ****										
ADD HYD	PD.319	7& 2		8	.43743	810.58	41.867	1.79460	1.550	2.895
*S*ROUTE C0.319 THROUGH CHANNEL SEG 1										
ROUTE	319.10	8		9	.43743	811.63	41.867	1.79460	1.550	2.899
*S**** COMPUTE TRACT 2A****										

```
  COMPUTE NM HYD          T2A   -    10        .00780        18.56         .777
 1.86682    1.500    3.718 PER IMP=  62.00
  *S**** ADD TRACT 2A TO BASIN 319****
  ADD HYD              PD.319  9&10  11        .44523       828.00       42.644
 1.79586    1.550    2.906
  *S**** COMPUTE TRACT 2****
  COMPUTE NM HYD           T2   -    12        .02852        42.21        2.693
 1.77035    1.650    2.312 PER IMP=  56.00
  *S**** ADD BASIN 2 TO BASIN 319****
  ADD HYD              PD.319 12&11  13        .47375       860.57       45.337
 1.79432    1.550    2.838
  *S*ROUTE C0.319 THROUGH CHANNEL SEG 2
  ROUTE                319.20   13   14        .47375       860.81       45.337
 1.79432    1.550    2.839
  *S**** COMPUTE STREET 8****
□
                                  FROM  TO                    PEAK         RUNOFF
         TIME TO    CFS      PAGE =   2
                    HYDROGRAPH   ID   ID         AREA     DISCHARGE       VOLUME
 RUNOFF     PEAK     PER
  COMMAND       IDENTIFICATION   NO.  NO.      (SQ MI)      (CFS)         (AC-FT)
(INCHES)  (HOURS)    ACRE     NOTATION

  COMPUTE NM HYD          ST8   -    15        .00220         5.09         .208
 1.77357    1.500    3.618 PER IMP=  56.20
  *S**** COMPUTE STREET 7****
  COMPUTE NM HYD          ST7   -    16        .00475         9.02         .473
 1.86682    1.550    2.968 PER IMP=  62.00
  *S**** ADD STREET 7 AND 8****
  ADD HYD            PD.319.2 15&16  17        .00695        13.53         .681
 1.83720    1.550    3.042
  *S**** ADD STREET 7 AND 8 TO BASIN 319****
  ADD HYD              PD.319 17&14  18        .48070       874.35       46.018
 1.79494    1.550    2.842
  *S*ROUTE C0.319 THROUGH CHANNEL SEG 3
  ROUTE                319.20   18   19        .48070       882.45       46.018
 1.79494    1.600    2.868
  *S**** COMPUTE TRACT 1****
  COMPUTE NM HYD           T1   -    20        .01680        25.22        1.621
 1.80894    1.650    2.345 PER IMP=  58.40
  *S**** COMPUTE TRACT 3****
  COMPUTE NM HYD           T3   -    21        .02220        43.60        1.986
 1.67710    1.550    3.068 PER IMP=  50.20
  *S**** ADD TRACT 1 AND 3****
  ADD HYD            PD.319.3 21&20  22        .03900        63.00        3.606
 1.73387    1.550    2.524
  *S**** ADD TRACT 1 AND 3 TO BASIN 319****
  ADD HYD              PD.319 22&19  23        .51970       944.37       49.624
 1.79036    1.600    2.839
  FINISH
```

APPENDIX D

HYDRAULIC ANALYSIS

. ıalyzer Report

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:ainage Structure Analyzer

Culvert Hydraulic Analysis

ıte: Tuesday, December 23, 2003 01:37:19 PM

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Input Data

ıape Circular

Material RC C76-A

Roughness 0.013000

ıtrance Edge Square edge w/ headwall

ımber of Barrels 1

Length 1110.00 ft

Slope 1.200%

ailwater 7.00 ft

ılet Control Equation Entrance Loss

Size (W x T): 96.00 x 8.0000

Flow Rate 311.0 cfs

ıtput Results

Flow Rate 311.0 cfs

ontrol Inlet

apacity 999.1 cfs

anning's Velocity 17.55 ft/s

Headwater 6.59 ft

ritical Depth 4.45 ft

ormal Depth 3.06 ft

ize (W x T): 96.00 x 8.0000

? alyzer Report

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I ainage Structure Analyzer

Culvert Hydraulic Analysis

I te: Tuesday, December 23, 2003 01:36:58 PM

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Input Data

! .ape	Circular	
Material	RC C76-A	
Roughness	0.013000	
I .trance Edge	Square edge w/ headwall	
I :mber of Barrels	1	
Length	1110.00	ft
Slope	1.200%	
' ilwater	7.00	ft
: ilet Control Equation	Entrance Loss	
Size (W x T):	96.00 x 8.0000	
Flow Rate	811.0	cfs

' itput Results

Flow Rate	811.0	cfs
ontrol	Inlet	
apacity	999.1	cfs
anning's Velocity	22.14	ft/s
Headwater	15.67	ft
ritical Depth	7.08	ft
ormal Depth	5.47	ft
Size (W x T):	96.00 x 8.0000	