



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

October 9, 1984

Hacker

*9601 Sierra Vista Ct NE
87113*

Mr. Steve Hacker
Hacker Limited
9580 Sierra Vista Court, NE
Albuquerque, New Mexico 87107

RE: RETAINING WALL FOR COTTONWOOD ESTATES SUBDIVISION

Dear Mr. Hacker:

The approved drainage plan for the Cottonwood Estates Subdivision indicates a retaining wall would be constructed on the west property line. A recent field trip to the site showed that the existing CMU wall had not been replaced. Please be advised that a retaining wall will be required as shown on the approved drainage plan submitted by Hall Engineering. Please contact Code Administration for the retaining wall permit.

Sincerely yours,

Carlos A. Montoya
Civil Engineer/Hydrology

CAM/bm

cc:
Cliff Gilbert, Supv., Building Section
Richard Hall, Hall Engineering
Barry Simmons, Senior Civil Engineer/Field

MUNICIPAL DEVELOPMENT DEPARTMENT

C. Dwayne Sheppard, P.E., City Engineer

ENGINEERING DIVISION

Telephone (505) 766-7467

AN EQUAL OPPORTUNITY EMPLOYER



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

DESIGN HYDROLOGY SECTION
123 Central NW, Albuquerque, NM 87102
(505) 766-7644

April 20, 1984

Mr. Richard Hall
Hall Engineering Co.
2625 Pennsylvania Avenue NE, Suite 350
Albuquerque, NM 87110

REF: GRADING AND DRAINAGE PLAN FOR COTTON WOOD ESTATES SUBDIVISION
(H22-D38) RECEIVED APRIL 17, 1984

Dear Rick:

I have reviewed the above referenced submittal and forward the following comments:

1. The site plan for this development has totally changed from the previous conceptual submittal; therefore, the Conceptual Drainage Approval is null and void. The detail associated with this submittal is only good to grant conceptual approval for this revised layout. It is not of sufficient detail for building permit.
2. Will the water, sewer and paving plans be submitted separately for approval from the City to issue work orders? How is the development of this site to be processed?
3. How are the backyards of each of the lots to drain i.e., there are three (3) walls internal, how are the areas between to drain? Backyard ponding is not allowed as credit for runoff control.
4. The Figure 1 mentioned in the report has been deleted from the submittal.
5. How is it proposed for vehicles to get into the drivepads without any curb-cuts provided?

MUNICIPAL DEVELOPMENT DEPARTMENT

C. Dwayne Sheppard, P.E., City Engineer

ENGINEERING DIVISION

Telephone (505) 766-7467

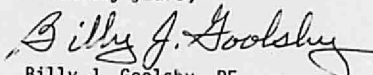
AN EQUAL OPPORTUNITY EMPLOYER

Mr. Richard Hall
April 20, 1984
Page -2-

6. Roof drainage should be indicated.
7. Does the off-site flows just run over the top of the walls? There aren't any elevations shown for the wall on the north end. How do the off-site flows enter?
8. The street names are not the same as shown on the previous submittal. Please provide a copy of the approved plat.
9. For building permit approval the grading plan should be of sufficient detail to build by since it is to be included in the construction set for sign-off.
10. All City standards should be identified and referenced by number of standard.

Should you have any questions or comments, please contact me at 766-7644.

Sincerely yours,



Billy J. Goolsby, PE
City/County Flood Plain Admin.

BJG:mrk



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

FILE COPY

February 28, 1984

Richard Hall
Hall Engineering
2625 Pennsylvania Avenue NE
suite 350
Albuquerque, NM 87110

REF: CONCEPTUAL DRAINAGE AND GRADING PLAN FOR COTTONWOOD ESTATES (H22-D38)
RECEIVED 2-17-84

Dear Richard:

The above referenced plan submitted on this date is hereby approved in concept; however, the plan is lacking the standard details associated with a typical plan and this will need to be provided on a future submittal. (i.e. Stamp, signature, vicinity map, legend, etc.)

If you should have any further questions or comments, please feel free to contact me at 766-7644.

Sincerely yours,

Billy J. Goolsby, P.E.
City/County Flood Plain Admin.

BJG:mrk

MUNICIPAL DEVELOPMENT DEPARTMENT

C. Dwayne Shappard, P.E., City Engineer

ENGINEERING DIVISION

Telephone (505) 766-7467

AN EQUAL OPPORTUNITY EMPLOYER



HALL ENGINEERING & SURVEYING CO.

2625 Pennsylvania Ave. N.E., Suite 350
Albuquerque, New Mexico 87110
Phones: (505) 884-6200 & 884-6444

Conceptual Erosion Control Plan

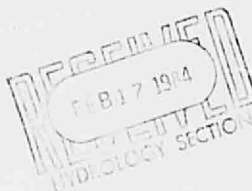
for COTTONWOOD ESTATES

Zone Atlas H-22

Tract A-3 Blk 27-A Brentwood Hills

The site fronts public R-0-W on Tramway Blvd. and a flood control channel on the east and south respectively. All land slopes to the west at 7% grade. At the present there is an existing earth channel with gravel bottom directing all water and runoff to the drainage channel at the south. We propose to keep all runoff directed to the same spot. All grading will be accompanied by watering and compaction to prevent erosion. No open trenches will remain open for more than 3 days. No severe slopes or cuts will be left for more than 3 days. Retaining walls will be placed within 3 days of any cut or fill with slopes exceeding 2 to 1. Preventing erosion in or to the flood control channel will require compaction and gravel over the existing channel and where the new rundown will be placed.

Richard Hall P.E.





CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION



HYDROLOGY SECTION PROJ. NO. H-22 DATE: 1/19/84

PLANNING DIVISION NO. _____

CONFERENCE RECAP

SUBJECT: Cottonwood Estates

WHO	REPRESENTING
ATTENDANCE: <u>Richard Hall</u>	
<u>Billy Goolsby</u>	

FINDINGS: ① Drainage Plan per DEM
② Free discharge through existing
run-down into Piedra Lisa concrete lined
channel.
③ Site to accept off-site flows in
Cottonwood Way from Tract A-1 and convey
to outlet at run-down.
④ Financial Surities required for
public & private infrastructures
⑤ Vacation of 10' private easements
acceptable if directed through Cottonwood Way.

The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: Billy Goolsby

SIGNED: Richard Hall

TITLE: CE/Hydrology

TITLE: PE

DATE: 1/19/84

DATE: JAN 19 84



CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION



HYDROLOGY SECTION PROJ. NO. H-22 DATE: 1/19/84

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The undersigned agrees that the above findings are summarized accurately and are only subject to change if further investigation reveals that they are not reasonable or that they are based on inaccurate information.

