HYDROLOGY F17/D6 ONE PLAN

F 17-06

1 PLAN

GARDNER ENGINEERS, INC.

October 5, 1978

Received
10/6/78

Mr. Bruno Conegliano
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

SUBJECT: Drainage Study
Malibu Race Track
Eastern Portion of Tract A-1C,
Cryer Property, Bernalillo
County, New Mexico

Dear Bruno:

I have revised the drainage study to reflect the recommendations made by your office. The revised computations result in a net increase of 0.2 acres total runoff after development of the site. This net increase in runoff can be handled in approximately 35,000 square feet of ponding area as shown on Plate IV of the study. The depth of the ponding area would range from 6 inches to 0 inches with an average of approximately 3 inches. Construction of the race track area will be such that all of the field area will be constructed approximately 6 inches below the track itself. This will result in a virtually total retention of all storm water flows.

We have plotted the adjacent drainage channel on the drainage plan as shown. Analysis of this channel indicates that the expected flow of 966 cubic feet per second after development of the total drainage area contributing to the channel at this point, will result in a velocity of approximately 9½ feet per second. This velocity will cause erosion of the channel therefore, maintenance of the channel will be required after a heavy thunderstorm. There is a berm constructed along the channel adjacent to the property understudy such that no flow from the property can get into the channel at this point either before or after development. The channel depth is such that during a 100-year flow the channel freeboard will be approximately 3 feet. The finished floor of the proposed building is 5024.50 feet which is above the flood level of the channel.

Current City of Albuquerque AMAFCA regulations require that the property owner participate in the development and improvement of the adjacent drainage channel. The drainage channel as constructed by the owners of the property is of sufficient size and capacity to handle the expected 100-year flows, although excessive velocities will occur. While the concrete lining of the channel at some future point may be desirable to minimize maintenance problems, it is our recommendation that the development of the subject project as shown be approved since this development will not significantly increase the 100-year flow in the channel.

7833 LOMAS BLVD. N.E., SUITE 23/ ALBUQUERQUE, N.M. 87110/ [505] 266-5858

If you feel that something should be done at this time to reduce the erosion potential of the channel, the depth of the channel as constructed is sufficient to allow the construction of riprap velocity checks to lower the velocity from approximately 9.5 feet per second to 5 feet per second and reduce the erosion.

The proposed grading plan will convey all runoff to on-site ponding areas with the exception of a small portion in the northwest corner of the site. The site will be graded such that there will be no undercutting or filling adjacent to the property lines which may require retention walls.

The total ponding volume is adequate to handle the increase in runoff for a 100-year storm. The ponds will be located such that all flows will be diverted to them. The proposed drainage provisions do not constitute an attractive nuisance or safety hazard and will be located directly on site with a maximum depth of 6 inches adjacent to the race track.

If you have any questions regarding our computations or the proposed site grading, please do not hesitate to call me.

Sincerely yours,

GARDNER ENGINEERS, INC.

Gilbert D. Gardner

Gilbert D. Gardner, P. E.

GDG/jh

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

October 18, 1978

Mr. Gil Gardner
Gardner Engineers, Inc.
7833 Lomas Blvd. N.E.
Albuquerque, New Mexico 87110

RE: DRAINAGE STUDY FOR AN EASTERLY PORTION OF TRACT A-1C, CRYER PROPERTY

Dear Mr. Gardner:

I am in agreement with the proposed drainage solution for the onsite handling of the runoff. I will, therefore, grant to this project conditional approval but for foundation only. The channel West of this property will have to receive erosion protection for a minimum height of 5.0 ft. above the flowline with an appropriate super elevation along the reach where the channel turns in a more Southwesterly direction. Thickness and dimensions of the rip rap will be a function of the computed flow velocity.

The pertinent design data, grading and construction plans will have to be submitted to my office, approved and attached to the construction plans before building permit is granted.

If you have any questions on these matters please feel free to contact me.

