HYDROLOGY F19/D1 FIVE PLANS

F19/D1

5 Plans

drainage file

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
Harry E. Kinney

CHIEF
ADMINISTRATIVE OFFICER
Frank A. Kleinhenz

May 31, 1977

See Reading File

The Muchmore Corporation
3240 Juan Tabo Blvd., N.E.
Albuquerque, New Mexico 87111

Re: Lot 28, Unit 2, American Heritage North

Dear Mr. Davis:

In reply to your recent letter regarding the above mentioned lot, please be advised that according to the determination by the flood insurance agency, the said property is inside the 100-year area.

If we can be of any further assistance, please do not hesitate to contact us.

Very truly yours,

Bruno Conegliano

Bruno Conegliano
Assistant City Engineer-Hydrology

BC/kr

1. American Heritage North Unit 2

Correpondence

1. From Richard L. Bock (Home planning Development Company Inc.) to Mr. V M. Kimmick · City Engineer Sept. 14, 1976 improvement of the "Bear Canyon arroyo Tributary
2. From Bill Wade (Best Western Realty Inc.) to Mr. Kleston Law with holding of Building permits on Tract-1-A and Tract-1-C till a satisfactory drainage plan is submitted Oct. 4, 1976

3. From Mr Phil Garcia (Principal Planner) to Mr G. John McMahan (Centennial Homes, Inc.) request for variance from the provisions of the Sidewalk Ordinance for Lot 27 & 28 Replat of American Heritage North (approved) June 17, 1976

4. From Mr G John McMahan (Centennial Home Inc.) to Mr. Phil Garcia (Planning Department) asking for a variance from the Sidewalk ordinance on Lots 27 & 28 Replat of American Heritage North June 17, 1976

5. From Richard L. Bock (Home Planning Development Company Inc.) to City of Albuquerque Bear Canyon Arroyo Tributary R.R. Rutledge Development Corporation agrees to maintain above drainage channel until subsequent development occurs. December 10, 1975

6. From Rutledge Development Corporation to City of Albuquerque advice the Rutledge Development Corporation is the owner of American Heritage North Unit 2 December 9, 1975

7. From Bruno Conegliano (Assistant City Engineer Hydrology) to The Muchmore Corporation Lot 28, unit 2 American Heritage North is within the 100 flood zone.

8. From Muchmore Corporation (Mr Davis) to Mr. Vern Kimmick (Engineering Division) asking that Mr. Kimmick write Sandia Savings a letter stating that Lot 28 of American Heritage North Unit 2

is outside the 100 flood zone May 16th, 1977

9. From Kleston H. Laws (City Engineers office) to Mr. Bill Wade (Best Western Realty Inc.) foundation permit obtained for 5341 Wyoming N.E. on Sept 30, 1976, Building permit for Tract B-1-B, no other permits will be approved for other tracts until the arroyo improvement plans and contract are approved by the City Oct 5, 1976

10. From R.W. Blair to W.T. Stevens reference Drainage study for American Heritage North Subdivision 5-16-69 and 4-21-69

11. From Kleston Laws (City Engineers office) to Mr John Bettis (Enchantment Engineering) American Heritage North Bear Tributary Channel not in agreement with the hydraulic calculations on the proposed drops, may wish to consider other alternatives.

Maps

1. Preliminary plat American Heritage North

2 Proposed Drop Structure

3. Topo Map and Drainage in Undeveloped State

the Muchmore corporation

May 16th, 1977

RECEIVED
MAY 18 1977
CITY ENGINEERS

Mr. Vern Kimmick,
City of Albuquerque - Engineering Division,
400 Marquette Avenue, N.W.,
Albuquerque, N.M. #87102.

Dear Mr. Kimmick,

I talked to you May 11th relative to a determination of a flood control zone. Mr. Ralph Melbourne of Sandia Savings has indicated that he would accept a statement from the City Engineering office, that a particular lot is outside the flood control zone.

The lot in question is Lot 28, American Heritage North Unit 2.

An engineering study by Chambers-Campbell-Isaacson-Chaplin, Incorporated titled "A Drainage Study for American Heritage North Subdivision Unit 2 and approved June 5, 1974, by John Robert", covers the lot in question.

Would your office kindly provide a statement to Sandia Savings, stating that Lot 28 is outside the Flood Hazard Boundary? Your assistance is greatly appreciated.

Sincerely,

Andy Davis

ANDY DAVIS
Associate Broker.

Bruno —

AD/vg.

3240 Juan Tabo Blvd., NE • Albuquerque, New Mexico 87111 • (505) 298-7531

Best Western Realty Inc.
6921 MONTGOMERY N.E. ■ ALBUQUERQUE, NEW MEXICO 87109
BILL WADE
BUS. (505) 293-3535
RES. (505) 296-8594

October 4, 1976

Kleston Laws
Dept. of Engineering
City of Albuquerque,
Albuquerque, NM

Dear Kleston:

In accordance to our conversation Friday, October 1, 1976, I would like to formally purpose that building permits for TRACTB-1-A and TRACTB-1-C be withheld until a satisfactory drainage plan is submitted and an AHBA contract is signed. The purposed drainage plans should be comprable to the one previously submitted but with details on the purposed drop structure.

This agreement will enable Ellen Fitzpatrick and partners to begin construction on their purposed medical complex to be located on TRACT B-1-B. Also I will grant drainage across B-1-C from B-1-B. The drainage plan shall be consistant to a plan to drain both B-1-C and B-1-B into Bear Canyon Tributary.

Thank you,

Bill Wade

Bill Wade

home planning development co.
2900 Louisiana Blvd., N.E. Suite 210
Albuquerque, New Mexico 87110
Phone 505-296-5451

Kles —

RECEIVED
SEP 14 1976
CITY ENGINEERS

September 14, 1976

Mr. V.M. Kimmick - City Engineer
City of Albuquerque
400 Marquette N.W.
Albuquerque, New Mexico

Dear Mr. Kimmick:

Please find attached an agreement from William C. Wade on the improvement of the "Bear Canyon Arroya Tributary" through land west of Wyoming and along the "Albuquerque Board of Education Tract 22 (Tract B-1).

Mr. Wade has purchased the north portion of this tract and is now responsible for approximately one-half of the improvement of the channel.

Attached is a drawing which shows approximately what Wade has acquired.

Yours truly,
HOME PLANNING DEVELOPMENT COMPANY, INC.