SIGNED: Billy Goolsby

SIGNED: Richard Hall

TITLE: CE/Hydrology

TITLE: PE

DATE: 1/19/84

DATE: JAN 19 84

INFORMATION SHEET

DRAINAGE REPORT

PROJECT TITLE COTTONWOOD ESTATES TYPE OF SUBMITTAL SECOND SUBMITTALZONE ATLAS PAGE NO. H22 CITY ADDRESS _____LEGAL DESCRIPTION TRACT A-3, Block 27-A, Brentwood Hills SubdivisionENGINEERING FIRM Hall Engineering CONTACT Richard HallADDRESS 2625 Pennsylvania NE PHONE 884-6200 or 884-6444 292/115OWNER Hacker Limited CONTACT Steve HackerADDRESS 9580 Sierra Vista Court., NE PHONE 292-6700ARCHITECT N/A CONTACT _____

ADDRESS _____ PHONE _____

SURVEYOR Hall Surveying Company CONTACT Richard HallADDRESS 2625 Pennsylvania PHONE 884-6444CONTRACTOR Hacker Limited, (see Owner) CONTACT _____

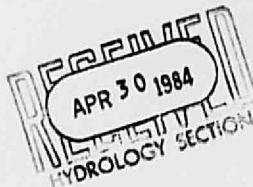
ADDRESS _____ PHONE _____

PRE-DESIGN MEETING:

- ☒ YES
☐ NO
☒ COPY OF CONFERENCE RECAP SHEET PROVIDED
- 2900
Salem* *3 am*

PLEASE CHECK TYPE OF APPROVAL EXPECTED WITH THIS SUBMITTAL:

- ☐ SKETCH PLAT APPROVAL
☐ PRELIMINARY PLAT APPROVAL
☐ SITE DEVELOPMENT PLAN APPROVAL
☒ FINAL PLAT APPROVAL
☒ BUILDING PERMIT APPROVAL
☐ CERTIFICATE OF OCCUPANCY APPROVAL
☐ ROUGH GRADING PERMIT APPROVAL
☐ GRADING/PAVING PERMIT APPROVAL
☐ OTHER _____ (SPECIFY)

DATE SUBMITTED: April 30, 1984 (resubmitted)BY: Richard Hall



HALL ENGINEERING & SURVEYING CO.

2625 Pennsylvania Ave. N.E., Suite 350
Albuquerque, New Mexico 87110
Phones: (505) 884-6200 & 884-6444

City of Albuquerque
Design Hydrology Section
123 Central NW
Albuquerque, NM 87102

Attn. Billy Goolsby, PE
City/County Flood Plain Administrator

REF: Grading and Drainage Plan for COTTONWOOD ESTATES SUBDIVISION
(H22-D38)

Dear Billy:

In reference to your letter of April 20, 1984, the subject grading and drainage plan has been revised in accordance with your remarks and the response to each comment is listed below in the same numerical order.

1. Detail has been added to the site plan as requested. The specific items of detail will be discussed in the comments below. Grading was previously shown only on the streets. It has been extended to remaining non-building areas.
2. Sewer, water and paving construction drawings will be submitted to the City Engineer on Tuesday, May 1, 1984. Construction will start on Enebro and proceed east. The total site will first be graded to approximate finish grade. Pads for the first row of dwellings will be constructed, stem walls poured and the buildings started. The utilities will be installed, curb and gutter placed and finally the pavement. The connection to the existing drainage rundown will be constructed at the same time as the curb and gutter.
3. The buildings are designed to drain to the front yard. The only runoff in the back yards will be that which falls upon them. It will be contained and infiltrate. However, calculations assume this runoff reaches the street.
4. Figure one has been included in this submittal.
5. Where mountable curb is called out on the plan, no special treatment of the curb is necessary. Where standard curb is called out, curb cuts have been shown on the plan.
6. Roof drains have been added to all buildings.
7. Sections BB and CC show that off-site flows will enter the property through holes in the block wall formed by turning an occasional block sideways. Once inside the wall it will flow in the direction indicated by arrows on the plan.
8. A copy of the revised plat is attached. It is not an approved plat as part of the purpose of the drainage plan and report is to obtain final plat approval.

9. The additional detail provided and described above will, we feel, be sufficient to build by. A copy of the Drainage Plan will be included with the building plans.

10. All city standards have been identified and referenced by number as requested.

If we may be of further assistance to you in this matter, please do not hesitate to call us at your convenience.

Thanking you, we are

Very truly yours,

HALL ENGINEERING COMPANY

Frank D. Lovelady
Frank D. Lovelady, P.E.

1.

STORM DRAINAGE REPORT
FOR
COTTONWOOD ESTATES

I. PURPOSE :

The purpose of this report is to present a comprehensive analysis of drainage control constraints on the proposed development and to present a plan for handling the storm runoff in a manner consistent with current storm drainage policy of the city of Albuquerque.

