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

November 7, 2002

Pamela L. Thies, PE
Bohannan Huston, Inc
7500 Jefferson NE
Albuquerque, NM 87109

Re: Vittoria at Ventana Ranch (Tract J) Drainage Report
Engineer's Stamp dated 10-4-02, (B10/D3F)

Dear Ms. Thies,

Based upon the information provided in your submittal dated 10-7-02, the above referenced report is approved for Preliminary Plat action by the DRB. Prior to Final Plat, Work Order or Grading Permit approval, please resubmit your report to address the following comments.

- Please modify the grading plan to include future grades of Paseo del Norte in order to verify that the pond may be able to be removed or drain to a storm drain in the future PDN R/W.

- Add enough conceptual master planning for Paseo del Norte (to the Piedras Marcadas outfall) to determine runoff amounts and critical analysis points for future development downstream.

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: file

DRAINAGE REPORT

FOR

VITTORIA AT VENTANA RANCH
(TRACT J)

OCTOBER 4, 2002

Prepared for:

LAS VENTANAS LIMITED PARTNERSHIP
#10 TRAMWAY LOOP NE
ALBUQUERQUE, NM 87122

Prepared by:

BOHANNAN HUSTON, INC.
COURTYARD I
7500 JEFFERSON STREET NE
ALBUQUERQUE, NM 87109

PREPARED BY:

Pamela L. Thies 10/4/02

Pamela L. Thies, P.E. **Date**

Bohannan Huston INC.

TABLE OF CONTENTS

page

FIGURES

APPENDICES

EXHIBITS

I. PURPOSE

The purpose of this report is to present the drainage management plan for Vittoria Subdivision at Ventana Ranch, also known as Tract J at Ventana Ranch, and to obtain approval of the preliminary plat and grading plan by the Development Review Board (DRB). The proposed development of the Tract J Subdivision consists of 107 single family detached residential lots on approximately 19.39 acres.

This report references the following City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) approved studies prepared for the Ventana Ranch Subdivision development: 1) the *Las Ventanas Subdivision Drainage Master Plan*, dated April 1995, 2) *Ventana Ranch Tract I*, October 2000 and 3) *Ventana Square Tract H & J – Conceptual Drainage Plan*, dated October 2001

The *Las Ventanas Subdivision Drainage Master Plan*, dated April 1995 (hereafter referred to as the LVDMP), was prepared to summarize the findings of a hydrologic analysis of existing and developed drainage conditions for the proposed Las Ventanas Subdivision and formulates a drainage master plan for the development of the property. The report evaluated drainage in Las Ventanas Subdivision based on the Piedras Marcadas Hydrologic model prepared by Molzen-Corbin & Associates in 1993, and provided a conceptual plan for drainage in order to determine drainage facilities sizes and total costs. In addition, it provided drainage outfall alternatives for the Las Ventanas Subdivision. Excerpts from this report are included in Appendix A.

Ventana Ranch Tract I, October 2000, lays out the drainage plan for Tract I, now known as La Scala Subdivision. A storm drain system that conveys flows from the northern portion of Tract J across Tract I to the AMAFCA Las Ventana Drainage Detention Facility is detailed in this report. This storm drain and associated calculations are included in Exhibit 2.

Ventana Square Tract H & J – Conceptual Drainage Plan, dated October 2001, details proposed grading and drainage for Tracts H and J and includes calculations for the temporary retention pond on the south end of Tract J. Excerpts from this report are also included in Appendix A.

II. METHODOLOGIES

Please refer to the above referenced reports for the specific methodologies used in preparing those individual reports or plans.

Site conditions are analyzed for a 100-year, 6-hour storm event in accordance with the City of Albuquerque Drainage Ordinance and the Development Process Manual (DPM) Volume 2, Design Criteria, Section 22.2, Hydrology, for the City of Albuquerque, January 1993.

The site, as described in the 'Site Location and Characteristics' section below, is approximately 20.47 acres. Therefore, Part A of the DPM, Section 22.2, which provides a simplified procedure for projects with sub-basins smaller than 40 acres is used.

The existing approved drainage reports referenced in the preparation of this plan are the "Las Ventanas Subdivision Drainage Master Plan" (LVDMP) prepared by Bohannan Huston (originally dated April 1995 and updated October 1995), and the "Ventana Square Tr. H & J – Conceptual Drainage Plan" prepared by Bohannan Huston (October 2001).

III. SITE LOCATION AND CHARACTERISTICS

Ventana Ranch is a 940-acre development located west of Paradise Hills between Paseo del Norte and Irving Boulevards. Tract J is located in the southeastern quadrant of the Ventana Ranch Master Plan. The site is bounded by Ventana Square (Tract H) to the west, future Paseo del Norte to the south and Paradise Blvd. to the north. An existing undeveloped parcel is located to the east of the site. See Figures 1 & 2.

The site consists of mass graded terrain with gradual slopes ranging 1% to 4%. The soil throughout this region has a Hydrologic Soil Group (HSG) classification of Type "A". Type "A" soils are known to have infiltration rates and are typically found in desert climates similar to that of Ventana Ranch. An outcrop of basalt exists in the central portion of Tract J. A portion of this outcrop will remain undeveloped in lieu of constructing two (2) lots.

IV. EXISTING HYDRAULIC AND HYDROLOGIC CONDITIONS

The initial existing conditions for the proposed subdivision, Tract J, are described in the LVDMP. Tract J is located in the eastern portion of basin 315B (basin J2) and the southeast portion of Basin 316 (basin J1). This site has been mass graded per the approved mass grading plan. (See Appendix A.) Current drainage patterns in basin J1 (14.42 ac.) direct the flow to the south to the existing temporary retention pond constructed with approved drainage plans under drainage file # B10/D3C (See Exhibit 3). Offsite flows from Ventana Square (Tract H), west of Tract J, drain to the southeast. At this location approximately 60 cfs is discharged to the retention pond on Tract J via a swale, which is currently being constructed with the improvements on Tract H-12, a portion of Tract H. No other offsite flows impact this site. Details for this retention pond appear in Appendix A, in the excerpt from the LVSMDP and in Exhibit 3, the Existing Drainage Basin Map. Basin J2 (5.21 ac.) flows north through an existing storm drain located in La Scala Subdivision (See Exhibit 2) to AMAFCA Las Ventana Drainage Detention Facility #1.

V. PROPOSED HYDRAULIC AND HYDROLOGIC CONDITIONS

For clarification throughout this portion of the report, please refer to the Existing Drainage Basin Map, Proposed Drainage Basin Map and the Grading and Drainage Plan enclosed in the Exhibit section of this report.

For this report existing Basin J2 is referred to as developed Basin A and is subdivided. Existing Basin J1 consists of developed Basins C,D and B which is also subdivided.

