HYDROLOGY

F21/D16

F21/D16

BEAR CANYON

ARROYO PARK

1 PLAN

home planning development co.

4010 carlisle, n.e.
suite d
albuquerque, new mexico 87107
phone 505-344-3585

February 14, 1975

RECEIVED
FEB 1 ? 1975
CITY ENGINEERS

Files.

Mr. Frank Kleinhenz
Chief Administrative Officer
400 Marquette Av. NW
Albuquerque, New Mexico 87102

Bob

Dear Sir:

Our Company has been trying to get Bear Canyon Park Subdivision in Academy Place under development since the summer of 1974 and met delay after delay. We are planning to subdivide this land for lower income families i.e. newly marrieds, retired people, etc.

Originally we had planned to build houses in the low $20,000 range, however, due to the rise in construction costs and inflation, we expect the costs to now be in the middle and upper twenties. And as more time goes by, the prices will increase.

We are particularly disturbed because we get contradictory statements from AMAFCA on when we can start development work and house construction. Our engineering firm, Chambers, Campbell, Isaacson & Chaplin, Inc., informed us last Fall that AMAFCA would allow us to start development as soon as the Bear Canyon arroyo right-of-way was delineated and not have to wait for the construction of the Bear Canyon dam. CCIC now informed us that AMAFCA will not allow work to start until the dam is in place east of Juan Tabo Blvd. We understand that no coordination has taken place with the city engineer or Scanlon & Associates, the engineering firm doing the design work for Juan Tabo Blvd. in Assessment District 184, and that design is held up until the dam site is located.

We will greatly appreciate it if you will call a meeting of the interested parties, i.e. the City Engineer, AMAFCA, Scanlon & Associates, CCIC and Home Planning Development Company to determine when and where the dam is to be constructed.

Sincerely,

Meeting Held!

Ed Leslie
President
Home Planning Development Company

cc: City Engineer, Executive Director AMAFCA, Scanlon & Associates, CCIC

LETTER OF TRANSMITTAL

CHAMBERS-CAMPBELL-ISAACSON-CHAPLIN, INC.
3500 Indian School Road, N.E.
Albuquerque, New Mexico 87106
Phone: (505) 266-5521

DATE: 4-25-75 JOB NO.
ATTENTION: Mr. Lewis
RE: Bear Canyon Park

TO
City Engineer
Albuq

GENTLEMEN:

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via _____ the following:

☐ Plans ☐ Specifications ☐ Copy of Letter ☐ Prints

☐ Weekly Inspection Report ☒ Drainage Report

COPIES	DATE	NO.	DESCRIPTION
1	4-23-75		Bear Canyon Park Drainage Study

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit ___ copies for approval

☐ For your use ☐ Approved as noted ☐ Submit ___ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return ___ corrected prints

☒ For review and comment ☐ _____

REMARKS _____

COPY TO _____ SIGNED: Chas Wells

IF ENCLOSURES ARE NOT AS NOTED, KINDLY NOTIFY US AT ONCE.

PLANNING DEPARTMENT
CITY OF ALBUQUERQUE

ADMINISTRATIVE REVIEW BOARD
September 15, 1975
S-71-39-6-A

S-71-39-6-A John R. Mendius, agent for Home Planning Development Co., Inc., requests approval of the proposed Bear Canyon Park, Unit 1, located on the west side of Morris Street N.E. between Spain and Osuna Roads, containing approximately 2.758 acres.

PL Map No.: F-21 Material: Report, Plat

COMMENTS FROM OTHER DEPARTMENTS:

City Engineer: "We have requested a drainage study showing how entire area will be handled. Section 10.C.1 of Subdivision regulations allows requiring the total picture. The drainage leaving Tolkien Court between Lots 12 & 13 must net to Bear Canyon Arroyo, but how? Section 10.A.2 of Subdivision Ordinance discusses programming of C.I.P. Presently, funds are not available to provide culvert at Bear Canyon Arroyo & Eubank or Morris Street which will provide major access to this subdivision."