Richard L. Bock

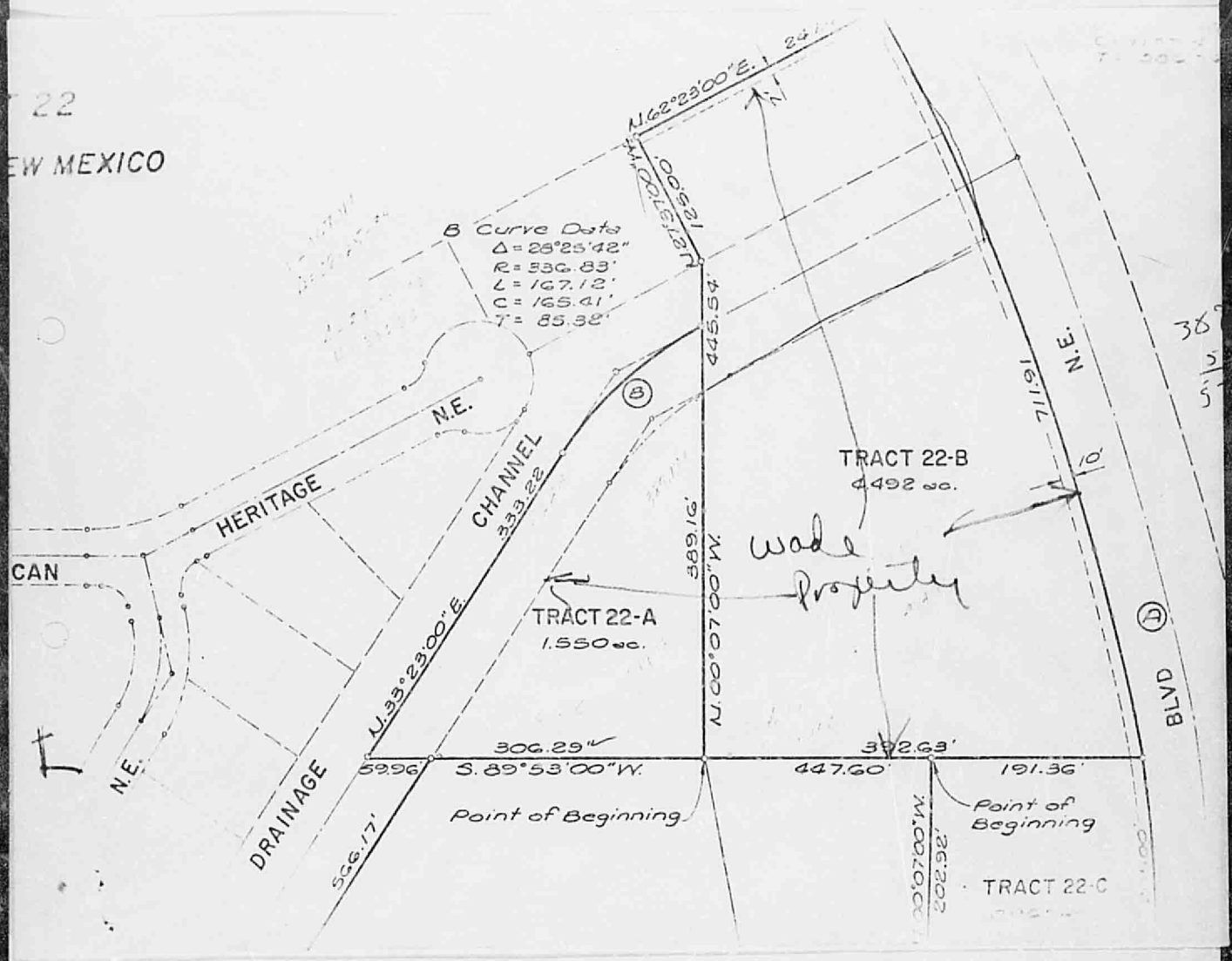
Richard L. Bock
Executive Vice President