Discharge (Q_{100}= 65.84cfs) generated by Tract J will flow through the proposed internal streets into inlet and storm drain systems to two outfall points. One outfall point is the temporary retention pond located at the far south end of the site. This pond will receive all of the flow from Basin C (0.88 cfs), Basin B (42.06 cfs) and Basin D (6.03 cfs), which is the area in and around the retention pond. The second outfall point is a storm drain system constructed with La Scala subdivision. (See Exhibit 2) This storm drain extends from the northern portion of Tract J, across

Paradise Blvd. through the La Scala subdivision and outfalls to AMAFCA Las Ventanas Drainage Detention Facility #1. A series of proposed inlets and storm drain will tie to the existing 30" stub out and will receive the majority of the flow from Basin A, a small amount of residual runoff will flow to Paradise Blvd. An existing Type "D" inlet in sump condition located in Paradise Blvd. will intercept this residual flow.

On-Site Basins: For the following portion of this report refer to Appendix B.

The proposed site is divided into four (4) primary on-site basins. Each of the basins is discussed in further detail below. See the proposed drainage basin map (Exhibit 4) for analysis point (AP) locations

Basin D (2.16ac, Q_{100}=6.03 cfs), as mentioned previously, is the area that encompasses the retention pond.

Basin C (0.32 ac, Q_{100}=0.88 cfs) is a small basin that drains directly to the retention pond through a swale.

Basin B (12.06 ac, Q_{100}=42.06 cfs) includes the streets, internal to the subdivision, and sixty-nine (69) proposed lots. This basin as a whole drains to the south and is divided into six (6) sub basins. Basin B1 (11.07 cfs) drains on the surface through the street and combines with Basin B2. Basin B2 (6.06 cfs) drains to the west side of the street and Basins B3&B4 (13.66 cfs) drain to the east side of the street, these basins combine with Basins B5&B6 to drain into sump inlets (AP-3). The total flow from Basin B outfalls to the retention pond. See street and inlet capacity calculations in Appendix B.

All of the developed flow from the southerly portion of Tract J (Basins B, C and D) will be collected in the existing temporary pond located in the southwest corner of the subdivision. The total volumetric runoff, for the 100yr-24hr storm, collected in this pond is 201603 cf. The actual pond volume with 2' of freeboard is 294161 cf. See Exhibit 3 for pond volume calculations

Basin A (4.78ac, Q_{100}=16.67cfs) includes internal streets and thirty-eight (38) proposed lots. This basin is divided into five (5) primary sub basins. All flows in Basin A

that are intercepted by inlets will drain through a storm drain system built with the La Scala Subdivision project (drainage file # B-10/D3D) and has an allowable flow from Tract J of 23.00 cfs. See Exhibit 2

Basin A3 generates 5.68 cfs and drains on the surface north to combine with Basin A4 (5.3 cfs). This flow then combines with the flow from Basin A2, which generates 2.02 cfs, and Basin A5, which generates 0.52cfs. Two double grate inlets, at AP-1, intercept the majority of this flow (12.45 cfs) and allow 1.08cfs of bypass flows.

Basin A1 generates 3.14 cfs and drains to AP-2 where 2.64 cfs is intercepted with 0.50 cfs bypassing.

The total flow intercepted in Basin A is 15.09 cfs. The total bypass flows from Basin A, AP-1 & AP-2, is 1.58 cfs and will drain into Paradise Blvd. This bypass flow will be picked up by an existing Type "D" inlet and will drain through the La Scala storm drain. The total flow in the La Scala storm drain is 16.67 cfs and is well below the allowable 23.00 cfs.

VI. POND NOTES

The pond located on Tract C (See Preliminary Plat – Exhibit 1) will have a covenant to be owned and maintained by the Las Ventanas Limited Partnership. In the future, this tract will be deeded to the Ventana Ranch Community Association (VRCA) as an asset to that organization. (The master covenants and financial statements of the VRCA are available to the City of Albuquerque for review if necessary.) The VRCA will have the right to develop this tract as a neighborhood park or open space upon completion of permanent drainage outfall. This tract cannot be subdivided and developed in the future as individual lots.

VII. CONCLUSION

Increases in runoff, depth and velocity due to proposed development are within parameters anticipated within the previously approved "Ventana Square Tr. H & J – Conceptual Drainage Plan" for this area. These flows can be safely conveyed and/or retained by the improvements proposed in this drainage plan to existing drainage facilities, which have adequate capacity to accept such runoff. Erosion and dust control, consisting of erosion control berms, snow fencing and sedimentation basins, are proposed to prevent soil washing or blowing into paved streets, storm drains, and existing development areas. Therefore we believe this report supports the preliminary plat and grading plan submittals and should be approved as requested.

The main reasons for the difference in LVDF No. 1 developed flows from the PMDMP are:

- The Las Ventanas drainage scheme maximizes the drainage area into the pond by diversions of "500" and "600" basins. This has increased the contributing basin area to over 2 square miles from the PMDMP's 1.3 square miles. This correspondingly has reduced the flows going to the Calabacillas and the Middle Branch Piedras Marcadas.

- The Las Ventanas development scenario is different from that assumed by the PMDMP.

The differences in the contributing drainage areas are pictured in Figure 5, Contributing Basins for Las Ventanas Drainage Facility No. 1.

The two city ponds in Basin 503W and Basin 315B are summarized in Table 3. Following Table 3 are brief descriptions of flow scenarios for the ponds.

Table 3

City Ponds

Name	Drainage Area (sq mi)	Flowrate (cfs) In	Flowrate (cfs) Out	Storage (ac-ft)	Total Depth (ft)
503W Pond	.034	73	13	1.7	3.5
315B Pond	.047	107	0	4.5	7

The city pond in Basin 503W intercepts flows from Basin 502 entering Las Ventanas just south of the northwest corner of the subdivision. This pond reduces flows from 73 cfs to 13 cfs.

The city pond proposed for Basin 315B is a temporary retention pond because there is no existing storm drain into which these flows can be discharged. As long as it is a temporary retention pond, maintenance will be the responsibility of the property owner. The pond may be reconstructed into detention or eliminated when downstream improvements or capacity become available. As a detention pond, flows are reduced from 107 cfs to 39 cfs, which approximates the existing condition flowrates.

6.5 Synopsis of Developed Flow

The following is a synopsis of the flow patterns for Las Ventanas:

- West Branch Calabacillas Diversion System: Basins 502, 503W, 503M, 504E, and 316NW are routed to LVDF No. 1 via the West Branch Calabacillas Diversion Channel, 316NE is added to these flows, and the sum is discharged into LVDF No. 1 from the northwest.

- North Branch Piedras Marcadas System: Basins 501, 504W, 319A, 319B, 318A, 318B, 317A, and 316SW are routed via Tributary A, Tributary B, and the North Branch Piedras Marcadas Channel. Basins 601, 602, and 317A are routed as street flows to the North Branch Piedras Marcadas Channel and summed. The combined flows are summed with 316SE and discharged from the channel into LVDF No. 1 from the west.

- Basin 320 discharges to LVDF No. 2 in the east of Basin 320. Facility No. 2's discharges are added to the same pipe that outfalls from LVDF No. 1. Basin 505 is also added to this pipe as it exits Las Ventanas at the northeast corner of the property. The sum of the flows are conveyed to the West Branch of the Calabacillas.