Liquid Waste Engineer: "Sanitary sewer service for this development will be difficult as an easement to the south or north to Spain Road will be required. The north branch of the Bear Arroyo prevents service via Morris to Spain Road."

Water Engineer: "No objection."
Traffic Engineer: " "
Dept. of Transportation: "Nearest transit is on Montgomery, 1/2 mile south. No increased service planned."

AMAFCA: "No plat should be approved until drainage plan for area bounded by Spain, Morris, Eubank and Bear Canyon Arroyo has been approved."

Environmental Health: "Top soil permit required prior to excavation. Proximity to Bear Canyon Arroyo suggests possible alteration of natural drainage pattern/Bear Canyon Arroyo. Degree of alteration and/or drainage plan for the project should be considered."

COG: "No transportation objection."
Fire Dept.: "Will not affect our operations."
Parks & Recreation: "The committee is requesting a copy of the Master Plan of Bear Canyon Park. We would prefer to have a park dedicated to serve this area rather than receive cash-in-lieu on each of the small parcels to be developed."

Albuquerque Public Schools: "Already impacted area, however, 20 units would not alter the existing situation seriously."

Mountain Bell: "Mountain Bell has no objection to the proposed park."
Southern Union Gas.: "No objection."
Police Dept.: no reply received
Public Service Co.: " " "

PLANNING DEPARTMENT COMMENTS:

The proposed plat is submitted for consideration under Section 12 of the Subdivision Ordinance. The subject property is presently zoned SU-1 (Special Use for a Planned Residential Development). The plat conforms to the development plan approved by the Environmental Planning Commission for the subject property. It contains a total of 19 lots to be developed with patio homes.

It should be noted that on July 10, 1974 the Environmental Planning Commission Land Controls Board approved the proposed plat of Bear Canyon Park Subdivision (S-71-39-6) and the proposed development plan therefor, "subject to a detailed study being made of the availability of services to this subdivision to determine when they can be furnished without unusual expenditures by the City and without a change in the timing for such services". No such study or information has been submitted to the Planning Department and, as noted by the Public Works Department, there appear to be several problems with providing adequate services to the subject property.

RECOMMENDATION: In view of the above, the Planning Department recommends deferral of this request for 30 days or until such time that the applicant has satisfied the conditions imposed by the Environmental Planning Commission on the approval of the development plan.

Phil Garcia
Principal Planner

PG:jd

cc: Home Planning Development Co., Inc.
2900 Louisiana Blvd. N.E.; 87110
ATTENTION: John R. Mendius

CHAMBERS • CAMPBELL • ISAACSON • CHAPLIN, INC.
3500 INDIAN SCHOOL RD., N.E. / ALBUQUERQUE, NEW MEXICO 87106 / PHONE (505) 266-5521

January 14, 1976

Office of the City Engineer
City of Albuquerque
City Hall
400 Marquette, N.W.
Albuquerque, New Mexico

ATTENTION: Mr. Kleston Laws

REFERENCE: Bear Canyon Park Subdivision
Drainage

Dear Mr. Laws:

In response to your request, we hereby clarify our intention for treatment of the runoff from the Tolkien Court portion of the aforementioned project. As you have noted, the pattern of drainage indicated in the drainage report for subject property is southwesterly through a drainage easement and onto adjacent vacant land. Since this vacant land is also owned by Home Planning Development Company, that company is completely willing to allow said runoff to flow across the vacant parcel and into the Bear Canyon Arroyo. At such time when said vacant land is developed, an appropriate means of conveyance will be designed and installed for continued passage of the flows from Tolkien Court into the Bear Canyon Arroyo.

Sincerely yours,

Thomas O. Isaacson

Thomas O. Isaacson
Vice President
CHAMBERS, CAMPBELL,
ISAACSON & CHAPLIN, INC.