Very Truly Yours,

Bruno Conegliano
Asst. City Engineer-Hydrology

BC/tl

cc: C. D. Sheppard, Acting City Engineer
Rick Leonard, AMAFCA
Drainage File

UNDEVELOPED AREA

100 YEAR 24 PRECIPITATION

AREA 6.15 ACRES

LONGEST ROUTE 600 ft

Δ ELEVATION 15 ft

IMPERVIOUS AREA 2.41

PERVIOUS AREA 3.74

SHEET FLOW VELOCITY 1.3 ft/sec

$T_c = \frac{600 \text{ ft}}{1.3 \text{ ft/sec}} = 461.5 \text{ sec} = 7.69 \text{ min} = .128 \text{ HRS}$

USE 10 MIN

$I_{10} = \frac{189}{t_{min}+25} = \frac{189}{10+35} = 4.2 \text{ INCHES/HR}$

$C_{UNDEVELOPED} = .4$

$Q = CIA$

$= (.4)(4.2)\,6.15 = 10.33$

DEVELOPED AREA

SHEET FLOW VELOCITY = .8 ft/sec

$T_c = \frac{600 \text{ ft}}{.8 \text{ ft/sec}} = 750 \text{ sec} = 12.5 \text{ min}$

$I = \frac{189}{12.5+25} = 5.04$

$C = .9\left(\frac{2.41}{6.15}\right) + .4\left(\frac{3.74}{6.15}\right) = .6$

$Q = CIA = .6(5.04)(6.15) = 18.6$

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100 YEAR 24 PRECIPITATION

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

Received
10/6/76

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Site Location

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Existing Topo

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Plot Plan

PLATE IV -
Drainage Plan

DRAINAGE STUDY

FOR

AN EASTERLY PORTION

OF

TRACT A-1C, CRYER PROPERTY

BERNALILLO COUNTY, NEW MEXICO

PURPOSE

The purpose of this report is to analyze the drainage characteristics of the proposed development of the Easterly Portion of Tract A-1C within Section 35, T11N, R3E Bernalillo County, New Mexico.

INTRODUCTION

This tract is located south of McLeod Road, N. E. on the west side of Interstate 25. The proposed development of this tract includes the construction of parking facilities, concession facilities and approximately 2,000 feet of racing tract, as shown on Plate III.

The site encompassed by this development slopes from Northeast to Southwest with an average gradient of 1.50%. The present ground cover is primarily weeds and other natural plants. The surface soils are predominately loose sandy loam classified in the Soil Conservation Service hydrologic soil Group B.

The proposed development is such that the drainage pattern will continue to be primarily sheet flow at an average gradient of 1%. The surface area outside of the parking lots and race track will be landscaped and sodded to provide maximum surface retention and infiltration.

METHODS OF ANALYSIS

The Soil Conservation Service method for determining peak rates of discharge from small water sheds was used in analyzing the storm runoff from this tract. The storm used was a 100-year 24-hour precipitation, as determined by the U. S. Weather Service for the Soil Conservation Service.

DETERMINATION OF CURVE NUMBER

The drainage area understudy consists of 6.15 acres in an undeveloped state. The area is poor range land with soil Group B and has been assigned a watershed curve number of 79. With the development planned, the tract will have 2.41 acres of hard surface B, with a curve number of 95 and 3.74 acres of sodded area with a curve number of 79. The weighted curve numbers after development will be CN = (2.41/6.15)(95) + (3.74/6.15)(79) = 85.3 - Use 85.

TIME OF CONCENTRATION

The Time of Concentration for this drainage area in an undeveloped state has been determined to be 0.15 hours using a sheet flow velocity of 1.3 feet per second. The Time of Concentration after development is 0.08 hours using a sheet flow velocity of 1.8 feet per second.

TOTAL VOLUME OF RUNOFF

The total volume of runoff in an undeveloped state is 0.62 acre/feet. The total volume of runoff with the development is 0.82 acre/feet. The increase of runoff cuased by the development of Tract B is 0.20 acre/feet. A minimum of 35,000 S.F. of onsite ponding will be required.

PEAK DISCHARGE

The peak discharge for this drainage area in an undeveloped state is 11.80 cubic feet per second. The peak discharge after the development is 15.80 cubic feet per second. The peak developed discharge after subtraction of 35,000 square feet of ponding area is 13.60 cfs. This results in an increase of 1.89 cfs in peak discharge for a 100-year storm. This flow will enter into the existing drainage channel along the north side of the property. This channel has been designed to handle 966 cfs at the point of which the developed discharge from this tract (13.69 cfs is 1.42% of the total channel flow.

ANALYSIS OF THE EXISTING DRAINAGE CHANNEL

The existing drainage channel along the north side of the property is a trapezoidal channel with a 10 foot bottom with 2.1 side slopes. The depth of the channel is 9.0 feet ±. The channel gradient is approximately 1.10 percent.

