

M1610



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

October 14, 1991

OCT 17 1991

PROJECT ACCEPTANCE LETTER

J.R. Hale Contracting
505 Carmony N.E.
Albuquerque, NM 87125

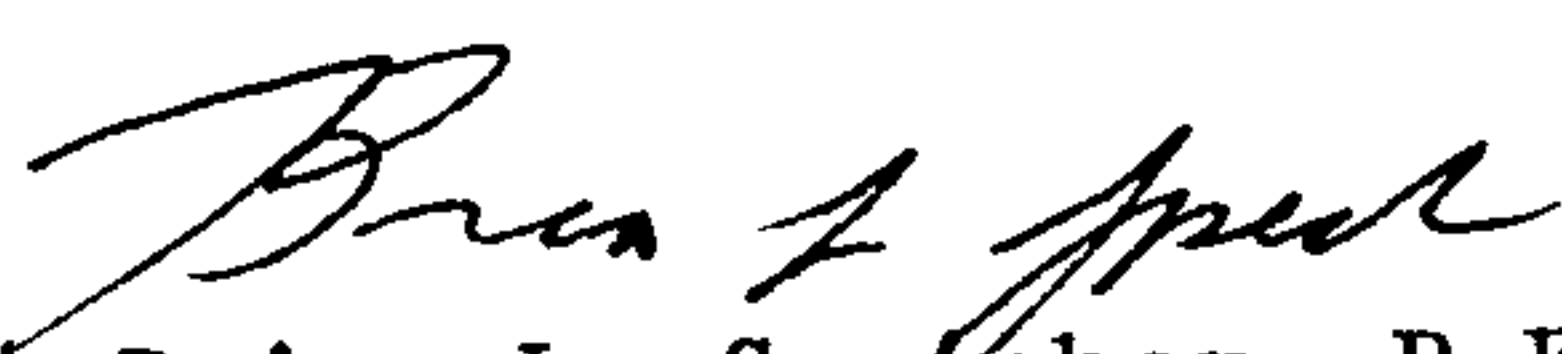
RE: OLD TERMINAL ROAD AND PARKING LOT IMPROVEMENTS, PROJECT NO. 4135.90

Dear Mr. Hale:

The above referenced project has been completed according to the plans and specifications. The project consisted of improvements to the Old Terminal Road and parking lot to include paving, grading, site lighting and electrical improvements, access grate and appurtenances, landscaping, wall, and utility adjustments.

The City of Albuquerque accepts the referenced project as a whole and the contractual correction period began August 30, 1991. The correction period on this project is for one (1) year.

Sincerely,


Brian L. Speicher, P.E.
Chief Construction Engineer
Public Works Department

BLS:tjp

October 14, 1991

Page 2

cc: Greiner, Inc.

Jim Hicks, Engineering Group, PWD

Carl Rodolph, Aviation

Dennis Parker, Aviation

Jim Hinde, Aviation

Mike Fellman, CIP Office

Denise Wilcox, Engineering Group, PWD

~~Fred Aguirre, Engineering Group, PWD~~

Terri Martin, Engineering Group, PWD

Martin Barker, Engineering Group, PWD

Steve Gonzales, Special Assessments

A. N. Gaume, Operations Group, PWD

Sam Hall, Operations Group, PWD

Jim Fink, Operations Group, PWD

Ray Chavez, Engineering Group, PWD

Greg Olson, Water/Wastewater Group, PWD

Dave Parks, Engineering Group, PWD

Tom Kennerly, Engineering Group, PWD

Josie Gutierrez, New Meter Sales, Finance Group, PWD

Claudia Gallegos, Standby Clerk, Finance, PWD

Virginia Candelaria-Martinez, Human Rights

Richard Zamora, Engineering Group, PWD

f/Project No. 4135.90

f/Readers

f/Warranty:Contract



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

PROJECT REVIEW COMMITTEE MEETING

1/31/91

3:30 P.M.

PROJECT: Albuquerque International Airport
Terminal Road & Parking Lot

PROJECT NO.: 4135.90

CONSULTANT: Greiner Engineering

ATTENDEES: Roger Green, DRC Chairman
Joe Luehring, Utility Coordinator
Richard Dourte, Transportation
Greg Olson, Water/Wastewater
Dennis Parker, Aviation
Bill Perkins, Campbell, Okuma, Perkins Assoc.
Mark Holstad, Consultant
Beverly Ortiz, Consultant

COMMENTS:

1. Plans signed by Diane Scena, Richard Dourte, Greg Olson, and John Murray.
2. Minor comments provided by Joe Luehring noted by Consultant.
3. Try to clean up shading on Sheet 3 to make notes legible.
4. No adverse comments on contract documents.

Return mylars to master scheduler for remaining signatures after comments are addressed.

WP+125121

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

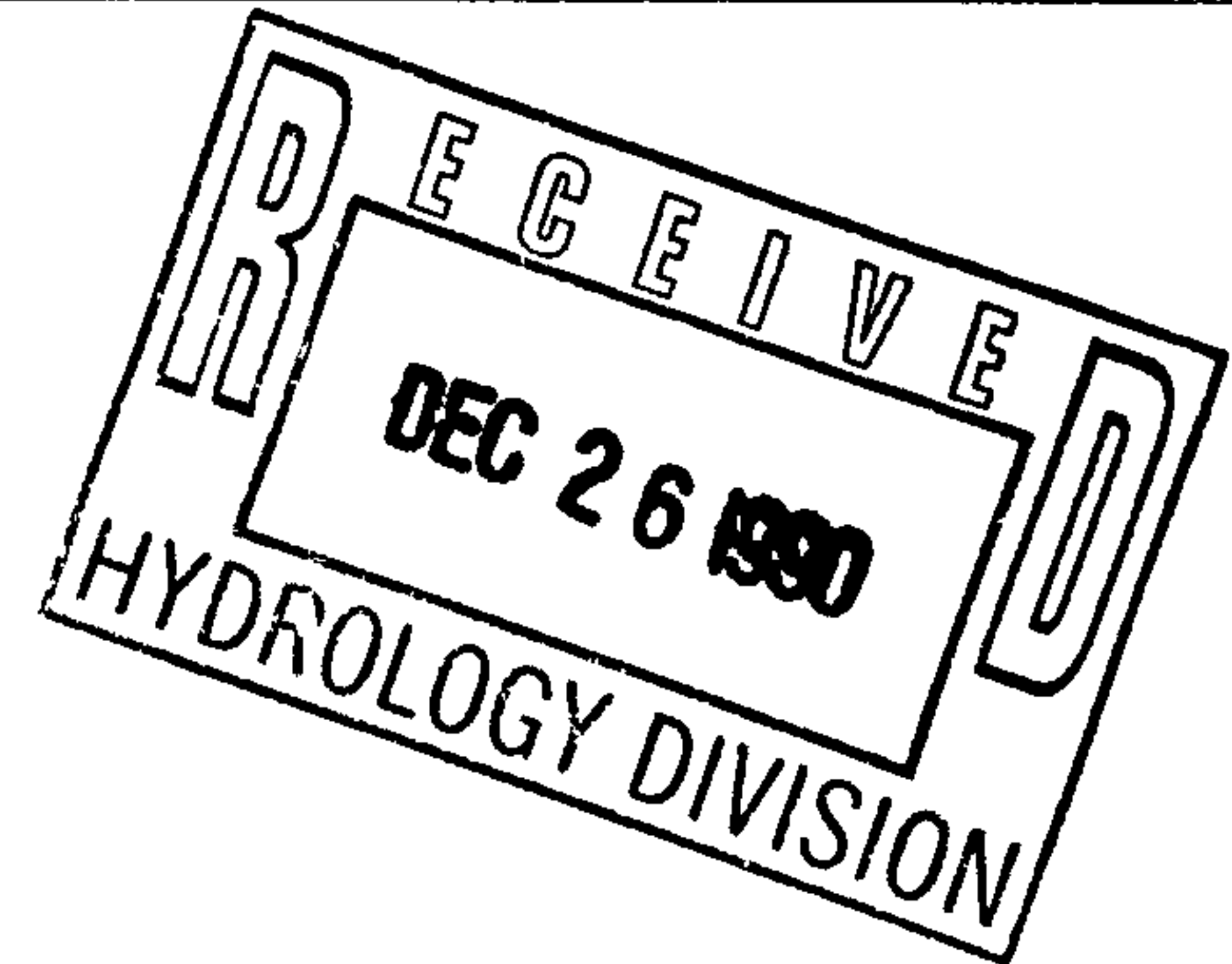
AN EQUAL OPPORTUNITY EMPLOYER

Greiner

Greiner, Inc.
5971 Jefferson Blvd., N.E.
Suite 101
Albuquerque, New Mexico 87109
(505) 345-3999
FAX: (505) 345-8393

December 20, 1990

Mr. Fred Aguirre, PE
Public Works Department
Hydrology Division
City of Albuquerque
P. O. Box 1293
Albuquerque, NM 87103



**RE: DRAINAGE ANALYSIS
OLD TERMINAL ROAD AND PARKING LOT IMPROVEMENTS**

Dear Fred:

In accordance with your request, we have analyzed the area that will drain to George Road from Yale Blvd. west. This analysis was consistent with the following previous studies which cover adjacent projects:

1. Drainage Report for Master Plan Improvements Program
Albuquerque International Airport, Greiner, October 1986
2. Conceptual Drainage Report and Submittal for Site
Development plan approval for the Postal Facility located
at Albuquerque International Airport, Molzen-Corbin &
Associates, November 1989.

The results of this analysis gave the following flows:

1. George Road at the south extension of Yale Blvd.
Q-10 = 12.7 cfs
Q-100 = 19.3 cfs
2. George Road at the west side of the Post Office site
Q-10 = 14.7 cfs
Q-100 = 22.2 cfs

These flows are within the capacity of the proposed street section, however, there will not be a free lane in each direction during a 10 year flood event. As previously discussed, this will be acceptable because George Road is being considered as a private road in this case. The above flow rates are to be added to the construction plans.

Greiner

Mr. Fred Aguirre, PE
December 20, 1990
Page 2

The project area was included in the previous downstream analysis in the Drainage Report for Sunport Park, Phase I dated August 1990 by Andrews, Asbury and Roberts. The proposed improvements are in substantial agreement with this report.

Please advise if you have any additional questions.

Sincerely,

GREINER, INC.



