HYDROLOGY K10/D4 6 PLANS

K10/D4

6 Plans

CITY OF ALBUQUERQUE
MUNICIPAL DEVELOPMENT DEPARTMENT
ENGINEERING DIVISION/DESIGN HYDROLOGY SECTION

CONFERENCE RECAP

DRAINAGE FILE/ZONE ATLAS PAGE NO.: K-10 DATE: 4/10/86 @ 1:00

PLANNING DIVISION NOS: EPC: _____ DRB: _____

SUBJECT: Mobile Home Development - Green Briar

STREET ADDRESS (IF KNOWN): Temp. Airport - future S. Coors

SUBDIVISION NAME: Tract 90; Town of Atrisco Grant

APPROVAL REQUESTED:

____	PRELIMINARY PLAT	____	FINAL PLAT
X	SITE DEVELOPMENT PLAN	____	BUILDING PERMIT
____	OTHER	____	ROUGH GRADING

	WHO	REPRESENTING
ATTENDANCE:	Tom Romero	Santiago Romero & Assoc.
	Roger Green	Hydrology Section

FINDINGS:

(1) Approved Conceptual Grading & Drainage Plan required for Site Development Plan Approval.
(2) Detailed Drainage Report will be required for platting and grading Approvals.
(3) Allowed Discharge Rate will depend upon downstream capacity of Cross Connector storm drain and street design. (DTM Engineers)
(4) Interim Retention ponding will be allowed if development precedes construction of Cross Connector.
(5) Off Site Flows must be accepted and Drainage Easement should be provided for future off site flows.
(6) 100yr flood zone bisects site

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:	Roger Green	SIGNED:	Tom Romero
TITLE:	Hydrology	TITLE:	
DATE:	4/10/86	DATE:	

NOTE PLEASE PROVIDE A COPY OF THIS RECAP WITH THE DRAINAGE SUBMITTAL

Murray - McCormick, Inc.
2601 Wyoming Blvd. N.E., Suite F
Albuquerque, New Mexico 87110
[redacted]

LETTER OF TRANSMITTAL

DATE	JOB NO.
RE:	
FROM:	

TO CITY OF ALB.

ATTN: MR L. LAWS
DRAINAGE ENGINEER

VIA: ☐ Parcel Post ☐ First Class ☐ Air Mail ☐ Special Delivery ☐ Messenger
☐ Air Freight via ☐ RR Express ☐ Other

GENTLEMEN: WE ARE SENDING YOU ☐ Attached ☐ Under separate cover
☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ Payrolls ☐

QUANT.	DATED	NO.	DESCRIPTION
			IMPROVEMENT PLANS
1			GREEN BRIAR MOBILE HOME PARK
1			DRAINAGE REPORT

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 ☐
☐ FOR BIDS DUE 19 ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS

MR ROBERT APPROVED DRAINAGE REPORT & REQUIRED A CPY OF REPORT & PLANS BE FORWARDED TO YOU.

COPY TO

SIGNED:

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

Z-73-101

DRAINAGE STUDY

FOR

DICK BURMEISTER

Approved
John L. Black
AMAFCA.
Sept. 17, 1973

PREPARED BY:
CHAMBERS, CAMPBELL
ISAACSON & CHAPLIN, INC.
3300 INDIAN SCHOOL ROAD, N.E.
ALBUQUERQUE, NEW MEXICO 87106

SEP 17 1973

APPROVED FOR DRAINAGE

24 Sep 79

PEACE

G. Kiehl

Z-73-101

DRAINAGE STUDY

FOR

DICK BURMEISTER

Approved
John L. Black
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SEP 17 1973

APPROVED FOR DRAINAGE
24 Sep 74
PEACE

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Plat B - Location and Drainage Map Scale 1" = 2000'