The channel was constructed in accordance with recommendations made in a drainage study prepared by Bohan-Westman for the Cryder Tract of which this parcel is a part. The channel as constructed generates velocities of ± 9.5 feet per second. Analysis of the soils report and review of literature regarding maximum nonerodible velocity for alluvial silts is 5 feet per second. The required gradient for reduction of the velocity from 9.5 feet/second to 5.0 feet/second is 0.20%.

The existing channel is presently in a stable condition with the top of the bands approximately 2 feet higher than the existing grade of the property in question. Development of the site will be such that no drainage will be able to flow into the existing ditch except at the northwest corner of the site.

Development of the site will result in a runoff of 15.8 cfs (1.6% of the total channel flow during a 100-year storm. The runoff during local afternoon rainfall will be entirely ponded on site and will contribute no flow to the channel.

REQUIRED CHANNEL IMPROVEMENTS

The existing channel section is adequate for the design flows, however, the velocities produced (9.5 fps) are excessive and would erode the channel sides. Lining the channel with concrete would eliminate maintenance problems but should not be done until the down storm portion is lined. Velocity checks may be installed to reduce the effective gradient to 0.20% if erosion becomes a problem.

No significant erosion has occurred as yet since most of the drainage area is still undeveloped with on site ponding. Development of the project site is such that on site ponding will be utilized to the maximum extent possible. Therefore, development of this parcel will not increase the runoff to the point that channel erosion will be a problem.

PROPOSED DRAINAGE IMPROVEMENTS

The proposed development of this tract includes the construction of a 7,200 square foot building and adjacent parking lot and a 16-foot wide race tract as shown on the attached plate. The areas adjacent to the race track will be sodded and graded such that the tract itself will be above the in field area. The runoff characteristics of this parcel after development will duplicate as much as possible the runoff characteristics in an undeveloped state due to the method of construction of the tract above the adjacent in field and will result in a development that does not significantly increase the flow into the adjacent channel.

RECOMMENDATIONS

On the basis of this study it is included that the area under consideration can be developed as proposed within the guidelines of the City of Albuquerque if the following recommendations are implemented:

A. Grade the entire tract at an average gradient of 1.0%.

B. Construct the race track itself a minimum of 6 inches above this average gradient and grade and landscape the in field areas to maximize ponding to the greatest extent possible.

C. Slope the parking area such that the major portion of the runoff from the asphalt parking area will flow into the planters as shown.

D. Maintain the adjacent storm drainage channel in a well graded condition and construct riprap velocity checks to minimize erosion if required (total development of the total drainage area for the adjacent storm drainage channel may require, in the future, that the chennel be concrete lined. It is the recommendation of this report that this lining not be constructed at this time since the existing channel is in a stable condition and there is no evidence of erosion problems at present).

Provided the recommendations of this report are implemented, the tract may be satisfactorily developed without creating flood danger to surrounding properties and without adding any significant flow to the adjacent channel.

DEVELOPED

HYDROLOGY DATA SHEET

(Chapter 2 - Engineering Field Manual for Conservation Practices)

SOIL CONSERVATION DISTRICT _____ FIELD OFFICE _____

COOPERATOR _____ LOCATION _____

SWCD
COOPERATOR Yes___ No___ GDCP No. _____ FIELD No. _____

ITEM No. _____
POND No. _____ KIND OF STRUCTURE _____ BY _____ DATE _____

DRAINAGE AREA: A = 6.15 acres

LENGTH: (longest waterway to the ridge) L = 600 ft.

ELEVATION DIFFERENCE: (to farthest ridge) H = 15 ft.

- Use USGS quads or hand level -
- H = S% x Lin. Ft. x 100

RUNOFF CURVE NUMBER: (Table 2-1 or Fig. 2-1) CN = 85

TIME OF CONCENTRATION: (Fig. 2-2 or Fig. 2-1) T_c = 0.08 hr.

RAINFALL, 24 hr. (Exhibit 2-2) Freq. 100 yr. P_{24} = 3.00 in.

DIRECT RUNOFF: (Fig. 2-4) Q = 1.60 in.

DISTRIBUTION CURVE NO.: (Exhibit 2-3) DC = 75 no.

c.f.s. PER ACRE PER INCH OF RUNOFF cfs/ac/in = 1.6 c.f.s.
(Fig. 2-5)

PEAK DISCHARGE: q = A x Q x cfs/ac/in

6.15 x 1.60 x 1.60 q = 15.80 c.f.s.

VOLUME OF RUNOFF: (Q x A) - 12

(1.60 x 6.15) - 12 Vol. = 0.82 ac. ft.