Mark S. Holstad, PE
Project Manager

MSH:cs

JN G0033.00

POST OFFICE/DRAIN



LEEDSHILL - HERKENHOFF, INC.
ALBUQUERQUE PHOENIX SANTA FE
SAN DIEGO SAN FRANCISCO
ENGINEERING COMPUTATIONS

NAME OF PROJECT

AIRMAIL FACILITY

SHEET NUMBER

OF

COMPUTED BY:

JE

CHECKED BY:

JOB NUMBER

DATE:

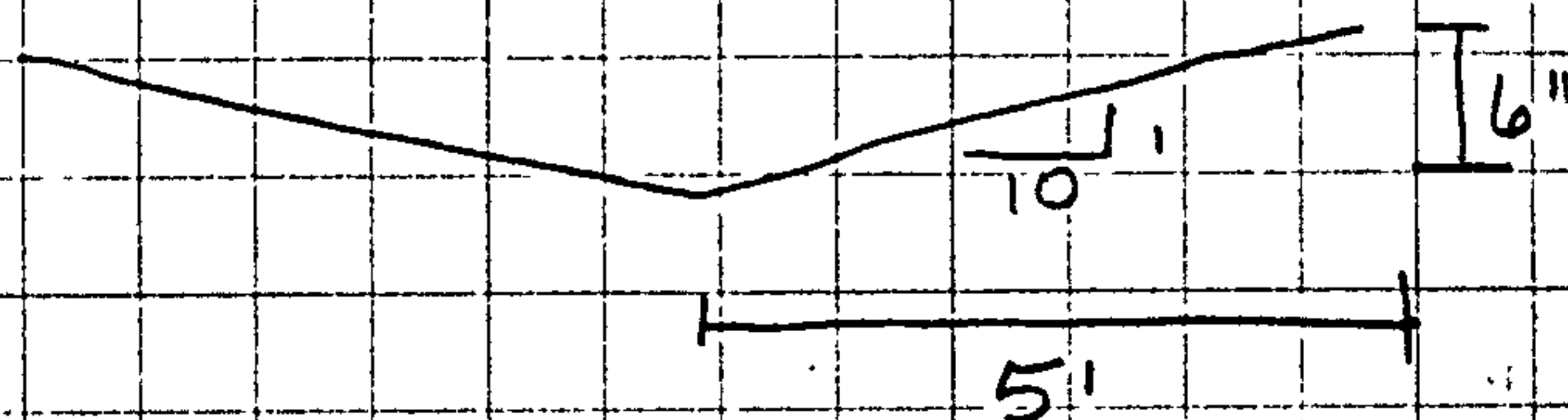
19 Aug 90

CHECK EROSION POTENTIAL AT RUNDOWNS LOCATED
AT AREA 1b AND OFFSITE AREA D

AREA 1b $Q_{100} = 0.6$ cfs - very minimal erosion potential,
rough broom finish on rundown
should prevent erosion

AREA D $Q_{100} = 5.3$ cfs

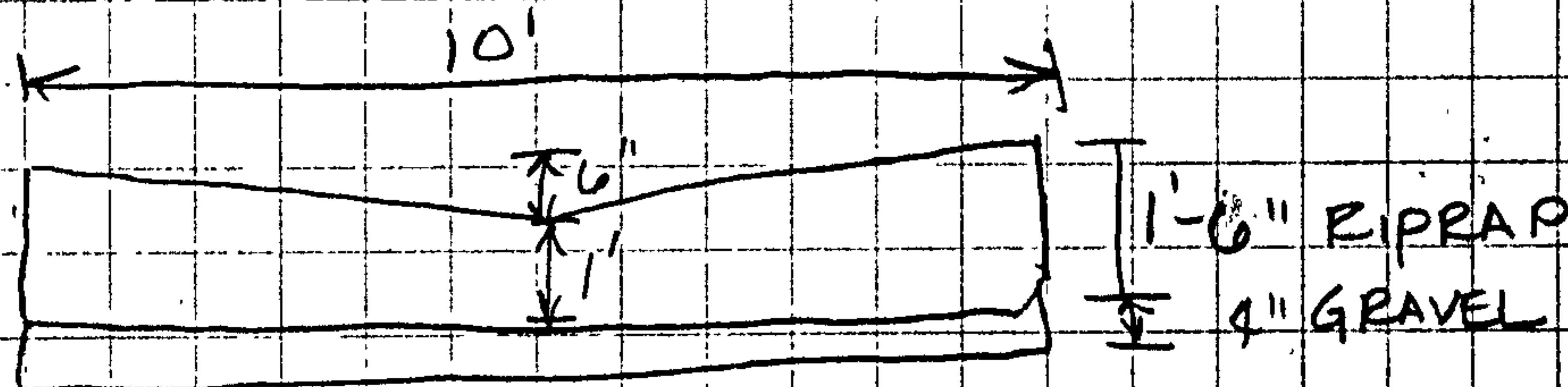
ASSUME THAT RUNDOWN IS 10' WIDE, HAS 6" DEPTH AT
CENTER, SLOPE MAX = 10%, ACTS LIKE A SMALL
"V" SHAPED CHANNEL. CALCULATE DEPTH AND VELOCITY
ON RUNDOWN



NORMAL DEPTH CALCULATIONS (ATTACHED) INDICATE
THAT VELOCITY = 8.9 FPS AT END OF RUNDOWN; SUFFICIENT
TO CAUSE EROSION. CHECK RIPRAP SECTION IN LIEU OF CONCRETE

RECOMMEND THAT RIPRAP RUNDOWN BE INSTALLED
RATHER THAN CONCRETE - REDUCES VELOCITY TO 4.2 FPS
RIPRAP SECTION SHOULD BE 1' THICK WITH 4"
OF GRAVEL UNDERNEATH

RUNDOWN SECTION



TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

August 29, 1990
RUNDOWN AT OFFSITE AREA D
(CONCRETE RUNDOWN)

=====

PROGRAM INPUT DATA:
DESCRIPTION

	VALL
Flow Rate (cubic feet per second).....	5.3
Channel Bottom Slope (feet per foot).....	0.100
Manning's Roughness Coefficient (n-value).....	0.013
Channel Side Slope - Left Side (horizontal/vertical)....	10.00
Channel Side Slope - Right Side (horizontal/vertical)...	10.00
Channel Bottom Width (feet).....	0.5

=====

PROGRAM RESULTS:
DESCRIPTION

	VALL
Normal Depth (feet).....	0.22
Flow Velocity (feet per second).....	8.93
Froude Number (Flow is Super-Critical).....	4.523
Velocity Head (feet).....	1.24
Energy Head (feet).....	1.46
Cross-Sectional Area of Flow (square feet).....	0.59
Top Width of Flow (feet).....	4.90

=====

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 198
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 7705
(713) 895-8322. A manual with equations & flow chart is available.

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

August 29, 1990
RUNDOWN AT OFFSITE AREA D
RIPRAP RUNDOWN

=====

PROGRAM INPUT DATA:
DESCRIPTION

	VAL
Flow Rate (cubic feet per second).....	5.3
Channel Bottom Slope (feet per foot).....	0.10
Manning's Roughness Coefficient (n-value).....	0.03
Channel Side Slope - Left Side (horizontal/vertical)....	10.00
Channel Side Slope - Right Side (horizontal/vertical)...	10.00
Channel Bottom Width (feet).....	0.5

=====

PROGRAM RESULTS:
DESCRIPTION

	VAL
Normal Depth (feet).....	0.33
Flow Velocity (feet per second).....	4.20
Froude Number (Flow is Super-Critical).....	1.76
Velocity Head (feet).....	0.27
Energy Head (feet).....	0.61
Cross-Sectional Area of Flow (square feet).....	1.26
Top Width of Flow (feet).....	7.12

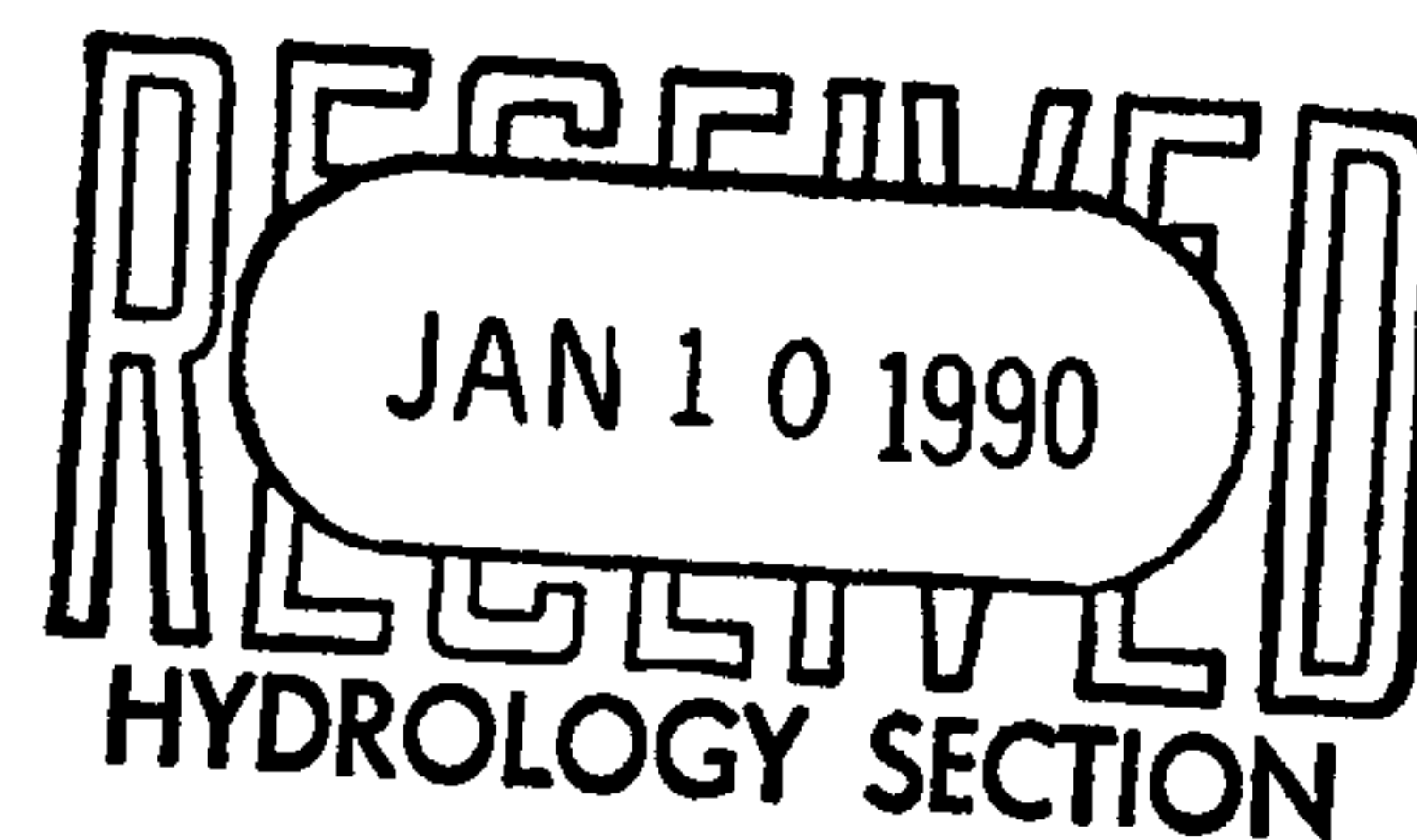
=====

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.3 (c) 1981
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77057
(713) 895-8322. A manual with equations & flow chart is available.

**CONCEPTUAL DRAINAGE REPORT
AND SUBMITTAL FOR
SITE DEVELOPMENT PLAN APPROVAL
FOR THE
POSTAL FACILITY LOCATED AT
THE ALBUQUERQUE INTERNATIONAL AIRPORT**

NOVEMBER 1989

**PREPARED FOR
CITY OF ALBUQUERQUE
AVIATION DEPARTMENT**



**PREPARED BY
MOLZEN-CORBIN & ASSOCIATES
2701 MILES ROAD, S.E.
ALBUQUERQUE, NEW MEXICO 87106
(505) 242-5700**

FILE NO. ABQ62-13.D03

TABLE OF CONTENTS

	<u>Page Number</u>
I. Purpose	1
II. Site Location and Existing Conditions	1
III. Proposed Condition	2
IV. Flood Zone	4
V. Erosion Control	4
VI. Design Criteria	5
VI. References	6

Appendix A: Calculations

EXHIBITS

- A. Vicinity Map
- A1. Location Map
- B. Existing Site and Utilities
- C. Proposed Drainage and Grading Plan

I. PURPOSE

The purpose of this report is to provide a drainage and storm sewer analysis for a building site located at the Albuquerque International Airport. This report, and the enclosed material will compose a submittal for site development plan approval.

