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

November 14, 2003

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

Re: Ventana Ranch West Subdivision Drainage Management Plan
Engineer's Stamp dated 10-10-03, (B8/D1)

Dear Mr. Dixon,

Based upon the information provided in your submittal dated 10-10-03, the above referenced plan is approved as a Master Plan for the above referenced planned community. Tract 6A should be designed to drain through Tract 6B and connect to Pinon Point 6 at the already approved point. I do not want a storm drain diagonal across Tract Y-1A-1A-5. This can be addressed at subdivision of that Tract. AMAFCA approval of the maintenance of the pond in their easement will be required.

Tract-specific drainage reports will be required for each subsequent subdivision.

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

Sincerely,

Bradley L. Bingham, PE
Sr. Engineer, Planning Dept.
Building and Development Services

C: Lynn Mazur, AMAFCA
file

N

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SCALE: 1" = 30'
(HORIZ.)

YOLANDA O. PADILLA
NEW MEXICO
12036
REGISTERED

4-27-05

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TW 11.29

TB

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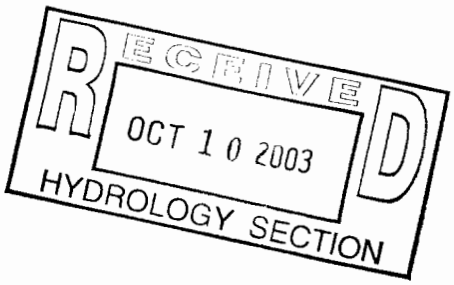
VENTANA RANCH WEST SUBDIVISION

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.

Brad Dixon 10/10/03

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



Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

2600 PROSPECT N.E. - ALBUQUERQUE, NM 87107
TELEPHONE (505) 884-2215 FAX (505) 884-0214

November 6, 2003

Mr. Bradley T. Dixon, P.E.
Bohannan Huston, Inc.
7500 Jefferson St. NE, Courtyard I
Albuquerque, New Mexico 87109

Re: Ventana Ranch West Subdivision Drainage Management Plan, ZAP B-8

Dear Brad:

AMAFCA has reviewed the referenced report and approves the drainage concept. Please send future subdivision plans to AMAFCA for review.

If you have any questions, please call me at 884-2215.

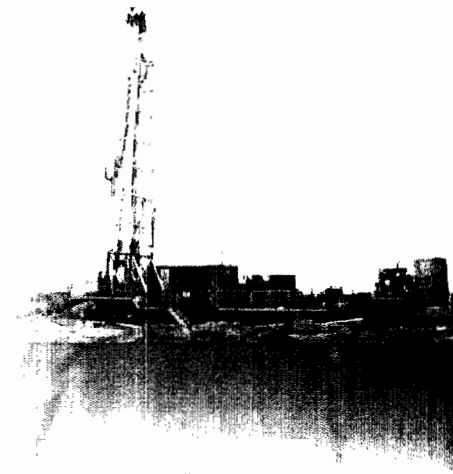
Sincerely,
AMAFCA

Lynn M. Mazur

Lynn M. Mazur, P.E.
Development Review Engineer

Cc: Brad Bingham, COA Hydrology

VENTANA RANCH WEST SUBDIVISION DRAINAGE MANAGEMENT PLAN



OCTOBER 10, 2003

Prepared for:
Sandia Properties Limited Company
#10 Tramway Loop NE
Albuquerque, NM 87122-2000

Bohannan Huston

ENGINEERING
SURVEYING
ADVANCED TECHNOLOGIES

TABLE OF CONTENTS

Tables

Appendices

EXECUTIVE SUMMARY

The following report presents the Drainage Management Plan for the Ventana Ranch West subdivision. The Ventana Ranch West subdivision is located directly west of the first phase of the Ventana Ranch subdivision, south of the West Branch of the Calabacillas Arroyo, and north of Paseo del Norte. The Drainage Management Plan (DMP) has evaluated drainage patterns, peak flow rates, and drainage infrastructure requirements for the Ventana Ranch West development. The analysis provides 100-yr, 24-hour storm event flow rates, the 2-year, 24-hour storage requirement for the linear detention pond, and preliminary sizing and layout for required drainage structures.

The Ventana Ranch West DMP is an extension of the Las Ventanas DMP and Piedras Marcadas DMP which were prepared, approved, and implemented starting in 1996. The proposed drainage infrastructure further develops the drainage planning developed in the Las Ventanas DMP, the Design Analysis Report for Ventana Ranch Subdivision Drainage Facilities (Bohannan Huston Inc., October 1995) and its four addenda, utilizing existing drainage infrastructure built in the Ventana Ranch subdivision.

The Drainage Management Plan recommends grading the proposed development to match existing drainage patterns and match existing drainage facility capacities where feasible. The Drainage Management Plan recommends directing developed runoff from a small area within Basin 318 into Basin 319, toward the North Branch Channel of the Piedras Marcadas Arroyo, in order to reduce discharges across collector streets and the underground storm drainage infrastructure required by such crossings. The North Branch Channel has adequate additional capacity to accept these flows. The remainder of Basin 318 will continue to be collected and conveyed by an existing 36" storm sewer through the Briar Ridge Subdivision within Ventana Ranch, which ultimately discharges into the same channel at Las Ventanas Loop.

Upon further review of the basins originally identified within the Piedras Marcadas DMP, which were referenced within the Las Ventanas DMP, this Drainage Management Plan determines that within Basin 501, an undeveloped piece of land west of Ventana Ranch West (Basin 501A) actually is collected within an existing shallow playa, which discharges upon overflow north toward the West Branch of the Calabacillas Arroyo.

The plan also includes the construction of a linear detention pond between Ventana Ranch West and the West Branch of the Calabacillas Arroyo (in coordination with AMAFCA) to provide erosion protection against frequent smaller storm events. The pond will provide storage volume for the developed conditions 2-year, 24-hour rainfall runoff for its contributing drainage area and will drain within a 96-hour period. In addition, this pond will be designed to store sediment carried by the runoff.

I. INTRODUCTION

The Ventana Ranch West Drainage Management Plan (DMP) is intended to provide a comprehensive analysis of the developed hydrologic conditions for Ventana Ranch West. The following report evaluates the hydrology and hydraulics for the drainage infrastructure associated with the development of Ventana Ranch West. The DMP includes the review of previous drainage studies conducted for the Ventana Ranch Subdivision, including the Las Ventanas Drainage Management Plan (Bohannan Huston Inc., July 1995), the Design Analysis Report for Ventana Ranch Subdivision Drainage Facilities (Bohannan Huston Inc., October 1995), and its four addendums, as well as the Piedras Marcadas DMP (Molzen-Corbin, May 1993).

The Ventana Ranch West DMP evaluates portions of two major drainage basins, the Piedras Marcadas Arroyo and the West Branch of the Calabacillas Arroyo, as they impact the drainage infrastructure required for the Ventana Ranch West Subdivision. These drainage basins were subdivided into smaller basins corresponding with the conceptual layouts for Ventana Ranch West. The smaller drainage basins or sub-basins were individually evaluated for drainage patterns, times of concentration, and contributing drainage areas. The analysis, results, and recommendations comprise the Drainage Management Plan for the development of the property.

II. PROJECT DESCRIPTION

A. Location

The Ventana Ranch West subdivision is located within the Albuquerque City limits in Bernalillo County, directly west of the Ventana Ranch Subdivision (Figure1). Ventana Ranch West occupies an area of approximately 290 acres, or approximately 0.45 square miles. The subdivision is bordered by Irving Boulevard and the West Branch of the Calabacillas Arroyo to the north, Paseo del Norte to the south, and Del Oeste Boulevard to the west.

B. Site Characteristics

1. Topographic Features

The terrain associated with the Ventana Ranch West subdivision contains mild slopes of 1% to 3% grade sloping downward from west to east, and a maximum elevation difference of approximately 100 feet. The existing vegetation consists of native brush and a few sporadic juniper trees. Two underground high pressure gas pipelines traverse diagonally across the Ventana Ranch West subdivision within an existing 50-foot easement.

2. Soils and Subsurface

According to the Soil Conservation mapping, the existing soil types consist of Bluepoint loamy fine sand, Madurez loamy fine sand and Madurez-Wink, and Alameda sandy loam. The corresponding hydrologic soil group classifications are A, B, and C, respectively.

The subsurface conditions contain underlying basalt bedrock in the southern area of the planned Ventana Ranch West subdivision. The basalt rock layer ranges from surface level to soil covered depths of greater than 20 feet. Areas identified as containing basalt rock will significantly affect the planning for the subdivision.

3. Site Grading

The grading within Ventana Ranch West will follow the existing drainage patterns for the majority of the development. Figure 2 shows a partial mass grading concept that has been prepared for Ventana Ranch West. An overall grading plan for Ventana Ranch West is presently being prepared and will be submitted to the City for rough grading approval in the near future. In areas of shallow rock or basalt, additional fill material will be utilized to provide sufficient cover for required utilities and infrastructure. The final detailed subdivision grading plans will be developed in phases as each subdivision is developed, with appropriate drainage and erosion protection facilities.

Along the northern boundary of the subdivision, a linear detention pond will be constructed to minimize impacts on the West Branch Calabacillas Arroyo from frequent storm events. The pond will be constructed to contain the developed conditions 2-year 24-hour

storage volume for its contributing drainage area as well as sediment carried by storm runoff. This volume will be discharged into the West Branch Calabacillas Arroyo at the minimum rate possible to drain within 96 hours. The pond's volume will be created through a combination of excavation and berming. Erosion will be controlled downstream of the primary and emergency spillways for the pond to protect the integrity of the pond and its outlet works.

III. HYDROLOGIC ANALYSIS

A. Methodology

The analyses described herein were performed in accordance with the City of Albuquerque Development Process Manual, Chapter 22, 1997 (DPM). The 1997 version of AHYMO was utilized to model the developed conditions within Ventana Ranch West.