UNDEVELOPED

HYDROLOGY DATA SHEET

(Chapter 2 - Engineering Field Manual for Conservation Practices)

SOIL CONSERVATION DISTRICT _____ FIELD OFFICE _____

COOPERATOR _____ LOCATION _____

SWCD
COOPERATOR Yes___ No___ GDCP No. _____ FIELD No. _____

ITEM No. _____
POND No. _____ KIND OF STRUCTURE _____ BY _____ DATE _____

DRAINAGE AREA:	A	=	6.15	acres
LENGTH: (longest waterway to the ridge)	L	=	600	ft.
ELEVATION DIFFERENCE: (to farthest ridge)	H	=	15	ft.

- Use USGS quads or hand level -
- H = S% x Lin. Ft. x 100

RUNOFF CURVE NUMBER: (Table 2-1 or Fig. 2-1)	CN	=	79	
TIME OF CONCENTRATION: (Fig. 2-2 or Fig. 2-1)	T_c	=	0.15	hr.
RAINFALL, 24 hr. (Exhibit 2-2) Freq. 100 yr.	P_{24}	=	3.00	in.
DIRECT RUNOFF: (Fig. 2-4)	Q	=	1.20	in.
DISTRIBUTION CURVE NO.: (Exhibit 2-3)	DC	=	75	no.
c.f.s. PER ACRE PER INCH OF RUNOFF cfs/ac/in (Fig. 2-5)		=	1.6	c.f.s.

PEAK DISCHARGE: q = A x Q x cfs/ac/in

6.15 x 1.20 x 1.6 q = 11.80 c.f.s.

VOLUME OF RUNOFF: (Q x A) - 12

(1.20 x 6.15) - 12 Vol. = 0.62 ac. ft.