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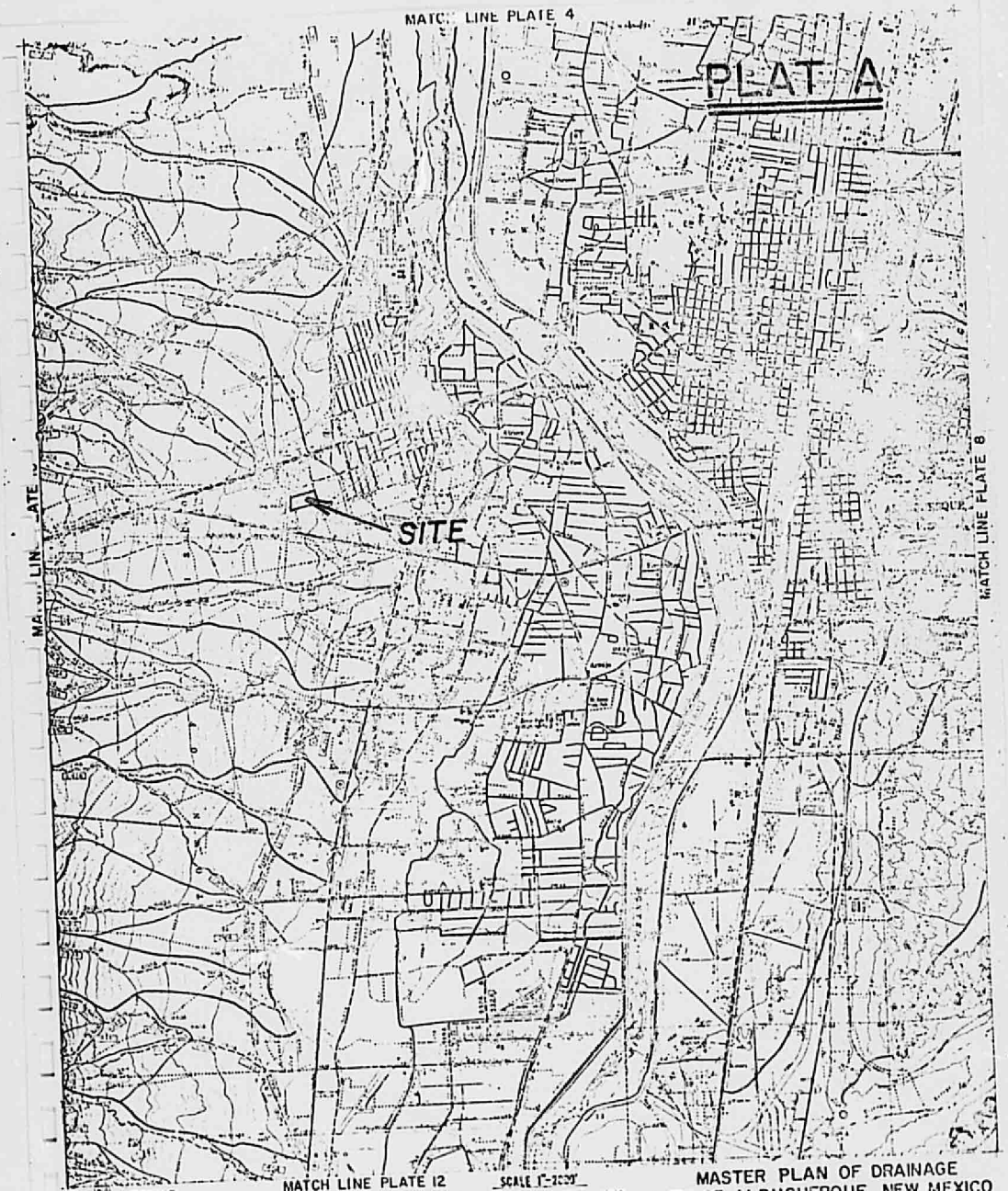
Chart II - Intensity Duration Frequency Curves