1. Base Information

The information utilized for the DMP consisted of aerial contours maps from the Piedras Marcadas DMP, existing and proposed development layouts for the Ventana Ranch Subdivision, the proposed layout for Ventana Ranch West, existing FEMA maps, and digital topographic mapping for the property, prepared by BHI, for detailed analysis and evaluation of existing and developed conditions.

2. Precipitation

The hydrologic analysis used the 100 year 24-hour storm event for determination of rainfall depths. The rainfall values used in the AHYMO model were the same as the values used in the Las Ventanas DMP. These values are:

Rain One (1-hour, 100-year)	1.84 inches
Rain six (6-hour, 100-year)	2.20 inches
Rain Day (24-hour, 100-year)	2.66 inches

3. Drainage Area

The drainage basins were delineated utilizing digital terrain models (DTM) with 2-foot contours. Two major watersheds identified in the Las Ventanas DMP impact Ventana Ranch

West. The previously established basins within these watersheds were divided into sub-basins to more accurately evaluate the proposed developed conditions for Ventana Ranch West with respect to drainage patterns and land treatment types. These basins are illustrated in Figure 3.

4. Time of Concentration

The time of concentration (T_c), for each drainage basin was calculated in accordance with the procedures defined in the DPM. The DTM's were utilized to determine average slopes, flow paths, and drainage distances with respect to conceptual layouts. The AHYMO model uses the parameter time to peak (T_p), which is equal to 2/3 T_c. The minimum T_c allowable is 12 minutes, which corresponds to T_p value of 8 minutes, or 0.133 hours. These values are shown in Appendix B.

5. Treatment Types

The AHYMO model uses land treatment types to describe land usage and projected infiltration. The four land treatment types A, B, C, and D are further defined in the City of Albuquerque DPM. The land treatment types range by percentage of impervious area with Type A as the most pervious and Type D as the most impervious.

Land use was determined utilizing the conceptual development layouts, projected housing densities, and procedures detailed in the DPM. The conceptual development layouts provide project housing densities, residential drainage areas, and paved drainage areas. Each sub-basin was assigned a percentage of each land treatment type based on the housing density. The DPM procedures determine the percentage of land treatment type D given a specific housing density. The remaining land use is equally divided between type B and type C. The land treatment types and weighted percentages are shown in Table 1 as follows:

Table 1 Ventana Ranch West Land Treatment Types

Sub-Basin	Percentage Treatment Type			
	Type A	Type B	Type C	Type D
Basin 319A, B, C, D	7.0	14.0	20.0	59.0
Basin 501A	98.0	0.0	2.0	0.0
Tract 1	0.0	20.8	20.8	58.5
Tract 2A	0.0	19.0	19.0	62.0
Tract 2, 2B	0.0	22.0	22.0	56.0
Tract 3	0.0	24.9	24.9	50.2
Tract 4	0.0	23.1	23.1	53.8
Tract 5	0.0	22.7	22.7	54.6
Tract 6	0.0	23.0	23.0	54.0
Tract 7	0.0	21.8	21.8	56.4
Tract 8	0.0	25.3	25.3	49.4
Tract 9	0.0	21.9	21.9	56.2
Tract 10	0.0	22.3	22.3	55.5
Tract 11	0.0	22.8	22.8	54.5
Tract 12	0.0	22.1	22.1	55.8
Tract 13	0.0	22.3	22.3	55.4
Tract 14	0.0	24.9	24.9	50.3
All Streets	0.0	19.0	19.0	62.0

6. Sediment Bulking

Sediment bulking factors are applied to the clean water flows in order to account for the increase in runoff due to sediment transport. A sediment bulking factor of 2.5% was used in the developed conditions AHYMO model. This factor was also used in the Las Ventanas DMP.

B. Developed Conditions

As described above under existing conditions, Ventana Ranch West is impacted by two watersheds comprised of four drainage areas. These drainage areas are illustrated in Figure 3, and identified as Basin 319, Basin 318, Basin 501, and Basin 502. These drainage basins are sub-basins to the Piedras Marcadas Arroyo and the West Branch of the Calabacillas Arroyo. Figure 4

illustrates the developed conditions drainage basins within the Ventana Ranch West subdivision. The Ventana Ranch Subdivision DMP previously identified these drainage basins and constructed facilities to accommodate the developed storm water flows from Ventana Ranch West. The Ventana Ranch West DMP has modeled and developed a drainage plan to match the existing downstream storm water facilities in the Ventana Ranch Subdivision. The developed conditions AHYMO model developed herein, which is based upon the Drainage Management Plan, Figure 5, verifies that the proposed discharge rates to the existing facilities within Las Ventanas will be equal to or less than the original design discharge rates for those specific facilities. Refer to Appendix B for model results for developed conditions.

1. North Branch Piedras Marcadas System

The drainage basins within the Piedras Marcadas system consist of Basin 319, Basin 318, and Basin 501. These basins were previously identified in the Las Ventanas DMP. Stormwater flows from Basins 319, 318, and 501 are collected in Tributary A and Tributary B of the North Branch Piedras Marcadas Channel. The Tributary A channel is located in the Ventana Ranch Subdivision and collects stormwater flows from Basin 318 and Basin 501 with two separate storm drain pipes sized in the Las Ventanas DMP and verified within this drainage plan.

Basin 319 is the largest area contributing upstream flow to the Piedras Marcadas North Channel. Flows from Basin 319 are collected in the Tributary B Channel which extends west from the Ventana Ranch Subdivision into Ventana Ranch West, terminating at the boundary of Tracts 2A and 2 (See Figure 4). Basin 319 contains of a large quantity of undeveloped land directly west of the property boundary for Ventana Ranch West. This undeveloped land was divided into basins 319A, 319B, 319C, and 319D. These basins were modeled for developed conditions to ensure properly sized drainage infrastructure is in place for future development and to utilize the existing outfalls within Ventana Ranch. The remainder of Basin 319 consists of Tracts 1, 2, 2A, and 3 and Streets 7 and 8.

Developed stormwater flows from Basin 318 are limited to Tract 4B. The conceptual development plan, which has been prepared to respect existing topography, coordinate local and collector street alignments, with drainage patterns and existing downstream drainage

capacities, dictates that the majority of the area within the original Basin 318 will be directed into Basin 319, toward the North Branch Channel of the Piedras Marcadas Arroyo. The remaining stormwater flows will be collected into an existing 36" storm drain that conveys flows through the Briar Ridge Subdivision within Ventana Ranch, and ultimately discharges into the Piedras Marcadas North Channel at Las Ventanas Loop.

Basin 501 contains the largest area of development relative to the original basins. The projected housing densities with the Ventana Ranch West subdivision are approximately 5 houses per acre. Upon further review of that portion of the basin west of Del Oeste Boulevard, it is apparent that flows in Basin 501A, west of Del Oeste Boulevard, actually collect in a shallow playa, which upon overflow discharge to the north into the West Branch of the Calabacillas. Therefore, under existing conditions, this off-site sub-basin does not impact Ventana Ranch West. The remainder of Basin 501 consists of Tracts 2B, 4A, 5, 8B, 9, 9A, 11A, 12, 13, and 14 and Streets 1-6. All the stormwater flows from these tracts are collected in a single storm drain system, which discharges into an existing 66" storm drain with the Ventana Ranch Subdivision. The stormwater flows carried within the 66" storm drain discharge to Piedras Marcadas North Channel Tributary A.

Per Final Addendum No. 4 for the Design Analysis Report for Ventana Ranch Subdivision Drainage Facilities (Bohannan Huston Inc., July 3, 2000), Basin 502 discharges into an existing 36" storm drain, which continues through Ventana Ranch as the West Branch Calabacillas Storm Drain Diversion. Ultimately, this storm drain discharges into the Las Ventanas Dam. For Ventana Ranch West, Basin 502 consists of Basins 6A, 6B, 7A and 8C and Street 9.

2. The West Branch of the Calabacillas Arroyo

The northwesterly portion of Ventana Ranch West is located within the watershed of the West Branch of the Calabacillas Arroyo. Per coordination with AMAFCA, a detention pond will be constructed to collect developed conditions stormwater flow from the area that historically drained to the arroyo and discharge it to the arroyo at a controlled rate in order to minimize erosion in the arroyo due to frequent storm events. The pond will store the rainfall from the 2-year, 24-hour storm, as well as sediment carried by this runoff, and release the

accumulated stormwater over a 96-hour time period. The developed drainage areas within Ventana Ranch West contributing to the linear pond include Tracts 7, 8A, 10, and 11B and Street 10 as shown in Figure 4. Figures 6 and 7 show a grading concept for the detention pond and details for its emergency spillway. The emergency spillway will consist of a stabilized weir with capacity for the 10-year, 24-hour peak discharge. The crest of this weir will be at the water surface elevation for the 2-year, 24-hour rainfall runoff and one foot below the remainder of the berm for the pond. Please note that the grading concept may be revised based upon the final grading design for Tract 10.

As illustrated in the table below, all projected peak discharges from Ventana Ranch West are less than or essentially equal to the design flow rates for the existing drainage structures within Ventana Ranch. The peak discharge for Basin 501 is projected to be 4 cfs higher than was estimated in the Las Ventanas DMP. However, considering the precision of hydrologic modeling, these two flow rates are essentially equal.

Table 2 AHYMO Model Results

Basin Analysis Point	Las Ventanas Drainage Area	Las Ventanas Flow Rate	Ventana Ranch West Drainage Area	Ventana Ranch West Flow Rate
Basin 319	.572 sq. mi.	959 cfs	.520 sq. mi.	944 cfs
Basin 318	.043 sq. mi.	96 cfs	.019 sq. mi.	39 cfs
Basin 501	.273 sq. mi.	432 cfs	.210 sq. mi.	436 cfs
Basin 502	.034 sq. mi.	76 cfs	.039 sq. mi.	68 cfs

3. Basin 601

A small piece of land along the southern boundary of Ventana Ranch West lies within the Basin 601, as identified in the Las Ventanas DMP. Flows from this sub-basin will be conveyed through existing streets within the Vista Casitas subdivision in Ventana Ranch and collected by existing storm drains to the Piedras Marcadas Arroyo.