John R. Mendius

John Mendius
Chief Engineer
HOME PLANNING
DEVELOPMENT CO., INC.

TOI:df

CHAMBERS • CAMPBELL • ISAACSON • CHAPLIN, INC.
3500 INDIAN SCHOOL RD., N.E. / ALBUQUERQUE, NEW MEXICO 87106 / PHONE (505) 266-5521

February 26, 1976

Mr. Kleston Laws
City Engineer's Office
P.O. Box 1293
Albuquerque, New Mexico 87103

REFERENCE: Drainage Report for Bear Canyon Park

Dear Mr. Laws:

Home Planning Development Company, Inc., has requested that we make a minor revision in the drainage management plan proposed for Bear Canyon Park. The aforementioned report proposes a diversion channel to direct the majority of upland flows into Bear Conyon. The revision consists of a relocation of the diversion channel to the east so that it aligns with a newly proposed north-south street. Although the relocation will allow additional acreage to drain onto Morris Street, our calculations show that Morris will not be overloaded. Reference to the Revised Figure II attached herewith shows a maximum flow at Morris of 79 cfs. while the estimated capacity of Morris is 85 cfs. This capacity figure was determined by reference to the Herkenhoff table of street flow capacities for a 40' wide, normal crowned street at .75%. Since the projected grade of Morris is .82%, the table figure was increased in proportion to the square root of the slopes yielding 85 cfs.

Please review this revision and advise us regarding its acceptability. Thank you for your cooperation.

Sincerely yours,

Kent M. Whitman

Kent M. Whitman, for
CHAMBERS, CAMPBELL,
ISAACSON, CHAPLIN, INC.

KMW/slf

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FIGURE I - Location Map - Plate F-20

FIGURE II - Topo Map and Existing Drainage Characteristics

FIGURE III - Bear Canyon Plat Map

FIGURE IV - Typical Lot Drainage Plat

FIGURE V - Time of Concentration of Small Basins

FIGURE VI - Intensity - Duration Frequency Curve

BIBLIOGRAPHY

PURPOSE

The purpose of this report is to analyze the drainage characteristics of the proposed development and make recommendations for controlling the drainage so that other urban planning for the area can be done safely.

To achieve these objectives, a two-phase approach was selected. In the initial phase, the subject property and contributing areas were analyzed in their undeveloped state. This determines the basic drainage characteristics of the area. The second phase deals with the subdivision in its developed state. Recommendations are made for compliance to the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) requirements. Furthermore, solutions for handling offsite drainage from contributing areas will be presented.

INTRODUCTION

Bear Canyon Park, a planned SU-8 development is located in the Northeast Heights of Albuquerque, south of Spain Road, east of Eubank Boulevard, and bordered on the east side by Morris Street (see Figure I).

The entire Bear Canyon Park encompasses approximately twenty two acres, the majority of which lies within the existing 100 year flood limit line of the Bear Canyon Arroyo. Present conditions forestall the development of all but the most northern part of the proposed site, which lies above the 100 year storm limit. This area encompasses approximately 2.8 acres with twenty units located around a cul-de-sac design. This report will concern itself specifically with the 2.5 acre section of the Bear Canyon Park Development, hereafter referred to as the "site". The remaining 19.5 acres of the Bear Canyon Park cannot be developed until definite construction plans are instigated for the Bear Canyon Dam, located east of Juan Tabo Boulevard (see Rice

Engineering Study of Drainage of the Northeast Heights, Volumes I & II, April 1975). ?

General information input includes the following: the site is located on a high knoll which abutts into the Bear Canyon Arroyo flood plain. It is well protected from offsite flows by nature of its elevation differences with the surrounding territory. It's surface is covered with a light growth of weeds and cacti, and the surface soils are predominantely of loose, decomposed granite. The surrounding neighbors include undeveloped land on three sides and a church on the west (see Figure I).