II. SITE LOCATION AND EXISTING CONDITION

The proposed building site is located west of the Terminal Building at the Albuquerque International Airport and bounded on the north by George Road, City of Albuquerque Zone Atlas Map M-15-Z, Municipal Addition No. 9. See Exhibit "A".

The existing site is presently atop an abandoned landfill. The surface was comprised of paved parking aprons and hangers for private aircraft. This parcel of land was recently abandoned and used as a holding area for contractors working on the Albuquerque International Terminal Building. When the site was developed for private aircraft a 36" storm sewer was installed. There are two catch basins and one manhole along this line. The tributaries for the two catch basins are within the property limits and a small portion of the parking lot east of the site. The line daylights on the west side of the site. No water is presently retained on site, this will also be true of the proposed site. During the years since this line was installed the topography in the tributaries has been altered and storm water is now routed to other catch areas. In the course of this project the 36" line will be removed and a new appropriately sized line will replace it. There is also a 24" storm drain located

on the south side of the site. All existing tributaries for this line are east and south of the site.

The flow at the outlet of the 24" line is calculated to be 11.78 CFS at 3.7 ft./sec.

This information was obtained from plans for construction of the Airline Provisioning Building Project No. 8666 dated March 1988, Sheet C2B.

The total runoff from the existing site, including the 24" storm drain, and the 36" storm drain is 1.351 acre feet. The runoff for the 24" is approximate using information from construction drawings for the Provisioning Building (Appendix A).

III. PROPOSED CONDITION

Proposed development of the site will occur in three stages. First, the site will be excavated, removing all landfill material from the site. This landfill material will be relocated west of the site and covered with clean material, as per New Mexico Health and Environmental Department Operational Procedures.

The second stage will consist of refilling the site with structural fill and liner material which will be borrowed from within the airport property. The final grade for the site is shown on Exhibit "C". Along with the site development there will also be a 1250 foot long access road. This road will be 40 feet wide, face of curb to face of curb and have a cross slope of 2% from the crown to lip of gutter.

The third stage of development will consist of the construction of a new postal facility and parking area. This final stage of development will leave the site covered with 95% paved area and building. The area of the postal facility and parking area site will be 5 acres. With the development of the site and road a total area of 8 acres will be affected.

The finished site will have pavement and building covering 95% of the area, the remaining 5% will be landscaped.

The total runoff from the proposed development will be 1.51 acre feet for a 100 year, six-hour storm which will be routed to the west in a storm drainage system where it will daylight and travel along the surface to natural arroyos. (Appendix A) The point of discharge for the new system will be near the same location as the existing 36" storm drain discharge which is to be completely removed during excavation. See Exhibit "C" for plan of new system.

The storm water that is discharged out of this proposed storm drain system will sheet flow in a westerly direction approximately 2,200 feet along an existing flow line where it will be picked up by a newly constructed holding basin. The storm water is then control released over a concrete spillway to a 52" RCP under University Boulevard. The water is then directed through existing channels and arroyos to the south diversion channel. This path is the same as what presently exists for this site and the provisioning building.

IV. FLOOD ZONE

The FEMA flood maps indicate no flood zones in the area of the proposed site.

Albuquerque Master Drainage Study Volume II by Bohannon-Huston, Inc.

This study shows a flood hazard area near the proposed site. Topography in this area has changed since the aerial photographs were taken and new building structures have been built. There is now an airline provisioning building where the flood hazard area is shown on Map M-15 and a 24" storm sewer which daylights west of the flood hazard area.

The proposed grading and drainage of the site under consideration does not allow for long-term detention or ponding within the site and will incorporate the existing 24" storm sewer, the detention of water within the site may have adverse affects on the new structures due to the possibility of water entrapment within the newly excavated area.

V. EROSION CONTROL

There are several slopes involved in this project which exceed the minimums provided for in the City of Albuquerque Development Process Manual (Chapter 22.5.A). All slopes are protected from runoff with a curb at the shoulder of the slope. This is true along the access road and the west side of the site. The only

runoff down a slope is at the southwest corner of the site where a concrete rundown is provided.

For erosion protection of the slopes, seeding will be performed upon completion of final grading. The following will be specified for seeding.

<u>Species</u>	<u>Pure Live Seed Per Acre</u>
Sand proposed	1.0
Giant sand proposed	1.0
Side oats grama	4.0
Alkali salaton	1.0

Seeding should be done by the drilling method. The depth should be between 1/4" and 1/2". Fertilizer should not be used in this area. The site should also be mulched with 5000 lb. per acre of hay crimped into the soil with a serated disk.

VI. DESIGN CRITERIA

The design criteria used for drainage analysis was the rational method as outlined in the City of Albuquerque Development Process Manual, Volume II, Chapter 22.

The six-hour, 100 year rainfall value of 2.3 inches was used for computing runoff values. (Plate 22.2 D-1) (Fig. 1)

The rational formula is as follows:

$$Q = CiA$$

Q = Rate of runoff in cubic feet per second

C = Coefficient of runoff (dimensionless)

i = Rainfall intensity in inches per hour

A = Drainage area in acres

The value for i for a 100 year rainfall is determined by the following formula:

i = Rainfall value x I

$$I = 6.84 T_c^{0.51}$$

T_c = Time of concentration in minutes

$$T_c = .0078 (L)^{.77} / (S)^{.385} \quad (\text{Kirpich Equation})$$

Where L = the length of the basin in feet measured from the most hydraulically remote point to the analysis point in question, and S = watershed slope determined by dividing the differences in elevation from the most hydraulically remote point to the analysis point in question by the length (L). The minimum T_c will be 10 minutes for the peak runoff calculation.

VII. REFERENCES

1. City of Albuquerque, Development Process Manual, Volume II, Design Criteria, Chapter 22.

2. A Practical Approach to Designing Storm Sewer System, by Ronald L. Rossmiller, Ph.D., P.E., ASCE

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 1 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

APPENDIX A CALCULATIONS

APPENDIX A

MOLZEN-CORBIN
& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. _____ OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

EXISTING CONDITIONS

ANALYSIS POINT 1 (FIRST BASIN ALONG 36" STORM DRAIN)

AREAS INCLUDED IN THIS ANALYSIS ARE:

AREA A1 (SEE EXHIBIT "B")

NO AREA
ONE ON EXHIBIT "B"

$$\text{AREA} = 27,524 \text{ FT}^2 = .633 \text{ ACRES}$$

$$T_c = 1.80 \text{ MIN} \quad \text{USE } 10 \text{ MIN}$$

$$I = 2.3 \text{ IN} \quad (\text{PLATE 22.2 D-1})$$

$$i = 5.29 \text{ IN} \quad (\text{PLATE 22.2 D-2})$$

$$CN = 98 \quad (\text{PLATE 22.2 C-2})$$

$$R = 2.1 \quad (\text{PLATE 22.2 C-4})$$

$$C = .95$$

$$Q = C i A = .95(5.29)(.633) = \underline{\underline{3.18 \text{ CFS}}}$$

ANALYSIS POINT 2 (SECOND CATCH BASIN ALONG 36" STORM DRAIN)

AREAS INCLUDED IN THIS ANALYSIS ARE: (SEE EXHIBIT B)

AREA A2

EAST $\frac{1}{2}$ OF AREA B

EAST $\frac{1}{2}$ OF AREA C

$$\text{AREA} = 140,346 \text{ FT}^2 \quad 3.22 \text{ ACRES}$$

$$T_c = 4.63 \text{ MIN} \quad \text{USE } 10 \text{ MIN}$$

$$I = 2.3 \text{ IN} \quad (\text{PLATE 22.2 D-1})$$

$$i = 5.29 \text{ IN} \quad (\text{PLATE 22.2 D-2})$$

$$CN = 91 \quad (\text{PLATE 22.2 C-2})$$

$$R = 1.4 \quad (\text{PLATE 22.2 C-4})$$

$$C = \frac{1.288(.40) + 1.932(.95)}{3.22} = .73$$

$$Q = C i A = .73(5.29)(3.22) = \underline{\underline{12.43 \text{ CFS}}}$$

MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 2 OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

EXISTING CONDITIONS CONT.

ANALYSIS POINT 3 (EXISTING DISCHARGE OF 36" STORM DRAIN)

AREAS INCLUDED IN THIS ANALYSIS ARE (SEE EXHIBIT "B")

AREA D

AREA E

AREA F

WEST $\frac{1}{2}$ OF AREA B

WEST $\frac{1}{2}$ OF AREA C

$$AREA = 223,105 \text{ FT}^2 = 5.12 \text{ ACRES}$$

$$T_c = 7.14 \text{ MIN} \quad \text{USE } 10 \text{ MIN}$$

$$I = 3.3 \text{ IN} \quad (\text{PLATE 22.2 D-1})$$

$$i = 5.29 \text{ IN} \quad (\text{PLATE 22.2 D-2})$$

$$CN = 75$$

$$Z = .8 \quad (\text{PLATE 22.2 C-4})$$

$$C = .40$$

$$Q = CIA = .40(5.29)(5.12) = \underline{\underline{10.83 \text{ CFS}}}$$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 3 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

EXISTING CONDITIONS CONT.RUNOFF CALCULATIONSANALYSIS POINT 1

$$V = \frac{R(A)}{12} = \frac{2.1(.633)}{12} = .1107 \text{ ACRE FT.}$$

ANALYSIS POINT 2

$$V = \frac{R(A)}{12} = \frac{1.4(3.22)}{12} = .375 \text{ ACRE FT.}$$

ANALYSIS POINT 3

$$V = \frac{R(A)}{12} = \frac{.8(5.12)}{12} = .341 \text{ ACRE FT.}$$

OFFSITE FLOWS

AT ANALYSIS POINT 1 THERE IS AN 8" DRAIN LINE THAT ENTERS THE 36" STORM DRAIN. THIS IS A ROOF DRAIN FROM THE WEATHER STATION EAST OF THE SITE.

$$\text{AREA} = 3000 \text{ FT}^2 \pm = .0689 \text{ ACRES}$$

$$R = 2.1 \text{ (PLATE 22.2 C-4)}$$

$$C = .90$$

$$i = 5.25 \text{ IN (PLATE 22.2 D-2)}$$

$$Q = CIA = .90(5.25)(.0689) = .325 \text{ CFS}$$

$$V = \frac{R(A)}{12} = \frac{2.1(.0689)}{12} = .012 \text{ ACRE FT.}$$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 4 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

EXISTING CONDITIONS CONT.

OFFSITE FLOWS

24" STORM DRAIN SOUTH AND EAST OF SITE.