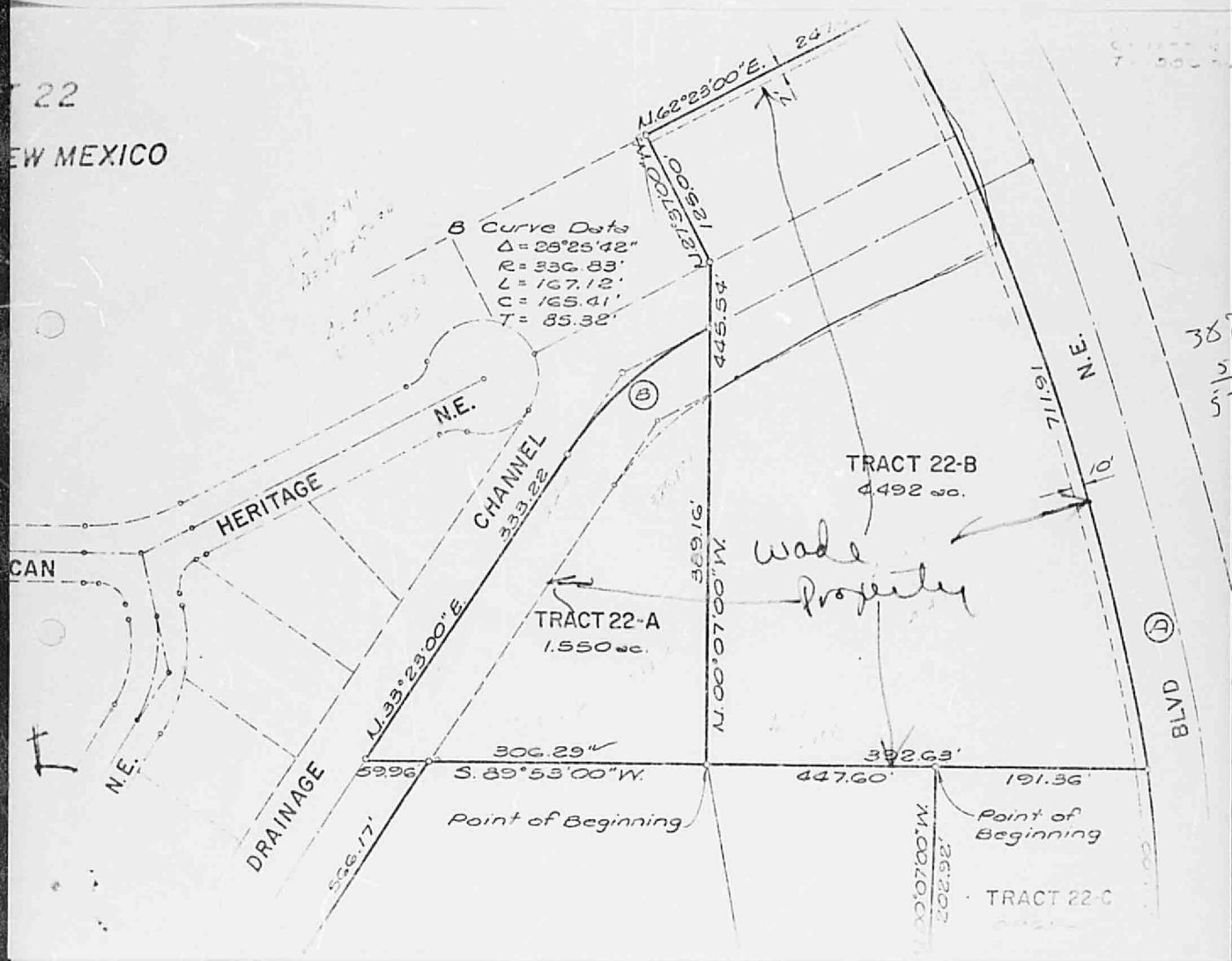
RLB/ges

Enc. 1

cc: Mr. Cleston Laws
City of Albuquerque

homes with the ACCENT on individuality


22
EW MEXICO
CAN
N.E.
HERITAGE
N.E.
DRAINAGE
CHANNEL
333.22
N.35°23'00"E.
566.17'
B Curve Data
Δ = 28°25'42"
R = 336.83'
L = 167.12'
C = 165.41'
T = 85.32'
B
N.62°23'00"E.
24
N.21°31'00"W.
125.00
445.54'
389.16'
N.00°07'00"W.
TRACT 22-A
1.550 ac.
TRACT 22-B
4.492 ac.
Wade Property
716.91'
N.E.
10'
D
BLVD
306.29'
392.63'
59.96'
S.89°53'00"W.
447.60'
191.36'
Point of Beginning
Point of Beginning
202.92'
TRACT 22-C


22
EW MEXICO
B Curve Data
Δ = 28°25'42"
R = 336.83'
L = 167.12'
C = 165.41'
T = 85.32'
N.62°23'00"E.
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125.00'
445.54'
N.E.
HERITAGE
CHANNEL
333.22
N.33°23'00"E.
TRACT 22-B
4.492 ac.
TRACT 22-A
1.550 ac.
Wade Property
389.16'
N.00°07'00"W.
711.91
10'
BLVD
CAN
N.E.
DRAINAGE
306.29'
53.96
S.89°53'00"W.
Point of Beginning
566.17'
447.60'
392.63'
191.36'
Point of Beginning
N.00°07'00"W.
326.02'
TRACT 22-C

June 10, 1976

City of Albuquerque
City Hall
400 Marquette Avenue, N.W.
Albuquerque, New Mexico 87102

Re: BEAR CANYON ARROYO TRIBUTARY

Gentlemen:

We have purchased under two Real Estate Contracts a portion of Tract lettered "A" of ALBUQUERQUE BOARD OF EDUCATION TRACT NO. 22, which has been redesignated Tract 22-A, containing approximately 1.5498 acres, more or less, and a portion of Tract lettered "B" of ALBUQUERQUE BOARD OF EDUCATION TRACT NO. 22, containing 4.491 acres, more or less. Contiguous to Tract 22-A on the West is a portion of the Drainage Channel, a part of which Drainage Channel is included within Tract 22-A, which we understand HOME PLANNING DEVELOPMENT COMPANY, INC., has agreed to develop according to a drainage construction plan acceptable to you and to the ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY, to which reference is made in HOME PLANNING's letter to you of December 10, 1975, a copy of which is attached. The Drainage Channel crosses our 4.491-acre tract.

As a part of the consideration for our purchase of Tract 22-A, we have agreed to assume all liens, assessments, and charges, now existing and hereafter arising, relating to the Drainage Channel, and including those arising in connection with the future development of the Drainage Channel, both to the City of Albuquerque and to the ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY, as to (1) that part of the Drainage Channel which abutts our property on the West, (2) that part of the Drainage Channel which is included within the westerly portion of our Tract 22-A property, and (3) that part of the Drainage Channel which is included within our 4.491-acre tract; and we have agreed to protect, defend, save harmless, and indemnify HOME PLANNING DEVELOPMENT COMPANY, INC., and Shirley C. Leslie, a widow, from any and all liability in connection therewith.

The purpose of this letter is to advise you of our purchase of these two parcels and of our assumption of all obligations relating to that part of the Drainage Channel which is included within our property and as to that part which abutts our property on the West, including the future development of the Drainage Channel. Please rely upon this letter as relieving HOME PLANNING DEVELOPMENT COMPANY, INC., and Shirley C. Leslie, a widow, from any further liability with respect to the development of the Drainage Channel within or abutting our two tracts.

Very truly yours,

William C. Wade

William C. Wade

Barbara A. Wade

Barbara A. Wade

On this 16th. day of June, 1976 before me appeared William C. Wade and Barbara A. Wade, his wife.

My commission expires: 3/10/77

Notary Public

home planning development co.
shirley leslie pres
richard l. bock exec v.p.

December 10, 1975

City of Albuquerque
400 Marquette N.W.
Albuquerque, New Mexico

Gentlemen:

This is concerning the drainage channel known as the "Bear Canyon Arroyo Tributary", further described as that portion of the said drainage channel that is adjacent to American Heritage North #2 Subdivision and our tract B-1 of approximately 13.109 acres located in Tract 22 Summary Plat.

We advise that the above said drainage channel will be developed according to an acceptable drainage construction plan at the time said tract B-1 is developed into a commercial Park.

Attached is an agreement executed by R. R. Rutledge. Rutledge Development Corporation, whereby Rutledge agrees to maintain above drainage channel until the subsequent development occurs.

Yours truly,

HOME PLANNING DEVELOPMENT COMPANY, INC.

Richard L. Bock

Richard L. Bock
Executive Vice President

RLB/mt

Rutledge Development Corporation

3240-B JUAN TABO BLVD. NE • P.O. BOX 14129 • ALBUQUERQUE, N.M. 87111 • (505) 294-5084

December 9, 1975

City of Albuquerque
Albuquerque, New Mexico

Gentlemen:

This is to advise that Rutledge Development Corporation is the owner of American Heritage North #2 Subdivision and that we do hereby agree to maintain the drainage easement adjacent to the East of said subdivision until such time as Home Planning and Development Co., the owner of the land to the East, developes this land and completes the construction of the drainage easement.