Although the 2.5 acre site is isolated from offsite flows, it is still necessary to control these flows to protect offsite improvements, i.e. Morris Street. Additionally, the property on the west side of Morris Street, north of the site, has potential for development in the near future. Thus, recommendations for controlling these flows will be presented in the following pages.

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 and Associates. (Note: where a Time of Concentration (Tc) is less than ten minutes from Figure V, the Intensity value 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 development form.

ESTIMATED RUNOFF - UNDEVELOPED STATE

Drainage within the boundaries of the site does not fall into one particular stream pattern. The runoff from the undeveloped site forms the basis of comparison with the drainage of the site in its developed state.

Offsite drainage is shown on Figure II. The offsite drainage from Area 1 has the general characteristics of sheet flow with the flow accumulating in the old arroyo bed which parallels Spain Road. This flow intercepts Morris Road and is then forced out of its historical channel because of a landfill operation. No effort has been taken to redirect these flows, and consequently, present conditions indicate that the flow from Area 1 might cross the northwest corner of the site.

Offsite drainage from Area 2 is comprised from a series of swales and arroyos. These convey the surface flows toward Morris Road. While the site isn't troubled by the majority of flows from Area 2, the remaining 19.5 acres of Bear Canyon Park will have to be protected for future development.

The following table shows runoff in the undeveloped state:

TABLE I

RUNOFF IN UNDEVELOPED STATE

Drainage Basin	Elev. Diff. (feet)	Length of Flow (feet)	TC (min.)	I ("/Hr)	R[1]	Area (Ac.)	Q cfs
Site	----	----	10	5.4	0.45	2.85	7
Area 1	50'	1500'	10	5.40	0.45	12.12	30
Area 2	120'	2600'	11	5.25	0.45	40.40	95
Area 3	150'	4200'	18	4.40	0.45	74.95	148

ESTIMATED RUNOFF - DEVELOPED STATE

Table 2 shows the results of calculations of runoff in the developed subdivision state.

Because development increases the area of impervious surfaces, runoff rates increase to a point which are greater than that which existed before development. To offset this increase, on-site restrictions of flows must be incorporated into the development of the subdivision. While this can take many forms, the most practical solution for this type of development is to utilize on-site ponding for each lot. This approach can satisfy AMAFCA's requirement that the runoff rate from the developed tract does not exceed the runoff rate from the tract in its natural state.

In analyzing the runoff from the individual lots, rear yard ponding was used. The contributing areas to the backyard pond include the backyard, sideyard from the front of the house, and in the majority of cases, the entire roof area. The area drained to the street includes the front yard, driveway

---

1 Table XII, Master Plan of Drainage, City of Albuquerque, New Mexico and Environs, 1963, G. Herkenhoff & Associates, R for undeveloped areas = 0.45.

and sidewalk-parkway areas (see Figure IV).

In situations where runoff leaves the lot, a composite runoff coefficient was developed (see Appendix). This is based upon the percentage of different types of surfaces in the drainage area.

The runoff coefficient used are as follows:[2]

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

The above values are only applicable for storms of five to ten years frequencies. The Rational Formula can be adjusted by a frequency factor Cf, which is used to account for antecedent precipitation conditions for greater frequency storms. A Cf factor of 1.25 for a 100 recurrence interval was used and this adjustment was reflected in the composite runoff coefficient.[3]

TABLE 2

RUNOFF IN DEVELOPED STATE (FIGURE III)

Drainage Basin	Elev. Diff.[4] (feet)	Length of Flow (feet)	Tc[5] (min.)	I ("/Hr)	Area (Acres)	Q (Cfs)
Site	2	400'	10	5.4	0.74	3

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

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

4 Obtained from estimated developed street grades.

5 Obtained from Figure V.

EXPLANATION OF RESULTS

Summary of Results for the site:

1. Runoff before development (within subdivision)

   Site = 7 cfs

2. Runoff after development (within subdivision)

   Site = 3 cfs

Therefore, summing total runoff rates under developed conditions vs. undeveloped conditions, the net results is a reduction of the total runoff rate by 4 cfs.