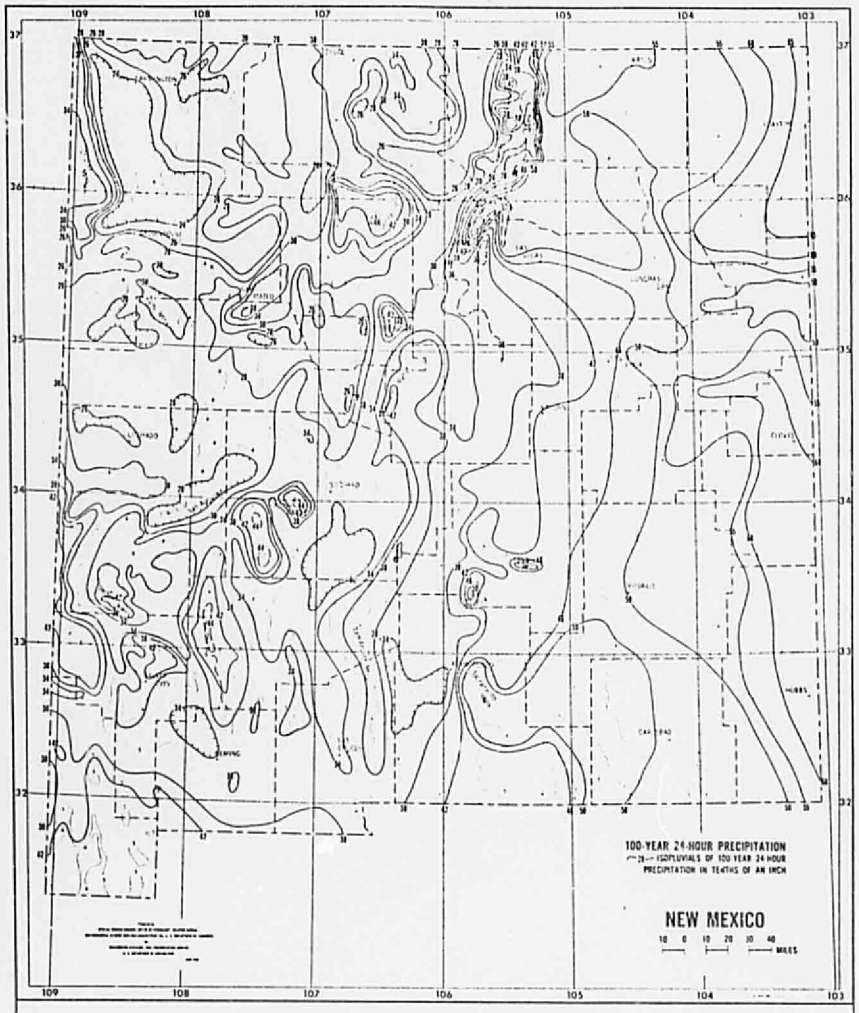
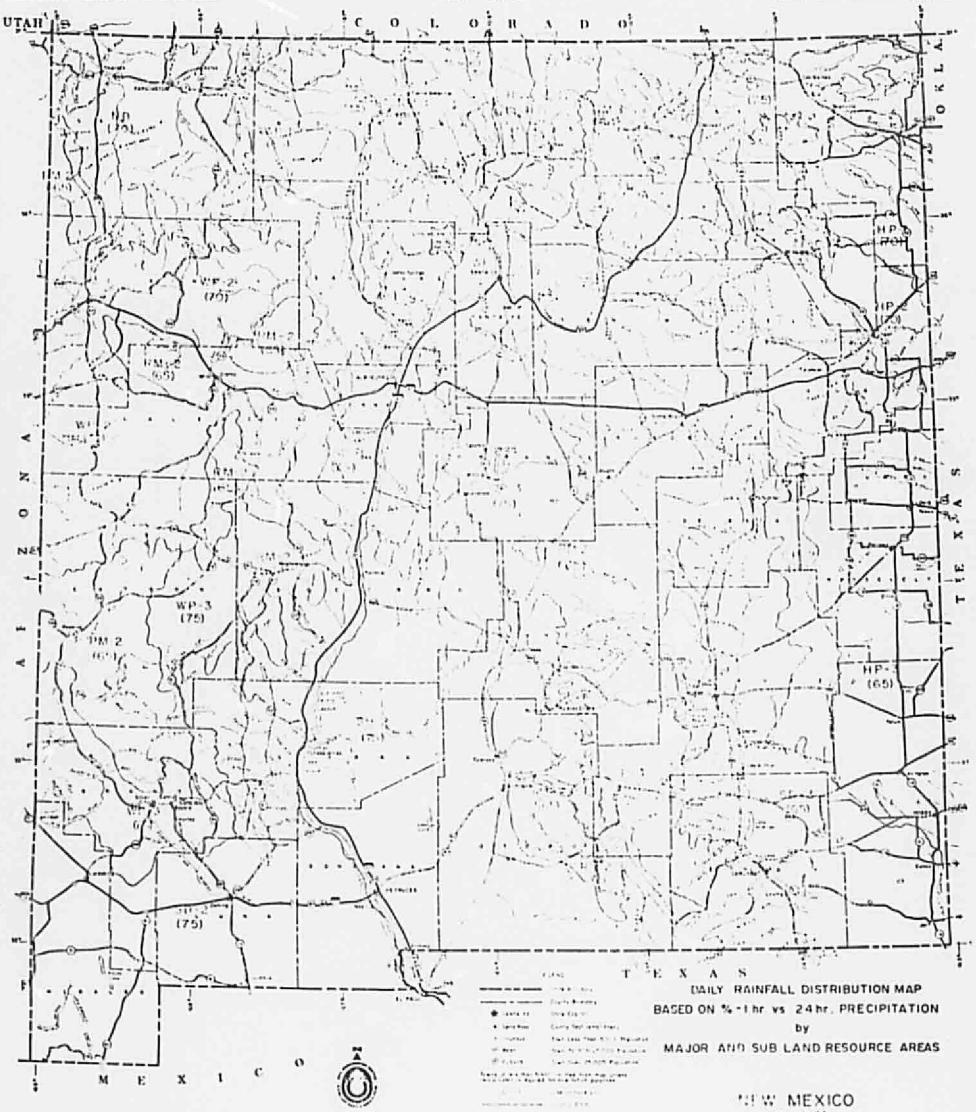

100-YEAR 24-HOUR PRECIPITATION
ISOPLUVIALS OF 100-YEAR 24-HOUR PRECIPITATION IN TENTHS OF AN INCH
NEW MEXICO
MILES

EXHIBIT 2-2

U.S. DEPARTMENT OF AGRICULTURE NEW MEXICO SOIL CONSERVATION SERVICE



DAILY RAINFALL DISTRIBUTION MAP
BASED ON % - 1 hr vs 24 hr. PRECIPITATION
by
MAJOR AND SUB LAND RESOURCE AREAS

NEW MEXICO

% of 1hr/24hr	MAJOR AND SUB LAND RESOURCE AREAS
60	HV, RM 1
65	HP 5, CP 4, SD 5, WP 1, RM 2
70	HP 1, HP 2, CP 2, CP 3, WP 2, SD
75	CP 1, SD 1, SD 2, WP 3