Very truly yours,

RUTLEDGE DEVELOPMENT CORPORATION

R. R. Rutledge, President

A

DRAINAGE STUDY

FOR

AMERICAN HERITAGE NORTH SUBDIVISION

UNIT 2

A

DRAINAGE STUDY

FOR

AMERICAN HERITAGE NORTH SUBDIVISION

UNIT NO. 2

PREPARED BY:

CHAMBERS, CAMPBELL, ISAACSON & CHAPLIN, INC.
3500 INDIAN SCHOOL ROAD, N.E.
ALBUQUERQUE, NEW MEXICO 87106

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FIGURE I	LOCATION & DRAINAGE MAP
FIGURE II	LOCATION & DRAINAGE MAP Scale 1" = 2000'
FIGURE III	LOCATION & DRAINAGE MAP Plat F-19
FIGURE IV	TOPO MAP AND DRAINAGE IN UNDEVELOPED STATE
FIGURE V	TOPO MAP AND DRAINAGE IN DEVELOPED STATE
FIGURE VI	TYPICAL LOT DRAINAGE PLAT
FIGURE VII	TIME OF CONCENTRATION OF SWALE BASINS
FIGURE VIII	INTENSITY - DURATION FREQUENCY CURVE

BIBLIOGRAPHY OF REFERENCES

PURPOSE

The purpose of this report is threefold - to determine the drainage characteristics of the subject property in its undeveloped condition, analyze the internal flows in its developed state with recommendations for compliance to the Albuquerque Metropolitan Arroyo Flood Control Authority's (A.M.A.F.C.A.) requirements, and make recommendations for positive drainage channel control to safeguard the subdivision.

INTRODUCTION

The subject property, an R-1 development, is located in the Northeast Heights of Albuquerque, west of Wyoming Boulevard N.E., and in the immediate vicinity of the Arroyo Del Oso Golf Course. (See Figure III).

The overall site is characterized by gentle rolling topography which slopes to the west-southwest. The property is bordered on the north by an existing subdivision and on the east by a well-defined drainage tributary which flows into the Bear Canyon Arroyo. Precipitation falling on this site appears to form into sheet flow with general accumulation in the valleys of the slopes before it is discharged into the downstream drainage system. The northern portion of the site, with no erosion of its top slopes evident, is isolated from any offsite drainage. The southern portion of the site, with erosion from the overflow of the Bear Canyon Tributary evident,

while not affected by low runoff rates, is affected during a 100 year storm. The upper limits of this design flow crosses the southern portion of the site as shown in Figure IV. Because this flow would endanger certain lots, positive steps should be taken to (1) raise the lots in the overflow area, and (2) provide positive control of the channel to the exit point at Spain Road, N.E.

In the following pages, design data will be presented to verify the conclusion that runoff flows after development will not exceed runoff conditions before development.

DESIGN CRITERIA

In analyzing the storm runoff, the Rational Formula, Q = CIA, was used. Where:

Q = Runoff quantity in cubic feet/second

A = Contributing area in acres

I = Intensity in inches/hour for a duration equal to the time of accumulation (duration) measured in minutes and obtained from Chart 1, Appendix A, the "Master Plan of Drainage, City of Albuquerque, New Mexico" by Herkenhoff & Associates. (Note: where a Time of Concentration [Tc] is less than ten minutes from Figure V, the Intensity valve equal to ten minutes was used as shown on the curve for a 100 year storm

in Figure VI.)

C = Runoff Coefficient (No Unit)

Quantities of runoff were computed on a 100 year storm frequency for both the undeveloped condition and the proposed final developed form.

PHASE I

Phase I consists of analyzing the site in the undeveloped form, considering internal flows originating within the boundary. The resulting flows are separated into two drainage patterns, A-1 and A-2. (See Figure IV). Area A-2 runoff has the characteristics of sheet flow with general accumulation in the valleys of the slopes. This runoff discharges immediately into the Bear Canyon Arroyo, which lies south of Spain Road. The overflow from the Bear Canyon Tributary was not considered here, but will be dealt with later in regard to the recommendations concerning positive channel control. The runoff from Area A-1 is also characterized by sheet flow with general accumulation into natural swales. This flow leaves the site at the intersection of Knight Road and American Heritage Drive N.E. and flows to the west, to intercept the Bear Canyon Arroyo further downstream.

The runoff coefficient used for undeveloped areas - 0.45.[1]

1. Table XII, Master Plan of Drainage, City of Albuquerque, New Mexico and Environs, 1963, G. Herkenhoff & Associates.

TABULATION OF RESULTS - PHASE I

DRAINAGE BASIN	ELEV. DIFF. FEET	LENGTH OF FLOW FEET	Tc.* MIN.		I "/Hr.	R NO UNIT	AREA ACRES	Q CFS
A-1	30'	1,100	7	Use 10	5.4	0.45	4.59	11.15
A-2	46.6'	1,250	6.8		5.4	0.45	11.69	28.41

*From Figure VII

PHASE II

Phase II consists of analyzing the site in its developed form. Only internal flows were considered in this phase. The resulting runoff flows and area contributing to this runoff are shown for each area on Figure V.

As with any area of land, when development occurs, runoff increases due to the increased area of impervious surfaces. To reduce the demand on the downstream facilities, one alternative of A.M.A.F.C.A. requires that the runoff rate from the developed tract does not exceed the runoff rate from the tract in its natural state. One way to achieve this is by utilizing on-site ponding.

The ponding areas incorporated into this design include the backyard and the side yards, starting at the middle of the house and sloping to the rear. Because the majority of houses built today utilize pitch roof design, the assumption was made that one half the roof area flows to the rear yard while the other half flows to the front.

In this design, it was desirable to develop a composite runoff coefficient based on the percentage of different types

of surface in the drainage area. This procedure was applied to a typical "sample" block to arrive at a reasonable value of the coefficient for the non-ponding areas. The runoff coefficients used are as follows:[1]

Streets, Walks and Drives	R = 0.90
Roofs	R = 0.90
Lawns, Sandy Soils Avg., 2 to 7% slope	R = 0.15

Because the above values are only applicable for storms of five to ten year frequencies, the Rational Formula can be adjusted by a frequency factor C_f, which is used to account for antecedent precipitation conditions. A C_f factor of 1.25 for a 100 recurrence interval was used and this adjustment was reflected in the composite runoff coefficient.[2] (See Calculation Sheet).

TABULATION OF RESULTS - PHASE II

DRAINAGE BASIN	ELEV. DIFF. FEET	LENGTH OF FLOW FEET	Tc. MIN.	I "/Hr.	R NO UNIT	AREA ACRES	Q CFS
A	34	1,400	8.5	5.4	0.74	2.22	8.87
B	30	850	5.1	5.4	0.74	2.33	9.31
C	25	800	5.1	5.4	0.74	2.10	8.39
D	25	700	4.3	5.4	0.74	1.83	7.31
E	8	310	2.7	5.4	0.74	0.43	1.72
F	6	185	1.6	5.4	0.74	0.32	1.28
PT. I	34	1,400	8.5	5.4	0.74	2.65	10.59
PT. II	40	1,250	7.2	5.4	0.74	6.58	26.29
					TOTAL FOR SITE		36.88

Use 10

1. Table 3-2, Urban Storm Drainage Criteria Manual, Volume I, Denver Regional Council of Governments.

2. Section 3.7 and Table 3-3 Urban Storm Drainage Criteria Manual, Volume I, Denver Regional Council of Governments.

SUMMARY OF RESULTS

1. Runoff before development

Area A-1 = 11.15

Area A-2 = 28.41

TOTAL = 39.56 cfs

2. Runoff after development from non-ponded areas = 36.88

Therefore, summing total runoff rates under developed conditions vs undeveloped conditions, the net result is a reduction of the runoff rate by 2.68 cfs.