AREA = 2.93 ACRES

$Q_{100} @ \text{OUTLET} = 11.78 \text{ CFS} @ 3.7 \text{ FT/SEC.}$

$R = 2.1$

$$V = \frac{R(A)}{12} = \frac{2.1(2.93)}{12} = \underline{\underline{.5127 \text{ ACRE FT.}}}$$

TOTAL RUNOFF INCLUDING ONSITE AND OFFSITE FLOWS:

$$.1107 + .375 + .341 + .012 + .5127 = \underline{\underline{1.351 \text{ ACRE FT}}}$$

MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



RUNOFF ANALYSIS FOR PROPOSED SITE "ULTIMATE DEVELOPEMENT"

100 YR./ 6 HR. STORM
2.3 INCH

BASIN	AREA (SQ. FT.)	L (FT.)	S (FT./FT.)	C	T _c (MIN.)	i (100) (IN.)	CN	R	VOL (100) (ACRE FT.)	Q (100) (CFS)	i (10) (IN.)	Q (10) (CFS)
A1	27,574	190	0.0263	0.95	1.80	5.29	98	2.1	0.1108	3.1812	3.81	2.2912
A2	45,831	300	0.0083	0.95	3.99	5.29	98	2.1	0.1841	5.2875	3.81	3.8082
B	126,966	485	0.0226	0.95	3.92	5.29	98	2.1	0.5101	14.6420	3.81	10.5499
C	62,065	680	0.0294	0.95	4.60	5.29	98	2.1	0.2493	7.1604	3.81	5.1571
D	61,662	1260	0.0615	0.95	5.57	5.29	98	2.1	0.2477	7.1139	3.81	5.1236
E	43,200	1080	0.0194	0.95	7.70	5.29	98	2.1	0.1736	4.9840	3.81	3.5896
F	23,727	450	0.0333	0.25	3.19	5.29	71	0.8	0.0363	0.7204	3.81	0.5188
TOTAL AREA 391,025									TOTAL RUNOFF 1.5119			

$$T_c = .0078 \left(\frac{L^{.77}}{S^{.385}} \right) \text{ MINIMUM OF 10 MIN. USED IN CALCULATIONS}$$

$$I = 2.3 \text{ IN. (PLATE 22.2 D-1)}$$

$$i = I (\text{VALUE FROM PLATE 22.2 D-2}) \text{ VALUE} = 2.3$$

CN = CURVE NUMBER FROM PLATE 22.2 C-2

R = RUNOFF IN INCHES (PLATE 22.2 C-4)

$$VOL = \frac{R(A)}{12}$$

$$Q = CiA$$

$$2.11 (2.3) = 4.85$$

90% TOO HIGH

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 3 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

STREET FLOW AND COMBINATION INLETS (TYPE "A" CATCH BASIN)

PEAK FLOW FOR AREA E = 5.03 CFS

PEAK FLOW FOR 1/2 STREET = $5.03 \text{ CFS} / 2 = 2.515 \text{ CFS}$

CROSS SLOPE OF STREET = 3% (S_x) $\equiv \frac{1}{.02} = 50$

MANNINGS $n = .017$ (FIG 15)

SLOPE OF ROAD = 4% ABOVE INLET (S_o)

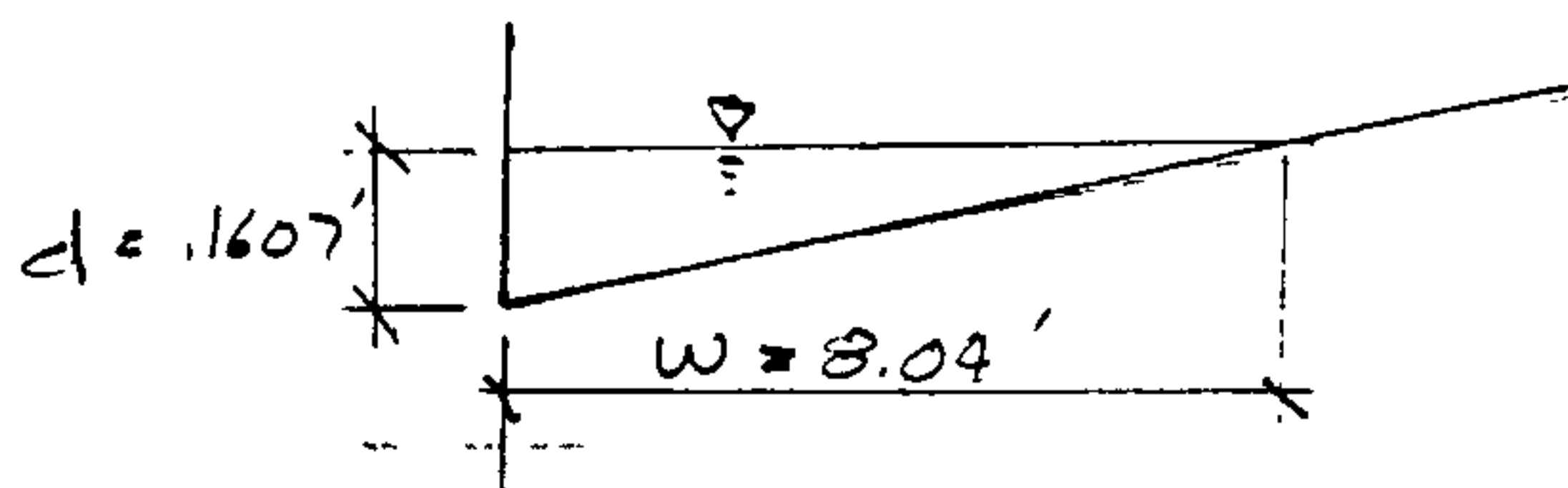
USING TYPE A CATCH BASIN WITH A 2' x 2' GRATE OPENING

$$d = \left[\frac{nQ}{.56 \equiv S_o^{1/2}} \right]^{3/8}$$

d = DEPTH @ CURB

$$d = \left[\frac{.017 (2.515)}{.56 (50) (\sqrt{.04})} \right]^{3/8} = .1607 \text{ FT}$$

W = WIDTH OF SPREAD = $2d = 50 (.1607) = 8.04 \text{ FT}$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 4 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

INLET @ C3

$$n = .017$$

$$S_o = .04 \text{ FT/FT}$$

$$S_x = .02 \text{ FT/FT}$$

$$Q = 2.515 \text{ CFS}$$

$$\text{SIZE OF GRATE} = 2' \times 2'$$

$$T = W = \text{WIDTH OF SPREAD} = 8.04'$$

$$W = \text{WIDTH OF GRATE} = 2 \text{ FT}$$

$$W/T = 2/8.04 = .2488$$

$$S_o/S_x = .04/.02 = 2$$

E_o = RATIO OF FRONTAL FLOW TO GUTTER FLOW (FIG 6)

$$E_o = .64$$

$$V = \frac{1.486}{n} R^{2/3} S_f^{1/2}$$

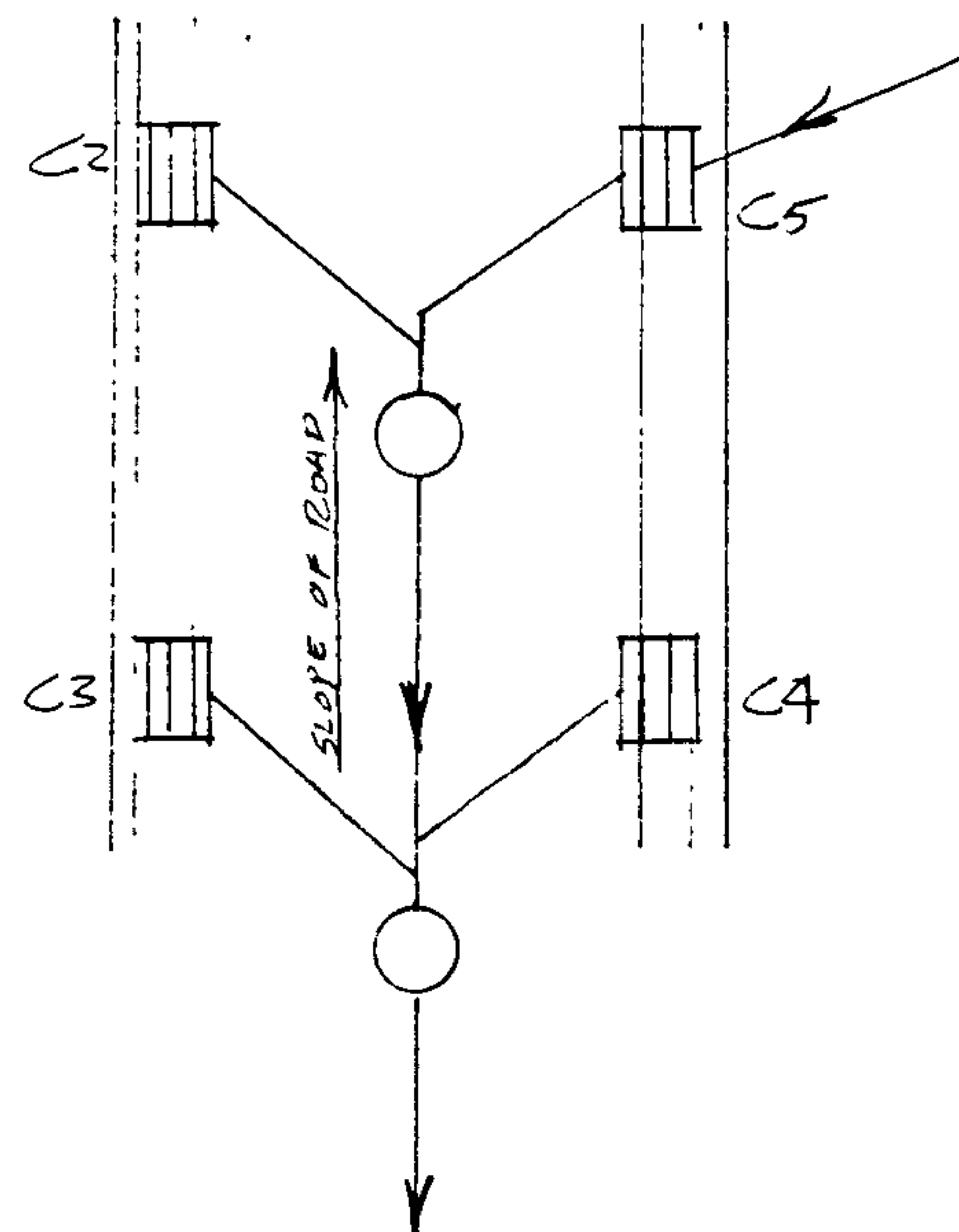
$$V = \frac{1.486}{.017} \left(\frac{.6460}{8.2} \right)^{2/3} (.04)^{1/2} = 3.21 \text{ FT/SEC}$$

R_F = FRONTAL FLOW EFFICIENCY (FIG. 7)

$$R_F = 1$$

R_S = SIDE FLOW EFFICIENCY (FIG. 8)

$$R_S = .08$$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 5 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