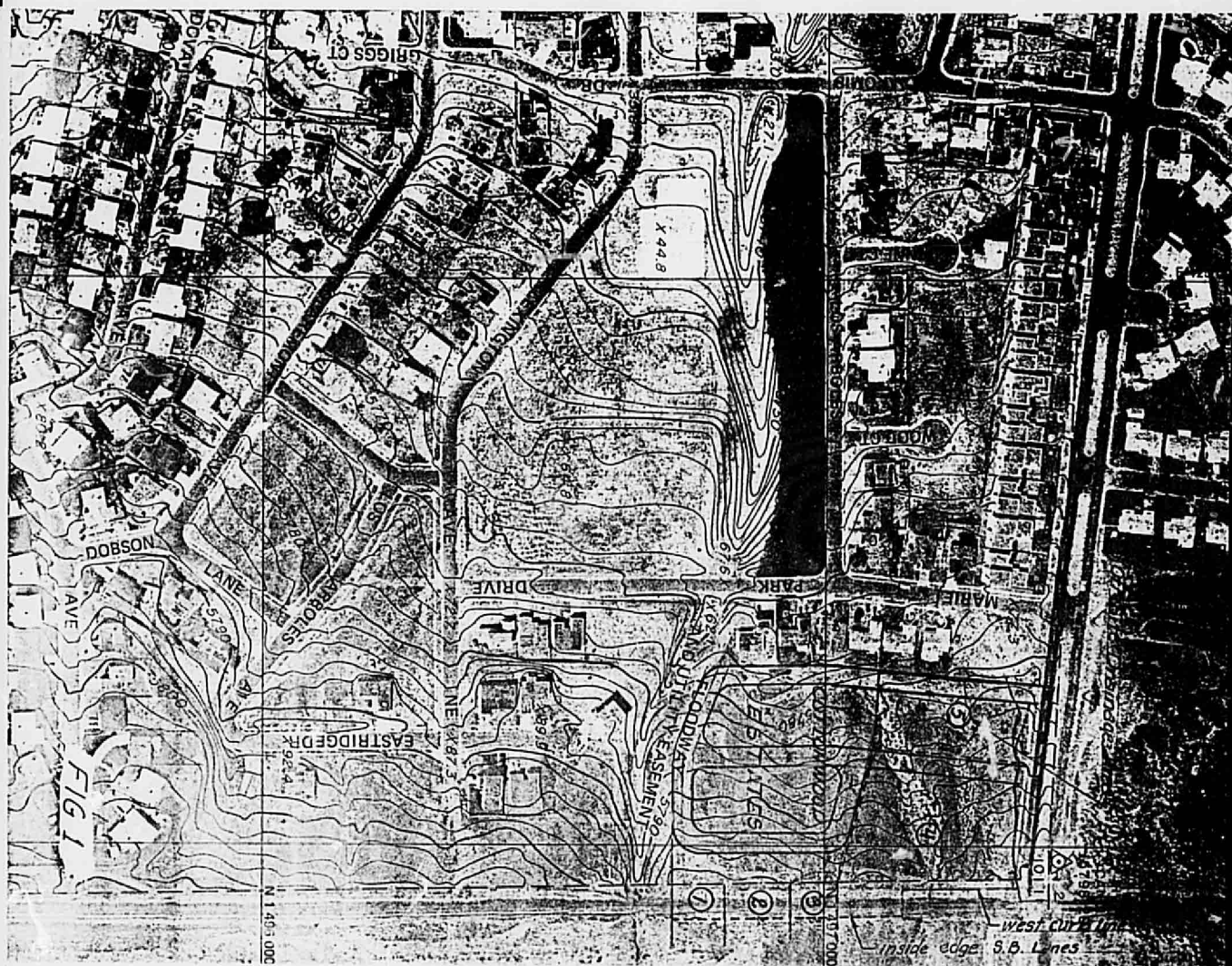
II. SCOPE :

The scope of this report includes determining on-site and off-site flow rates and velocities and the peak rate of discharge from the site into the concrete lined floodway channel.

III. LOCATION AND USE :

The area being developed is located in Zone Atlas Grid No. H-22. The site is near the S.E. corner of the intersection of Candelaria Road NE and Tramway Blvd. N.E. The legal description of the site is Tract A-3, Brentwood Hills Subdivision.

It is proposed to develop the property as a 48 unit townhouse addition. The proposed development is superimposed on the City Orthotopo map in Figure 1.



IV. EXISTING CONDITIONS :

Adjacent to the site on the east is Tramway Blvd. Figure 2
Some off-site drainage comes from Tramway
Blvd. Off-site Areas 1, 2 and 3 extend to the
inside edge of the southbound lanes (See Figure 1). Areas 1,
Off-site areas together with their respective flows
are tabulated later in the report.

Adjacent to the site on the north is partially
developed land. Drainage Areas 4 and 5 cover
this area. Drainage will be intercepted by Enebro
and Sabina. ... carried through the
subdivision to the concrete-lined drainage channel that
borders the subdivision on the south.

Adjacent to the site on the west is an existing subdivision.
A retaining wall is planned on the west side of Enebro.

Adjacent to the site on the south is the Piedra Lisa lined drainage channel into which free discharge is proposed. The floodway map is shown in Figure 2 which shows that the 100-year flood is confined to the constructed channel.

V. SOIL SURVEY

The Soil Survey of Bernalillo County, Sheet No 22 is shown in Figure 3. The soil type in the area surrounding the subdivision is ETC, Embudo-Tijeras complex, 0-9 percent slopes. The SCS Hydrologic Soil Group is B.

VI. TIME OF CONCENTRATION

The drainage areas considered in this report are relatively small and the terrain is moderately steep, therefore, the time of concentration for all areas will be less than ten minutes. Therefore, the minimum T_c of 10 minutes is used. To verify this, T_c is computed below for the largest single area, off-site Area 4.

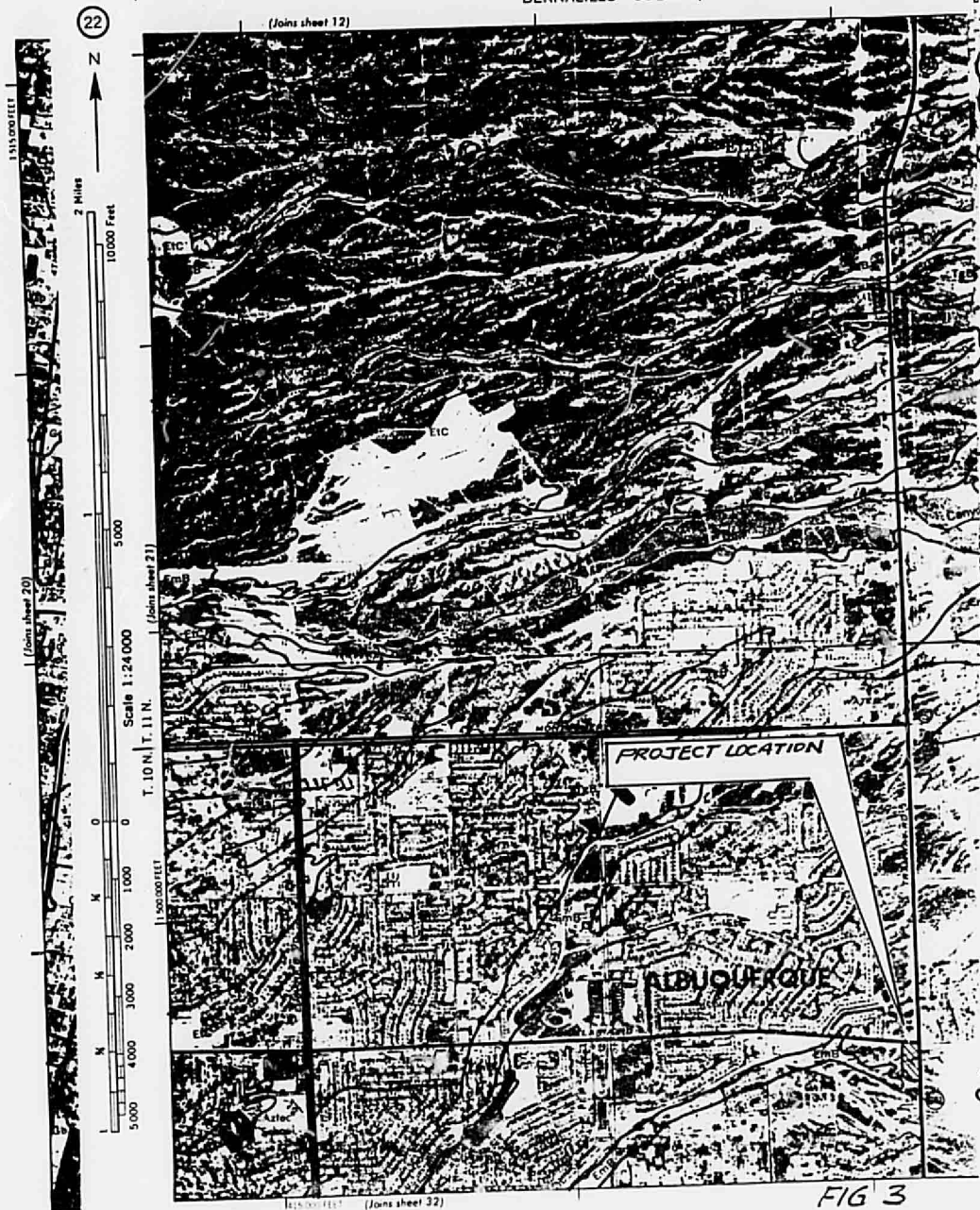
$$T_c = 0.0078 (L)^{0.77} / (S)^{0.385}$$