OFFSITE DRAINAGE

In looking at the offsite drainage from Area 1, it can be seen that this area is the lower part of a much larger drainage area (Area 3), which originates below the diversion structure (see Figure II). Using present conditions as a guide, it can be seen that Area 3 has been diverted onto Spain Road by (1) making Spain Road lower than the existing stream bed, and by (2) landfill in the historical channel which forces water toward Spain Road. This diversion compounds a problem on an already overloaded Spain Road. The City Engineer recommends that the channel link be re-established between Areas 1 and 3 so that flows from Area 3 continue toward Morris Street.

However, Areas 1, 2 and 3 contribute enough runoff to overload Morris Street at its projected grade of 0.82%. Therefore, to safeguard Morris Street, the site and future development west of Morris Street, it will be necessary to construct a diversion channel as shown in Figure II. This channel will intercept flows from these areas until such time as development to the east of Morris Street occurs. Such development can be planned so that

east-west runoff is intercepted by north-south street systems and diverted directly into the Bear Canyon Arroyo. Such planning will negate the need of the diversion channel.

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.

On-Site

1. Due to the type of construction which is planned, there is not a great deal of available open area for a shallow ponding concept. Therefore, in order to handle the volume of runoff for a 3"-100 year, 6 hour storm, it will be necessary to make the standing water depth an average of 2' deep (see Appendix). This can be made attractive by lining the perimeter of the ponding area with large rock, over excavating the bottom approximately 5 feet, and filling it in with gravel to the top. Thus the ponding area becomes an infiltration gallery.

2. Additionally, the developer may wish to pond a maximum of 1" of rainfall upon the roof. This would result in a roof load of 4.98#/ft.^{2} and the volume of the infiltration gallery could be reduced by 31%.

Off-Site

1. The drainage from Areas 1, 2 and 3 will be intercepted by a diversion channel as shown on Figure II. This channel will be temporary in that future development to the east should divert these flows directly into the Bear Canyon Arroyo.

2. A redefinition of the channel will have to be made between Drainage Areas 1 and 3. This can be accomplished by a simple grading operation with the excess dirt spread next to Spain Road to form an embankment. This action will further safeguard Spain Road and the downstream developments from excess flows. What about land fill

SUMMARY

The SU-8 development of Bear Canyon Park (2.8 acre section), by utilizing the ponding procedures outlined in the developed state, will contribute less interval runoff to the downstream drainage system than that which existed before development.

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

Respectfully submitted,

CHAMBERS, CAMPBELL, ISAACSON AND
CHAPLIN, INC.

Thomas O. Isaacson

Thomas O. Isaacson
Reg. N.M. L.S. & P.E. #3895

APPENDIX

Calculations for Rational Formula

1. Sample calculations for Rational Formula

$Q = CIA$

Area 1 ~ Where:

H = height above most remote point above outlet

= 50'

L = distance most remote point

= 1500'

T_c = 10 min. (Figure V)

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

C = 0.45

A = 12.12 Ac.

$Q = CIA$

$= (0.45)(5.40)(12.12) = 30$ cfs

Calculations for Composite Runoff Factor

Typical Plan "T" - 1242 ft.^{2} House

- 284 ft.^{2} Garage

on a 87' x 40' (3,480 ft.^{2}) Lot

Impervious Area (C = 0.90)

Street, Walk and Driveway = 1086 ft.^{2}

Yard Area (C = 0.15)