4. Prudent Line for the West Branch of the Calabacillas Arroyo

As discussed above, Ventana Ranch West is bounded on the north by the West Branch of the Calabacillas Arroyo. The draft prudent line for the arroyo was developed in 1999 by Mussetter Engineering and is shown on Figure 5. Per the conceptual land use plan for Ventana Ranch West, no residential units will be placed within the prudent line; however, as Figure 2 shows, the fill slope for Tract 7 may extend beyond this boundary. If this is the case, the fill slope will be stabilized as high as the 100-year water surface elevation for the arroyo, with a toe-in depth equal to the long-term degradation for the arroyo plus local scour.

IV. HYDRAULIC ANALYSIS

The following hydraulic analysis was used to develop the infrastructure sizing required to convey the 100-year, 24-hour stormwater flows projected from the hydrologic analysis. The Ventana Ranch West subdivision infrastructure requirements consist of a grouted basalt channel, a concrete box culvert, and RCP storm drains varying form 36" to 66". The grouted basalt channel, Tributary B, collects all stormwater flow from Basin 319 and conveys it into the Piedras Marcadas North Channel. The preliminary sizing of drainage structures was determined using Manning's equation for open channel flow and pipes. The drainage structures' locations and preliminary sizes are illustrated in Figure 5. Refer to Appendix D for hydraulic analyses. The structures' sizes and layouts will be further refined during the design of the initial phases of the subdivision.

Table 3 Hydraulic Analysis Results

Pipe Location	Pipe Size	Slope	Project peak Flow	Pipe Capacity
Tract 3	36"	1.0%	44 cfs	67cfs
Tract 4B	36"	1.0%	39 cfs	67 cfs
Tract 4A	36"	1.0%	33 cfs	67 cfs
Street 1	48"	1.0%	130 cfs	144 cfs
Street 2A	54"	1.0%	196 cfs	197 cfs
Street 2B	60"	0.75%	216 cfs	226 cfs
Street 6	66"	1.0%	259 cfs	336 cfs
Basin 501	66"	1.75%	436 cfs	444 cfs
Tract 1	36"	1.5%	25 cfs	82 cfs
Tract 7	48"	0.75%	59 cfs	124 cfs
Tract 12	36"	1.25%	64 cfs	75 cfs
Tract 2B	36"	1.0%	13 cfs	67 cfs
Tract 6	36"	1.5%	68 cfs	82 cfs
Tract 11 B	36"	1.0%	34 cfs	67 cfs

V. DRAINAGE FACILITY MAINTENANCE

The drainage facilities proposed for the Ventana Ranch West development, which require maintenance, consist of the proposed storm drain system, the lined open channel and the linear detention pond. The components of the storm system to be located within City of Albuquerque right-of-way or easement, will be owned, operated, and maintained by the City. The maintenance responsibilities for the linear detention pond are still being negotiated with AMAFCA, along with easements or right-of-way issues for the draft prudent line area of the West Branch of the Calabacillas Arroyo. The open channel will be maintained by AMAFCA

VI. CONCLUSIONS AND RECOMMENDATIONS

Based on the analyses described herein, the stormwater hydrology and hydraulics for the Ventana Ranch West subdivision remain consistent with the analyses performed in the original Las Ventanas DMP. The only change to the Las Ventanas DMP is that a small portion of Basin 501 (Basin

501A), as previously defined within the Piedras Marcadas DMP, was found to discharge into the West Branch of the Calabacillas Arroyo and does not impact Ventana Ranch West. All modeled flow rates at the boundary between Ventana Ranch West and Las Ventanas were equal to or less than the projected flows rates previously modeled in the Las Ventanas DMP.

This DMP establishes preliminary locations, sizes, and alignments for the hydraulic structures including major storm sewers, channels and the detention pond associated with Ventana Ranch West. The design of extensions and connections to these facilities, which include storm sewer inlets, laterals, and other drainage structures and appurtenances, will be further developed with the design of individual parcels within the Master Planned community. The final design will be presented in a Final Drainage Report for each phase of the development.

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

FIGURE 1
VICINITY MAP

DRAWN BY: S.F.G.	DATE: 10.10.03
CHECKED BY: S.M./B.T.D.	PROJECT NO. 040140.001.CWH

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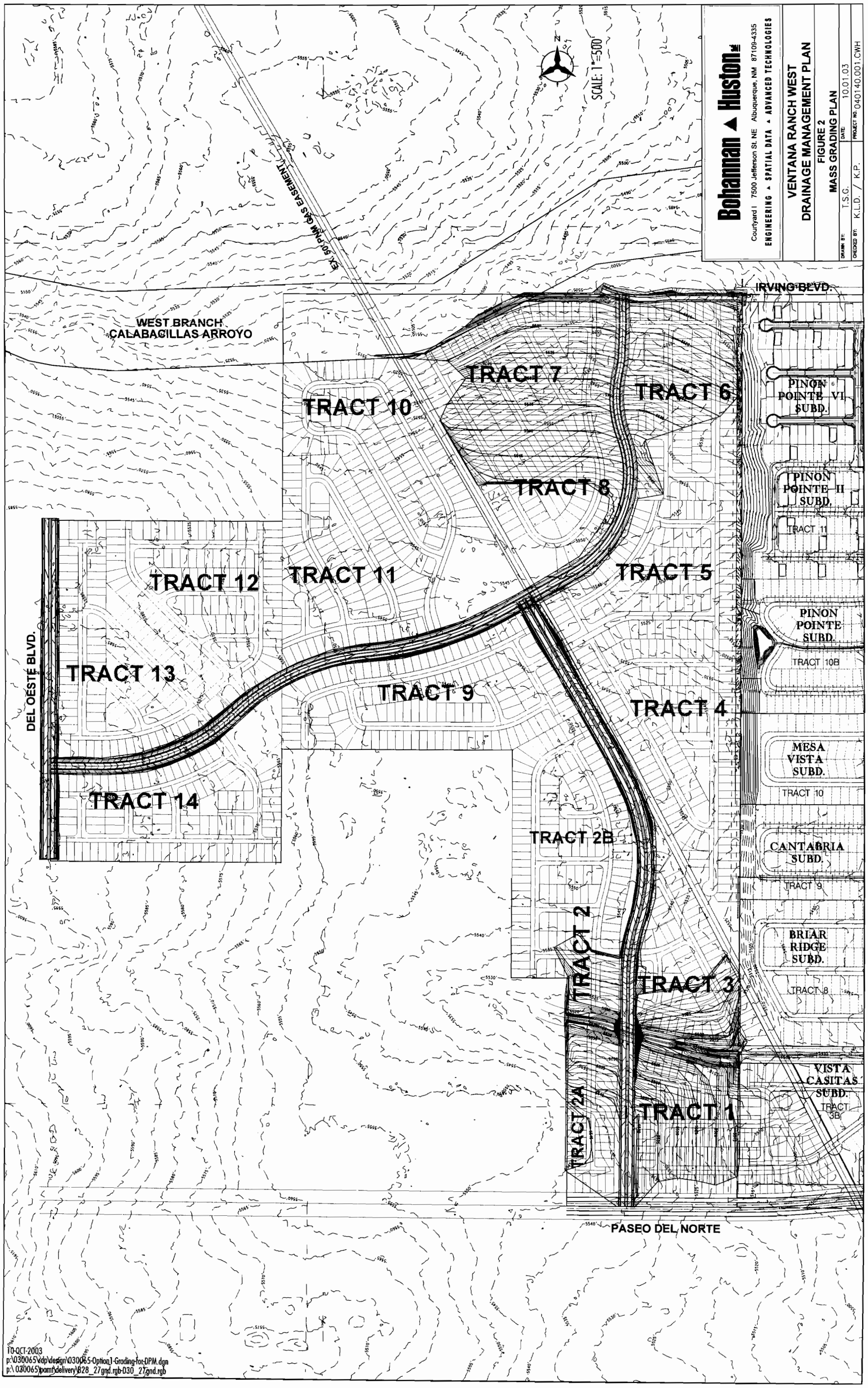
Oct 10, 2003 - 9:08am


Bohannan ▲ Huston
Courtyard I 7500 Jefferson St. NE Albuquerque, NM 87109-4335
ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES
VENTANA RANCH WEST
DRAINAGE MANAGEMENT PLAN
FIGURE 2
MASS GRADING PLAN
DRAWN BY: T.S.G.
DATE: 10.01.03
CHECKED BY: K.L.D. / K.P.
PROJECT NO: 040140.001.CWH
SCALE: 1"=500'
N
EX. 50' PNM GAS EASEMENT
WEST BRANCH CALABACILLAS ARROYO
IRVING BLVD.
DEL OESTE BLVD.
PASEO DEL NORTE
TRACT 1
TRACT 2A
TRACT 2B
TRACT 3
TRACT 4
TRACT 5
TRACT 6
TRACT 7
TRACT 8
TRACT 9
TRACT 10
TRACT 11
TRACT 12
TRACT 13
TRACT 14
PINON POINTE VI SUBD.
PINON POINTE II SUBD.
TRACT 11
PINON POINTE SUBD.
TRACT 10B
MESA VISTA SUBD.
TRACT 10
CANTABRIA SUBD.
TRACT 9
BRIAR RIDGE SUBD.
TRACT 8
VISTA CASITAS SUBD.
TRACT 3B
10-OCT-2003
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WEST BRANCH OF THE CALABACILLAS ARROYO

IRVING BLVD

BASIN 502

PNM GAS LINES

FUTURE DEL OESTE

BASIN 501

VENTANA RANCH

BASIN 318

N

BASIN 319

600 300 0 600

SCALE: 1"=600'
(HORIZ.)