$$L = 300 \quad S = 0.0433$$

$$T_c = 0.0078 (300)^{0.77} / (0.0433)^{0.385} = 2.11 \text{ min.}$$

Use 10 minutes as a minimum T_c .





VII. RAINFALL INTENSITY.

Based on a time of concentration of 10 minutes and a 6-hour 100-year rainfall of 2.55 (see Plate 22.2D-1), the intensity is determined by the following equation.

$$I = (6\text{-hr. rain}) 6.84 i_c^{-0.51}$$

$$= (2.55) 6.84 (10)^{-0.51} = 5.39 \text{ inches/hour.}$$

VIII. RUNOFF COEFFICIENT

The runoff coefficient is determined from Plate 22.2 C-1, using the curve for SCS Soils Group B and the percent impervious. The runoff coefficient for on-site areas is shown in Table 2 on the next page.

The runoff coefficient for off-site Areas is computed in the same manner. The off-site drainage areas and their corresponding percentages of impermeability are tabulated in Table 1 below:

TABLE 1

OFF-SITE DRAINAGE AREAS, "C" FACTORS AND FLOWS.

OFF-SITE AREA	IMPERVIOUS (SF)	PERVIOUS (SF)	% IMPERVIOUS	"C" FACTOR	TOTAL AREA	Q (CFS)
1	3,220	3,575	47.4%	0.54	0,156	0.45
2	4,212	4,674	47.4%	0.54	0,204	0.59
3	5,365	3,735	47.4%	0.76	0,163	0.67
4			80 ⁽¹⁾	0.76	1,455	5.96
5						1.86 ⁽²⁾
						9.35

(1) Assumed percent impervious at full development

(2) From drainage plan for Tract A-2

TABLE 2

ON-SITE DRAINAGE AREAS AND FLOWS

DRAINAGE AREA	IMPERVIOUS AREAS		TOTAL	PERVIOUS AREAS (1)		TOTAL	PERCENT IMPERVIOUS	"C" FACTOR	TOTAL AREA (AC)	Q (CFS)
	HOUSES	DRIVEWAYS		FRONT YARDS	BACK YARDS					
1-A	1943	545	2,288	1,008	605	1,613	0.59	0.62	0.0896	0.30
1-B	6,337	1,702	8,039	1,452	2,195	3,647	0.69	0.68	0.2683	0.98
2-A	1,616	604	2,220	747	635	1,382	0.62	0.64	0.0827	0.29
2-B	5,656	1,787	7,443	2,107	2,450	4,557	0.62	0.64	0.2755	0.95
2-C	7,272	2,278	9,550	3,917	3,078	6,995	0.58	0.62	0.3798	1.27
3-A	8,280	4,634	12,914	3,373	2,800	6,173	0.67	0.67	0.4347	1.57
3-B	7,272	1,912	9,184	3,345	2,520	5,865	0.61	0.63	0.3455	1.17
ENEBRO (OFFSITE)			6,380			440	94	0.91	0.1566	0.77
ENEBRO (ONSITE)			9,159			716	93	0.89	0.2267	1.09
ROSEL (WEST)			3,135			428	88	0.84	0.0818	0.37
ROSEL (EAST) and MITES (SOUTH)			17,364			640	96	0.93	0.4133	2.07
MITES (NORTH)			7,606			-	100	1.00	0.1746	0.94
SABINA (OFFSITE)			5,500			-	100	1.00	0.1263	0.68
SABINA (ONSITE)			9,537			32456	100	1.00	0.2258	1.22
			110,469			14,283	32,456			13.6706

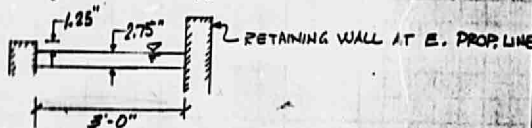
(1) BACK YARDS WILL RETAIN ALL DRAINAGE - THEY ARE INCLUDED IN COMPUTATION OF TOTAL AREA OR PERCENT IMPERVIOUS.

TOTAL MEASURED AREA - 142,925
TOTAL ACTUAL AREA - 132,161 + 5500 = 137,661
ABOUT 3.8% HIGH (SAFETY FACTOR)

IX. ANALYSIS OF FLOW IN DRAINAGE EASEMENTS AND STREETS

A. OFF-SITE AREAS 1, 2, 3. These areas are east of the site and drains to the channel between garden wall and retaining wall adjacent to the east property line. The slope of the channel varies for each drainage area but the minimum slope is 1%. Try a rectangular channel between the two walls.

By Mannings equation, $Q = \frac{1.486}{n} (A) R^{2/3} S^{1/2}$



$$\text{Wetted Perimeter} = 3.2085' \quad \text{Area} = 0.6875 \text{ sf} \quad R = \frac{0.6875}{3.2085} = 0.2143$$

Assume $n = 0.95$ for the unpaved space between the walls.