Chart III - Nomograph for Solution of Manning Equation

Table IV - Street Carrying Capacities

Bibliography of References



LEGEND

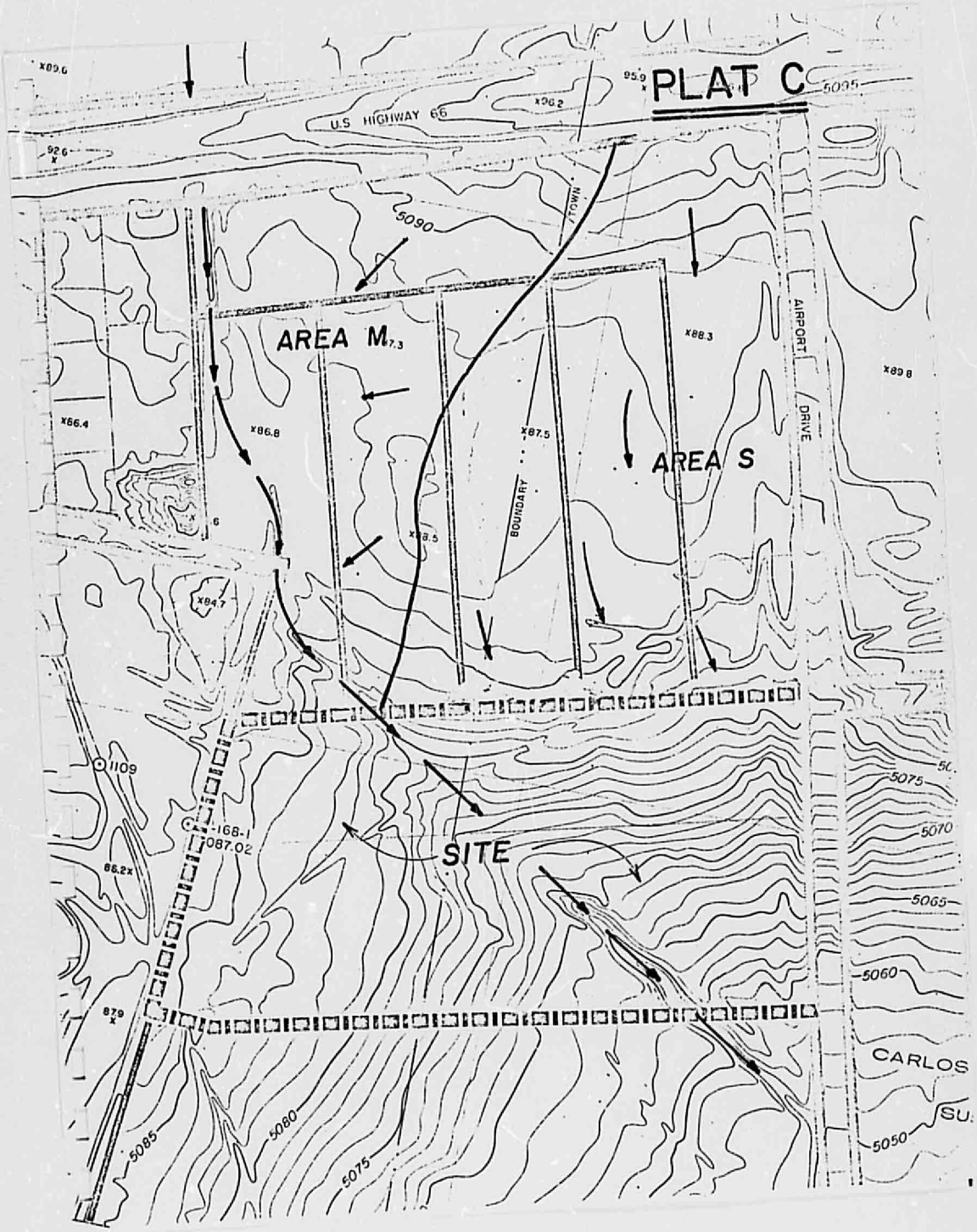
- LIMIT OF DRAINAGE AREA
- LIMIT OF SUB-DRAINAGE AREA
- DRAINAGE EASEMENT
- NATURAL DRAINAGE AREA
- DRAINAGE AREA AFTER DEVELOPMENT
- WEATHER STATION (CLIMATIC CONDITIONS)
- RUNOFF MEASURING STATIONS

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

PLATE 9

PLAT B

SITE
Drainage Basin
Drag Strip
ALBUQUERQUE
Gravel Pit
Arenal


PLAT C
U.S HIGHWAY 66
TOWN
BOUNDARY
AIRPORT
DRIVE
AREA M
AREA S
SITE
CARLOS
5090
5085
5080
5075
5070
5065
5060
5050
1109
168-1
087.02

PURPOSE

The purpose of this report is threefold: to determine the drainage characteristics of the subject property in (1) its undeveloped condition, (2) in its developed stage, and (3) to analyze the capacity of the drainage channel to pass outside flow through the subject property.

INTRODUCTION

The subject property, a proposed trailer park, is located west-southwest of Albuquerque in the southeastern corner of Section 22, T.10N, R2E, N.M.P.M., New Mexico. (See Plat A.)

The property lies in the center of a drainage area, with a natural drainage swale passing through the center, sloping toward the southeast. The proposed trailer park is bordered on the north and south by undeveloped land; on the west by Skyview West Subdivision; and on the east by Airport Road, S.W.

Offsite drainage enters the property via the natural drainage swale at Point I (See Plat D). Other offsite drainage in the form of sheet flow, intersecting the north boundary from the adjacent property (Area S, Plat C) will be allowed to infiltrate the subject property and be retained in the ponding areas, with any overflow being received by the streets.(See Plat D.) These flows, plus part of the internal drainage within the park, leave the property at Points II,

III and IV, and flow to the southeast via the natural drainage swale and Airport Road. (See Plat D). As it will be shown, these flows will be accomodated either by ponding or by related facilities.

CALCULATIONS

In analyzing the storm runoff, the Rational Formula, Q = AIR, 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. (Where a Time of Concentration [Tc] is less than ten minutes, the Intensity value equal to ten minutes was used.)

R = Runoff coefficient (no unit)

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

PHASE I

Phase I consisted of analyzing the proposed trailer park in the undeveloped form. The resulting runoff accumulates by flowing into the natural drainage swale with the flow concen-

trating at the south boundary before discharging to the southeast.

The runoff coeficient used for undeveloped areas = 0.45 (Table XII, Master Plan of Drainage, City of Albuquerque, New Mexico and Environs, 1953, G. Herkenhoff and Associates.)