BASIN 601

PASEO DEL NORTE

Bohannan ▲ Huston Inc.

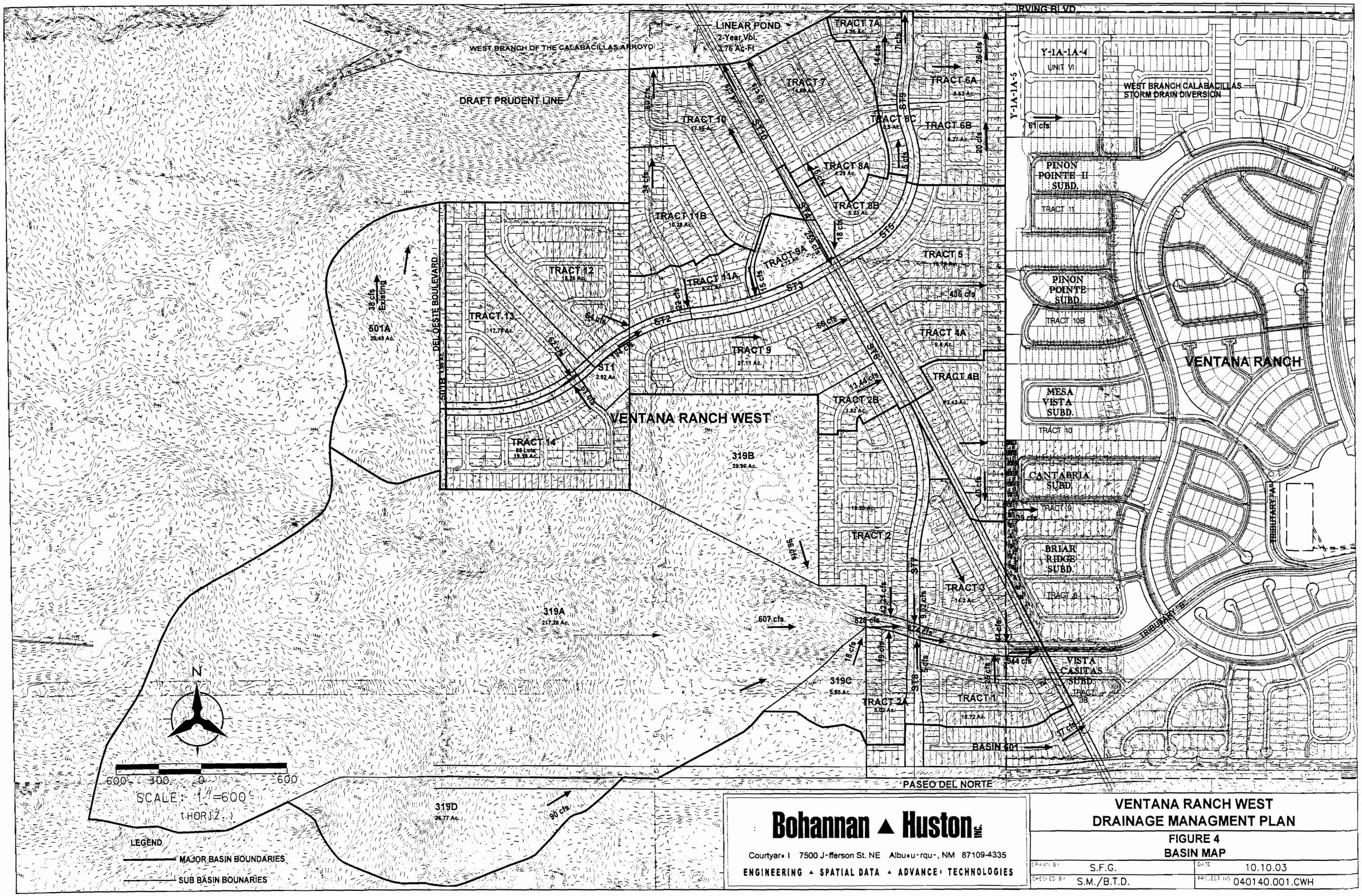
Courtyard 1 7500 Jefferson St. NE Albuquerque, NM 87109-4335

ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

VENTANA RANCH WEST
DRAINAGE MANAGMENT PLAN

FIGURE 3
EXISTING HYDROLOGY

DRAWN BY: S.F.G.	DATE: 10.10.03
CHECKED BY: S.M./B.T.D.	PROJECT NO. 040140.001.CWH



Bohannan ▲ Huston INC.

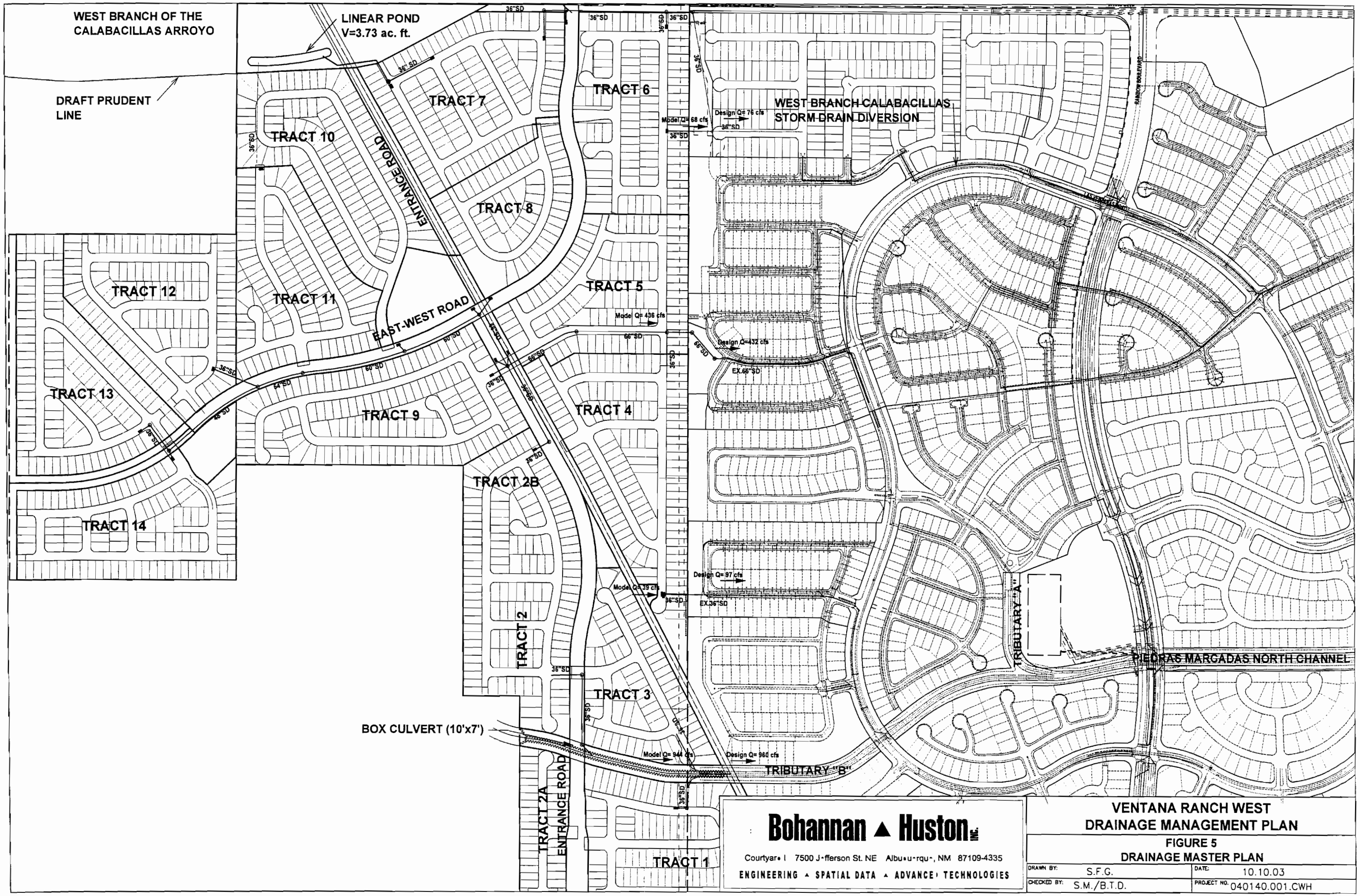
Courtyard 1 7500 Jefferson St. NE Albuquerque, NM 87109-4335

ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

VENTANA RANCH WEST
DRAINAGE MANAGMENT PLAN

FIGURE 4
BASIN MAP

DRAWN BY: S.F.G.	DATE: 10.10.03
CHECKED BY: S.M./B.T.D.	PROJECT NO: 040140.001.CWH



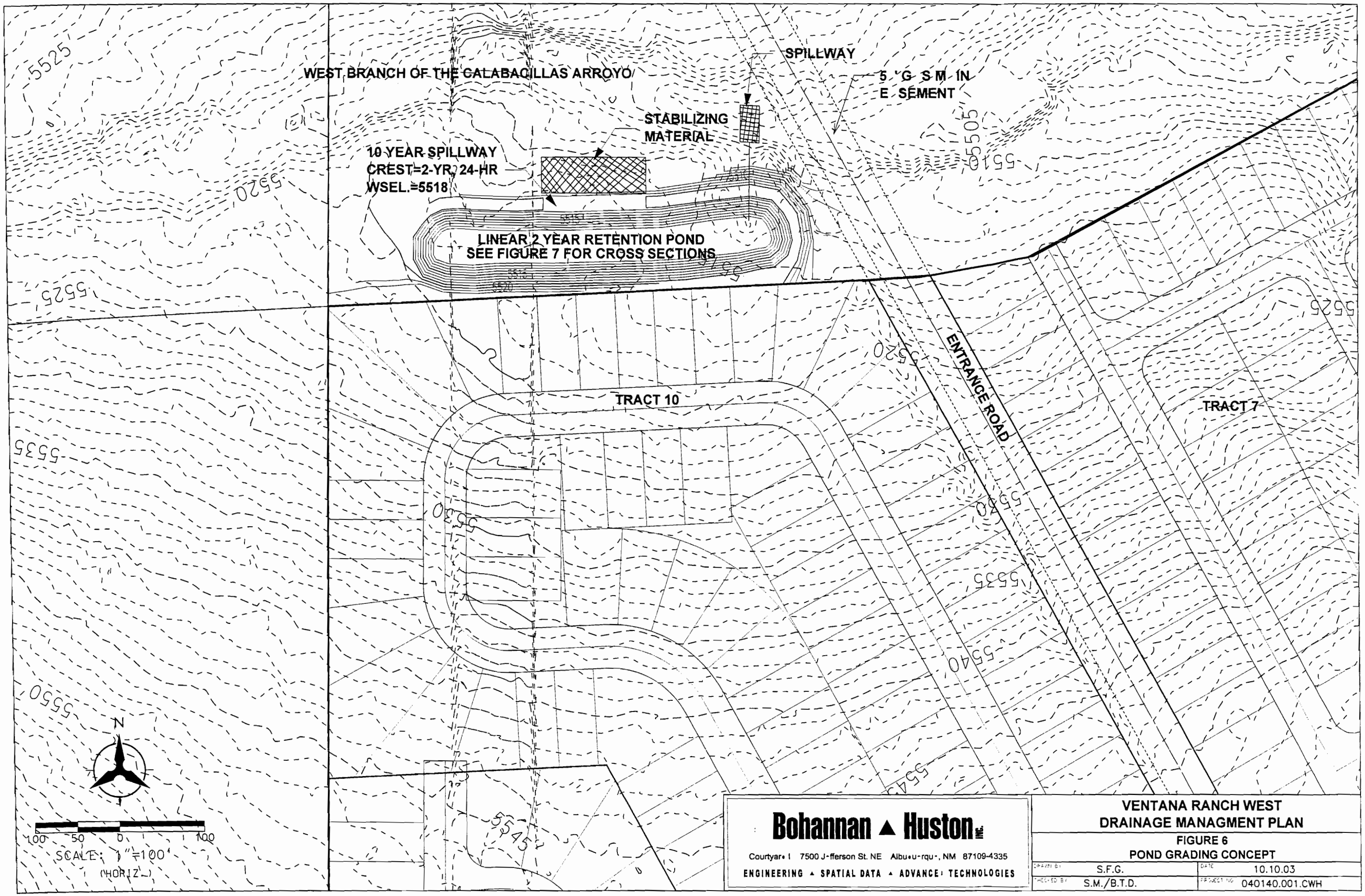
Bohannan ▲ Huston INC.

Courtyard 1 7500 Jefferson St. NE Albuquerque, NM 87109-4335

ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

VENTANA RANCH WEST
DRAINAGE MANAGEMENT PLAN
FIGURE 5
DRAINAGE MASTER PLAN

DRAWN BY: S.F.G.	DATE: 10.10.03
CHECKED BY: S.M./B.T.D.	PROJECT NO. 040140.001.CWH



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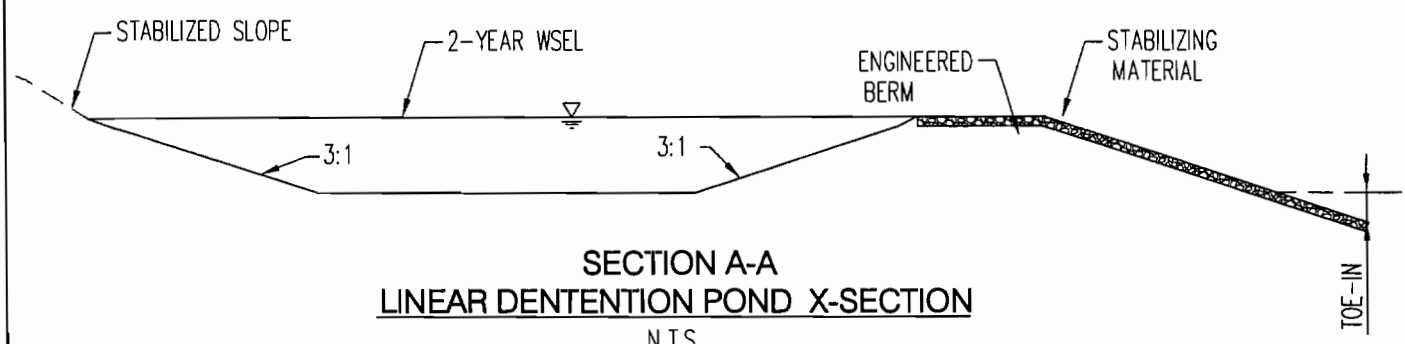
ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

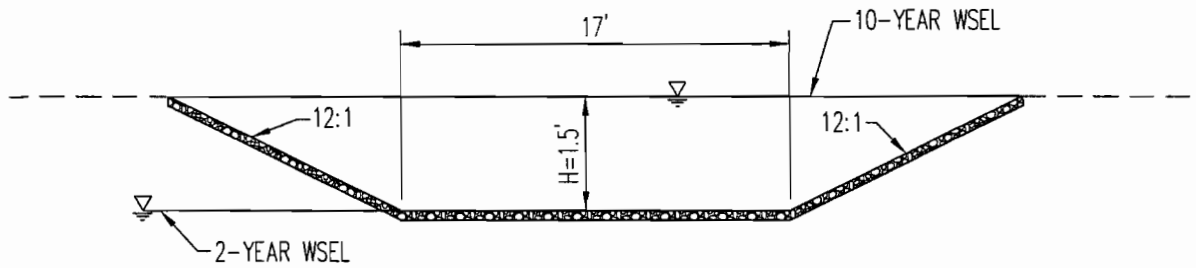
VENTANA RANCH WEST
DRAINAGE MANAGMENT PLAN

FIGURE 6
POND GRADING CONCEPT

DRAWN BY	S.F.G.	DATE	10.10.03
CHECKED BY	S.M./B.T.D.	PROJECT NO	040140.001.CWH



SECTION A-A
LINEAR DENTENTION POND X-SECTION
N.T.S.



SECTION B-B
10-YEAR SPILLWAY X-SECTION
N.T.S.

P:\040140\Hydro\reports\Figures\040140x-sections01.dwg
Oct 10, 2003 - 8:46am

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ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

VENTANA RANCH WEST
LINEAR DETENTION POND DETAILS

FIGURE 7
DETENTION POND CROSS SECTIONS

DRAWN BY:	S.F.G.	DATE:	10.10.03
CHECKED BY:	S.M./B.T.D.	PROJECT NO.	040140.001.CWH

APPENDIX B

BASIN TIME OF CONCENTRATION CALCULATIONS

Calculation of Time to Peak
Revised DPM procedure

Description	Var.	Unit	
Basin 318			TRACT 4B
Basin Area		Acres	12.43
Total Reach	L	Feet	1260.0
Overland Reach	L1	Feet	400.0
Overland K	K1		0.7
Overland Slope	S1	Percent	1.25
Adj. Overland Slope	S1'	Percent	1.250
Gully Reach	L2	Feet	860.0
Gully K	K2		2.000
Gully Slope	S2	Percent	2.000
Adj. Gully Slope	S2'	Percent	2.000
Arroyo Reach	L3	Feet	0.0
Arroyo K	K3		3.000
Arroyo Slope	S3	Percent	2.100
Adj. Arroyo Slope	S3'	Percent	2.100
Kn	Kn		0.021
Orig. TC	TC	Hrs.	0.226
Time to Peak	TP	Hrs.	0.151

Calculation of Time to Peak
Revised DPM procedure

Description	Var.	Unit									
Basin 319			319A	319B	319C	319D	TRACT 2A	TRACT 2	STREET 8	STREET 7	TRACT 1	TRACT 3
Basin Area		Acres	217.28	29.96	5.85	26.77	5.02	18.25	1.41	2.98	10.72	14.20
Total Reach	L	Feet	5620.0	1875.0	1750.0	2400.0	700.0	1500.0	720.0	1675.0	750.0	1530.0
Overland Reach	L1	Feet	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0
Overland K	K1		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Overland Slope	S1	Percent	3.40	2.13	1.72	3.50	3.43	0.50	1.11	1.20	0.50	1.25
Adj. Overland Slope	S1'	Percent	3.400	2.130	1.720	3.500	3.430	0.500	1.110	1.200	0.500	1.250
Gully Reach	L2	Feet	1600.0	1475.0	1350.0	1600.0	300.0	1100.0	320.0	1275.0	350.0	1130.0
Gully K	K2		2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Gully Slope	S2	Percent	3.400	2.130	1.720	3.400	3.430	0.500	1.110	1.200	0.050	2.000
Adj. Gully Slope	S2'	Percent	3.400	2.130	1.720	3.400	3.430	0.500	1.110	1.200	0.050	2.000
Arroyo Reach	L3	Feet	3620.0	0.0	0.0	400.0	0.0	0.0	0.0	0.0	0.0	0.0
Arroyo K	K3		3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
Arroyo Slope	S3	Percent	3.400	2.130	1.720	3.400	3.430	0.500	1.110	1.200	0.050	2.100
Adj. Arroyo Slope	S3'	Percent	3.400	2.130	1.720	3.400	3.430	0.500	1.110	1.200	0.050	2.100
Kn	Kn		0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
Orig. TC	TC	Hrs.	0.313	0.249	0.264	0.225	0.108	0.441	0.193	0.307	0.442	0.253
Time to Peak	TP	Hrs.	0.208	0.166	0.176	0.150	0.133	0.294	0.133	0.204	0.295	0.169