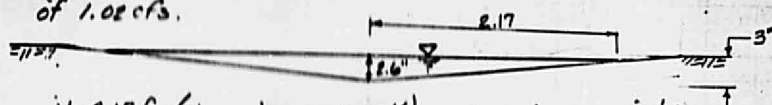
$$Q = \frac{1.486}{0.95} (0.6875) (0.2143)^{2/3} (0.0100)^{1/2} = 1.04 \text{ cfs capacity.}$$

Dis from Area 1, is 0.45 cfs < 1.16 cfs - Capacity is OK

Velocity $V = Q/A = 1.04 / 0.6875 = 1.51 \text{ fps.}$ velocity is less than 2.0 fps so there should be no erosion.

This flow will discharge into Mitro at the north and south ends and at a point in between. Area 2 discharges at the point in between. The slope is $(93.2 - 91.1) / 50 = 0.0362$

By Manning's Equation, (HP41CV Program V-DITCH), The cross section of the unpaved swale shown below has a capacity of 1.02 cfs.



$V = 2.17 \text{ fps}$ (Assuming $n = 0.08$) No paving required.

B. OFF-SITE AREA 2

The flow from this area is only 0.51 cfs. Therefore, the section between the garden wall and retaining wall previously determined for Off-site Area 1 is adequate.

The flow will be turned west at the N.W. corner of the site and be carried to Mitro Drive

in an unpaved swale with the same dimensions as shown for Off-site Area 1. above. The slope of the swale is $(94.4 - 91.2) / 60 = 0.06$ feet per foot.

A flow depth of 2 inches, 10:1 side slopes and a slope of 0.06% will carry 0.68 cfs > 0.51

For a flow of 0.68 the cross sectional area of flow is $2(0.17 \times 1.67) / 2 = 0.28$ cfs. $Q = AV$ or $V = Q/A$.

Velocity = $0.68 / 0.28 = 2.43$ feet per second

No paving is required.

C. FLOW IN STREETS

The flow quantity, depth and velocity are shown in Figure 4. For streets with City Standard Mountable Curb, Roll Type, flow depth and velocity are determined by the nomograph in Appendix A.

X. OUTFALL CHANNEL

The total combined off-site and on-site drainage is proposed

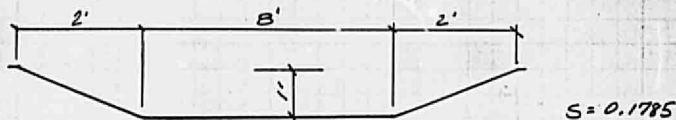
to discharge from the site near the southwest corner of the property. There is an existing concrete structure that directs the flow into the concrete-lined channel of Piedra Lisa drainage facility. The cross-section of the entrance channel is rectangular adjacent the Piedra Lisa channel and transitions to a trapezoidal section at 14 feet from the Piedra Lisa channel. It is proposed to connect this structure to Encino by means of a 10-foot wide, 6-inch deep concrete channel.

The total discharge for which this structure must be designed is 22.71 cfs. The slope is $(76.0 - 72.3)/40 = 0.0925$ ft/ft.

At this slope and flow, a 10-foot wide channel with a depth of 0.22 feet will carry 23.47 cfs > 22.71 cfs.

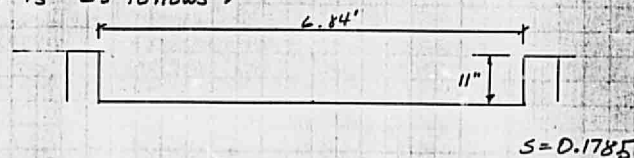
The above calculation is performed by HP41CV program FB (Flat bottomed) ditch. Therefore, a 6-inch deep channel will have adequate capacity.

The trapezoidal portion of the existing rundown has the dimensions shown below:



For a depth of flow of 0.2 feet, the discharge for the above section and slope is 23.15 cfs > 22.71 cfs.

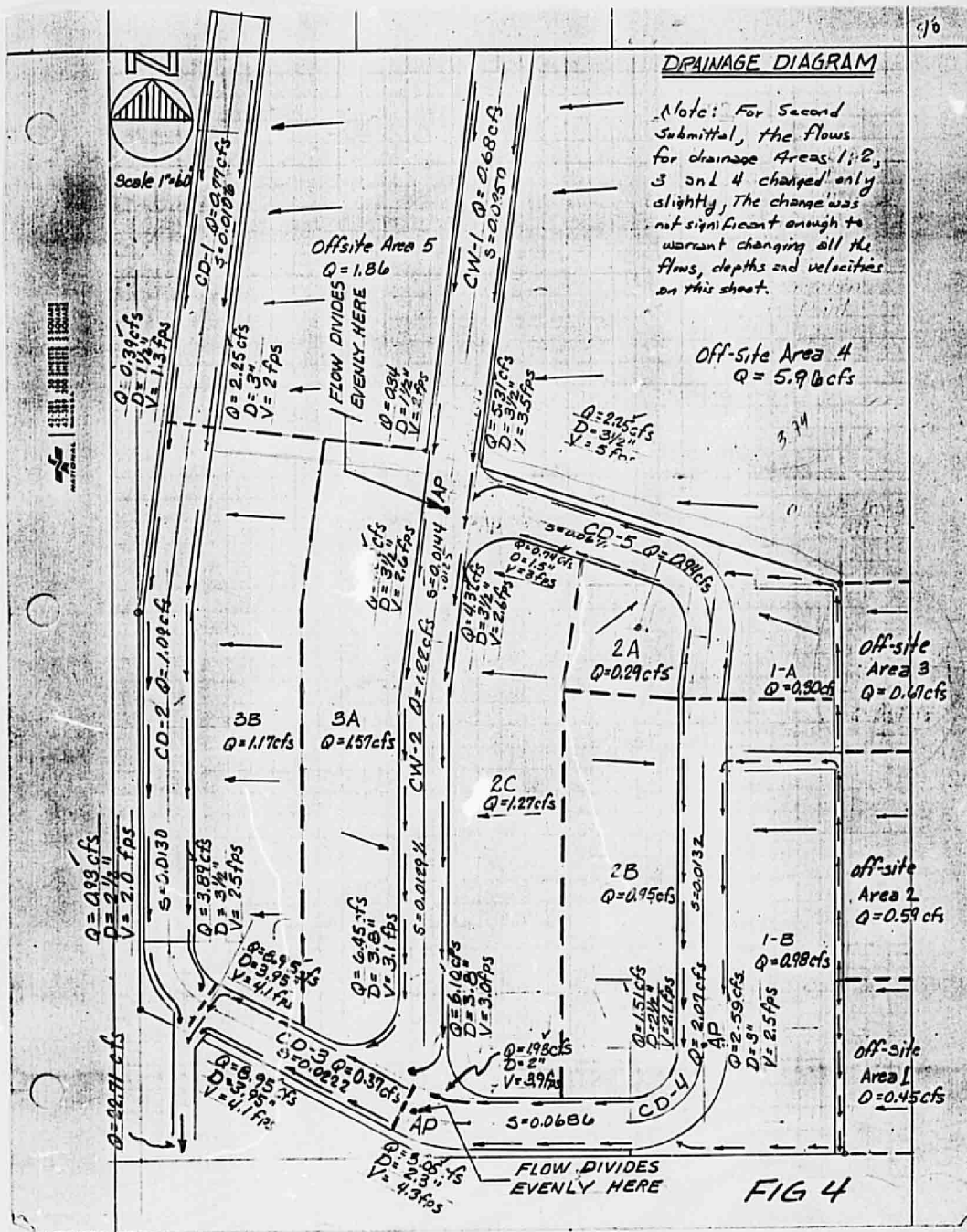
The section of the rundown nearest the Piedra Lisa Channel is as follows:



If the flow depth in the above section is 3 inches, the discharge would be 27.09 cfs > 22.71; Therefore, the existing rundown is adequate.

XI CONCLUSION

The drainage from the site can discharge freely into Piedra Lisa. None of the proposed drainage easements or street street sections will have their capacity exceeded by the 100-year storm runoff.

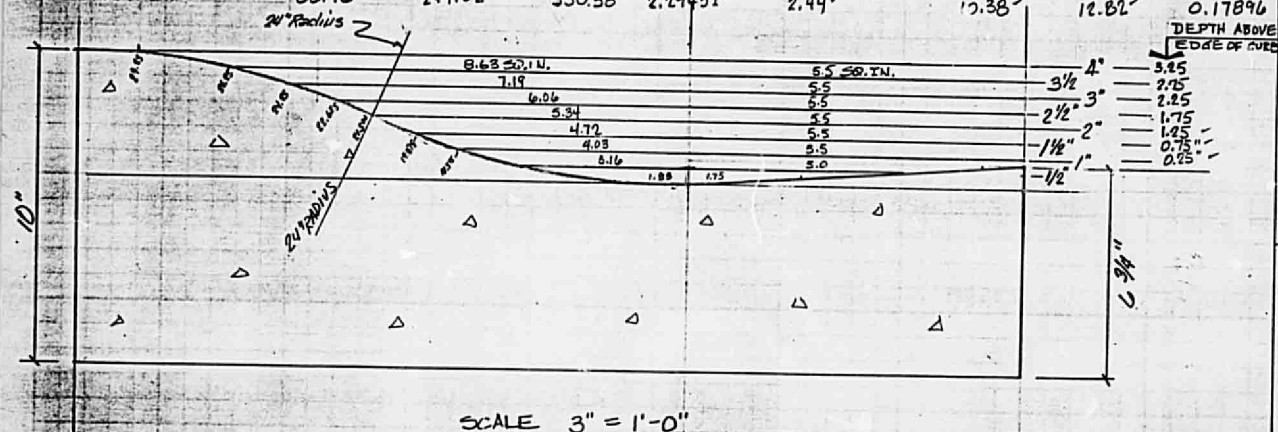


APPENDIX A

DEVELOPMENT OF NOMOGRAPH
FOR ROLLED CURB

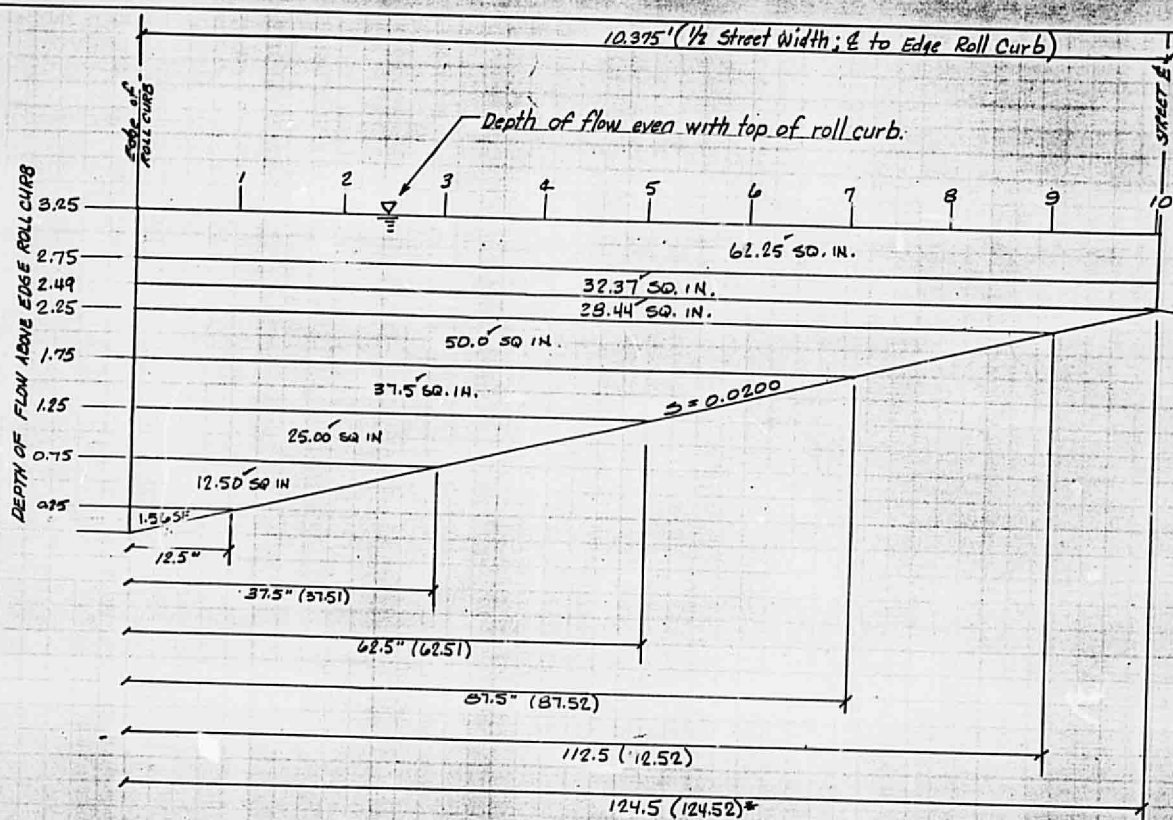
CITY OF ALBUQUERQUE STANDARD MOUNTABLE CURB-ROLL TYPE
DATA RELATIVE TO AREA AND WETTED PERIMETER FOR VARIOUS DEPTHS OF FLOWS