TABULATION OF RESULTS - PHASE I - PLAT C

DRAINAGE BASIN	ELEV. DIFF. FEET	LENGTH OF FLOW FEET	Tc MIN	I "/Hr	R	AREA ACRES	Q Cfs
PROPOSED TRAILER PARK	26'	1000'	6.5 Use 10	5.4	0.45	15.00	36.45

PHASE II

Phase II consisted of analyzing the trailer park in its developed form. Only internal flows were considered in this phase. The resulting runoff flows and area contributing to this runoff are shown at each street intersection on Plat D.

To help reduce the developed runoff flows, back yard ponding was incorporated into the design (See Figure I). The assumption was made that the rear half of the trailer roof will contribute to the pond volume along with runoff from the patio and storage shed. The runoff from the parking area and the front half of the trailer roof will exit

onto the streets.

The runoff from the west half of the park is channeled into the open area in the center of the park with the exception of area E. The runoff from the east half of the park is channeled to two outlet points on Airport Road. (See Plat D).

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" lot to arrive at a reasonable value of the coefficient for the non-ponding areas. (See Calculation Sheet I). The runoff coefficients used are as follows- (Table 3-2, Urban Storm Drainage Criteria Manual, Volume I, Denver Regional Council of Governments).

Streets, Walks & Drives	R = 0.98
Roofs	R = 0.98
Lawns, Sandy Soils: Avg., 2 to 7%	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. (Section 3.7

and Table 3-3, Urban Storm Drainage Criteria Manual, Volume I, Denver Regional Council of Governments.) See Calculation Sheet I.

TABULATION OF RESULTS - PHASE II - PLAT D

DRAINAGE BASIN	ELEV. DIFF. FEET	LENGTH OF FLOW FEET	Tc MIN	I "/Hr.	R	AREA ACRES	Q Cfs
A	7'	360	3.3	5.4	0.65	0.748	2.63
B	2	170	2.3	5.4	0.95	0.194	1.00
C	9	520	4.8	5.4	0.65	1.126	3.95
D	6	300	2.8	5.4	0.65	0.636	2.23
E	11	350	2.6	5.4	0.65	0.873	3.06
F	4	650	8.0	5.4	0.65	1.417	4.97
G	3	310	3.8	5.4	0.65	0.747	2.62
H	14	340	2.3	5.4	0.65	0.488	1.71
I	4	260	2.9	5.4	0.65	0.504	1.77
Internal Concentration Flows - See Plat D							
F-Pt. III	4	650	Use 10 8.0	5.4	0.65	1.417	4.97
GHI-Pt. IV	12	620	Use 10 5.2	5.4	0.65	1.739	6.10
E-Into Drainage Channel	11	350	Use 10 2.6	5.4	0.65	0.873	3.06
							14.13

Use Tc = 10 min.

PHASE III

In Phase III, the drainage way was analyzed for capacity to handle external and internal runoff drainage. The flow at Point I is from a drainage basin that is largely undeveloped. (Plat B). The adjacent drainage basins to the west originally contributed to the flows at Point I, but now these flows are intercepted by a dike surrounding the Unser's garage. These flows are then directed through pipes under Central Avenue and are intercepted by 78th Street (Plat B).

Analyzing the flows within the trailer park, from Point I to Point II, the only contributing area that drains into the channel before it exits at the south boundary is from Area E. Area E drains into the channel because the surrounding topography makes ponding of this area impossible. (Plat D).

The drainage channel at Point II empties into a natural drainage swale and thus the flow is retained and continues in its natural water course.

TABULATION OF RESULTS - PHASE III - PLAT D

DISCHARGE POINT	DIFF. ELEV. Ft.	LENGTH OF FLOW Feet	Tc Min.	T Hr.	R	AREA Acres	Q Cfs
I	240'	13,500	57	2.3	0.45	558.528	578.08
II	260'	14,310	58	2.28	0.45	560.09	574.65

RECOMMENDATIONS

The following recommendations are made to enable the developer to complete this project within the design framework stated above.

1. All streets should be paved, with curb and gutter, to best facilitate the movement of runoff waters without undue erosion.
2. The ponding areas should be surrounded on four sides by a 6" earth dike to prevent breaching of the berms. (See Figure I). The ponding areas bordering the north boundary should be left open so as to accept the sheet flow from the adjacent land.
3. The central ponding area will require grading and terracing so that its capacity can be utilized fully.
4. The recreational vehicle storage area should be graded so as not to contribute any runoff onto the streets.
5. A substantial embankment should be constructed between the central ponding area and the drainage channel to prevent any inter-mixing of flows.
6. Where the streets cross the drainage channel, adequate protection should be taken in the form of rip-rap to prevent the dip section from being washed out.