Calculation of Time to Peak
Revised DPM procedure

Description	Var.	Unit																
Basin 501			501A	501B	TRACT 14	TRACT 12/13	ST 1	TRACT 9A	TRACT 11A	ST2	ST4	ST3	ST5	TRACT 8B	TRACT 2B	TRACT 9	ST6	TRACT 4A	TRACT 5
Basin Area		Acres	29.49	1.95	19.19	36.04	1.4624	4.72	6.27	1.2288	0.91	1.70	1.05	5.23	3.82	21.11	3.55	9.40	16.78
Total Reach	L	Feet	1300.0	1250.0	1600.0	1400.0	370.0	1000.0	875.0	600.0	750.0	790.0	540.0	600.0	1400.0	1500.0	520.0	745.0	1050.0
Overland Reach	L1	Feet	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0
Overland K	K1		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.5	0.7	0.7	0.7	0.7	0.7
Overland Slope	S1	Percent	3.40	2.13	1.72	3.43	0.50	1.11	1.20	0.50	1.25	1.25	1.25	1.11	1.25	1.25	1.25	1.25	1.25
Adj. Overland Slope	S1'	Percent	3.400	2.130	1.720	3.430	0.500	1.110	1.200	0.500	1.250	1.250	1.250	1.110	1.250	1.250	1.250	1.250	1.250
Gully Reach	L2	Feet	900.0	850.0	1200.0	1000.0	-30.0	600.0	475.0	200.0	350.0	390.0	140.0	200.0	1000.0	1100.0	120.0	345.0	650.0
Gully K	K2		2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Gully Slope	S2	Percent	3.400	2.130	1.720	3.430	0.500	1.110	1.200	0.050	2.000	2.000	2.000	1.110	2.000	2.000	2.000	2.000	2.000
Adj. Gully Slope	S2'	Percent	3.400	2.130	1.720	3.430	0.500	1.110	1.200	0.050	2.000	2.000	2.000	1.110	2.000	2.000	2.000	2.000	2.000
Arroyo Reach	L3	Feet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arroyo K	K3		3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
Arroyo Slope	S3	Percent	3.400	2.130	1.720	3.430	0.500	1.110	1.200	0.050	2.100	2.100	2.100	1.110	2.100	2.100	2.100	2.100	2.100
Adj. Arroyo Slope	S3'	Percent	3.400	2.130	1.720	3.430	0.500	1.110	1.200	0.050	2.100	2.100	2.100	1.110	2.100	2.100	2.100	2.100	2.100
Kn	Kn		0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
Orig. TC	TC	Hrs.	0.154	0.190	0.248	0.161	0.219	0.230	0.205	0.349	0.176	0.180	0.156	0.237	0.240	0.250	0.154	0.176	0.206
Time to Peak	TP	Hrs.	0.133	0.133	0.165	0.133	0.146	0.153	0.137	0.232	0.133	0.133	0.133	0.158	0.160	0.167	0.133	0.133	0.137

Calculation of Time to Peak
Revised DPM procedure

Description	Var.	Unit					
Basin 502			TRACT 7A	TRACT 6A	TRACT 6B	TRACT 8C	STREET 9
Basin Area		Acres	4.25	8.62	8.27	1.50	2.11
Total Reach	L	Feet	775.0	800.0	900.0	640.0	1200.0
Overland Reach	L1	Feet	400.0	400.0	400.0	400.0	400.0
Overland K	K1		0.7	37	0.7	0.7	0.7
Overland Slope	S1	Percent	3.40	0.80	3.33	2.25	2.25
Adj. Overland Slope	S1'	Percent	3.400	0.800	3.330	2.250	2.250
Gully Reach	L2	Feet	375.0	400.0	500.0	240.0	800.0
Gully K	K2		2.000	2.000	2.000	2.000	2.000
Gully Slope	S2	Percent	3.400	0.050	0.050	2.920	2.920
Adj. Gully Slope	S2'	Percent	3.400	0.050	0.050	2.920	2.920
Arroyo Reach	L3	Feet	0.0	0.0	0.0	0.0	0.0
Arroyo K	K3		3.000	3.000	3.000	3.000	3.000
Arroyo Slope	S3	Percent	3.400	0.050	0.050	0.050	0.050
Adj. Arroyo Slope	S3'	Percent	3.400	0.050	0.050	0.050	0.050
Kn	Kn		0.021	0.021	0.021	0.021	1.021
Orig. TC	TC	Hrs.	0.114	0.252	0.398	0.125	0.171
Time to Peak	TP	Hrs.	0.133	0.168	0.265	0.133	0.133

Calculation of Time to Peak
Revised DPM procedure

Description	Var.	Unit					
Basin Pond			TRACT 8A	TRACT 7	TRACT 11B	TRACT 10	STREET 10
Basin Area		Acres	4.29	14.65	10.28	17.96	1.20
Total Reach	L	Feet	775.0	1000.0	900.0	850.0	800.0
Overland Reach	L1	Feet	400.0	400.0	400.0	400.0	400.0
Overland K	K1		0.7	0.7	0.7	0.7	0.7
Overland Slope	S1	Percent	3.40	2.13	1.72	3.43	0.50
Adj. Overland Slope	S1'	Percent	3.400	2.130	1.720	3.430	0.500
Gully Reach	L2	Feet	375.0	600.0	500.0	450.0	400.0
Gully K	K2		2.000	2.000	2.000	2.000	2.000
Gully Slope	S2	Percent	3.400	2.130	1.720	3.430	0.500
Adj. Gully Slope	S2'	Percent	3.400	2.130	1.720	3.430	0.500
Arroyo Reach	L3	Feet	0.0	0.0	0.0	0.0	0.0
Arroyo K	K3		3.000	3.000	3.000	3.000	3.000
Arroyo Slope	S3	Percent	3.400	2.130	1.720	3.430	0.500
Adj. Arroyo Slope	S3'	Percent	3.400	2.130	1.720	3.430	0.500
Kn	Kn		0.021	0.021	0.021	0.021	0.021
Orig. TC	TC	Hrs.	0.114	0.166	0.174	0.119	0.303
Time to Peak	TP	Hrs.	0.133	0.133	0.133	0.133	0.202

APPENDIX D

HYDRAULIC ANALYSIS

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


```
*S*                PROJECT NAME:  VENTANA WEST, ALBUQUERQUE, NM
*S*                JOB NO. 040140
*S*                DATE: August 2003
*S*
*S*                INPUT FILE NAME: VWEST318.HYM
*S*                OUTPUT FILE NAME:  VWEST318.OUT
*S*                FILES LOCATION: BHI-MAIN\040140\HYDRO\STUDIES\AHYMO\VWEST
*S*   COMMENTS:
*S*
*S*                Each sub-basin is repesented like this: C0.130
*S*                C stands for Calabacillas Arroyo
*S*
*S*                ings n value calculated with procedure outlined in ALB. DPM.
*S*
*S*                Basin 318 discharges into 36" culvert, which is routed into
*S*                Tributary a to the Piedras Marcadas North Channel
*S*                ____________________________________________________________
*S*
RAINFALL  TYPE= 2                                                          RAIN24=   2.660
SEDIMENT BULK                                                              PK BF =   1.02
*S**** COMPUTE TRACT 4B****
COMPUTE NM HYD          8.00   -    16        .01940        38.92        1.700      1.64289    1.500    3.135 PER IMP=  49.40
FINISH
```

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	
											PAGE = 1
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****										

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
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										

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

S PROJECT NAME: VENTANA WEST, ALBUQUERQUE, NM
S JOB NO. 040140
S DATE: August 2003
S
S INPUT FILE NAME: VWEST.HYM
S OUTPUT FILE NAME: VWEST.OUT
S FILES LOCATION: BHI-MAIN\040140\HYDRO\STUDIES\AHYMO\VWEST
S COMMENTS:
S
S Each sub-basin is repesented like this: C0.130
S C stands for Calabacillas Arroyo
S
S ommand ADD HYD after routing, the HYD NO is denoted like V0.
S 1 sub-basins above this basin have been taken into account
S
S Tp CALCULATED WITH PROCEDURE OUTLINED IN ALB. DPM.
S
S value used in routing has been adjusted to simulate critical
S depth in arroyos
S
S

RAINFALL TYPE= 2 RAIN24= 2.660
SEDIMENT BULK PK BF = 1.02

*S**** COMPUTE BASIN 501A****											
COMPUTE NM HYD	C0.501A	-	1	.04610	38.90	1.103	.44869	1.500	1.319	PER IMP=	.00
*S**** COMPUTE BASIN 501B****											
COMPUTE NM HYD	C0.501B	-	2	.00300	6.98	.296	1.85273	1.500	3.634	PER IMP=	62.00
*S*ROUTE C0.501 THROUGH STORM DRAIN											
ROUTE	501.10		2	4	.00300	6.36	.296	1.85289	1.550	3.313	
*S**** COMPUTE TRACT 14****											
COMPUTE NM HYD	9.00	-	5	.02998	61.90	2.648	1.65622	1.500	3.226	PER IMP=	50.20
*S**** COMPUTE TRACT 12/13****											
COMPUTE NM HYD	12.00	-	6	.05631	126.49	5.254	1.74948	1.500	3.510	PER IMP=	55.80
*S**** ADD TRACT 14 AND 12/13 ****											
ADD HYD	C0.501	5& 6	7	.08629	188.40	7.902	1.71707	1.500	3.411		
*S**** ADD TRACT 14 AND 12/13 TO BASIN 501 ****											
ADD HYD	C0.501	7& 4	8	.08929	194.19	8.199	1.72162	1.500	3.398		
*S*ROUTE C0.501 THROUGH STORM DRAIN - STREET 1											
ROUTE	501.10		8	9	.08929	191.16	8.199	1.72163	1.500	3.345	
*S**** COMPUTE STREET 1****											
COMPUTE NM HYD	ST1	-	10	.00229	4.73	.201	1.65288	1.500	3.232	PER IMP=	50.00
*S**** ADD STREET 1 TO BASIN 501 ****											
ADD HYD	C0.501	10& 9	11	.09158	195.88	8.400	1.71991	1.500	3.342		
*S*ROUTE C0.501 THROUGH STORM DRAIN - STREET 2											
ROUTE	501.10		11	12	.09158	195.18	8.400	1.71991	1.500	3.330	
*S**** COMPUTE TRACT 11A****											
COMPUTE NM HYD	11A	-	13	.00980	21.55	.903	1.72692	1.500	3.436	PER IMP=	54.45
*S**** COMPUTE STREET 2****											
COMPUTE NM HYD	ST2	-	14	.00192	1.92	.190	1.85274	1.950	1.564	PER IMP=	62.00
*S**** ADD TRACT 11A TO STREET 2****											