- Tributary "A" and Tributary "B" Channels join at a confluence located in the park at the well site. This confluence will need to be analyzed and modeled in the future during design. From here, the channel becomes the North Branch Piedras Marcadas Channel, a 7-foot deep channel.

- The North Branch Piedras Marcadas Channel flows east across Las Ventanas paralleling an existing water line easement, crossing Rainbow Boulevard and the Loop Road. It travels 3200 feet, gathering local flows and off-site flows from the southwest corner of Las Ventanas before reaching Universe Boulevard.

- At the intersection of Universe Boulevard and North Branch Piedras Marcadas Channel, the channel increases to 8' deep and flows east 800 feet before discharging to the west side of LVDF No. 1.

7.3.3 Outfall to the Calabacillas Summary (Includes Las Ventanas Drainage Facilities No. 1 and No. 2 and Reaches 6, 7, and 8)

- LVDF No. 1 is a detention pond with 143 ac-ft of storage that occupies over 34 acres of land. This pond accommodates all of the flows discharged to it from the West Branch Calabacillas Diversion Channel and the North Branch Piedras Marcadas Channel, and will be sized for 5-year sediment accumulation. Total peak inflow in the 100-year storm is 2998 cfs, which is attenuated to a peak outflow of 49 cfs.

- The outfall from Facility No. 1 is a 42" storm drain (Reach 6) that flows north 2250 feet to where it intercepts the outfall of LVDF No. 2.

- LVDF No. 2 is a detention pond with a storage of less than 10 ac-ft and accommodates local flows from the region north of LVDF No. 1. Total

peak inflow in the 100-year storm is 293 cfs, which is attenuated to a peak outflow of 32 cfs. This pond outfalls to a 36" pipe (Reach 7) that flows eastward a distance of 150 feet.

- At the confluence of the outfall from LVDF No. 2, the 42" outfall pipe from LVDF No. 1 increases to a 60" pipe (utilizing the 60" pipe that was salvaged from Golf Course Road) (Reach 8).

- Over a distance of 1500 feet, the 60" pipe gathers local flows from the northeast region of Las Ventanas, crosses Irving Boulevard, and outfalls to the West Branch of the Calabacillas Arroyo.

- The outfall discharges through a drainage easement to the West Branch of the Calabacillas, directly north of the northeast corner of Las Ventanas. This is to be a joint trench with a waterline being installed by New Mexico Utilities, Inc. (NMUI). In addition to the original 25' drainage easement, NMUI has acquired a 20' easement, and Sandia is obtaining an additional 15' easement for AMAFCA, for a total easement width of 60 feet.

- A USBR Type IV baffle-wall energy dissipator is proposed to reduce the velocity of the 92 cfs flows where it exits to the natural arroyo.

7.4 Development and Infrastructure Phasing

This section describes the anticipated project phasing with respect to the permanent and interior construction of the AMAFCA outfall facilities. The interior drainage facilities are described in a separate report entitled "Las Ventanas Subdivision Interim Drainage Facilities." Dedication of temporary and permanent easements will occur at platting.

Sandia Properties intends to develop the Las Ventanas Subdivision from the south to the north. The southern one-third of the property will be constructed first. Due to the shallow depth to rock on the eastern portion of the site, earth from the western portion will be placed on the eastern portion to provide enough soil cover for utility services. This will minimize the amount of rock excavation.

The anticipated yearly build-out for Las Ventanas will be 190 to 250 lots. Table 4, Development and Drainage Outfall Phasing, describes the proposed build-out through the year 1999.

Table 4

Development and Drainage Infrastructure Phasing

Year	Cumulative No. of Lots Built	AMAFCA Outfall Activity
1995	-	-
1996	250	Sandia to design outfall diversion and dam
1997	450	AMAFCA build outfall diversion
1998	640	AMAFCA start dam construction September 1998
1999	890	AMAFCA construction of dam complete by May 1999

The increased runoff from the development of lots will be accommodated in the two existing playas through construction of the first two phases. The two playas have enough volume to store upstream existing flows and flows from individual developments totaling 450 residential units. Before any more than 450 lots can be developed the outfall diversion to the Calabacillas will need to be constructed. With the outfall diversion constructed and the Loop Road Playa removed, a total of 640 residential units can be constructed. Any lot development beyond 640 lots will require

LVDF No. 1 to be under construction. While LVDF No. 1 is under construction an additional 250 lots can be developed. LVDF No. 2 will be built when the basin that drains to it (Basin 320 in northeast Las Ventanas) is developed. Sandia Properties will maintain the two playas prior to the construction of LVDF No. 1 by AMAFCA.

TRACTJ @ VENTANA RANCH BASIN CALCULATIONS

Ultimate Development Conditions Basin Data Table

			This table is based on the DPM Section 22.2, Zone: 1									
BASIN	Units	Area	Area	Land Treatment Percentages				Q(100)	Q(100)	WT E	$V(100)_{360}$	$V(100)_{1440}$
ID	#	(SQ. FT)	(AC.)	A	B	C	D	(cfs/ac.)	(csf)	(inches)	(CF)	(CF)
Basin A	38	208218	4.78	0.0%	23.0%	23.0%	54.0%	3.49	16.67	*1.45*	*25083*	*29393*
A1		39204	0.90	0.0%	23.0%	23.0%	54.0%	3.49	3.14	*1.45*	*4723*	*5534*
A2		25265	0.58	0.0%	23.0%	23.0%	54.0%	3.49	2.02	*1.45*	*3044*	*3567*
A3		71003	1.63	0.0%	23.0%	23.0%	54.0%	3.49	5.68	*1.45*	*8554*	*10023*
A4		66211	1.52	0.0%	23.0%	23.0%	54.0%	3.49	5.30	*1.45*	*7976*	*9347*
A5		6534	0.15	0.0%	23.0%	23.0%	54.0%	3.49	0.52	*1.45*	*787*	*922*
Basin B	69	525336	12.06	0.0%	23.0%	23.0%	54.0%	3.49	42.05	*1.45*	*63285*	*74160*
B1		138086	3.17	0.0%	23.0%	23.0%	54.0%	3.49	11.05	*1.45*	*16635*	*19493*
B2		75795	1.74	0.0%	23.0%	23.0%	54.0%	3.49	6.07	*1.45*	*9131*	*10700*
B3		77537	1.78	0.0%	23.0%	23.0%	54.0%	3.49	6.21	*1.45*	*9341*	*10946*
B4		93219	2.14	0.0%	23.0%	23.0%	54.0%	3.49	7.46	*1.45*	*11230*	*13159*
B5		69696	1.60	0.0%	23.0%	23.0%	54.0%	3.49	5.58	*1.45*	*8396*	*9839*
B6		71003	1.63	0.0%	23.0%	23.0%	54.0%	3.49	5.68	*1.45*	*8554*	*10023*
Basin C		14018.305	0.32	5.0%	5.0%	90.0%	0.0%	2.75	0.88	*0.95*	*1106*	*1106*
Basin D		94286.612	2.16	0.0%	10.0%	90.0%	0.0%	2.79	6.03	*0.96*	*7527*	*7527*

NOTES: Impervious percentages are calculated using the DPM equation A-4, the remaining percentages are distributed evenly between land treatment types B and C. Basins A1, A2, & A4 were divided for the purpose of creating analysis points. For these basins a weighted average for %D was determined and is reflected in this table.