7. As presently shown on Plat D, the Office, Laundry, and Recreation Building should be relocated so that the parking lot is between the building and the drainage channel.

8. The channel will have to be formed as shown on Calculation Sheet II, with drop structures placed as shown on Plat D.

SUMMARY

The subject property, by utilizing back yard ponding and a central ponding area, will contribute less internal runoff to surrounding areas than that which existed before development. i.e. 36.45 cfs in its natural state vs 14.13 cfs from areas F, G, H, I, and E. (See Plat D.) The internal discharge at Points III and IV will not exceed Airport Road's carrying capacities.

Additionally, external flows will be routed through the park so as not to disturb the overall drainage characteristics of the area. The drainage channel will accomodate all flows safely and return these flows to its natural drainage path.

In conclusion, the development of this trailer park 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,
September 11, 1973

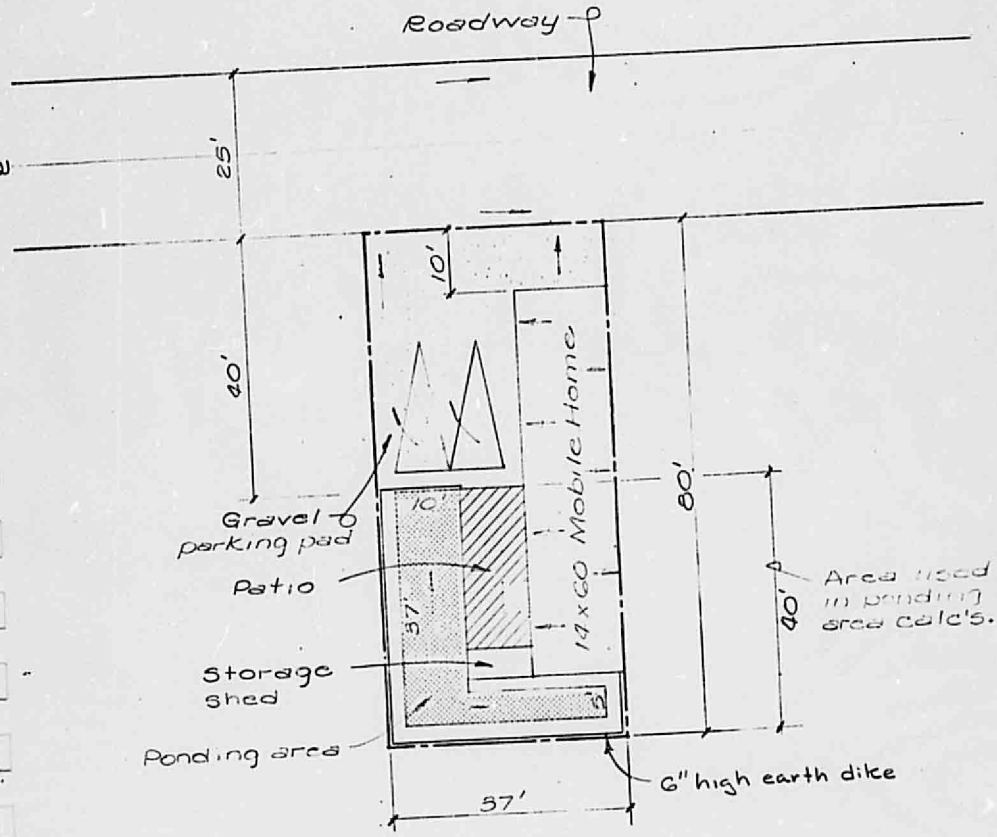
Thomas O. Isaacson

Thomas O. Isaacson, for

CHAMBERS, CAMPBELL
ISAACSON & CHAPLIN, INC.

FIGURE 1

Scale 1" = 20'



TYPICAL PAD

CALCULATION SHEET I

Calculations for Composite Runoff Factor for Rear Yard Pond.

R = 0.98 Trailer & Patio = 720 ft² $\frac{720}{1480}$ = 49%

R = 0.15 Yard & Drive Pad = 760 ft² $\frac{760}{1480}$ = 51%

(0.49)(0.98) = 0.48
(0.51)(0.15) = 0.08
(0.56)(1.25) = 0.70 Composite Runoff Factor

Pond Surface Area = 480 ft² x 0.6 ft = 288 ft³ Storage Availab
40' x 37' = (1480 ft²)(0.70)(0.25*) = 259 ft³ – required for flow from rear half of trailer, patio, etc. for a 6 hr/100 yr. storm.