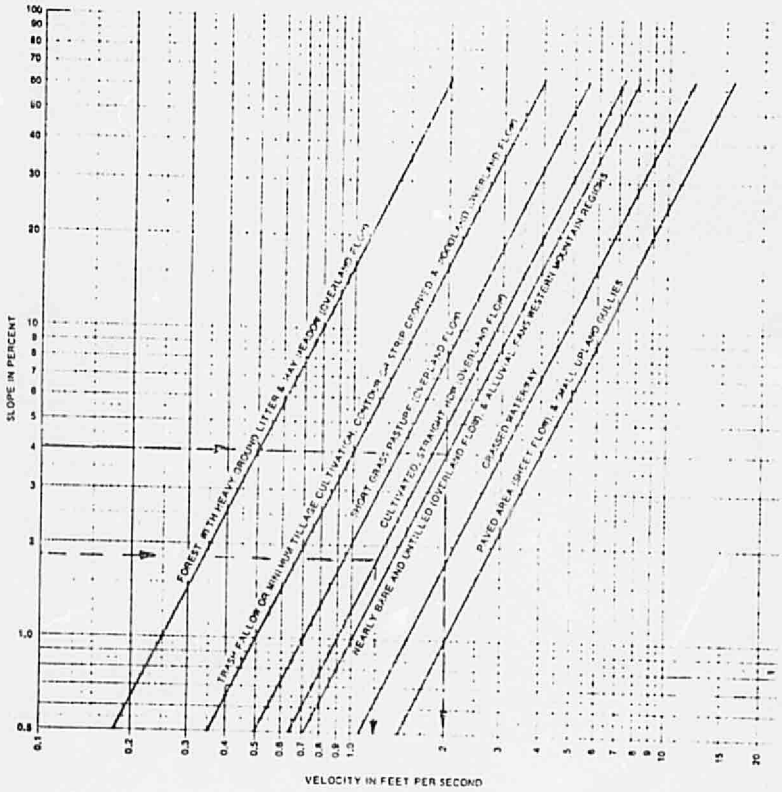


Figure 2-3 -Velocities for upland method of estimating T_c

FIELD PERCOLATION TEST

Test Data: The percolation test was run in accordance with the procedures set forth in the U.S. Depth. of Health, Education and Welfare, Public Health Service Publication No. 526, "Manual of Septic Tank Practice." The test was run at a depth of approximately 2½ feet beneath the existing ground's surface in 6"± diameter holes. The hole was allowed to saturate with water prior to running the test.

Test Results:

Time Interval (minutes)	Drop in Water Level (inches)
0 - 10	3-3/4
10 - 20	2
20 - 30	1-1/8
30 - 40	1-1/16
40 - 50	15/16
50 - 60	9/16

* Percolation Rate = 18.0

* Time in minutes required for water level to drop one inch, the drop occurring during the final 10 minute time period being used to calculate the percolation rate.

Gradation (Auger Cuttings 0 to 2½' Depth

% Gravel = 6
% Sand = 68
% Silt/Clay = 26

Unified Soils Classification: (SM-SC), silty to slightly clayey sand.