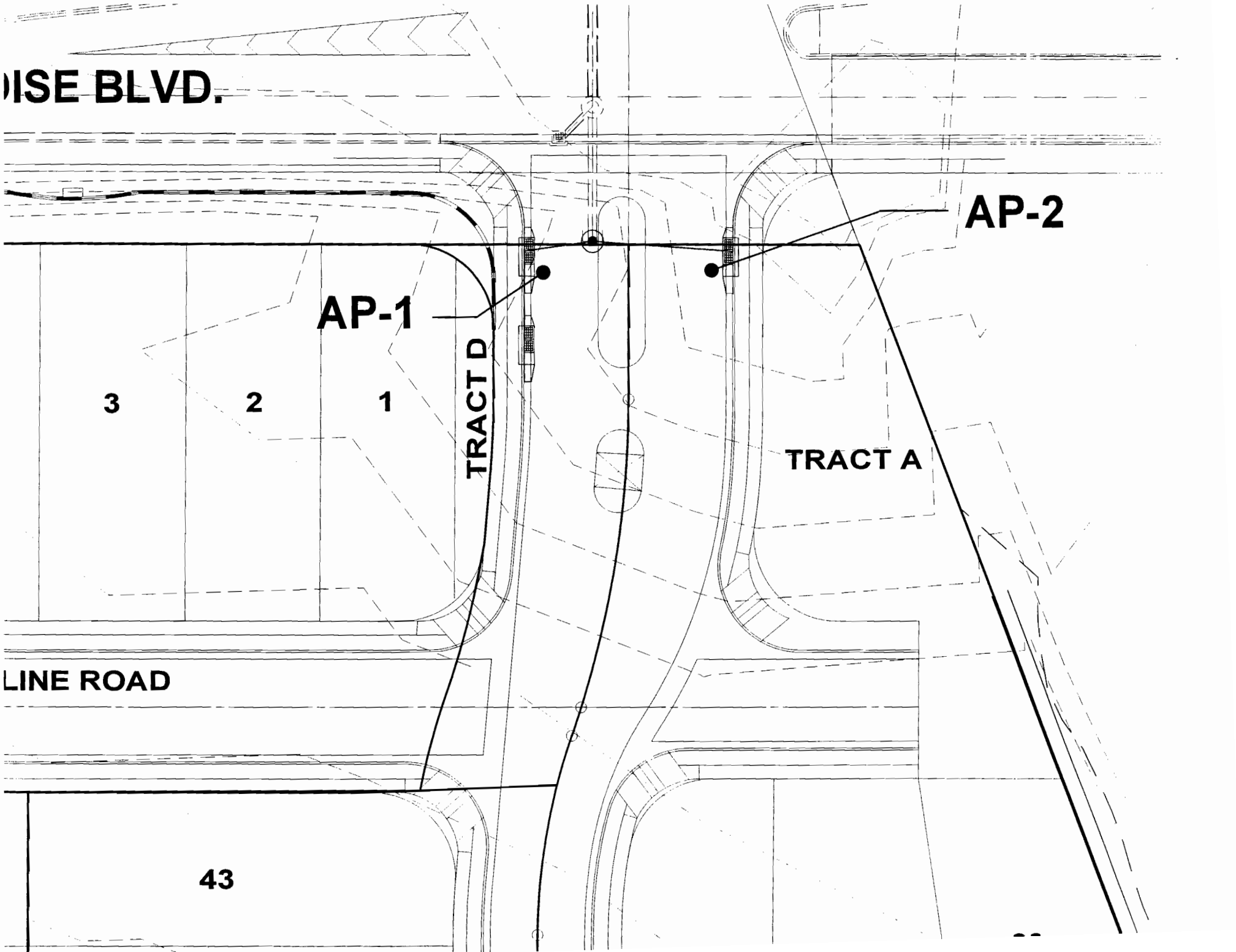
DPM Eqn. A-4 calculation

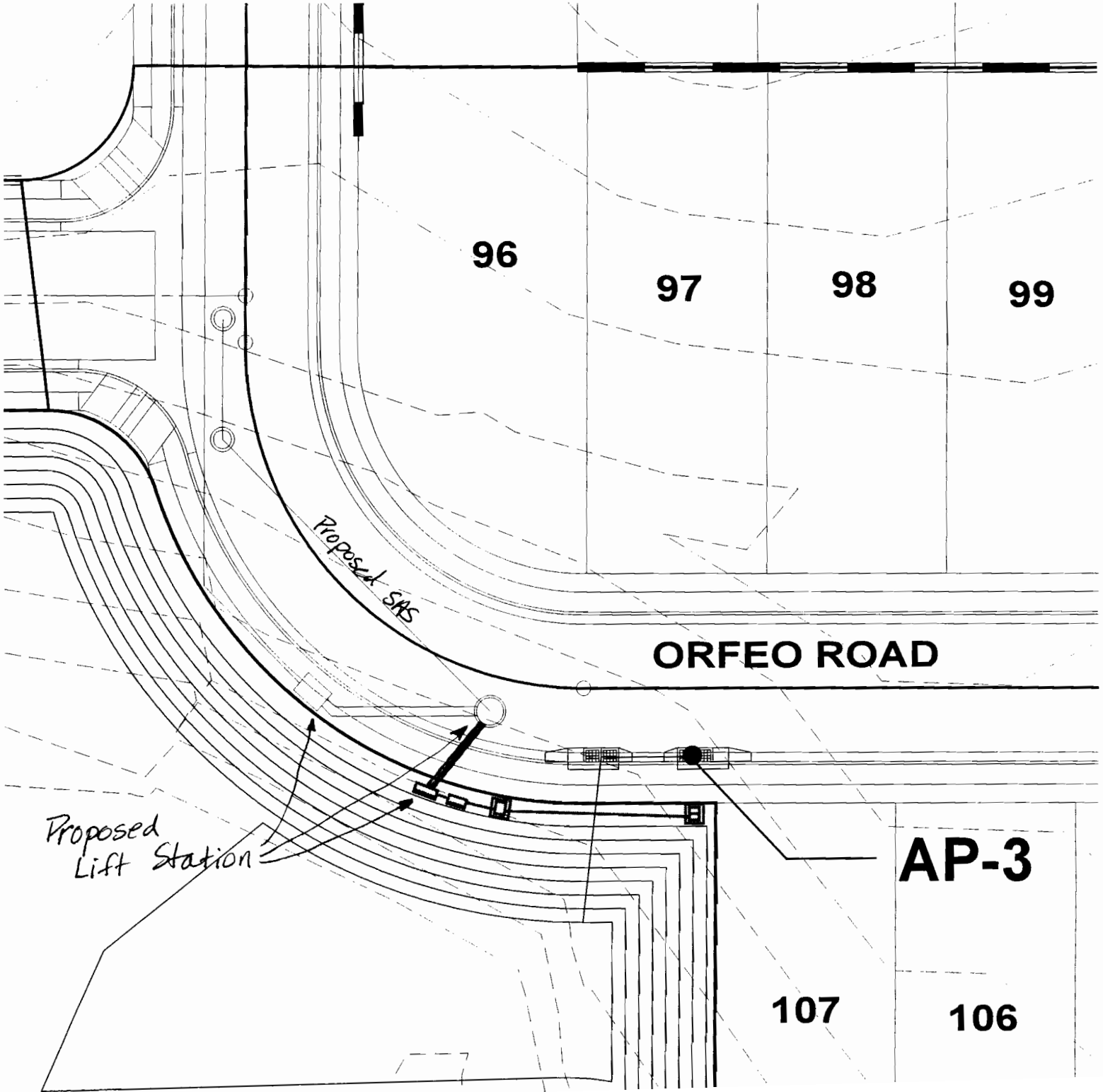
acres	19.07	
units	107.00	
N=	5.61	units/ac
%D=	54.0%	