* 3" - 6 Hr/100 Storm - Tech. Paper #40

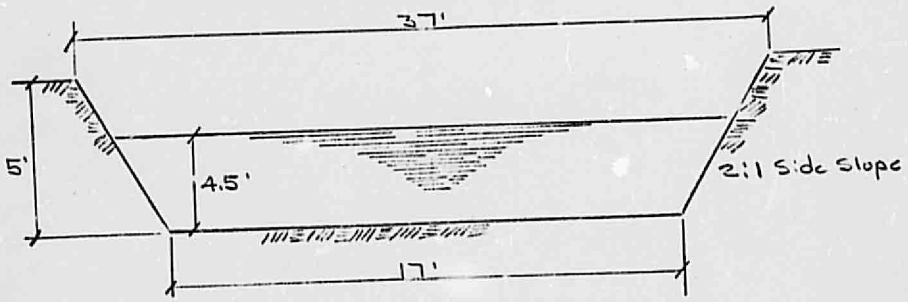
Calculations for Composite Runoff Factor for Lot Drainage
Total Runoff Area = (37)(52.5) = 1942.50 ft²

R = 0.98 Trailer = 30 x 14 = 420 ft²
Road = 12.5 x 37 = 463 ft²
883 ft² $\frac{883}{1942.5}$ = 45%

R = 0.15 1942.5 - 883 = 1059.50 ft² $\frac{1059.5}{1942.5}$ = 55%

(0.45)(0.98) = 0.44
(0.55)(0.15) = 0.09
(0.52)(1.25) = 0.65 Composite Runoff Factor

CALCULATION SHEET 2



Typical Channel Section

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

Area = $2\left(\frac{4.5 \times 9}{2}\right) + 4.5(17) = 117$ ft

$V = \frac{578.08}{117.0} = 4.94$ '/sec.

where B = 17' D = 4.5'

$\frac{D}{B} = \frac{4.5}{17} = 0.26$ @ 2:1 slope = 6.87 Table 7-10, Handbook of Hydraulics, King & Brater

$$578.08 = \frac{(6.87)(4.5^{8/3})(\text{slope}^{1/2})}{0.030}$$

S = 0.21% slope for non-eroding conditions

Calculations for capacity of Central Ponding Area

Area contributing to Pond Area = 2.704 Ac.

Area of Ponding Area = 1.40 Ac

4.104 Ac

R = 0.65 - Composite Factor

$\frac{2.704}{4.104} = 65\%$ (0.65)(0.65) = 0.42

R = 0.45

$\frac{1.40}{4.104} = 35\%$ (0.35)(0.45) = 0.15

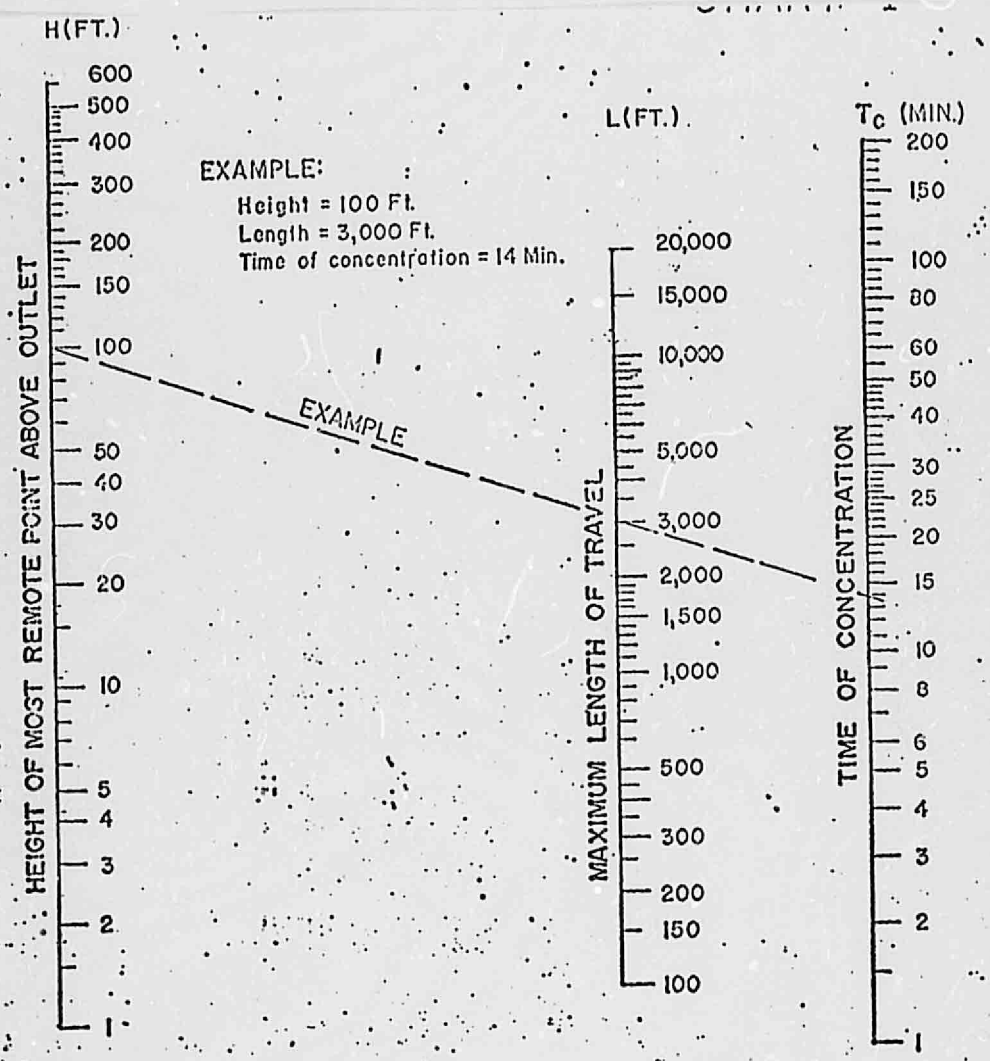
0.57 Adjusted Composite Factor for Ponding Area.