DRAINAGE CHANNEL CRITERIA

The peak flow at the intersection of the Drainage Channel and Spain Road is 1336 cfs[1] under existing conditions. When upstream development occurs in accordance with this master plan, the peak flow at this point will be 850 cfs.[1] But for this design, existing conditions prevail. The natural slope of the channel bordering the site is approximately 2.5%. In order to leave the channel in a soft-bottom state, this slope will have to be flattened to 0.77% to prevent erosion. This can best be accomplished by the use of drop structures, such as rock "gabions". These structure locations are shown on

---

1. From design by Rice Engineering - Preliminary Master Plan of Drainage for the Northeast Heights of Albuquerque.

Figure V.

RECOMMENDATIONS

The following recommendations are made to enable the Developer of this site and the Local Government to complete this project within the design framework stated above:

1. The ponding areas in each back yard would be best situated toward the rear of the yard. There should be a minimum of a 5 foot buffer zone between the rear property lines and the edge of the pond in order to protect any fences which might be constructed. In no case should the ponded waters be allowed to stand against the fence.
2. The ponds should average 6 inches deep and the minimum surface area should not be less than 30% of the total area drained into the pond.
3. There is a 5 to 8 foot difference in elevation between the east bank of the site and the drainage channel, at the northern half of the site. Positive steps should be taken to stabilize the back yard areas adjacent to the drainage channel in this area. This can take the form of a retaining wall on the east property line, rock rip-rap on the channel slope, or a maintained grass stabilized slope.

4. The southern area of the site bordering the channel does not have adequate freeboard to prevent flooding by the channel in a 100 year design state. There should be a minimum of 4 feet difference in elevation between the lots bordering the channel and the flow line of the channel in this overflow area. The remaining lots in the overflow area should be raised approximately 2 feet to provide positive drainage and a buffer zone from any drainage conditions which might develop south of Spain Road.

5. The entire length of the channel, starting at Wyoming Boulevard and extending to Spain Road, should be sloped and stabilized according to the design requirements set forth in this report. (See Calculation Sheet for channel shape and slope.)

6. Where Spain Road is concerned, small flows can best be passed under the road by the installation of a 24" CMP. The road should be dipped across the drainage channel area to act as a spillway for larger flows. By utilizing a combination of a pipe and a dip section, the cost at this crossing can be kept to a minimum and the road can be used more fully as an "all weather" road.

SUMMARY

The subject property, by utilizing back yard ponding, will contribute less internal runoff to surrounding areas than that which existed before development. In addition, the bulk of the runoff which does depart the site enters the Bear Canyon Arroyo directly without congesting any downstream facilities. Furthermore, the Bear Canyon Tributary will be able to accomodate all flows safely and return these flows to the Bear Canyon Arroyo without jeopardizing the subdivision.

In conclusion, the development of this site should have a beneficial effect on the drainage characteristics of this area.

REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR NO. 3895 NEW MEXICO THOMAS O. ISAACSON

Respectfully submitted,

CHAMBERS, CAMPBELL,
ISAACSON & CHAPLIN, INC.

Thomas O. Isaacson

Thomas O. Isaacson
Registered New Mexico
L.S. & P.E. #3895

TOI:dd

CALCULATIONS FOR RATIONAL FORMULA

1. Sample calculation for Rational Formula Q = CIA

   Sectic A - where

   H = height above most remote point above outlet

   = 34' (based upon estimated development grades)

   L = distance most remote point

   = 1400'

   Tc= 8.5 min. (use 10 min.) - Figure V

   $I = \frac{189}{T+25}$ for 100 year storm = $\frac{189}{35}$ = 5.4"/Hr. (Figure VI)

   C = 0.74 (from composite calculations) no unit

   A = 2.22 Acres

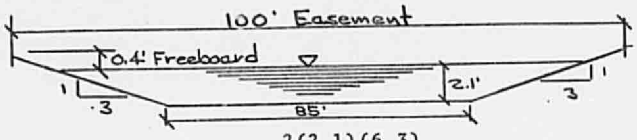
   Q = CIA

   = (0.74) (5.4) (2.22) = 8.87 cfs

CALCULATIONS FOR BEAR CANYON ARROYO

TRIBUTARY CHANNEL

1. Find channel slope for non-eroding velocities



$$\text{Area} = (2.1)\ (85) + \frac{2(2.1)(6.3)}{2}$$

$$= \underline{191.73}\ ft^2$$

$$V = Q/A = \frac{1336}{191.73} = 6.97'/\text{sec.}$$

$$Q = \frac{(k)\ (D^{8/3})\ (S^{1/2})}{N}$$

Where B = 85', D = 2.1

$\frac{D}{B} = \frac{2.1}{85} = 0.025$, then k = 63.25 for 3:1 slope. From Table 7-10, Handbook of Hydraulics, King & Barter.

Solve for S

$$1336 = \frac{(63.25)\ (2.1^{8/3})\ (S^{1/2})}{0.030}$$

$S^{1/2} = 0.0876$

S = .0077 = 0.77% = maximum slope of channel

2. <u>Subcritical vs Supercritical</u>

Using Froude No, a dimensionless ratio, which represents the effect of gravitational forces relative to inertial forces,

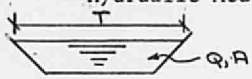
Fr = V/ gD

Where Fr = Froude No

V = Mean Velocity = Q/A

g = Gravitational Acceleration

D = Hydraulic Mean Depth = A/T



$$Fr = \frac{6.97}{\sqrt{(32.2)(1.96)}} = \frac{6.97}{7.95} = 0.87$$

Where Fr < 1.0, flow is subcritical - safe range should be 10% less than 1.0 or 0.90. Results = 0.87 < 0.90

Build channel to grade of 0.77% to hold velocity to subcritical flow and avoid channel erosion.