ANALYSIS POINT CALCULATIONS - INLET CAPACITIES FOR Tract J

Analysis Point	Contributing Basin (s)	Site Flow (CFS)	Street Slope	1st Intercepted Flow	2nd Intercepted Flow	Bypass Flow	Total in street (CFS)	Road* Capacity (CFS)	Notes
1	A2, A3, A4, & A5	13.53	3.66%	8.59	3.86	1.08	1.08	27.90	2- double grate "A" inlet
2	A1	3.14	3.56%	2.64		0.50	0.50	27.90	1- double grate "A" inlet
							1.58		Total Bypass Flow to Paradise Blvd.
3	B1, B2, B3, B4, B5 & B6	42.05	sump	21.03	21.03	0.00	0.00	43.39	2- double grate "A" inlet

* Road Capacity for 1/2 street and is measured at a depth to top of curb. See Appendix B for capacity calculations.


ISE BLVD.
AP-2
AP-1
3
2
1
TRACT D
TRACT A
LINE ROAD
43


96
97
98
99
Proposed SAS
ORFEO ROAD
Proposed
Lift Station
AP-3
107
106

B-4

WEST

A 360%.OUT

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

Street A S= 3.60%

MANNING'S N= .017 SLOPE= .036

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.84	5	11.00	0.12	9	41.17	0.67
2	8.37	0.67	6	25.00	0.40	10	41.62	0.67
3	8.83	0.67	7	39.00	0.12	11	50.00	0.84
4	9.00	0.00	8	41.00	0.00	12	0.00	0.00

WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.05	0.05	0.04	0.1	1.72	1.37	1.64	0.03	0.08
0.10	0.10	0.16	0.4	3.44	2.18	3.28	0.07	0.17
0.15	0.15	0.39	1.0	6.92	2.44	6.68	0.09	0.24
0.20	0.20	0.85	2.4	12.02	2.84	11.70	0.13	0.33
0.25	0.25	1.56	5.2	17.13	3.36	16.73	0.18	0.43
0.30	0.30	2.52	9.8	22.23	3.89	21.75	0.23	0.53
0.35	0.35	3.74	16.4	27.33	4.40	26.78	0.30	0.65
0.40	0.40	5.20	25.5	32.44	4.90	31.80	0.37	0.77
0.45	0.45	6.81	39.5	32.94	5.80	32.23	0.52	0.97
0.50	0.50	8.42	56.2	33.04	6.67	32.25	0.69	1.19
0.55	0.55	10.04	75.1	33.15	7.48	32.28	0.87	1.42
0.60	0.60	11.65	96.0	33.25	8.24	32.30	1.06	1.66
0.65	0.65	13.27	119.0	33.35	8.97	32.33	1.25	1.90
0.70	0.70	14.96	135.0	37.26	9.02	36.21	1.26	1.96
0.75	0.75	16.89	152.1	42.19	9.01	41.13	1.26	2.01
0.80	0.80	19.07	173.0	47.12	9.07	46.06	1.28	2.08
0.84	0.84	20.99	192.5	51.06	9.17	50.00	1.31	2.15

@ 1st Inlet
Q = 13.8 cfs
D = 0.33 ft

EAST

A 360%.OUT

***** PC PROGRAM STREAM SEPTEMBER 1994 *****

Street A S= 3.60%

MANNING'S N= .017 SLOPE= .036

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.84	5	11.00	0.12	9	41.17	0.67
2	8.37	0.67	6	25.00	0.40	10	41.62	0.67
3	8.83	0.67	7	39.00	0.12	11	50.00	0.84
4	9.00	0.00	8	41.00	0.00	12	0.00	0.00

WSEL	DEPTH INC	FLOW AREA	FLOW RATE	WETTED PER	FLOW VEL	TOPWID	VEL HEAD	ENERGY HEAD
(FT)	(FT)	SQ.FT.	(CFS)	(FT)	(FPS)	(FT)	(FT)	(FT)
0.05	0.05	0.04	0.1	1.72	1.37	1.64	0.03	0.08
0.10	0.10	0.16	0.4	3.44	2.18	3.28	0.07	0.17
0.15	0.15	0.39	1.0	6.92	2.44	6.68	0.09	0.24
0.20	0.20	0.85	2.4	12.02	2.84	11.70	0.13	0.33
0.25	0.25	1.56	5.2	17.13	3.36	16.73	0.18	0.43
0.30	0.30	2.52	9.8	22.23	3.89	21.75	0.23	0.53
0.35	0.35	3.74	16.4	27.33	4.40	26.78	0.30	0.65
0.40	0.40	5.20	25.5	32.44	4.90	31.80	0.37	0.77
0.45	0.45	6.81	39.5	32.94	5.80	32.23	0.52	0.97
0.50	0.50	8.42	56.2	33.04	6.67	32.25	0.69	1.19
0.55	0.55	10.04	75.1	33.15	7.48	32.28	0.87	1.42
0.60	0.60	11.65	96.0	33.25	8.24	32.30	1.06	1.66
0.65	0.65	13.27	119.0	33.35	8.97	32.33	1.25	1.90
0.70	0.70	14.96	135.0	37.26	9.02	36.21	1.26	1.96
0.75	0.75	16.89	152.1	42.19	9.01	41.13	1.26	2.01
0.80	0.80	19.07	173.0	47.12	9.07	46.06	1.28	2.08
0.84	0.84	20.99	192.5	51.06	9.17	50.00	1.31	2.15

Q= 3.08 cfs

D= 0.21

MASTER STORM DRAIN HYDROLOGIC VOLUMETRIC & DISCHARGE DATA

STREET A

HYDRAULIC EVALUATION OF INLETS - HEC12 METHOD
10-YEAR STORM - RIGHT (WEST) 1/2 STREET FLOWS W/ 20% CLOGGING FACTOR
15% REDUCTION IN ROUTED Q'S FOR ATTENUATION