$$\frac{(4.104\text{ Ac})(43{,}560\text{ ft}^2/\text{Ac})(0.25^*)(0.57)}{0.50\text{ ft}} = 50{,}950\text{ ft}^2 = 1.17\text{ Ac req'd for 6hr/100 yr. storm.}$$

* 3"-6 Hr/100 yr storm – Tech Paper #40

CHAMBERS, CAMPBELL, ISAACSON & CHAPLIN
ENGINEER-ARCHITECT-PLANNERS
ALBUQUERQUE, NEW MEXICO

SUBJECT _____ JOB NO. ____
CLIENT _____
BY _____ DATE _____ SHEET NO. ____ OF ____

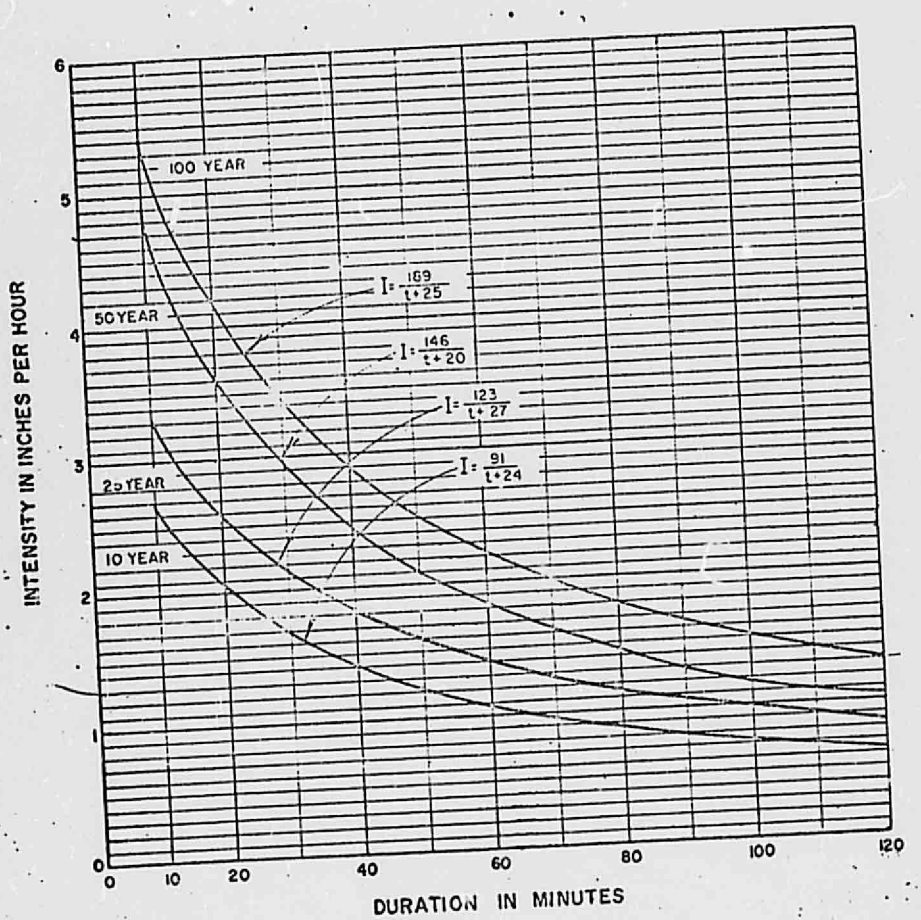


Based on study by P. Z. Kirpich,
Civil Engineering, Vol. 10, No. 6, June 1940, p. 332