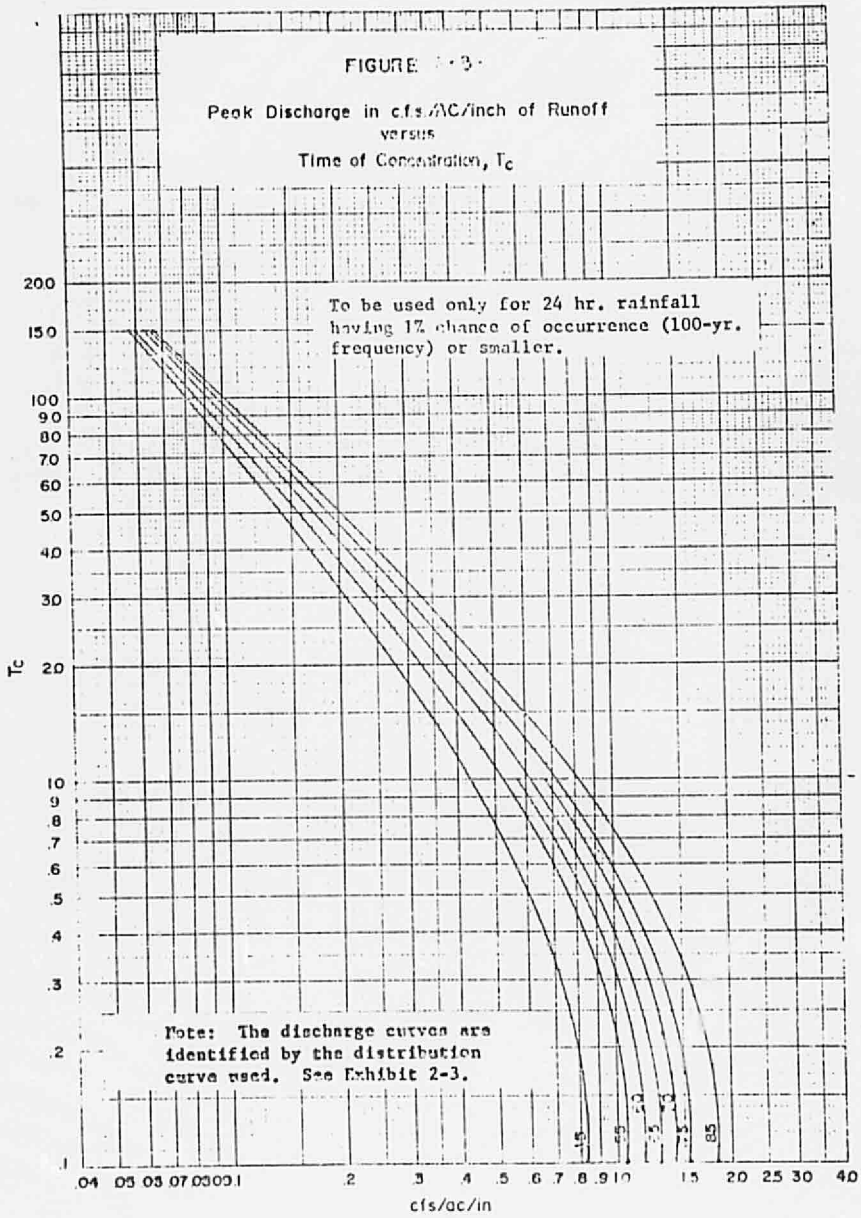
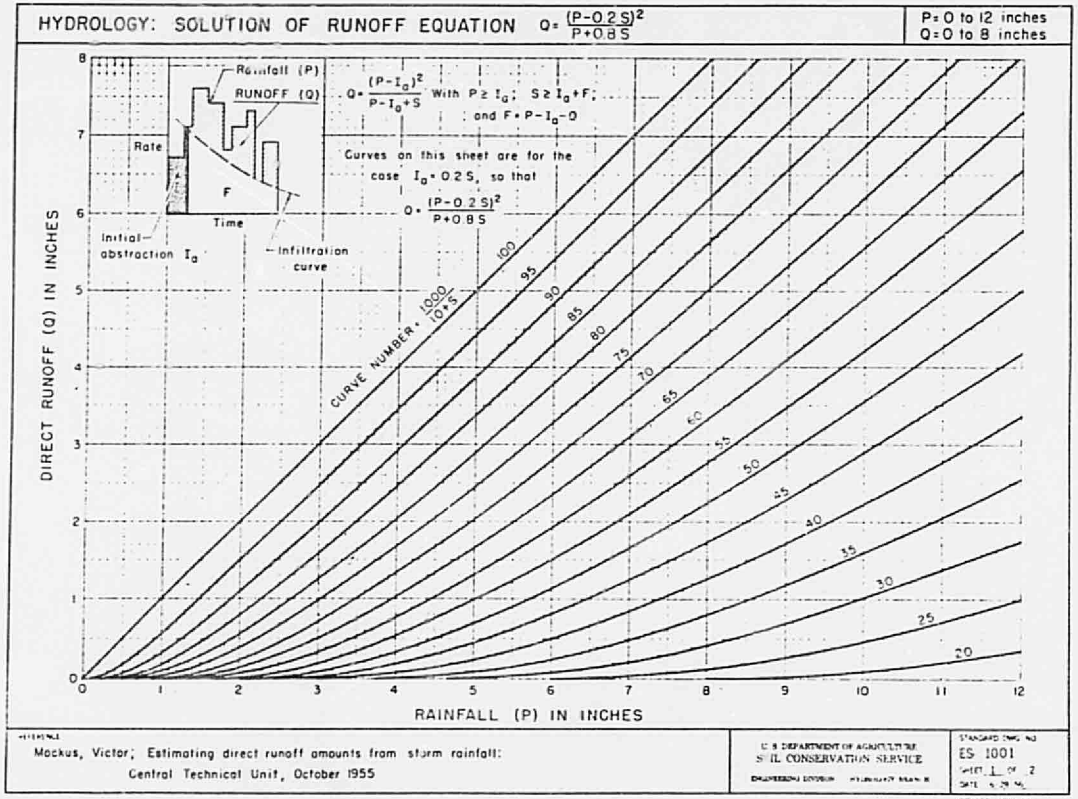