Qi = Intercepted Flow
Qb = Bypass Flow
S = Longitudinal Slope
Sx = Cross Slope
Vo = Gutter Velocity where splash-over first occurs
Eo = Ratio of frontal flow to total gutter flow
Rf = Ratio of frontal flow intercepted to total frontal flow
Rs = Ratio of side flow intercepted to total side flow
E = Efficiency

Inlet ID	Total Rtd Q (cfs)	Inlet Width (ft)	Inlet Length (ft)	Ponding Width (ft)	Pond Depth (ft)	Qi (cfs)	Qb (cfs)	S (ft/ft)	Sx (ft/ft)	Vo (fps)	V (fps)	Eo	Rf	Rs	E
BASIN A - AP-1															
2	13.53	1.54	5.32	7.37	0.46	8.59	4.94	0.0366	0.0625	9.5	8.0	0.47	1.0	0.3	0.63
3	4.94	1.54	5.32	5.06	0.32	3.86	1.08	0.0366	0.0625	9.5	6.2	0.62	1.0	0.4	0.78
		Section Total Intercepted Flow:				*12.45*									
		Total Intercepted Flow:				***12.45***									

MASTER STORM DRAIN HYDROLOGIC VOLUMETRIC & DISCHARGE DATA

STREET A

HYDRAULIC EVALUATION OF INLETS - HEC12 METHOD
10-YEAR STORM - LEFT (EAST) 1/2 STREET FLOWS W/ 20% CLOGGING FACTOR
15% REDUCTION IN ROUTED Q'S FOR ATTENUATION

Qi = Intercepted Flow
Qb = Bypass Flow
S = Longitudinal Slope
Sx = Cross Slope
Vo = Gutter Velocity where splash-over first occurs

Eo = Ratio of frontal flow to total gutter flow
Rf = Ratio of frontal flow intercepted to total frontal flow
Rs = Ratio of side flow intercepted to total side flow
E = Efficiency

Inlet ID	Total Rtd Q (cfs)	Inlet Width (ft)	Inlet Length (ft)	Ponding Width (ft)	Pond Depth (ft)	Qi (cfs)	Qb (cfs)	S (ft/ft)	Sx (ft/ft)	Vo (fps)	V (fps)	Eo	Rf	Rs	E
BASIN A - AP-2															
1	3.14	1.54	5.32	4.29	0.27	2.64	0.50	0.0356	0.0625	9.5	5.5	0.70	1.0	0.5	0.84
			Total Intercepted Flow:			***2.64***									

DOUBLE "A" INLETS @ AP-3 IN SUMP CONDITION

ANALYSIS OF AN INLET IN A SUMP CONDITION -

INLET TYPE: Double Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5

Wing opening	Grate opeining	Grate opening	Wing opening
C= 3.0	C=3.0	C=0.6	C=0.6
L= 4.0 ft	L(double grate)=[2(2.67')+2(1.8')]=8.94 ft	A(double grate)=8.19 sf	A=2.0 sf
Q=3.0(4.0')H**1.5= 12.0H**1.5	Q=3.0(8.94)H^1.5=26.82*H^1.5	Q=4.194*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

ORIFICE: Q=C*A*(2*G*H)**0.5

			Q (CFS)	Q (CFS)	Q (CFS)	TOTAL		
			WEIR	WEIR	ORIFICE	Q		
	WS	HEIGHT	"A"	DOUBLE	DOUBLE	(CFS)		
	ELEVATION	ABOVE INLET	OPENING	GRATE	GRATE		COMMENTS:	
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at double "A" inlet w/ two wing openings	
	0.10	0.10	0.38	0.85	11.87	1.61	Weir controls on grate analysis	
	0.20	0.20	1.07	2.40	16.79	4.55		
	0.30	0.30	1.97	4.41	20.56	8.35		
	0.40	0.40	3.04	6.78	23.75	12.86		
	0.50	0.50	4.24	9.48	26.55	17.97		
	0.60	0.60	5.58	12.46	29.08	23.62	Q(100 yr) = 21.03cfs at this depth	
TOP OF CURB	0.67	0.67	6.58	14.71	30.73	27.87		
	0.80	0.80	8.59	19.19	33.58	36.36		
ROW LIMIT	0.90	0.90	10.25	22.90	35.62	43.39	Q(2X100 yr) =42.06 cfs at this depth	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:

Qr(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].

100 YR STORM EVENT = 21.03 CFS at the sump condition on each half of the street.

2*100 YR STORM EVENT = 42.06 CFS at the sump condition on each half of the street.

****Shaded cells require user input. Non-shaded cells cannot be edited.****

[redacted] Dam - Tract I

***** HYDRAULIC GRADE LINE CALCULATIONS *****

Manning's n = [redacted] for pipe

Structure	Diam. (in.)	Q (cfs)	Area	Vel.	K	Sf	Length (ft.)	MH Dia. (ft.)	BEND Angle	Hf	Hb	Hj	Hmh	Ht	Total Losses	HGL(dn)	HGL(up)	Low Point	HV	EGL(dn)	EGL(up)
OUTFALL	[redacted]							[redacted]			0.00	0.00	0.00	0.00	0.00		[redacted]	[redacted]	0.65	5402.52	5402.52
MH#1	[redacted]							[redacted]		0.38	0.05	0.00	0.03	0.00	0.38 0.08	5402.25	5402.33	[redacted]	0.65	5402.90	5402.98
INLET#1	[redacted]							[redacted]		0.36	0.00	0.14	0.00	0.00	0.36 0.14	5402.69	5402.98	[redacted]	0.51	5403.34	5403.48
INLET#2	[redacted]							[redacted]		0.07	0.00	0.17	0.00	0.00	0.07 0.17	5403.05	5403.08	[redacted]	0.64	5403.56	5403.72
MH#2	[redacted]							[redacted]		0.07	0.05	0.00	0.03	0.00	0.07 0.08	5403.15	5403.23	[redacted]	0.64	5403.80	5403.88
INLET#3	[redacted]							[redacted]		0.83	0.00	0.33	0.00	0.00	0.83 0.33	5404.06	5404.73	[redacted]	0.31	5404.71	5405.04
MH#3	[redacted]							[redacted]		0.08	0.00	0.00	0.02	0.00	0.08 0.02	5404.81	5404.82	[redacted]	0.31	5405.12	5405.13
MH#4	[redacted]							[redacted]		0.15	0.00	0.00	0.02	0.00	0.15 0.02	5404.98	5404.99	[redacted]	0.31	5405.29	5405.30
MH#5	[redacted]							[redacted]		0.06	0.00	0.03	0.00	0.00	0.06 0.03	5405.05	5405.05	[redacted]	0.34	5405.36	5405.40
STUBOUT	[redacted]	23.0	4.91	4.69	410	0.0031	[redacted]	[redacted]		0.16	0.00	0.00	0.00	0.07	0.16 0.07	5405.21	5405.62	[redacted]	0.00	5405.55	5405.62