$$E = \text{EFFICIENCY} = R_F(E_0) + R_S(1 - E_0)$$

$$E = 1(.64) + .08(1 - .64) = .6688$$

$$Q_{IN} = E(Q) = .6688(2.515) = \underline{\underline{1.68 \text{ CFS}}}$$

INLET @ CZ

$$n = .017$$

$$S_0 = .04 \text{ FT/FT}$$

$$S_x = .02 \text{ FT/FT}$$

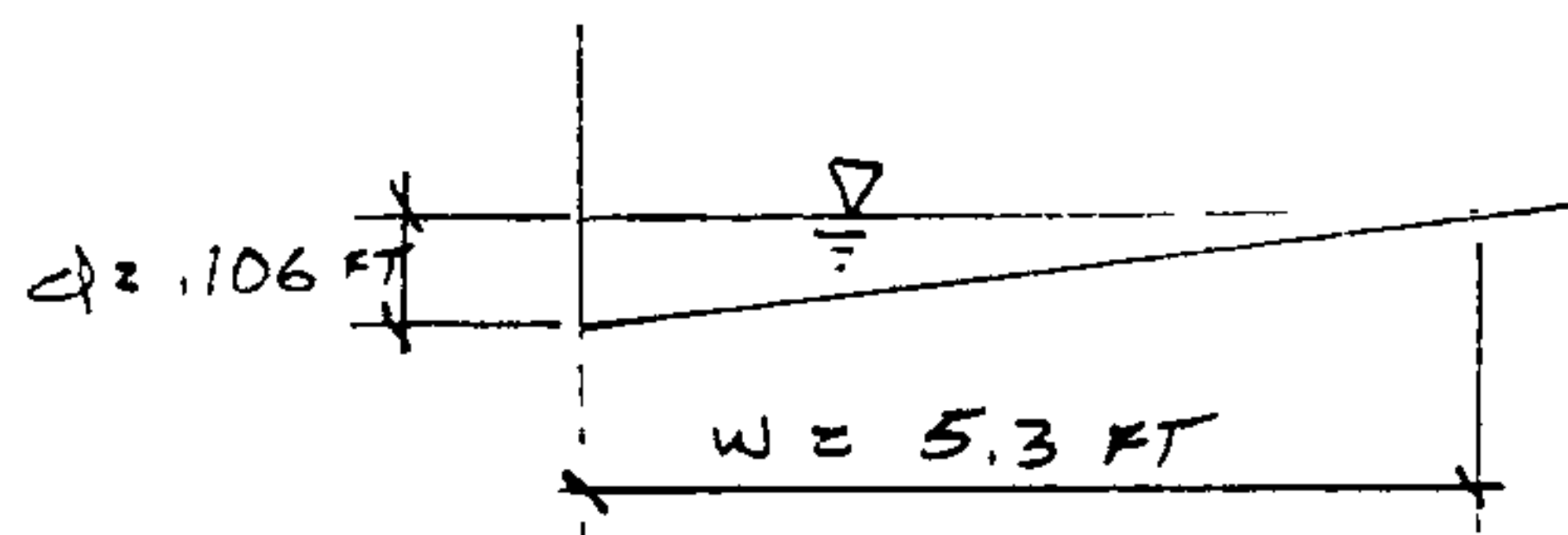
$$Q = 2.515 - 1.68 = .833 \text{ CFS}$$

$$\text{SIZE OF GATE} = 2' \times 2'$$

d = DEPTH OF CURB

$$d = \left[\frac{nQ}{.56(50)^{1/2}} \right]^{3/8} = \left[\frac{.017(.833)}{.56(50)^{1/2}} \right]^{3/8} = .106 \text{ FT}$$

$$W = \text{WIDTH OF SPREAD} = 50d = 50(.106) = 5.3 \text{ FT}$$



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 6 OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

$$T = W = \text{WIDTH OF SPREAD} = 5.3 \text{ FT}$$

$$W = \text{WIDTH OF GRATE} = 3 \text{ FT}$$

$$W/T = 3/8.04 = .2488$$

$$S_0/S_x = .04/.02 = 2$$

E_0 = RATIO OF FRONTAL FLOW TO GUTTER FLOW (FIG. 6)

$$E_0 = .64$$

$$V = \frac{1.486}{n} (R^{2/3}) (S_0^{1/2})$$

$$V = \frac{1.486}{.017} \left(\frac{.2809}{5.406} \right)^{2/3} (.04)^{1/2} = 2.43 \text{ FT/SEC}$$

R_F = FRONTAL FLOW EFFICIENCY (FIG. 7)

$$R_F = 1$$

R_S = SIDE FLOW EFFICIENCY (FIG. 8)

$$R_S = .15$$

$$E = \text{EFFICIENCY} = R_F(E_0) + R_S(1 - E_0)$$

$$E = 1(.64) + .15(1 - .64) = .694$$

$$Q_{IN} = E(Q) = .694(.833) = \underline{\underline{.578 \text{ CFS}}}$$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 7 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

GRATE SIZES (SUMP CONDITION)

(FIG. 9)

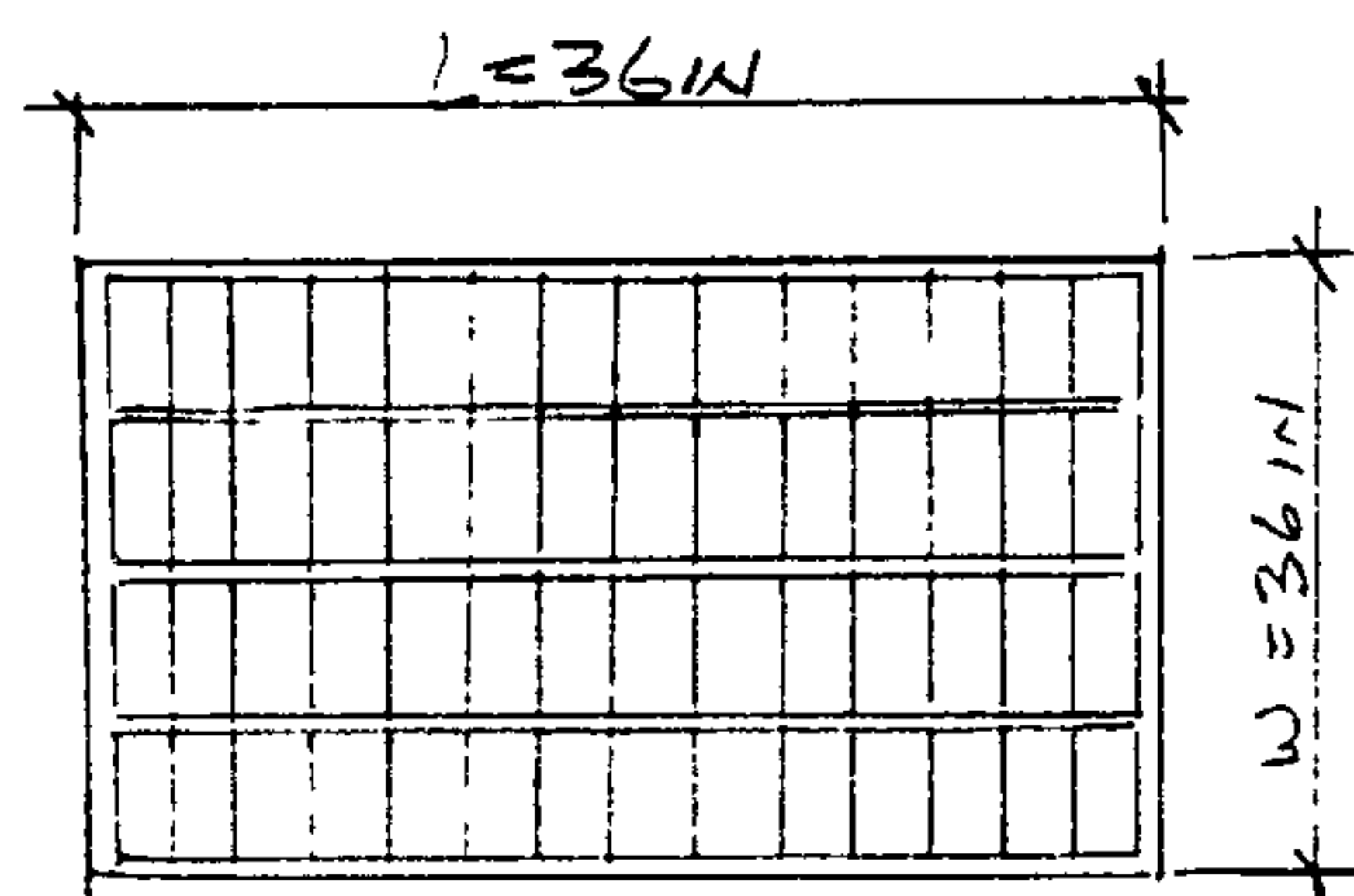
BASIN	GRATE	Q _{IN}	CLOGGING FACTOR	Δ	A (OPEN)
A ₁	C ₇	3.7 CFS	.5	.25 FT	9 FT ²
B	C ₁	14.65 CFS	.5	.67 FT	9 FT ²
D, A ₂ , C	C ₆	14.56 CFS	.5	.8 FT	9 FT ²

$$P = 2(W + L) \quad P = 2(3 + 3) = 12 \text{ (WITHOUT CURB)}$$

$$W/ \text{ CLOGGING FACTOR} = .5 \quad P = 2(1.5 + 3) = 9 \text{ FT (WITHOUT CURB)}$$

USE GRATE SIZE OF 9 FT² OPEN AREA

$$P = 1 - 7/8$$



$$\text{TOTAL AREA} = 3 \text{ FT} \times 3 \text{ FT} = 9 \text{ FT}^2$$

$$\text{OPEN AREA} = 9 (.9) = 8.1 \text{ FT}^2$$

MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 8 OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

CHECK MINIMUM V DEPTH FOR CATCH BASINS

(FIG. 1)

CATCH BASIN C3

$$Q = 1.68 \text{ CFS}$$

$$D = 18"$$

$$V = 2.8 \text{ FT}$$

(SET CONNECTING PIPE @ .03% SLOPE)

CATCH BASIN C2

$$Q = .578$$

$$D = 18"$$

$$V = 2.8 \text{ FT}$$

(SET CONNECTING P.PE @ .03% SLOPE)

CATCH BASIN C1

$$Q = 14.65 \text{ CFS}$$

$$D = 18"$$

$$V = 4.1 \text{ FT}$$

CATCH BASIN C6

$$Q = 19.56$$

$$D = 24"$$

$$V = 4 \text{ FT}$$

CATCH BASIN C7

$$Q = 3.2$$

$$D = 18"$$

$$V = 2.8 \text{ FT}$$

MOLZEN-CORBIN
& Associates



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 9 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

JUNCTION LOSS

$$Q_1 = 31 \text{ CFS}$$

$$Q_2 = 50.17 \text{ CFS}$$

$$Q_3 = 19.17 \text{ CFS}$$

$$A_1 = A_2 = A_3 = 3.14 \text{ FT}^2$$

$$V_1 = \frac{Q_1}{A_1} = \frac{31}{3.14} = 9.87 \text{ FT/SEC}$$

$$V_2 = \frac{Q_2}{A_2} = \frac{50.17}{3.14} = 15.97 \text{ FT/SEC}$$

$$V_3 = \frac{Q_3}{A_3} = \frac{19.17}{3.14} = 6.17 \text{ FT/SEC}$$

$$A_{AVG} = 3.14$$

$$h_j = \frac{Q_2 V_2 - Q_1 V_1 - Q_3 V_3 (\cos \theta)}{3 (AVG A)}$$

$$h_j = \frac{50.17(15.97) - 31(9.87) - 19.17(6.17)(.707)}{32.2(3.14)}$$

$$h_j = 4.07 \text{ FT}$$



PROJECT POST OFFICE SITE

TABLE 8
MINOR LOSSES AND HYDRAULIC GRADE LINE,

SHEET 1 OF 2
BY _____
DATE 1/01/89

① STRUCTURE NO.	② TYPE (MH OR C.B.)	③ MAX ELEVATION H.G.L.	④ D ₂ /D ₁	⑤	⑥ V	⑦ H _f	⑧ H _j	⑨ H _{mh}	⑩ E.G.L.	⑪ H _v	⑫ H.G.L.	⑬ INVERT ELEVATION	⑭ DEPTH
<u>D1</u>	<u>DISCHARGE</u>	<u>70</u>							<u>73.96</u>	<u>3.71</u>	<u>70.0</u>	<u>68.0</u>	<u>2.0</u>
						<u>3.675</u>			<u>77.64</u>	<u>3.96</u>	<u>73.68</u>		
<u>M3</u>	<u>MH</u>	<u>90</u>					<u>4.07</u>	<u>.198</u>	<u>81.90</u>	<u>.579</u>	<u>81.32</u>	<u>71.67</u>	<u>18.33</u>
						<u>.59</u>			<u>82.49</u>	<u>.579</u>	<u>81.91</u>		
<u>M7</u>	<u>MH</u>	<u>87.2</u>						<u>.0289</u>	<u>85.52</u>	<u>.394</u>	<u>85.13</u>	<u>72.26</u>	<u>14.94</u>
						<u>.269</u>			<u>85.78</u>	<u>.394</u>	<u>85.39</u>		
<u>M1</u>	<u>MH</u>	<u>85</u>						<u>.0177</u>	<u>85.88</u>	<u>1.34</u>	<u>84.54</u>	<u>72.53</u>	<u>12.47</u>
						<u>1.52</u>	<u>.15</u>		<u>87.47</u>	<u>1.34</u>	<u>86.13</u>		
<u>C1</u>	<u>CB</u>	<u>95.5</u>										<u>74.0</u>	<u>21.5</u>
<u>M3</u>	<u>MH</u>	<u>90</u>							<u>81.90</u>	<u>1.51</u>	<u>80.39</u>	<u>71.67</u>	<u>18.33</u>
						<u>2.44</u>			<u>84.34</u>	<u>1.51</u>	<u>82.83</u>		
<u>M4</u>	<u>MH</u>	<u>95</u>						<u>.0756</u>	<u>87.41</u>	<u>1.12</u>	<u>86.29</u>	<u>74.11</u>	<u>20.89</u>
						<u>2.8</u>			<u>87.21</u>	<u>1.12</u>	<u>86.09</u>		
<u>C6</u>	<u>CB</u>	<u>90</u>										<u>76.11</u>	<u>13.09</u>