FIGURE 2-3
Peak Discharge in c.f.s./AC/inch of Runoff
versus
Time of Concentration, Tc
To be used only for 24 hr. rainfall having 1% chance of occurrence (100-yr. frequency) or smaller.
Note: The discharge curves are identified by the distribution curve used. See Exhibit 2-3.
Tc
200
150
100
90
80
70
60
50
40
30
20
10
9
.8
.7
.6
.5
.4
.3
.2
.1
.04 .05 .06 .07 .08 .09 .1
.2
.3
.4
.5
.6
.7
.8
.9
1.0
1.5
2.0
2.5
3.0
4.0
cfs/ac/in

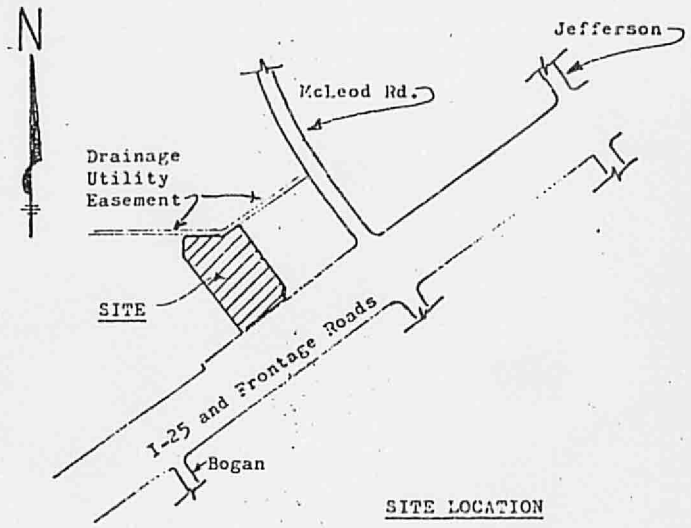


REFERENCE
Mockus, Victor; Estimating direct runoff amounts from storm rainfall: Central Technical Unit, October 1955

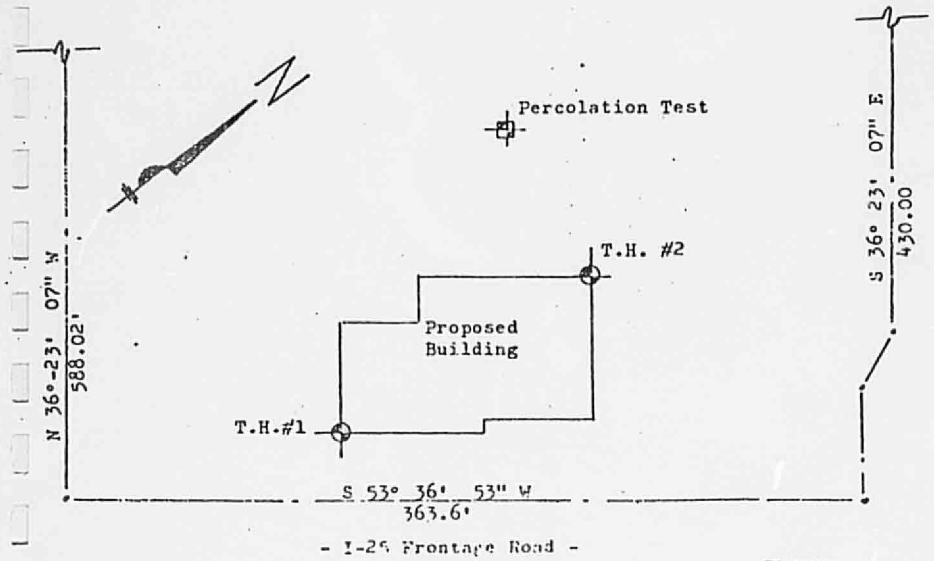
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ENGINEERING DIVISION

STANDARD DWG. NO.
ES 1001
SHEET 1 OF 2
DATE
REVISED 12-1-64

Figure 2-4



SITE LOCATION



TEST LOCATIONS

PLATE I