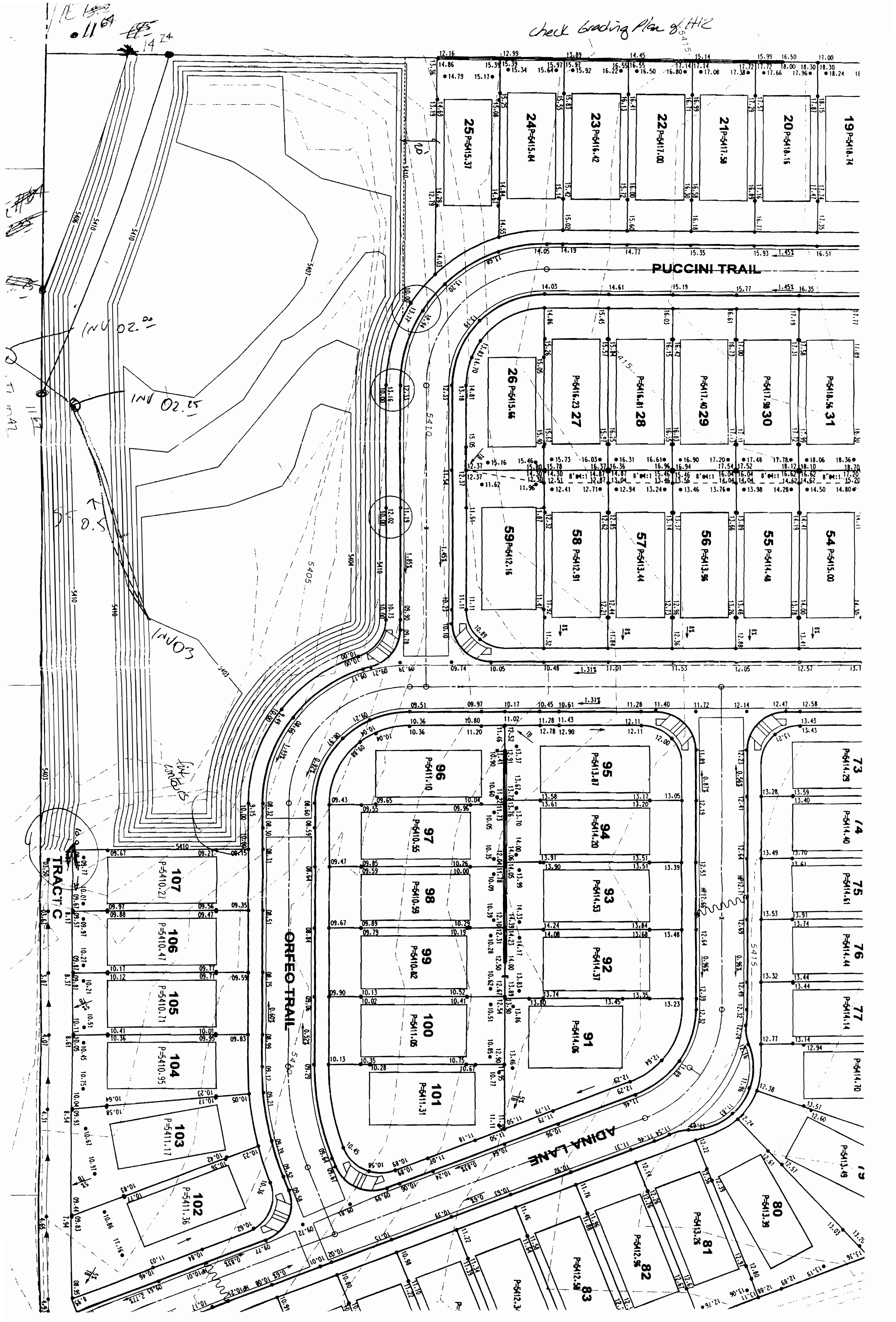
JUNCTION LOSSES

Dia. 3 (in.)	Junct. Angle	<delta>y	Ht(inc.)	Ht(dec.)
[redacted]	[redacted]	0.0000	0.0650	0.0000
[redacted]	[redacted]	0.0000	0.0000	0.0000
[redacted]	[redacted]	0.2889	0.00	0.00
[redacted]	[redacted]	0.0268	0.00	0.00
[redacted]	[redacted]	0.0000	0.00	0.00
[redacted]	[redacted]	0.6693	0.00	0.00
[redacted]	[redacted]	0.0000	0.00	0.00
[redacted]	[redacted]	0.0000	0.00	0.00
[redacted]	[redacted]	-0.2066	0.00	0.00
[redacted]	[redacted]	0.0000	0.00	0.07