Front grassed area = 754 ft.^{2}

Total Area Drained = 1840 ft.^{2}

3480
1840
1640
3480

$$Q = \frac{K'}{n} 10^{8/3} (.02)^{1/2}$$

$$\frac{(255)(.030)}{(464)(.1414)} = K' = .01166$$

~~0.525~~

$$A = (10+4)^2$$

$$28$$

$$V = \frac{255}{28} =$$

1.8

29/10.0

1.0

Area Drained under 0.90 Classification

$$= \frac{1086}{1840} = 59\%$$

Area Drained under 0.15 Classification

$$= \frac{754}{1840} = 41\%$$

Composite Runoff Coefficient =

$$\begin{aligned} (0.90)(0.59) &= 0.53 \\ (0.15)(0.41) &= \underline{0.06} \\ & \quad\ \ 0.59 \end{aligned}$$

Adjust for 100 year recurrence interval

Adjusted Factor (0.59)(Cf)
(0.59)(1.25) = <u>0.74</u>

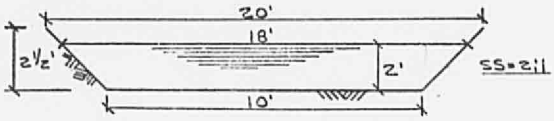
Ponding Area Requirements

Composite Runoff Coefficient = <u>0.80</u> for backyard, sideyard and roof runoff (total of 2640 ft.^{2}).

Volume based upon a 3"-6 hr/100 year storm = (0.25')(2640 ft.^{2})(0.80) = 528 ft.^{3} of volume required. Average size of pond, if left with free standing water, would be 10' x 26' x 2'. An infiltration gallery, filled with gravel, would have 10' x 26' x 6' dimensions.

Diversion Channel

Average slope for channel would be 2%. The following configuration will carry 255 cfs at 2% slope in a 30' easement.*



* Table VII, Carrying Capacities of Lined and Unlined Channels, Master Plan of Drainage, City of Albuquerque, New Mexico, and Environs, 1963, Gordon Herkenhoff and Associates.