- ③ NOT LESS THAN 1 FT. BELOW BOTTOM OF SLAB.
④ RATIO OF LARGER TO SMALLER PIPE DIAMETER.
⑤ FROM CHART 7.
⑥ VELOCITY FROM TABLE 6
⑦ HEAD LOSS DUE TO FRICTION FROM TABLE 7

- ⑧ H_j = HEAD LOSS AT JUNCTION = COL. 5 X COL. 11
⑨ ~~H_{mh} = HEAD LOSS AT MH = 0.02 ALWAYS.~~
⑩ EGL = ENERGY GRADE LINE.
⑪ H_v = VELOCITY HEAD = V² ÷ 64.4
⑫ HGL = HYDRAULIC GRADE LINE = E.G.L. - H_v

* GIVEN

$$h_b = K_b \left[\frac{V^2}{2g} \right]$$

$$K_b = .20 \sqrt{\frac{45}{10}} = .1414$$

$$H_{mh} = .05 \left(\frac{V^2}{2g} \right)$$

V-30

PROJECT POST OFFICE SITE

TABLE 8
MINOR LOSSES AND HYDRAULIC GRADE LINE,

SHEET 2 OF 2
BY _____
DATE Nov 89

[illegible]

- (3) NOT LESS THAN 1 FT. BELOW BOTTOM OF SLAB.
 (4) RATIO OF LARGER TO SMALLER PIPE DIAMETER.
 (5) FROM CHART 7.
 (6) VELOCITY FROM TABLE 6
 (7) HEAD LOSS DUE TO FRICTION FROM TABLE 7

- ⑧ H_j = HEAD LOSS AT JUNCTION = COL. 5 X COL. 11
- ⑨ H_{mh} = HEAD LOSS AT MH = 0.02 ALWAYS.
- ⑩ EGL = ENERGY GRADE LINE.
- ⑪ H_v = VELOCITY HEAD = $V^2 \div 64.4$
- ⑫ HGL = HYDRAULIC GRADE LINE = E.G.L. - H_v

* GIVEN

A-30

CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 13 OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

DEPTH OF CATCH BASIN C7 IS TOO DEEP
SET LINE @ .04% SLOPE

$$Q = 4.22 \text{ CFS} \quad D = 18''$$

$$S = .040 \text{ FT/FT}$$

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

$$Q_{\text{FULL}} = \frac{1.486}{.013} (3.74)^{2/3} (.040)^{1/2} (1.767) = 21.0 \text{ CFS}$$

$$\frac{Q}{Q_{\text{FULL}}} = \frac{4.22}{21.0} = .20$$

$$\frac{d}{D} = .30 \quad d = 1.5(.3) = .45 \text{ FT (FIG. 13)}$$

$$\frac{V}{V_{\text{FULL}}} = .73 \quad (\text{FIG. 13})$$

$$V_{\text{FULL}} = \frac{Q}{A} = \frac{21.0}{1.767} = 11.88 \text{ FT/SEC}$$

$$V = .73(11.88) = \underline{8.67 \text{ FT/SEC}}$$

$$\text{INV @ C7} = 98.71$$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 14 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

DEPTH OF CG IS TOO DEEP SET LINE BETWEEN
114 AND CG @ .05 FT/FT

$$Q = 36.77$$

$$S = .05 \text{ FT/FT}$$

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

$$Q_{\text{FULL}} = \frac{1.486}{.013} (.5)^{2/3} (.05)^{1/2} (3.14) = 50.58 \text{ cfs}$$

$$\frac{Q}{Q_{\text{FULL}}} = \frac{36.77}{50.58} = .529$$

$$\frac{d}{D} = .52$$

$$\frac{V}{V_{\text{FULL}}} = 1$$

$$V_{\text{FULL}} = \frac{Q}{A} = \frac{50.58}{3.14} = 16.1 \text{ FT/SEC}$$

$$\text{INV @ CG} = 86.11$$

MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



CONCLUSIONS FROM CALCULATIONS

STRUCTURE	TYPE	INV. ELEV.	LENGTH (FT.)	SLOPE (FT/FT)	SIZE (IN.)	Q(100) (CFS)	V(100) (FT/SEC)	Q(10) (CFS)	V(10) (FT/SEC)
D1	DISCHARGE	68.00	75.00	0.0490	24	50.17	15.97	36.41	11.59
M3	MHI	71.67	82.00	0.0072	24	19.17	6.11	14.14	4.5
M2	MHI	72.26	55.00	0.0049	24	15.81	5.04	11.99	3.8
M1	MHI	72.53	80.00	0.0190	18	14.65	8.29	10.55	5.97
C1	CE#	74.00							
M3	MHI	71.67	130.00	0.0188	24	31.01	9.87	22.27	7.09
M4	MHI	74.11	200.00	0.0140	24	26.77	8.52	19.28	6.14
C6	CE#	76.91							
M4	MHI	74.11	335.00	0.0400	18	4.22	8.67	3.01	7.72
M5	MHI	87.51	220.00	0.0400	18	4.22	8.67	3.01	7.72
M6	MHI	96.31	60.00	0.0400	18	4.22	8.67	3.01	7.72
C7	CE#	98.71							

CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 1 OF 3

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

DISCHARGE ENERGY BASIN CALCULATIONS

GIVEN: 24" RCP STORM DRAIN

(HYDRAULIC ENGINEERING CIRCULAR
No. 14) U.S.D.O.T

$$S_0 = .0490 \text{ FT/FT}$$

$$n = .013$$

$$D_0 = 2 \text{ FT}$$

$$Q = 50.17 \text{ CFS}$$

$$V = 15.97 \text{ FT/SEC}$$

$$T_w = 1 \text{ FT}$$

$$Q/D^{2.5} = 50.17 / 2^{2.5} = 8.37$$

$$T_w/D = 1/2 = .5$$

$$Y_0/D = 1 \quad (\text{FIG. 16})$$

$$Y_0 = 1(2) = 2 \text{ FT}$$

$$A = .7854(4) = 3.14 \text{ FT}^2$$

(.7854 FROM FIG. 17)

$$V_0 = Q/A = 50.17 / 3.14 = 15.97 \text{ FT/SEC}$$

$$Y_e = (A/Z)^{1/2} = \sqrt{3.14/2} = 1.25 \text{ FT}$$

$$F_r = \frac{V_0}{\sqrt{g(Y_e)}} = \frac{15.97}{\sqrt{32.2(1.25)}} = 2.52$$



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 2 OF 3

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

FOR LOCALLY AVAILABLE RIPRAP $0.35 < d_{50}/Y_e < .45$

DESIGN FOR $2 < h_s/d_{50} < 4$

TRY $d_{50}/Y_e = .45$

$$d_{50} = .45 (1.25) = .563$$

$$h_s/Y_e = 1.95 \text{ (FIG. 18)}$$

$$h_s = 1.95 (1.25) = 2.43$$

$$h_s/d_{50} = 2.43 / .563 = 4.31$$

$4.31 > 4 \therefore$ WILL NOT WORK

TRY $d_{50}/Y_e = .51$

$$d_{50} = .51 (1.25) = .6375$$

$$h_s/Y_e = 1.7$$

$$h_s = 1.7 (1.25) = 2.13$$

$$h_s/d_{50} = 2.13 / .6375 = 3.34$$

$3.34 < 4 \therefore$ O.K.

MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 3 OF 3

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

$$L_s = 10 (h_s) = 10 (2.13) = 21.3 \text{ FT}$$

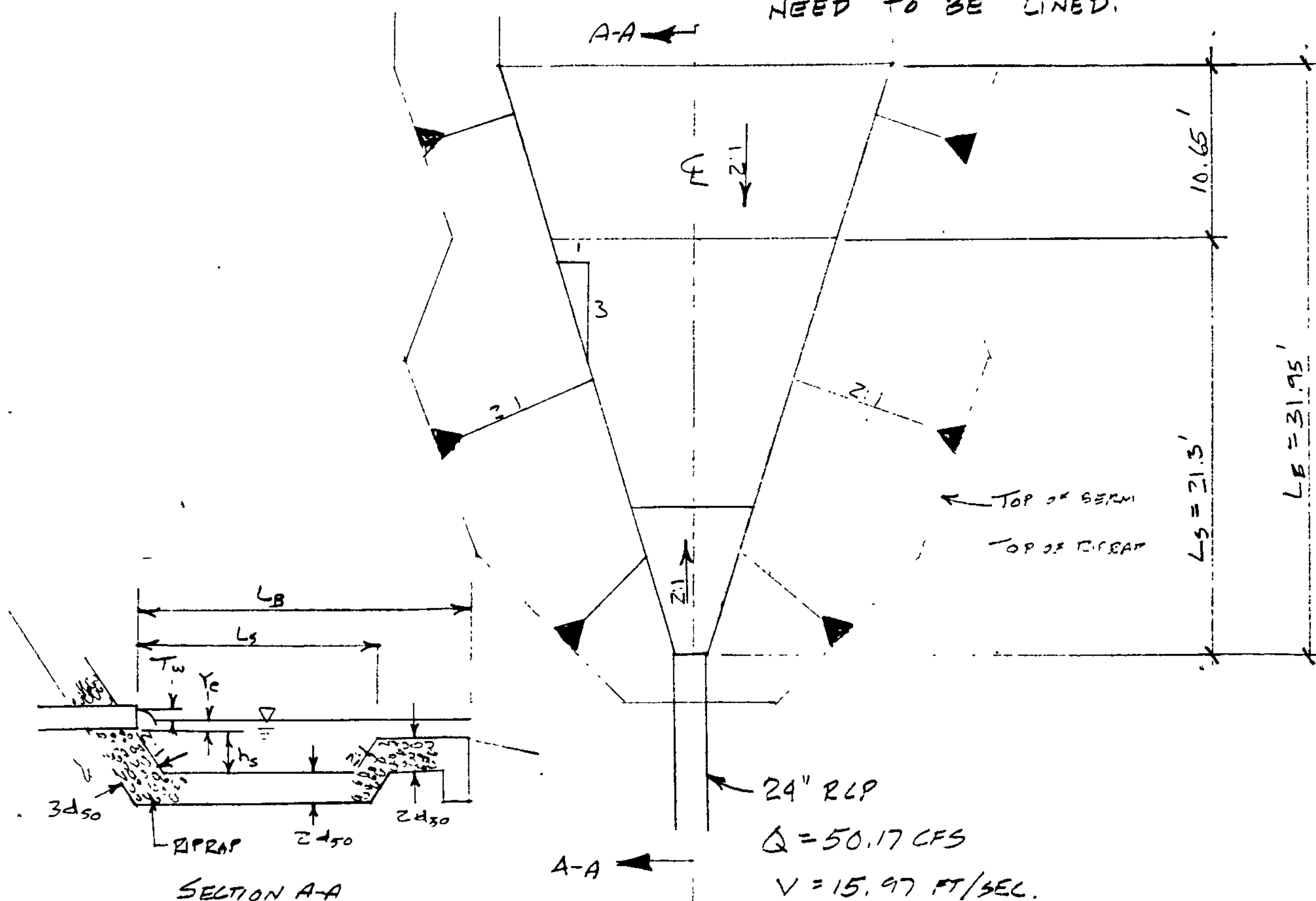
$$L_s = 3 (w_s) = 3 (2) = 6 \text{ FT} \quad \text{USE } 21.3 \text{ FT}$$

$$L_B = 15 (h_s) = 15 (2.13) = 31.95 \text{ FT}$$

$$L_B = 4 (w_s) = 4 (2) = 8 \text{ FT} \quad \text{USE } 31.95 \text{ FT}$$

$$d_{50} = .6375 \text{ FT} \quad \text{USE } 3''$$

$$T_w / Y_o = 1/2 = .5 < .75 \quad \text{CHANNEL BELOW BASIN DOES NOT NEED TO BE LINED.}$$