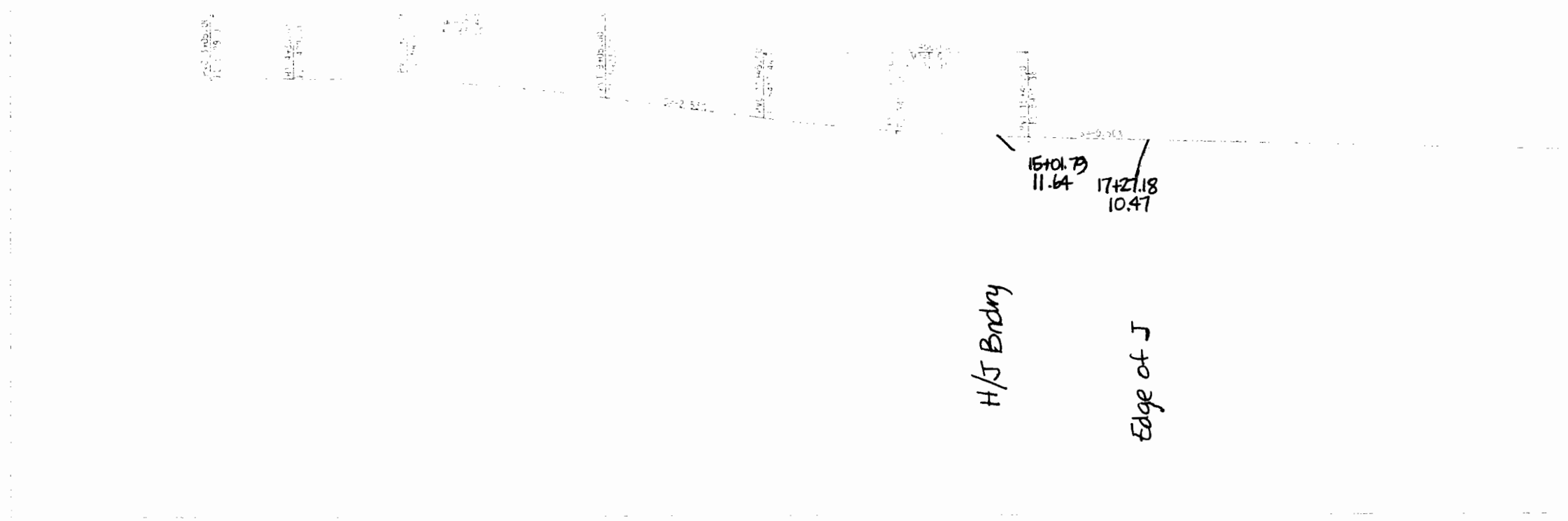
ALLOWABLE Q = 23 CFS

APPROVED UNDER DRAINAGE FILE # B10/D3D

Exhibit 2



check Grading Plan of HI2
PUCCINI TRAIL
ORFEO TRAIL
ADINA LANE
TRACT C
INV 02.00
INV 02.25
INV 03
S 0.5
fit contours
25 P=5415.37
24 P=5415.84
23 P=5416.42
22 P=5417.00
21 P=5417.58
20 P=5418.16
19 P=5418.74
26 P=5415.66
P=5416.23 27
P=5416.81 28
P=5417.40 29
P=5417.98 30
P=5418.56 31
59 P=5412.16
58 P=5412.91
57 P=5413.44
56 P=5413.96
55 P=5414.48
54 P=5415.00
96 P=5411.10
97 P=5410.55
98 P=5410.59
99 P=5410.82
100 P=5411.05
101 P=5411.31
95 P=5413.87
94 P=5414.20
93 P=5414.53
92 P=5414.37
91 P=5414.06
107 P=5410.21
106 P=5410.47
105 P=5410.71
104 P=5410.95
103 P=5411.17
102 P=5411.36
73 P=5414.29
74 P=5414.40
75 P=5414.61
76 P=5414.44
77 P=5414.14
P=5414.70
P=5413.49
80 P=5413.39
81 P=5413.26
82 P=5412.96
83 P=5412.58
P=5412.3
5410
5407
5406
5405
5404
5403
5415
1.45%
1.31%
1.85%



PASEO EXTENSION

VITTORIA AT VENTANA RANCH
CONTROLLED DISCHARGE INTO PASEO DEL NORTE

BASIN	Comments	AREA (ACRES)	Q(100-YR) DEVELOPED (CFS)
Vittoria Basins B, C & D	(see Proposed Basin Map for Tract J)	14.48	48.96
Tract H 1 - 12 (Basin A)	(see Conceptual G&D Plan for Tracts G, H, I & J)	14.75	60.32
Paseo del Norte ROW	(basin is from Universe Blvd to Tract J frontage)	4.00	16.08
Totals		**33.23**	**125.36**
0.5 cfs per acre			14.62
Paseo del Norte ROW			16.08
Total for Controlled Runoff			**30.70**

VITTORIA AT VENTANA RANCH
FREE DISCHARGE INTO PASEO DEL NORTE

BASIN	Comments	AREA (ACRES)	Q(100-YR) DEVELOPED (CFS)
Vittoria Basins B, C & D	(see Proposed Basin Map for Tract J)	14.48	48.96
Tract H 1 - 12 (Basin A)	(see Conceptual G&D Plan for Tracts G, H, I & J)	14.75	60.32
Paseo del Norte ROW	(basin is from Universe Blvd to Tract J frontage)	4.00	16.08
Totals		**33.23**	**125.36**

Obtained from Section 22.2, Hydrology of the Development Process Manual, Volume 2,
Design Criteria for the City of Albuquerque, January, 1993
Exhibits are referenced from the approved Drainage Report for Travilla Subdivision (Tract J, Ventana Ranch)

Max RCP flow (non-pressure, full pipe)

Table assumes Manning's n =

Slope	18	24	30	36	42	48	54	60	66	72	78
0.10%	3.33	7.17	13.01	21.15	31.90	45.55	62.35	82.58	106.48	134.29	166.24
0.20%	4.71	10.14	18.39	29.91	45.12	64.41	88.18	116.79	150.58	189.91	235.09
0.30%	5.77	12.42	22.53	36.63	55.25	78.89	108.00	143.03	184.43	232.59	287.93
0.40%	6.66	14.35	26.01	42.30	63.80	91.09	124.71	165.16	212.96	268.57	332.47
0.50%	7.45	16.04	29.08	47.29	71.33	101.84	139.43	184.66	238.09	300.27	371.72
0.60%	8.16	17.57	31.86	51.80	78.14	111.57	152.73	202.28	260.82	328.93	407.20
1.00%	10.53	22.68	41.13	66.88	100.88	144.03	197.18	261.14	336.71	424.65	525.69
1.50%	12.90	27.78	50.37	81.91	123.55	176.40	241.49	319.83	412.39	520.09	643.83
2.00%	14.90	32.08	58.16	94.58	142.67	203.69	278.85	369.31	476.18	600.54	743.44
2.50%	16.65	35.87	65.03	105.74	159.51	227.73	311.77	412.90	532.39	671.43	831.19
3.00%	18.24	39.29	71.23	115.84	174.73	249.47	341.52	452.31	583.20	735.51	910.52
3.50%	19.70	42.44	76.94	125.12	188.73	269.46	368.89	488.55	629.93	794.44	983.47
4.00%	21.07	45.37	82.26	133.76	201.76	288.06	394.36	522.29	673.43	849.30	1051.38
4.50%	22.34	48.12	87.24	141.87	214.00	305.53	418.28	553.97	714.28	900.81	1115.15
5.00%	23.55	50.72	91.96	149.54	225.58	322.06	440.90	583.93	752.91	949.54	1175.47
5.50%	24.70	53.20	96.45	156.84	236.59	337.78	462.42	612.44	789.66	995.89	1232.85
6.00%	25.80	55.56	100.74	163.82	247.11	352.80	482.99	639.67	824.77	1040.17	1287.67
6.50%	26.85	57.83	104.85	170.51	257.20	367.21	502.71	665.79	858.45	1082.64	1340.25
7.00%	27.87	60.01	108.81	176.94	266.90	381.07	521.68	690.92	890.86	1123.51	1390.84
7.50%	28.84	62.12	112.63	183.15	276.27	394.44	540.00	715.17	922.13	1162.95	1439.66
8.00%	29.79	64.16	116.33	189.16	285.33	407.38	557.70	738.63	952.37	1201.09	1486.87
8.50%	30.71	66.13	119.91	194.98	294.11	419.92	574.87	761.36	981.68	1238.05	1532.63
9.00%	31.60	68.05	123.38	200.63	302.64	432.09	591.53	783.43	1010.14	1273.94	1577.06
9.50%	32.46	69.91	126.76	206.13	310.93	443.93	607.74	804.90	1037.82	1308.85	1620.28
10.00%	33.31	71.73	130.06	211.49	319.01	455.46	623.53	825.81	1064.78	1342.85	1662.37
10.50%	34.13	73.50	133.27	216.71	326.89	466.71	638.93	846.20	1091.07	1376.02	1703.42
11.00%	34.93	75.23	136.40	221.81	334.58	477.69	653.97	866.11	1116.75	1408.40	1743.51
11.50%	35.72	76.92	139.47	226.79	342.10	488.43	668.66	885.58	1141.85	1440.05	1782.69
12.00%	36.49	78.58	142.47	231.67	349.46	498.93	683.05	904.63	1166.41	1471.02	1821.04
12.50%	37.24	80.20	145.41	236.45	356.67	509.22	697.13	923.28	1190.46	1501.36	1858.59
13.00%	37.98	81.79	148.29	241.13	363.73	519.31	710.94	941.57	1214.04	1531.09	1895.39