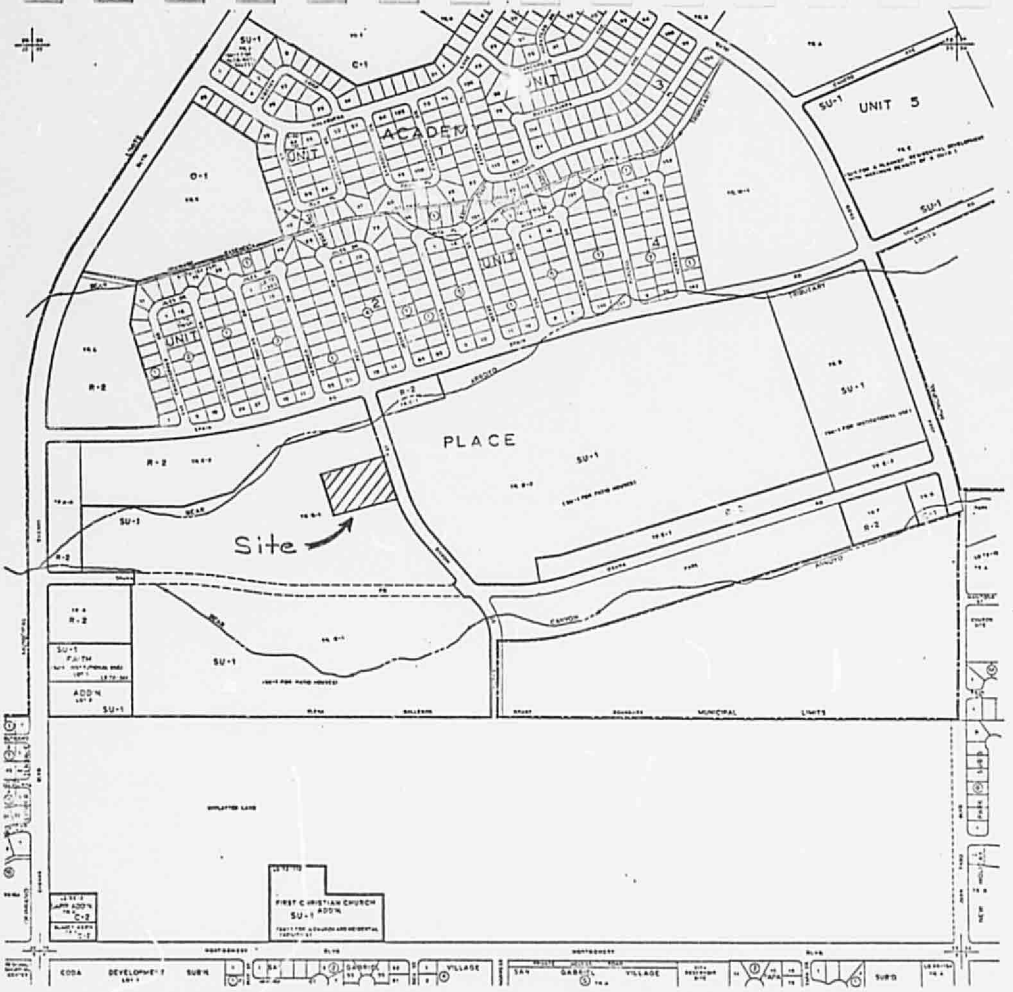
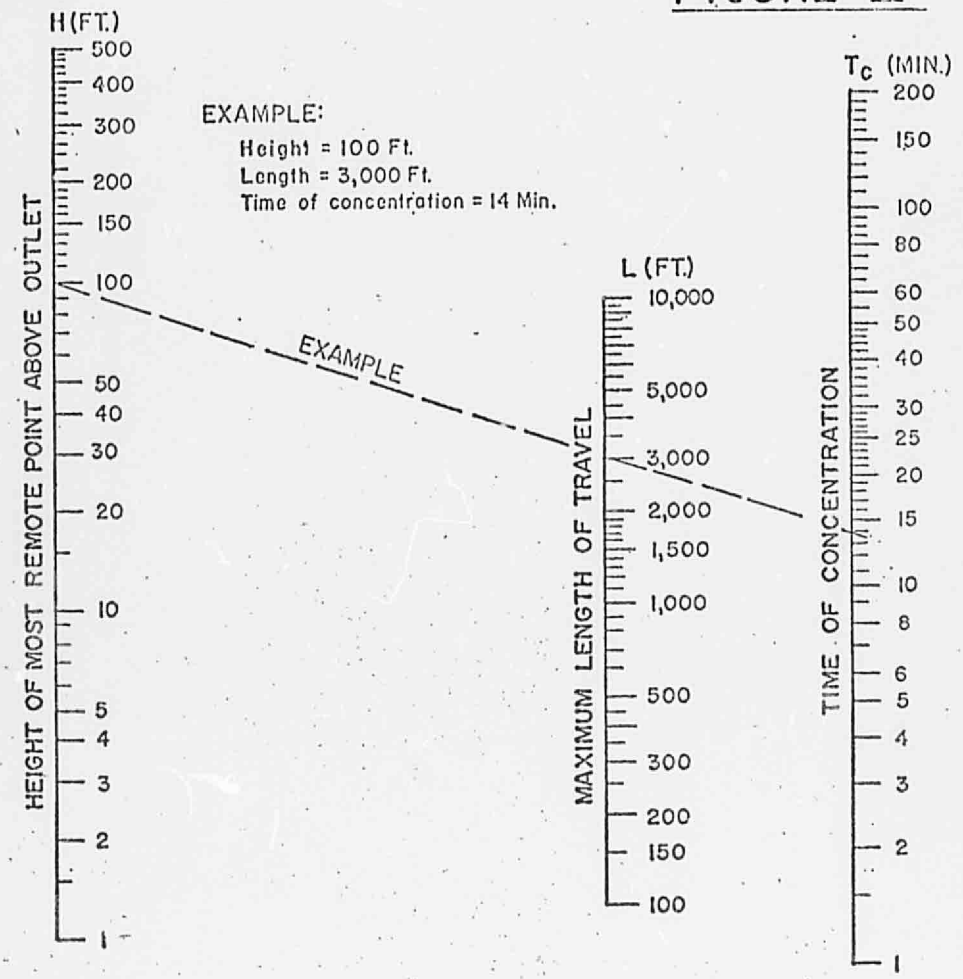