DEPTH OF FLOW IN GUTTER	CROSS SECTIONAL AREA AT THE PARTICULAR DEPTH LISTED (A)				WETTED PERIMETER FOR THE DEPTH LISTED (P)			HYDRAULIC RADIUS, R = $\frac{A}{P}$ (FEET)
	AREA ABOVE CURB (SQ. IN.)	AREA ABOVE ASPHALT (SQ. IN.)	TOTAL AREA OF FLOW SQ. IN.	SO FT.	PERIMETER ALONG CURB (FEET)	PERIMETER ALONG ASPH. PAVING (FEET)	TOTAL (FEET)	
1/2 INCH	3.63	-	3.63	0.02521	1.03	-	1.03	0.02448
1 "	11.79	1.56	13.35	0.09271	1.53	1.04	2.57	0.03607
1 1/2 "	21.32	14.06	35.38	0.24569	1.66	3.13	4.79	0.05129
2 "	31.54	39.06	70.60	0.49028	1.79	5.21	7.00	0.07004
2 1/2 "	42.38	76.56	118.94	0.82597	1.89	7.29	9.18	0.08997
3 "	53.94	146.56	180.50	1.25347	2.02	9.38	11.40	0.10995
3 1/2 "	66.63	187.37	254.00	1.76389	2.19	10.38	12.57	0.14033
4 "	80.76	249.62	330.38	2.29431	2.44	12.38	12.82	0.17896





330 300 200 100 0



* HORIZ. DIST (SLOPE DIST.)

CAPACITY OF STREET WITH ROLL CURB

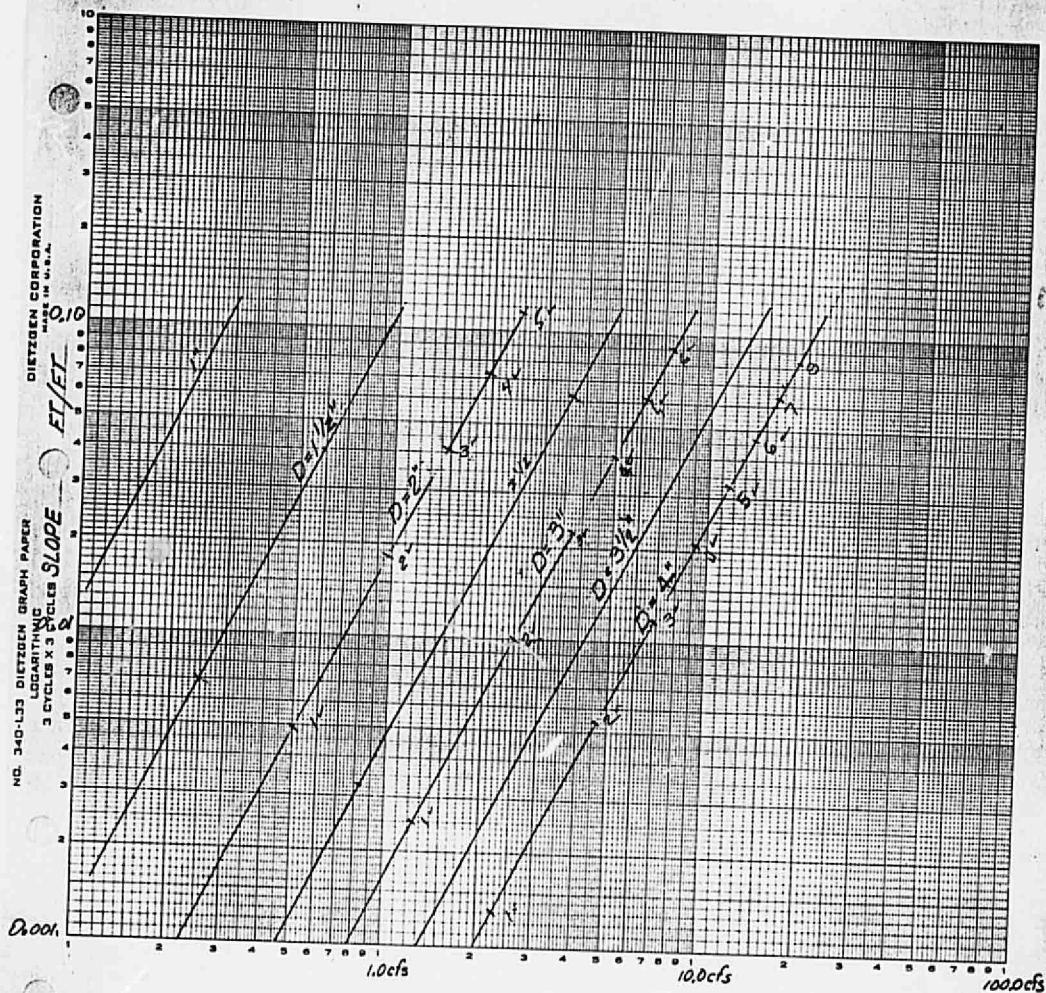
By Mannings Equation :

$$Q = (A) \frac{1.486}{n} R^{2/3} S^{1/2}$$

HP-41 CV Program to solve the above equation.

01	LBL [A] ROLCURB [A]	
02	[A] R [A] ? [A]	
03	XEC [A] PROMPT [A]	PROMPTS FOR HYDRAULIC RADIUS - STORES IN REG 00
04	STO 00	
05	[A] S [A] ? [A]	
06	XEC [A] PROMPT [A]	PROMPTS FOR SLOPE - STORES IN REG 01
07	STO 01	
08	[A] N [A] ? [A]	
09	XEC [A] PROMPT [A]	PROMPTS FOR Mannings Coeff. - Stores in Reg 02
10	STO 02	
11	[A] A [A] ? [A]	
12	XEC [A] PROMPT [A]	PROMPTS FOR AREA - STORES IN REG 03
13	STO 03	
14	1.486	
15	RCL 02	
16	[÷]	Computes 1.486/n
17	RCL 00	
18	2	
19	ENTER	
20	3	
21	[÷]	
22	[x]	Computes $R^{2/3}$ and multiplies it by the above (ie. $\frac{1.486}{n} R^{2/3}$)
23	X	
24	RCL 01	
25	[x]	
26	X	Computes $S^{1/2}$ and gives $\frac{1.486}{n} R^{2/3} S^{1/2}$
27	RCL 03	
28	X	Computes $(A) \frac{1.486}{n} R^{2/3} S^{1/2}$
29	XEC [A] PSE [A]	PAUSES TO DISPLAY Q.
30	XEC [A] PSE [A]	
31	STO 04	
32	RCL 03	
33	[÷]	computes velocity.
34	STO 05	

NOMOGRAPH FOR ROLLED CURB
 26' WIDE STREET (BACK CURB)
 $N = 0.017$



APPENDIX B

DRAINAGE CALCULATIONS

FOR

TRACT A-2

Area of Site = 0.538 Ac.