CALCULATIONS FOR COMPOSITE RUNOFF FACTOR

TYPICAL LOT DRAINAGE

Typical 80 x 100' Lot Runoff Area Breakdown

R = 0.90

Street & Walk Area = (19.5 x 80) = 1,560
Roof Area = (20.0 x 70) = 1,400
Driveway = (30.5 x 15) = 458
3,418 ft.^{2}

R = 0.15

Front & Side Yard - Minus Drive and One-half Roof Area
(50.5 x 80) - 1858 = 2,182
= 2,182 ft.^{2}

Total Area Drained = 5,600 ft.^{2}

Typical 110 x 110' Lot Runoff Area Breakdown

R = 0.90

Street & Walk Area = (251.28 x 19.5) = 4,900
Roof Area = (20 x 70) = 1,400
Driveway = (30.5 x 15) = 458
6,758

R = 0.15

Front & Side Yard - Minus Drive and One-half Roof Area
(7150 - 1858) = 5,292
= 5,292

Total Area Drained = 12,050 ft.^{2}

Assuming a typical block consisting of 10 lots, 2 of which are side street lots - total area drained for the block is:

(5,600 x 8) = 44,800
(12,050 x 2) = 24,100
= 68,900 ft.^{2} Drained Area

Total Area Drained under the 0.90 classifications =

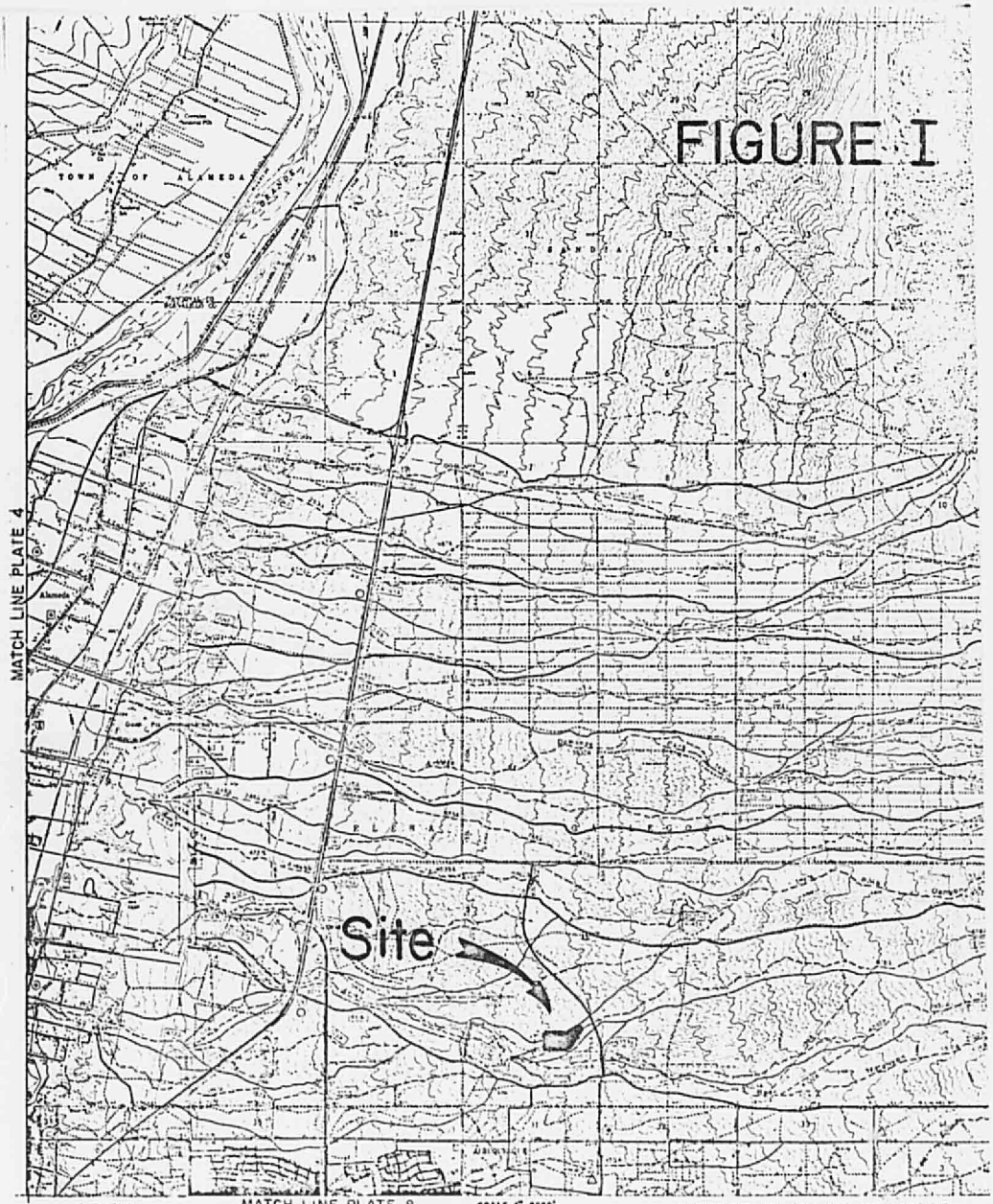
$$(3418 \times 8) + (6758 \times 2) = \frac{40,860 \text{ ft.}^2}{68,900 \text{ ft.}^2} = 59\% \text{ of Area Drained}$$

Total Area Drained under the 0.15 classifications =

$$(2,182 \times 8) + (5,292 \times 2) = \frac{28,040}{68,900} = 41\% \text{ of Area Drained}$$

Composite Runoff Coefficient = (0.59) (0.90) = 0.53
= (0.41) (0.15) = 0.06
= 0.59

Adjusted Factor = (0.59) (Cf) = (0.59) (1.25) = 0.74



LEGEND

LIMIT OF DRAINAGE AREA
LIMIT OF SUB-DRAINAGE AREA
DRAINAGE EASEMENT
NATURAL DRAINAGE AREA 2537A
DRAINAGE AREA AFTER DEVELOPMENT 2537A
WEATHER STATION (CLIMATIC CONDITIONS) △
RUNOFF MEASURING STATION ○

SCALE 1"=2000'
0 2000 4000 6000
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