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
ADD HYD	CO.501.2	13&14	15	.01172	21.79	1.092	1.74742	1.500	2.906	
*S**** ADD STREET 2 AND TRACT 11A TO BASIN 501****										
ADD HYD	CO.501.2	15&12	16	.10330	216.97	9.492	1.72303	1.500	3.282	
*S*ROUTE C0.501 THROUGH 60" STORM DRAIN - STREET 3										
ROUTE	501.10	16	17	.10330	216.02	9.492	1.72304	1.550	3.268	
*S**** COMPUTE TRACT 9A****										
COMPUTE NM HYD	9A	-	18	.00738	15.21	.686	1.74282	1.500	3.219	PER IMP= 55.40
*S**** COMPUTE STREET 3****										
COMPUTE NM HYD	ST3	-	19	.00265	6.17	.262	1.85273	1.500	3.635	PER IMP= 62.00
*S**** ADD STREET 3 AND TRACT 9A****										
ADD HYD	CO.501	18&19	20	.01003	21.37	.948	1.77179	1.500	3.329	
*S**** COMPUTE STREET 4****										
COMPUTE NM HYD	ST4	-	21	.00142	3.31	.140	1.85273	1.500	3.643	PER IMP= 62.00
*S**** ADD STREET 4/3 AND TRACT 9A****										
ADD HYD	CO.501.2	21&20	22	.01145	24.68	1.088	1.78180	1.500	3.368	
*S**** ADD STREET 4/3 AND TRACT 9A TO BASIN 501****										
ADD HYD	CO.501.2	22&17	23	.11475	239.23	10.580	1.72890	1.550	3.258	
*S**** COMPUTE STREET 5****										
COMPUTE NM HYD	ST5	-	24	.00163	3.80	.161	1.85273	1.500	3.640	PER IMP= 62.00
*S**** ADD STREET 5 AND BASIN 501****										
ADD HYD	CO.501.2	24&23	25	.11638	242.59	10.742	1.73063	1.550	3.257	
*S**** COMPUTE TRACT 8B****										
COMPUTE NM HYD	ST5	-	99	.00820	17.80	.718	1.64289	1.500	3.392	PER IMP= 49.40
*S**** ADD TRACT 8B AND BASIN 501****										
ADD HYD	CO.501.2	25&99	98	.12458	259.19	11.460	1.72485	1.500	3.251	
*S*ROUTE C0.501 THROUGH 66" STORM DRAIN - STREET 6										
ROUTE	501.10	98	27	.12458	261.68	11.460	1.72486	1.550	3.282	
*S**** COMPUTE TRACT 9****										
COMPUTE NM HYD	9.00	-	28	.03298	65.53	3.089	1.75614	1.550	3.104	PER IMP= 56.20
*S**** COMPUTE STREET 6****										
COMPUTE NM HYD	ST6	-	29	.00555	12.89	.548	1.85273	1.500	3.630	PER IMP= 62.00
*S**** ADD TRACT 9 AND STREET 6****										
ADD HYD	CO.501.3	29&28	30	.03853	76.91	3.637	1.77004	1.550	3.119	
*S**** COMPUTE TRACT 2B****										
COMPUTE NM HYD	2B	-	31	.00597	13.44	.558	1.75354	1.500	3.518	PER IMP= 56.04
*S*ROUTE C0.501 THROUGH 36" STORM DRAIN - STREET 6										
ROUTE	501.10	31	32	.00597	13.45	.558	1.75363	1.500	3.520	
*S**** ADD TRACT 2B TO STREET 6 AND TRACT 9****										
ADD HYD	CO.501.3	32&30	33	.04450	89.68	4.196	1.76782	1.500	3.149	
*S**** ADD TRACT 2B/9 TO BASIN 501****										
ADD HYD	CO.501	33&27	34	.16908	351.20	15.656	1.73616	1.550	3.246	
*S*ROUTE C0.501 THROUGH 72" STORM DRAIN										
ROUTE	501.10	34	35	.16908	355.14	15.656	1.73616	1.550	3.282	
*S**** COMPUTE TRACT 5****										
COMPUTE NM HYD	5.00	-	36	.02622	57.69	2.419	1.72949	1.500	3.438	PER IMP= 54.60
*S**** COMPUTE TRACT 4A****										
COMPUTE NM HYD	4A	-	37	.01469	32.65	1.344	1.71540	1.500	3.473	PER IMP= 53.75
*S**** ADD TRACT 5 AND 4A****										
ADD HYD	CO.501	37&36	38	.04091	90.34	3.762	1.72442	1.500	3.450	
*S**** ADD TRACT 5/4A TO BASIN 501****										
ADD HYD	CO.501	38&35	39	.20999	436.30	19.418	1.73387	1.550	3.246	
FINISH										

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
S	PROJECT NAME: VENTANA WEST, ALBUQUERQUE, NM									
S	JOB NO. 040140									
S	DATE: August 2003									
S										
S	INPUT FILE NAME: VWEST502-100YR.HYM									
S	OUTPUT FILE NAME: VWEST502-100YR.OUT									
S	FILES LOCATION: BHI-MAIN\040140\HYDRO\STUDIES\AHYMO									
S	COMMENTS:									
S										
S	Each sub-basin is repesented like this: C0.130									
S	C stands for Calabacillas Arroyo									
S										
S	ings Value n calculated with procedure outlined in ALB. DPM.									
S										
S	Percent impervious determined utilizing Albuquerque DPM procedures.									
S										
S	asin 502 discharges in 36" storm drain, which is routed into									
S	the West Branch Calabacillas Diversion Channel									
S										
S										
RAINFALL TYPE= 2										RAIN24= 2.660
SEDIMENT BULK										PK BF = 1.02
*S**** COMPUTE TRACT 6A****										
COMPUTE NM HYD	T6A	-	1	.01347	25.77	1.187	1.65288	1.550	2.989	PER IMP= 50.00
*S**** COMPUTE TRACT 6B****										
COMPUTE NM HYD	T6B	-	2	.01290	19.55	1.183	1.71950	1.650	2.368	PER IMP= 54.00
*S**** COMPUTE STREET 9****										
COMPUTE NM HYD	ST9	-	5	.00330	7.30	.326	1.85273	1.500	3.457	PER IMP= 62.00
*S**** COMPUTE TRACT 7A****										
COMPUTE NM HYD	T7A	-	3	.00660	14.33	.578	1.64289	1.500	3.393	PER IMP= 49.40
*S**** COMPUTE TRACT 8C****										
COMPUTE NM HYD	T8C	-	4	.00234	5.10	.205	1.64289	1.500	3.400	PER IMP= 49.40
*S**** ADD TRACT 8C TO TRACT 7A****										
ADD HYD	CO.501.3	4&	3 4	.00894	19.43	.784	1.64282	1.500	3.395	
*S**** ADD STREET 9 TO TRACT 8C/7A****										
ADD HYD	CO.501.3	4&	5 4	.01224	26.73	1.110	1.69937	1.500	3.411	
*S*ROUTE TRACT 7A/8C/ST9 THROUGH STORM DRAIN										
ROUTE	502.10		5 4	.01224	26.55	1.110	1.69944	1.500	3.388	
*S**** ADD TRACT 7A TO TRACT 6A****										
ADD HYD	CO.501.3	4&	1 5	.02571	51.29	2.297	1.67501	1.500	3.116	
*S**** ADD TRACT 6B TO TRACT 6A & 7A****										
ADD HYD	CO.501.3	5&	2 6	.03861	67.68	3.480	1.68986	1.550	2.739	
FINISH										

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

S PROJECT NAME: VENTANA WEST, RIO RANCHO, NM
S JOB NO. 040140
S DATE: August 2003
S
S INPUT FILE NAME: VWESTPND2.HYM
S OUTPUT FILE NAME: VWESTPND2.OUT
S FILES LOCATION: BHI-MAIN\040140\HYDRO\STUDIES\AHYMO
S COMMENTS:
S
S Each sub-basin is repesented like this: C0.130
S C stands for Calabacillas Arroyo
S
S Tp and Mannings n value calculated with preocedure
S outlined in the Alb. DPM.
S
S Percent impervious determined utilizing Albuquerque DPM procedures.
S
S