MOLZEN-CORBIN

& Associates

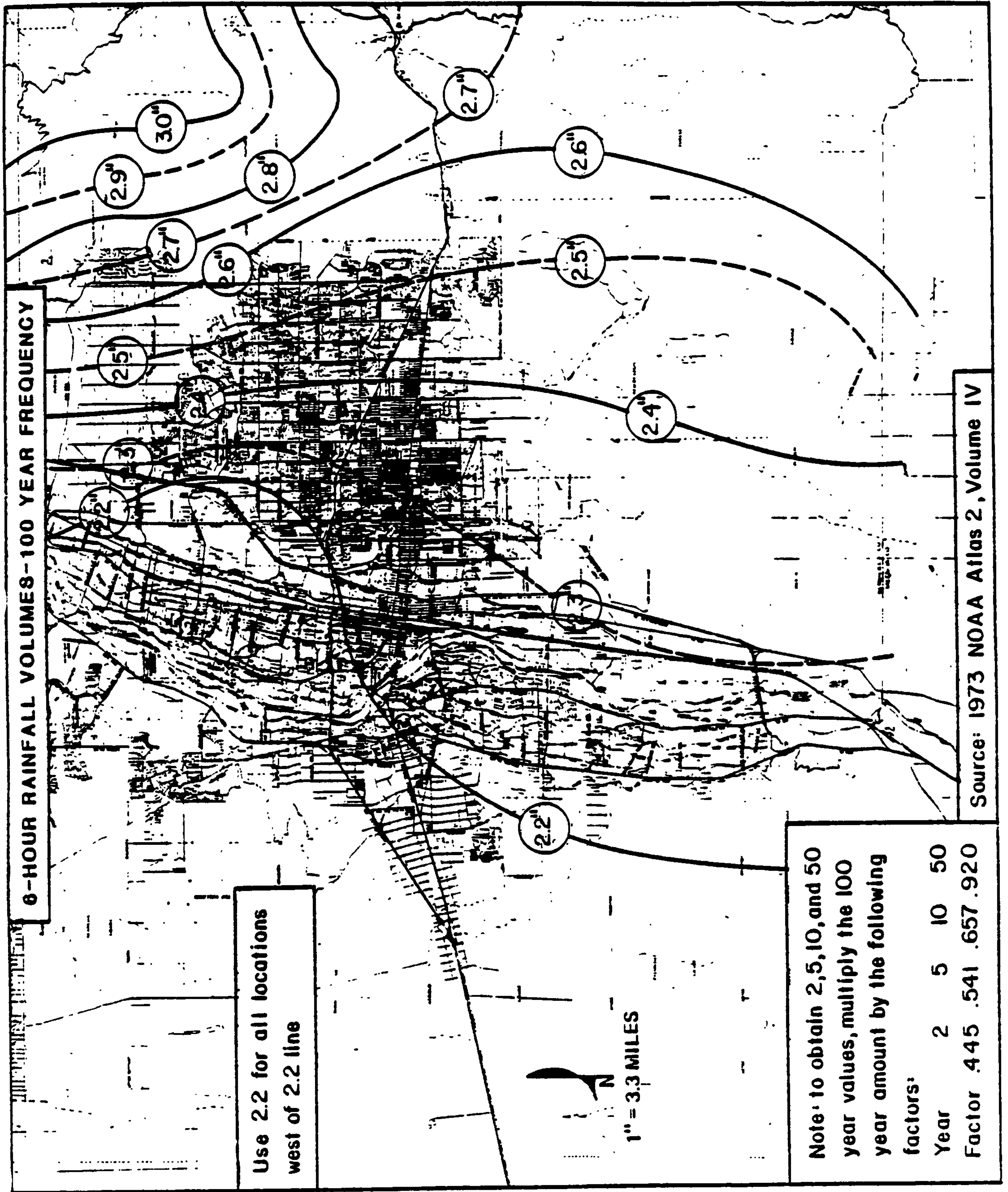
505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397

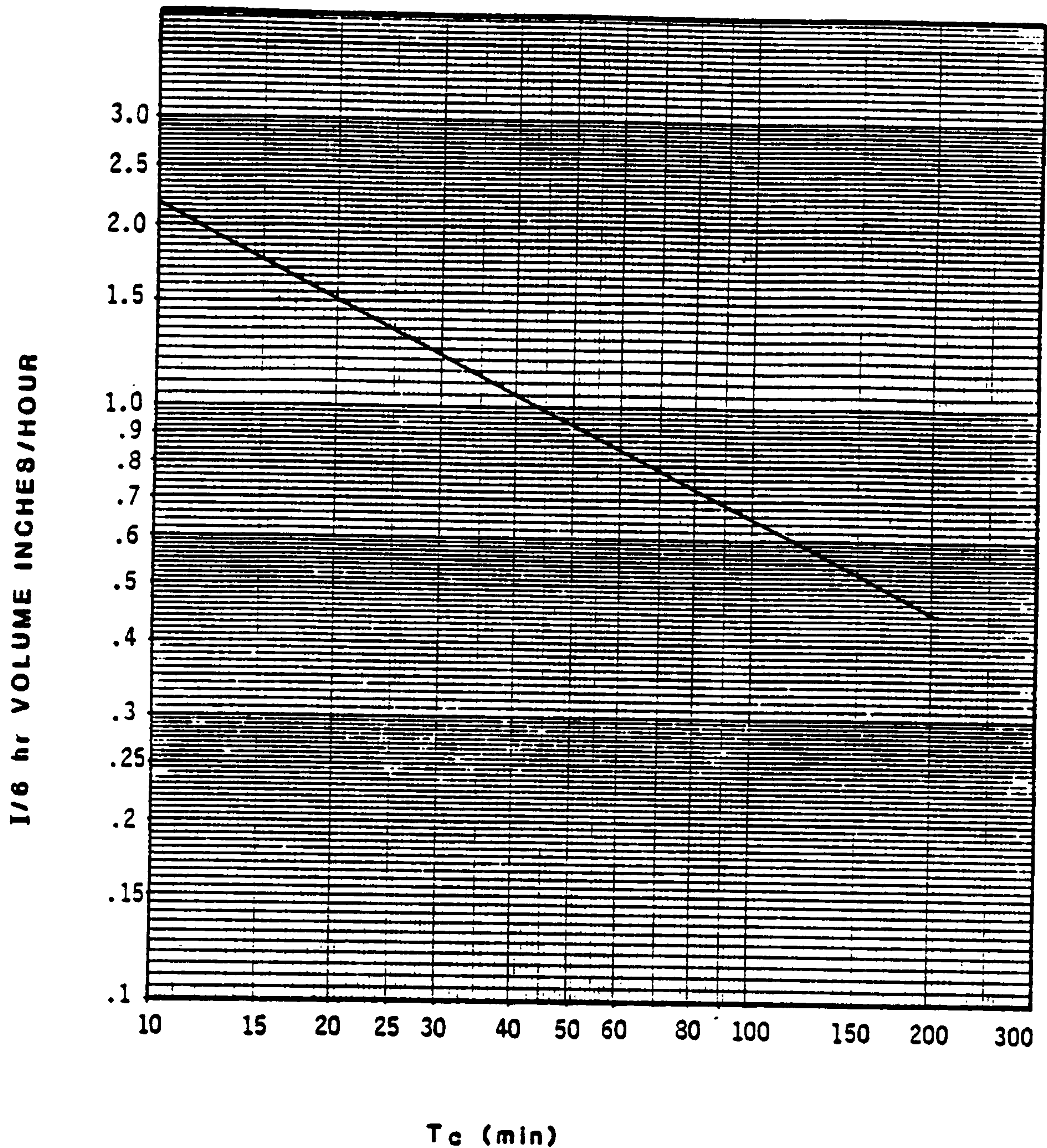


FIG. 1



DIMENSIONLESS RAINFALL INTENSITIES

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



note: To get actual intensities, multiply rainfall volume from plate D-1 by value from curve. Use reduction factors on Plate D-1 for other than 100-yr.

RUNOFF CURVE NUMBER (CN) CALCULATION

LAND USE DESCRIPTION	Hydrologic Soil Group				Present Area				Future Area			
	A	B	C	D	A	B	C	D	A	B	C	D
Cultivated land ^{1/} : without conservation treatment	72	81	88	91								
: with conservation treatment	62	71	78	81								
: poor condition	68	78	88	89								
Pasture or range land: fair condition	64	70	80	86								
: good condition	58	61	74	80								
Meadow: good condition	30	58	71	78								
Wood or Forest land: thin stand, poor cover, no mulch	45	84	77	83								
good cover ^{2/}	25	65	70	77								
Open Spaces, lawns, parks, golf courses, cemeteries, etc.												
good condition: grass cover on 75% or more of the area	38	61	74	80								
fair condition: grass cover on 50% to 75% of the area	48	68	78	84								
Commercial and business areas (85% impervious)	88	92	94	96								
Industrial districts (72% impervious)	81	88	91	93								
Residential ^{3/}												
Average lot size Average % impervious ^{4/}												
1/8 acre or less 65	77	85	90	92								
1/4 acre 38	61	75	83	87								
1/3 acre 30	57	72	81	86								
1/2 acre 25	54	70	80	85								
1 acre 20	51	68	78	84								
Paved parking lots, roofs, driveways, etc. ^{5/}	98	98	98	98								
Streets and roads:												
paved with curbs and storm sewers ^{6/}	98	98	98	98								
gravel	78	85	88	91								
dirt	72	82	87	89								

Present CN _____

Runoff Volume = _____ in

$-DA(AC) \times \frac{RO(in)}{12} =$ _____ ac ft.

Future CN _____

Runoff Volume = _____ in

$-DA(AC) \times \frac{RO(in)}{12} =$ _____ ac ft.

Area, Acres _____

Project _____

Approved By _____

Date _____

1/ For a more detailed description of agricultural land use curve numbers, refer to National Engineering Handbook, Section 4, Hydrology, Chapter 8, August 1972.

2/ Good cover is protected from grazing and litter and brush cover soil

3/ Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

4/ The remaining pervious area (lawn) are considered to be in good pasture condition for these curve numbers.