MASTER PLAN OF DRAINAGE
CITY OF ALBUQUERQUE, NEW MEXICO
AND ENVIRONS

PLATE 5

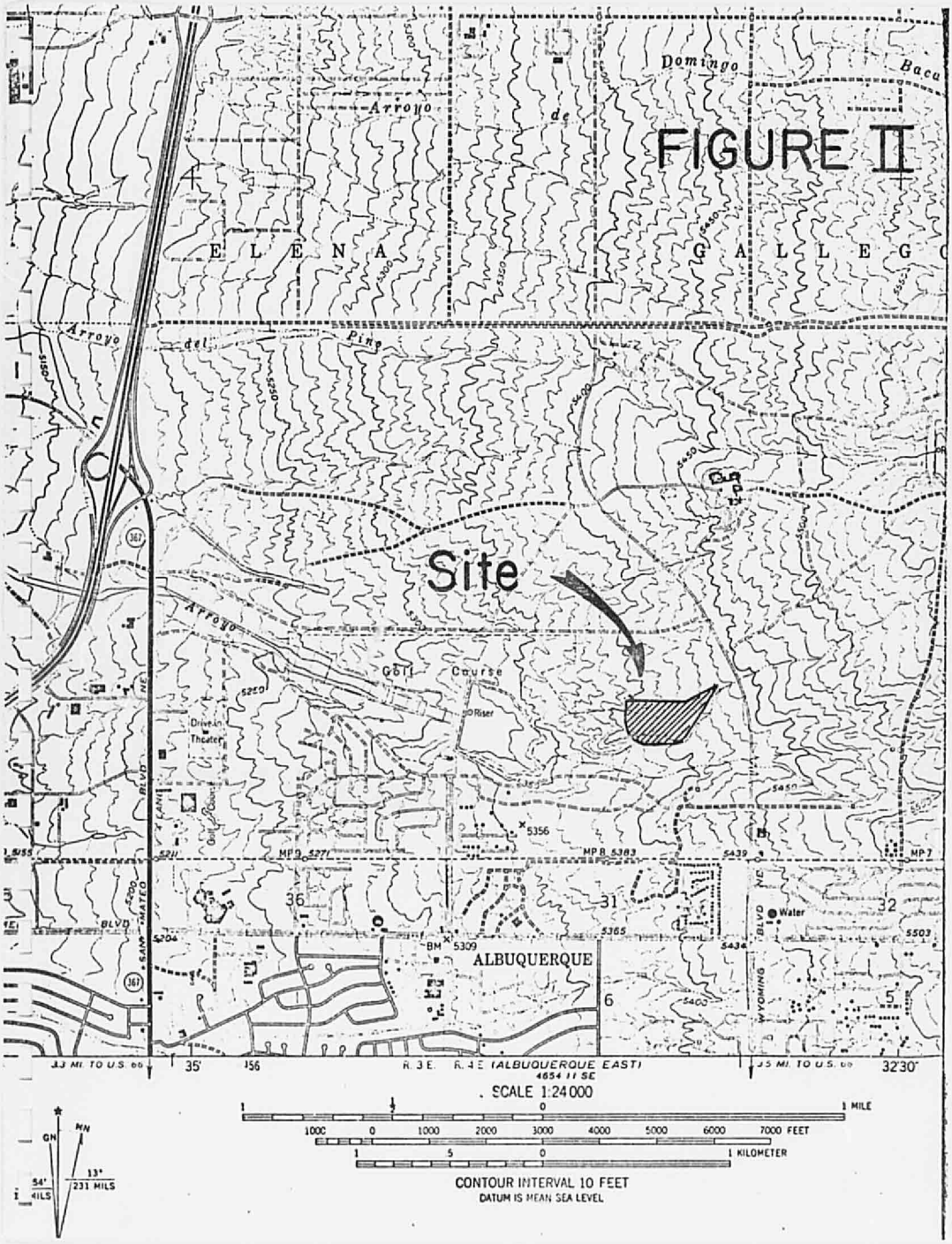
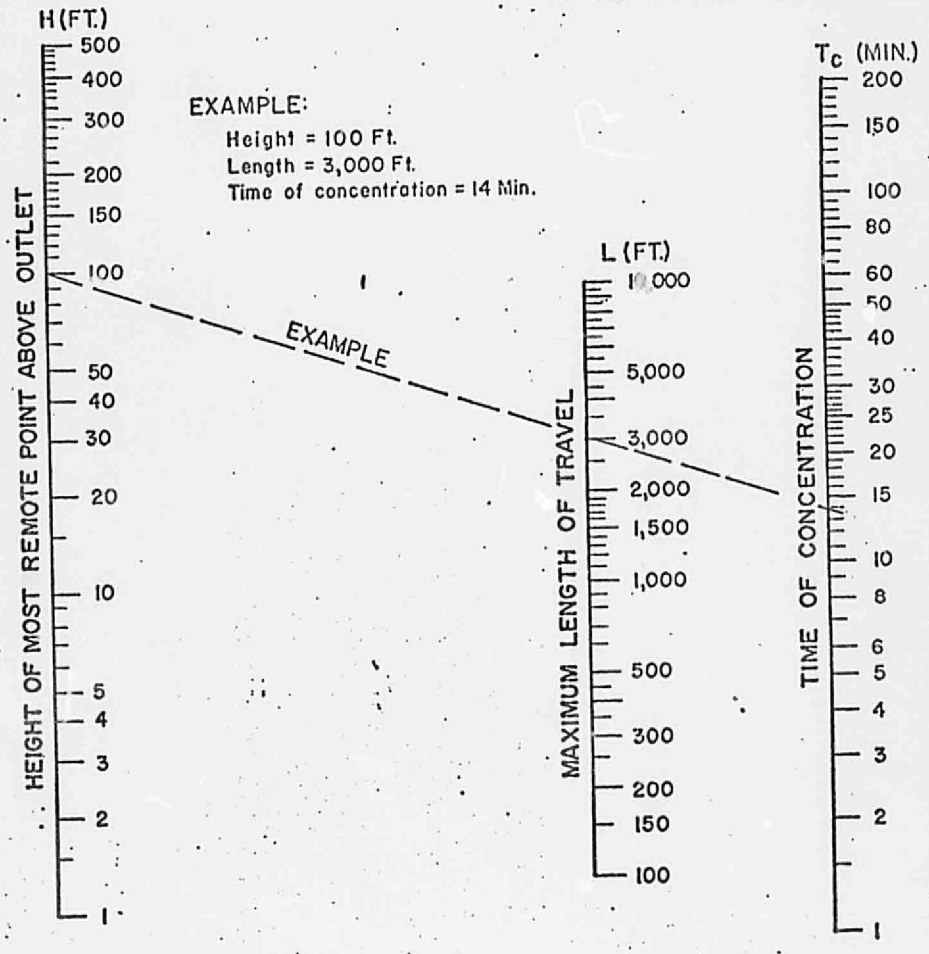


FIGURE II
Site
Arroyo
de
Domingo
Baca
ELENA
GALLEG
Arroyo del Pino
Golf Course
Riser
Drive-in Theater
Golf Course
ALBUQUERQUE
Water
SAN MATEO BLVD
WYOMING BLVD NE
36
31
32
6
5
35'
32'30'
R. 3 E.
R. 4 E. (ALBUQUERQUE EAST)
4654 II SE
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL
GN
MN
13°
231 MILS