ACADEMY
UNIT 1
UNIT 2
UNIT 3
UNIT 4
UNIT 5
PLACE
Site
C-1
R-2
SU-1
FIRST CHRISTIAN CHURCH ADDN
MUNICIPAL LIMITS
F-21-Z

FIGURE 1

FIGURE V

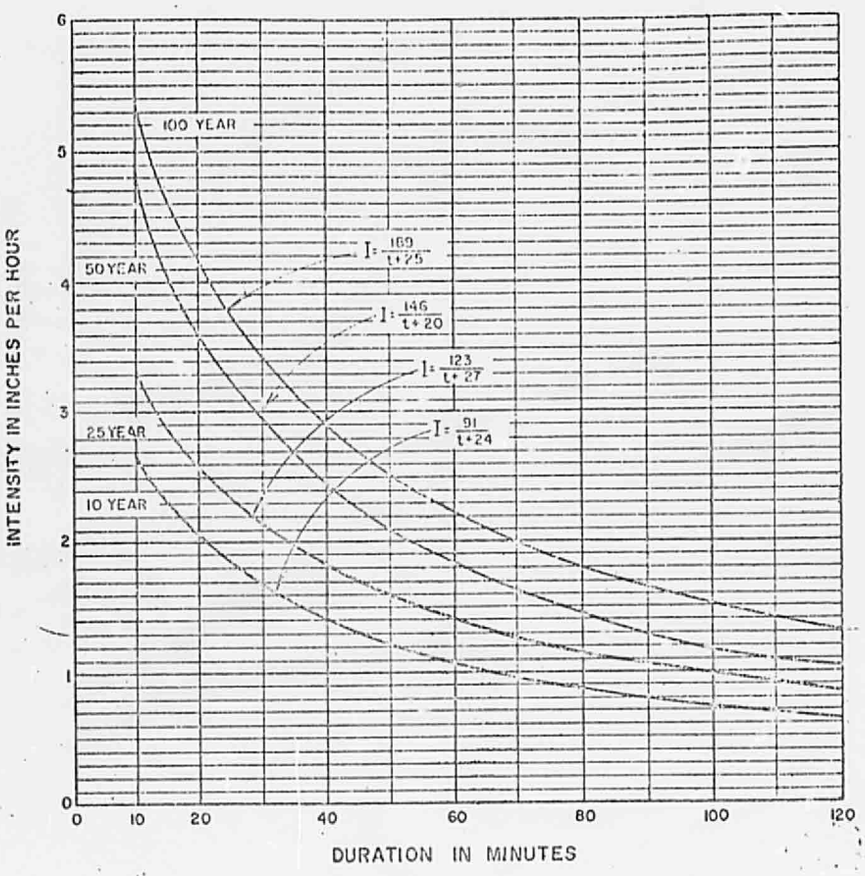


Based on study by P. Z. Kirpich,
Civil Engineering, Vol. 10, No. 6, June 1940, p. 332

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 VI



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

INTENSITY DURATION
FREQUENCY CURVES

(ALBUQUERQUE AREA - 1961)

GORDON HERRENKOHL & ASSOC
CONSULTING ENGINEERS
ALBUQUERQUE, NEW MEXICO

CHART
I

THIS MICROIMAGE IS THE BEST POSSIBLE
REPRODUCTION DUE TO THE POOR QUALITY
OF THE ORIGINAL DOCUMENT

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