Existing Condition:

$$L = 230 \text{ LF}$$

$$H_2 - H_1 = 27 - 21 = 6.0$$

$$S_{\text{avg.}} = \frac{6.0}{230} = 0.026087$$

$$T_c = \frac{0.00015}{0.0018} \cdot \frac{0.77}{0.008} \quad (\text{Kirch Equation})$$

$$T_c = 0.035 \text{ hrs.} = 2.09 \text{ min.}$$

into swales and

Therefore $T_c = 10 \text{ min.}$ will be used herein

ion joint.

$$i_{100} = \frac{189}{T_c + 35} = 5.4 \text{ in/hr}$$

$$C = 0.40 \text{ (assumed)}$$

$$Q_{100} = CIA \text{ (Rational Formula)}$$

$$Q_{100} = 0.40 (5.4) (0.556 \text{ Ac}) = \underline{1.20 \text{ cfs}}$$

$$\text{Volume}_{100} = 0.40 \left(\frac{2.3}{12} \right) (0.556) (43560)$$

$$V_{100} = 1456.3 \text{ cf}$$

Developed Condition:

$$\text{Impervious area} = 0.270 \text{ Ac} \quad (C = 0.95)$$

$$\text{Pervious area} = 0.268 \text{ Ac} \quad (C = 0.40)$$

$$\text{Composite 'C'} = \frac{0.27}{0.538} (0.95) + \frac{0.268}{0.538} (0.40) = 0.62$$

$$Q_{100} = 0.62 (5.4) (0.556) = \underline{1.86 \text{ cfs}}$$

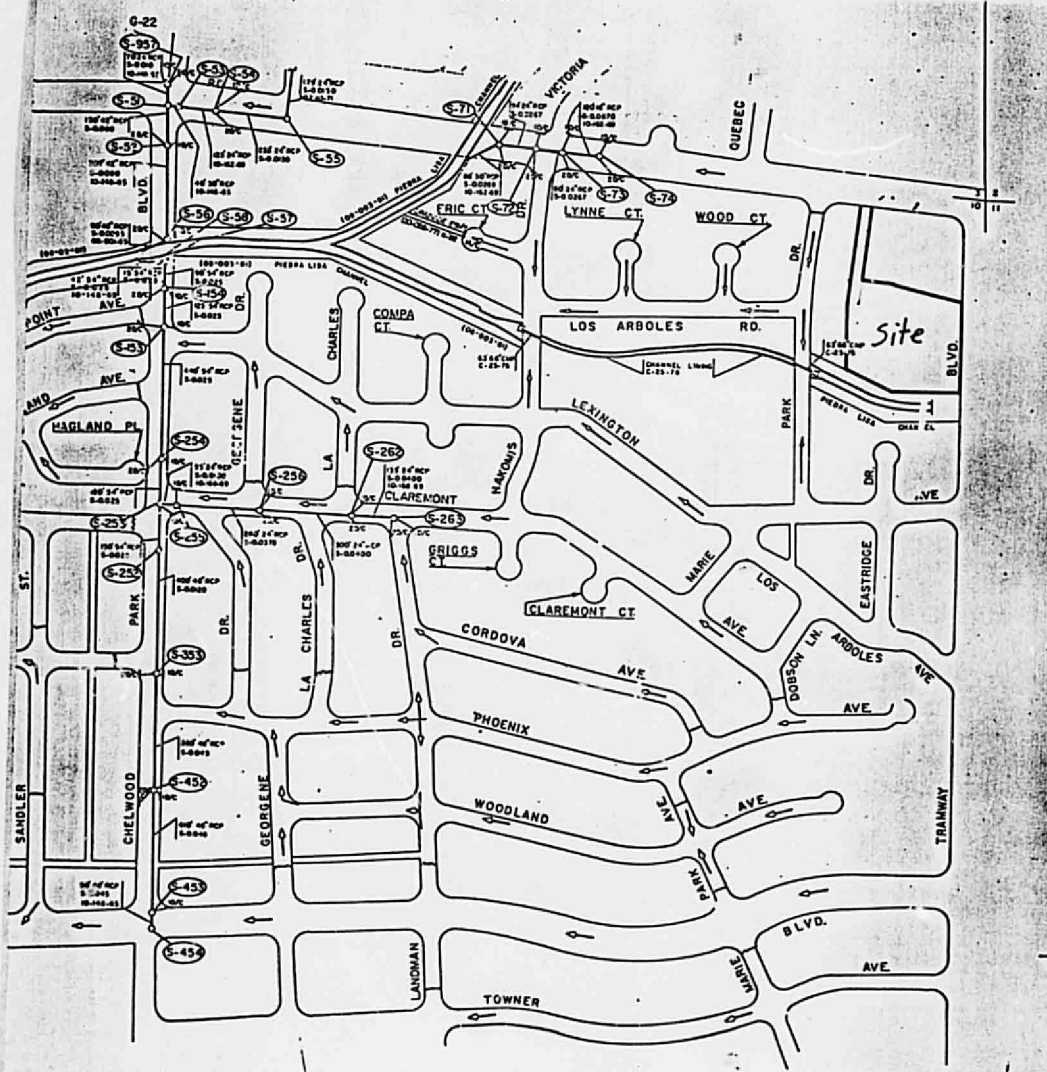
$$\text{Volume}_{100} = 0.62 \left(\frac{2.3}{12} \right) (0.556) (43560) =$$
$$2,875.1 \text{ cf}$$

$$V_2 = 1000 \left(\frac{0.95}{0.62} \right) = 2875.1 \left(\frac{0.95}{0.62} \right) = 1126.2 \text{ cf}$$

Comparison:

$$\Delta Q_{100} = 1.86 - 1.20 = 0.46 \text{ cfs}$$

$$\Delta V_{100} = 2875.1 - 1456.3 = 1418.8$$



NEXT SHEET No. J-22 N

LEGEND		NOTES		REVISIONS		MAP
—	STORM SEWER LINE	1. MANHOLE IDENTIFICATION REQUIRES BOTH THE MAP GRID & MANHOLE No. 2. MANHOLE NUMBERS CARRIED FROM ADJACENT MAPS HAVE THE MAP GRID SHOWN.		DATE	REMARKS	14-2
○	MANHOLE					
○	MANHOLE NUMBER					
□	STRAIN INLET					

DRAINAGE FACILITY