RAINFALL TYPE= 2										RAIN24=	2.660
SEDIMENT BULK										PK BF =	1.02
*S**** COMPUTE TRACT 8A****											
COMPUTE NM HYD	T8A	-	1	.00670	14.55	.587	1.64289	1.500	3.393	PER IMP=	49.40
*S*ROUTE TRACT 8A THROUGH STREET											
ROUTE	502.10	1	9	.00670	9.68	.587	1.64297	1.600	2.258		
*S**** COMPUTE TRACT 7****											
COMPUTE NM HYD	T7	-	3	.02289	51.58	2.147	1.75874	1.500	3.521	PER IMP=	56.36
*S**** ADD TRACT 8A TO TRACT 7****											
ADD HYD	CO.501.2	9& 3	3	.02959	58.81	2.734	1.73249	1.500	3.105		
*S*ROUTE TRACT 7/8A THROUGH STORM DRAIN											
ROUTE	502.10	3	7	.02959	58.27	2.734	1.73252	1.500	3.077		
*S**** COMPUTE TRACT 11B****											
COMPUTE NM HYD	T11B	-	8	.01606	33.99	1.479	1.72616	1.500	3.307	PER IMP=	54.40
*S*ROUTE TRACT 11B THROUGH STREET											
ROUTE	502.10	8	9	.01606	24.35	1.479	1.72619	1.600	2.370		
*S**** ADD TRACT 11B TO LINEAR POND****											
ADD HYD	CO.501.2	9& 7	14	.04565	78.80	4.213	1.73027	1.550	2.697		
*S**** COMPUTE STREET 10****											
COMPUTE NM HYD	ST10	-	11	.00188	3.51	.185	1.85273	1.550	2.924	PER IMP=	62.00
*S**** ADD STREET 10 TO LINEAR POND****											
ADD HYD	C0.501	11&14	12	.04753	82.31	4.398	1.73509	1.550	2.706		
*S**** COMPUTE TRACT 10****											
COMPUTE NM HYD	T10	-	8	.02806	59.37	2.583	1.72616	1.500	3.306	PER IMP=	54.40
*S**** ADD TRACT 10 TO LINEAR POND****											
ADD HYD	C0.501	8&12	10	.07559	138.48	6.981	1.73177	1.550	2.863		
FINISH											

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	
											PAGE = 1
S	PROJECT NAME: VENTANA WEST, RIO RANCHO, NM										
S	JOB NO. 040140										
S	DATE: August 2003										
S											
S	INPUT FILE NAME: VWEST502-100YR.HYM										
S	OUTPUT FILE NAME: VWEST502-100YR.OUT										
S	FILES LOCATION: BHI-MAIN\040140\HYDRO\STUDIES\AHYMO										
S	COMMENTS:										
S											
S	Each sub-basin is repesented like this: C0.130										
S	C stands for Calabacillas Arroyo										
S											
S	Tp CALCULATED WITH PROCEDURE OUTLINED IN ALB. DPM.										
S											
S	Percent impervious determined utilizing Albuquerque DPM procedures.										
S											
S	value used in routing has been adjusted to simulate critical										
S	depth in arroyos										
S											
S											
RAINFALL TYPE= 2											RAIN24= 1.600
SEDIMENT BULK											PK BF = 1.02
*S**** COMPUTE TRACT 8A****											
COMPUTE NM HYD	T8A	-	1	.00670	3.24	.304	.85153	1.500	.756	PER IMP=	49.40
*S*ROUTE TRACT 8A THROUGH STREET											
ROUTE	502.10	1	9	.00670	2.35	.304	.85160	1.600	.549		
*S**** COMPUTE TRACT 7****											
COMPUTE NM HYD	T7	-	3	.02289	12.11	1.170	.95803	1.500	.827	PER IMP=	56.36
*S**** ADD TRACT 8A TO TRACT 7****											
ADD HYD	CO.501.2	9& 3	3	.02959	14.16	1.474	.93390	1.500	.748		
*S*ROUTE TRACT 7/8A THROUGH STORM DRAIN											
ROUTE	502.10	3	7	.02959	14.04	1.474	.93393	1.500	.741		
*S**** COMPUTE TRACT 11B****											
COMPUTE NM HYD	T11B	-	8	.01606	8.00	.795	.92808	1.500	.778	PER IMP=	54.40
*S*ROUTE TRACT 11B THROUGH STREET											
ROUTE	502.10	8	9	.01606	5.99	.795	.92811	1.600	.582		
*S**** ADD TRACT 11B TO LINEAR POND****											
ADD HYD	CO.501.2	9& 7	14	.04565	19.15	2.269	.93185	1.550	.655		
*S**** COMPUTE STREET 10****											
COMPUTE NM HYD	ST10	-	11	.00188	.91	.104	1.04444	1.550	.755	PER IMP=	62.00
*S**** ADD STREET 10 TO LINEAR POND****											
ADD HYD	C0.501	11&14	12	.04753	20.05	2.373	.93628	1.550	.659		
*S**** COMPUTE TRACT 10****											
COMPUTE NM HYD	T10	-	8	.02806	13.98	1.389	.92808	1.500	.778	PER IMP=	54.40
*S**** ADD TRACT 10 TO LINEAR POND****											
ADD HYD	C0.501	8&12	10	.07559	33.86	3.762	.93324	1.500	.700		
FINISH											

APPENDIX C

HYDROLOGIC ANALYSIS

Analyzer Report

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Drainage Structure Analyzer

Pipe Hydraulic Analysis

Date: Thursday, October 09, 2003 02:58:17 PM

==========

Tract 1

==========

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	25.2 cfs
Slope	1.500%
Size (W x T):	36.00 x 3.0000

Output Results

Flow Rate	25.2 cfs
Slope	1.500%
d/D	0.38
Capacity	81.7 cfs
Velocity	10.18 ft/s
Depth	1.14 ft
Critical Depth	1.62 ft
Size (W x T):	36.00 x 3.0000

Tract 3

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	43.6 cfs
Slope	1.000%
Size (W x T):	36.00 x 3.0000

Output Results

Flow Rate	43.6 cfs
Slope	1.000%
d/D	0.59
Capacity	66.7 cfs
Velocity	10.06 ft/s
Depth	1.77 ft
Critical Depth	2.15 ft
Size (W x T):	36.00 x 3.0000

Tract 4A

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	32.6 cfs
Slope	1.000%
Size (W x T):	36.00 x 3.0000

Output Results

Flow Rate	32.6 cfs
Slope	1.000%
d/D	0.49
Capacity	66.7 cfs
Velocity	9.39 ft/s
Depth	1.48 ft
Critical Depth	1.85 ft
Size (W x T):	36.00 x 3.0000

Tract 4B

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	38.9 cfs
Slope	1.000%
Size (W x T):	36.00 x 3.0000

Output Results

Flow Rate	38.9 cfs
Slope	1.000%
d/D	0.55
Capacity	66.7 cfs
Velocity	9.80 ft/s
Depth	1.65 ft
Critical Depth	2.03 ft
Size (W x T):	36.00 x 3.0000

Tract 2B

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	13.4 cfs
Slope	1.000%
Size (W x T):	36.00 x 3.0000

Output Results

Flow Rate	13.4 cfs
Slope	1.000%
d/D	0.30
Capacity	66.7 cfs
Velocity	7.39 ft/s
Depth	0.91 ft
Critical Depth	1.16 ft
Size (W x T):	36.00 x 3.0000

Tract 12

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	64.1 cfs
Slope	1.250%
Size (W x T):	36.00 x 3.0000

Output Results

Flow Rate	64.1 cfs
Slope	1.250%
d/D	0.71
Capacity	74.6 cfs
Velocity	11.86 ft/s
Depth	2.14 ft
Critical Depth	2.57 ft
Size (W x T):	36.00 x 3.0000

Street 1

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	130.1 cfs
Slope	1.000%
Size (W x T):	48.00 x 4.0000

Output Results

Flow Rate	130.1 cfs
Slope	1.000%
d/D	0.75
Capacity	143.6 cfs
Velocity	12.95 ft/s
Depth	2.98 ft
Critical Depth	3.41 ft
Size (W x T):	48.00 x 4.0000

Street 2A

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	195.9 cfs
Slope	1.000%
Size (W x T):	54.00 x 4.5000

Output Results

Flow Rate	195.9 cfs
Slope	1.000%
d/D	0.82
Capacity	196.6 cfs
Velocity	14.10 ft/s
Depth	3.67 ft
Critical Depth	4.00 ft
Size (W x T):	54.00 x 4.5000

Street 2B

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	216.0 cfs
Slope	0.750%
Size (W x T):	60.00 x 5.0000

Output Results

Flow Rate	216.0 cfs
Slope	0.750%
d/D	0.78
Capacity	225.5 cfs
Velocity	13.08 ft/s
Depth	3.92 ft
Critical Depth	4.17 ft
Size (W x T):	60.00 x 5.0000

Street 6

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	259.2 cfs
Slope	1.000%
Size (W x T):	66.00 x 5.5000

Output Results

Flow Rate	259.2 cfs
Slope	1.000%
d/D	0.66
Capacity	335.8 cfs
Velocity	15.60 ft/s
Depth	3.63 ft
Critical Depth	4.48 ft
Size (W x T):	66.00 x 5.5000

Basin 501

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	436.0 cfs
Slope	1.750%
Size (W x T):	66.00 x 5.5000

Output Results

Flow Rate	436.0 cfs
Slope	1.750%
d/D	0.80
Capacity	444.2 cfs
Velocity	21.32 ft/s
Depth	4.42 ft
Critical Depth	5.27 ft
Size (W x T):	66.00 x 5.5000

Tract 6

Input Data	
Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	68.0 cfs
Slope	1.500%
Size (W x T):	36.00 x 3.0000

Output Results	
Flow Rate	68.0 cfs
Slope	1.500%
d/D	0.70
Capacity	81.7 cfs
Velocity	12.93 ft/s
Depth	2.09 ft
Critical Depth	2.63 ft
Size (W x T):	36.00 x 3.0000

Tract 7

Input Data	
Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	58.8 cfs
Slope	0.750%
Size (W x T):	48.00 x 4.0000

Output Results	
Flow Rate	58.8 cfs
Slope	0.750%
d/D	0.48
Capacity	124.4 cfs
Velocity	9.76 ft/s
Depth	1.94 ft
Critical Depth	2.30 ft
Size (W x T):	48.00 x 4.0000

Tract 11B

Input Data

Shape	Circular
Material	RC C76-A
Roughness	0.013000
Method	Manning
Flow Rate	34.0 cfs
Slope	1.000%
Size (W x T):	36.00 x 3.0000

Output Results

Flow Rate	34.0 cfs
Slope	1.000%
d/D	0.51
Capacity	66.7 cfs
Velocity	9.48 ft/s
Depth	1.52 ft
Critical Depth	1.89 ft
Size (W x T):	36.00 x 3.0000