FIGURE III

F-19-Z

FIGURE VII

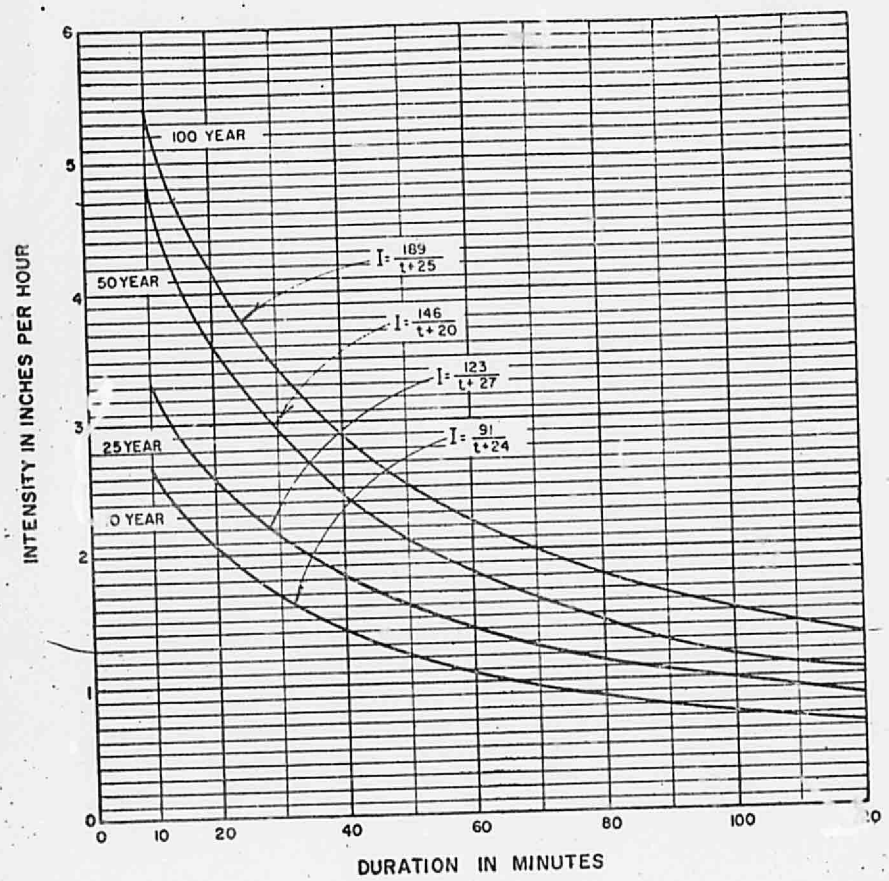


Based on study by P. Z. Kirpich,
Civil Engineering, Vol. 10, No. 6, June 1940, p. 332

FIG. 1 TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

Reprinted from "Design of Roadside Drainage Channels - Hydraulic Engineering Circular No. 6", April 1962, U. S. Dept.

FIGURE VIII



MASTER PLAN OF DRAINAGE
CITY OF ALBUQUERQUE - NEW MEXICO
AND ENVIRONS

INTENSITY DURATION
FREQUENCY CURVES

(ALBUQUERQUE AREA - 1961)

GORDON HERKENHOFF & ASSOC
CONSULTING ENGINEERS
ALBUQUERQUE, NEW MEXICO

CHART
1

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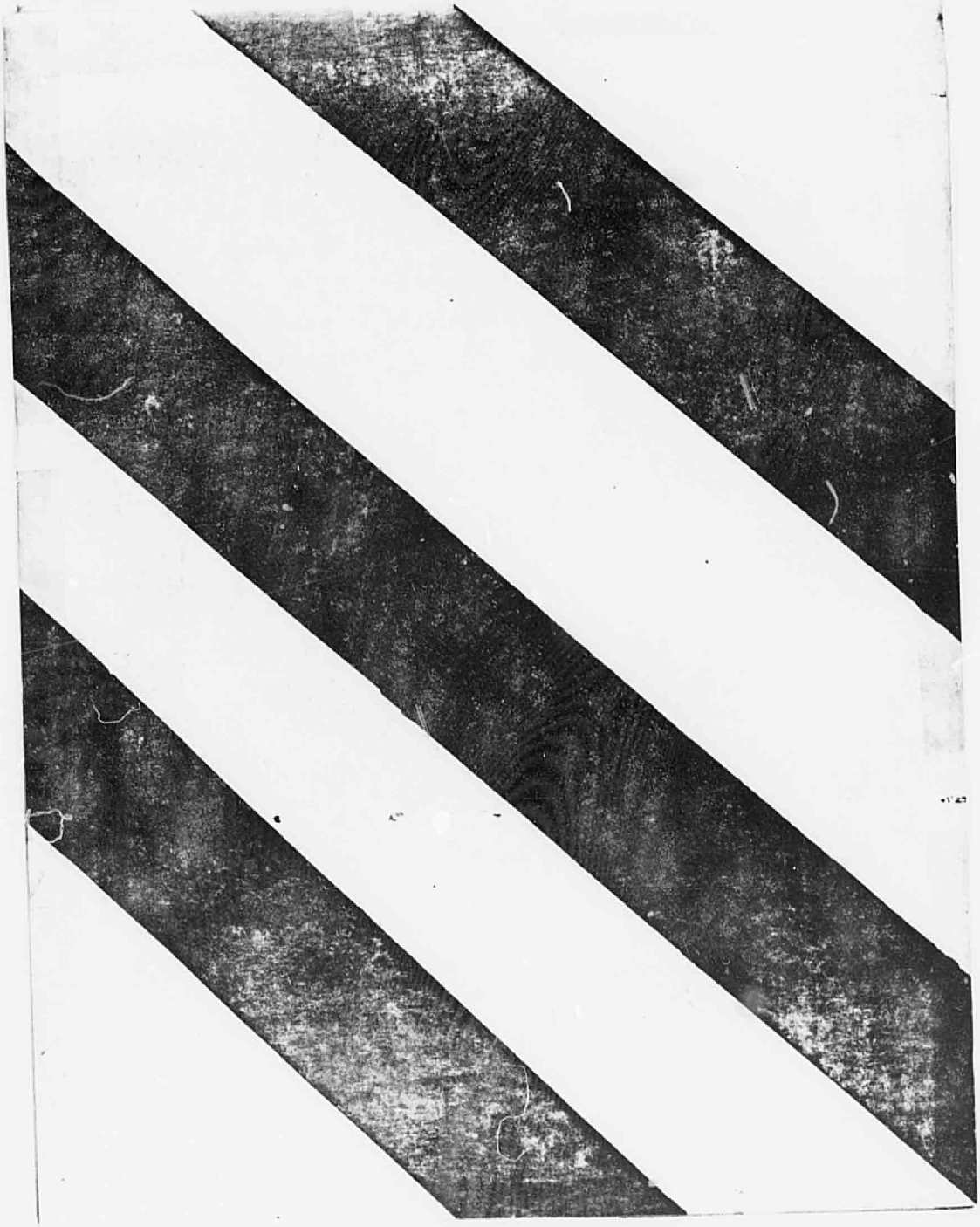
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