FIG. 1 TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

Reprinted from "Design of Roadside

CHART II



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

INTENSITY DURATION
FREQUENCY CURVES

(ALBUQUERQUE AREA - 1961)

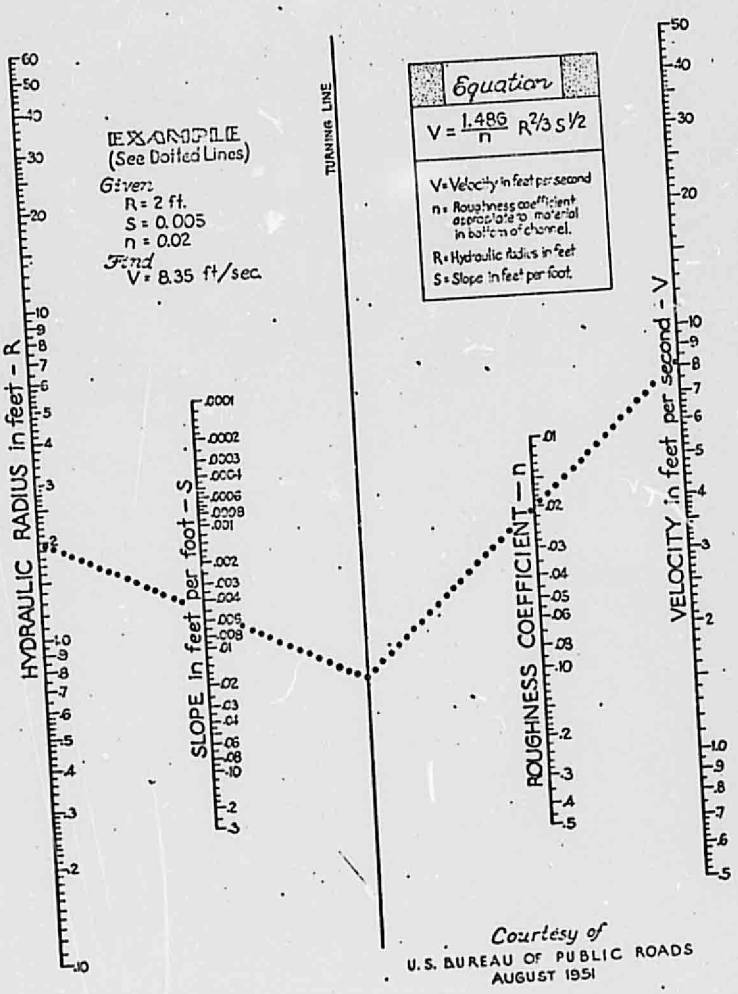
GORDON HERKENHOFF & ASSOC
CONSULTING ENGINEERS
ALBUQUERQUE, NEW MEXICO

CHART
1

FIGURE 7-306.1A

CHART III

NOMOGRAPH FOR SOLUTION OF MANNING EQUATION



Courtesy of
U.S. BUREAU OF PUBLIC ROADS
AUGUST 1951

TABLE IV

STREET CARRYING CAPACITIES
(CFS)

Slope	32' Street 6" Crown at center line or 6" sidehill with no crown	32' Street Flat Cross-section	32' Street 6" Inverted crown at center line	32' Street with 8" sidehill with no crown	32' Street with 12" sidehill with no crown	40' Street 6" Crown at center-line or 6" sidehill with no crown	44' Street 6" Crown at center-line or 6" sidehill with no crown	48' Street 6" Crown at center-line or 6" sidehill with no crown
0.0025	37	78	133	25	17	47	51	56
0.0050	53	111	189	36	23	66	72	79
0.0075	65	136	231	44	29	81	89	97
0.0100	75	156	267	51	33	93	102	112
0.0125	84	175	299	57	37	104	115	125
0.0150	92	193	328	62	41	114	126	138
0.0175	99	207	352	67	44	123	135	148
0.0200	105	221	376	71	47	131	144	158
0.0225	112	235	400	76	50	139	154	168
0.0250	118	247	422	80	52	147	162	177
0.0275	124	260	444	84	55	155	170	186
0.0300	129	271	462	88	57	161	177	193
0.0325	134	282	480	91	59	167	184	202
0.0350	139	293	499	95	62	174	191	209
0.0375	145	304	518	98	64	180	199	217
0.0400	149	313	534	101	66	186	205	224
0.0425	154	322	550	104	68	192	211	231
0.0450	158	332	566	107	70	197	217	237
0.0475	163	341	582	110	72	203	223	244
0.0500	167	350	598	113	74	208	230	251

Coefficient of Roughness = n = 0.015 for all streets.
Carrying Capacity Given in Cubic Feet per Second (C.F.S.)
Arterial Design (Stage & Final) has a +2% Slope from the Top of Curb to the top of Median Curb.
Curb Height = 8'

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