5/ In some warmer climates of the country, a curve number of 98 may be used

HYDROLOGY: SOLUTION OF RUNOFF EQUATION

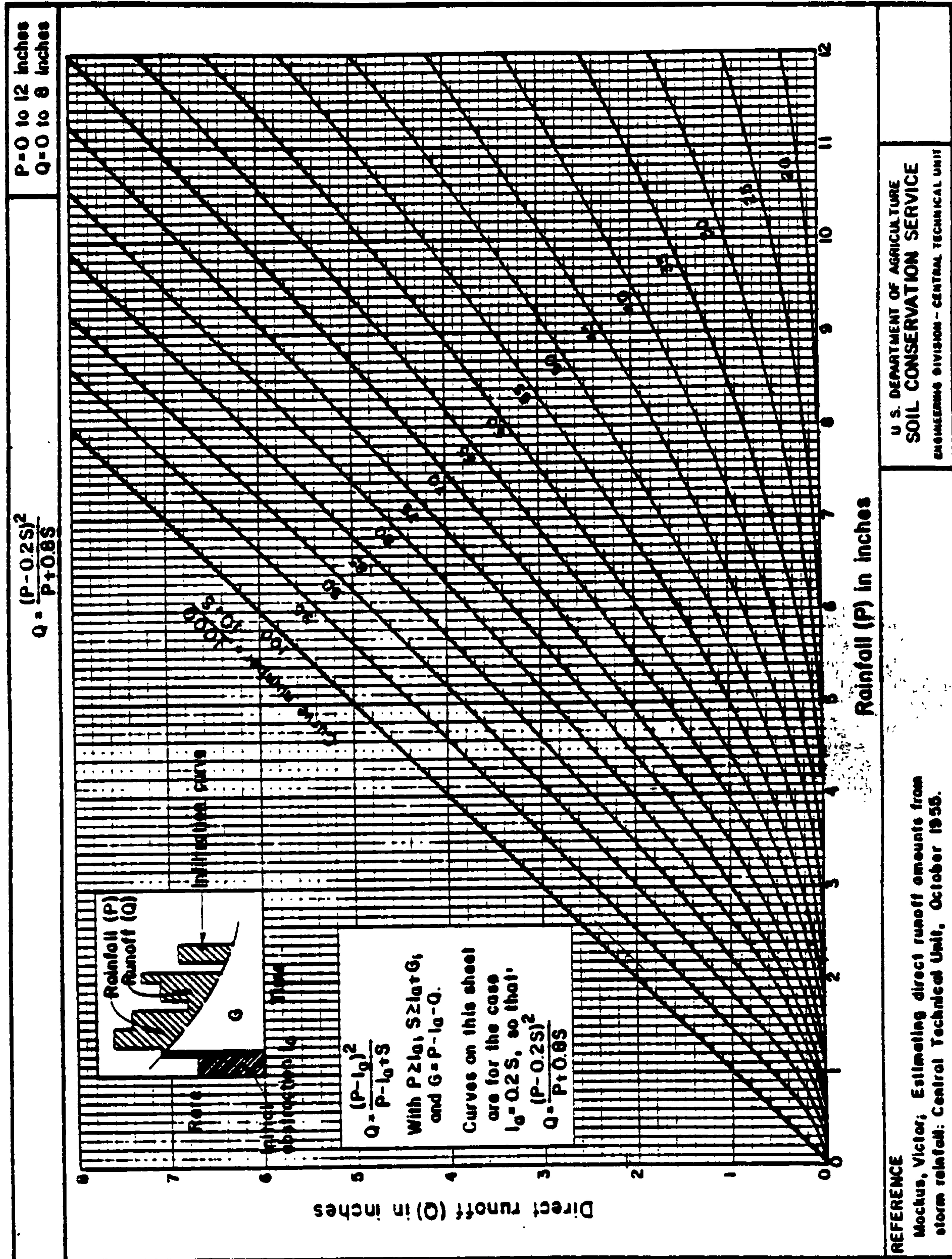


FIG. 4

B. Nomograph solution

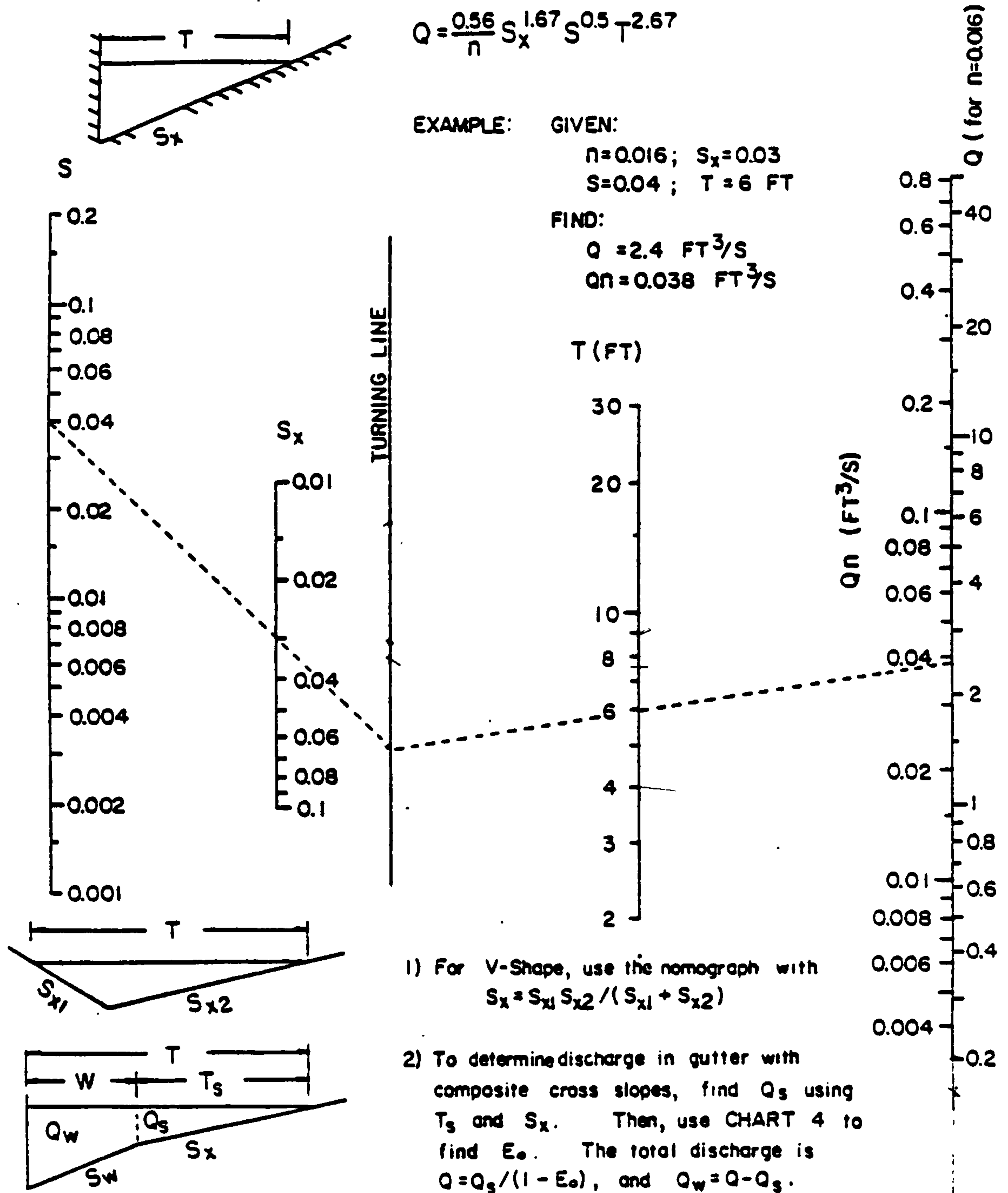


CHART 3. Flow in triangular gutter sections.

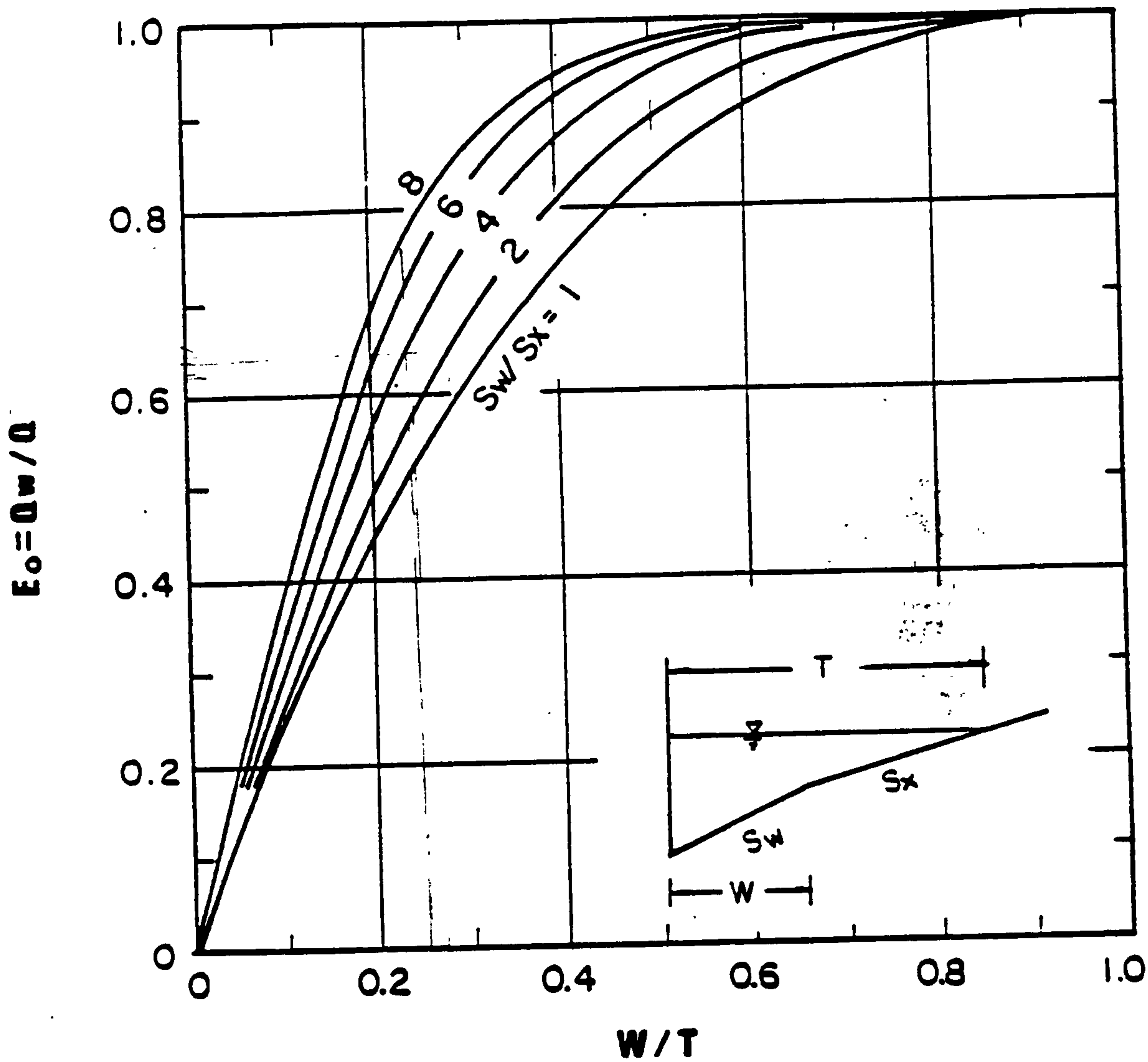


CHART 4. Ratio of frontal flow to total gutter flow.

FIG. 7

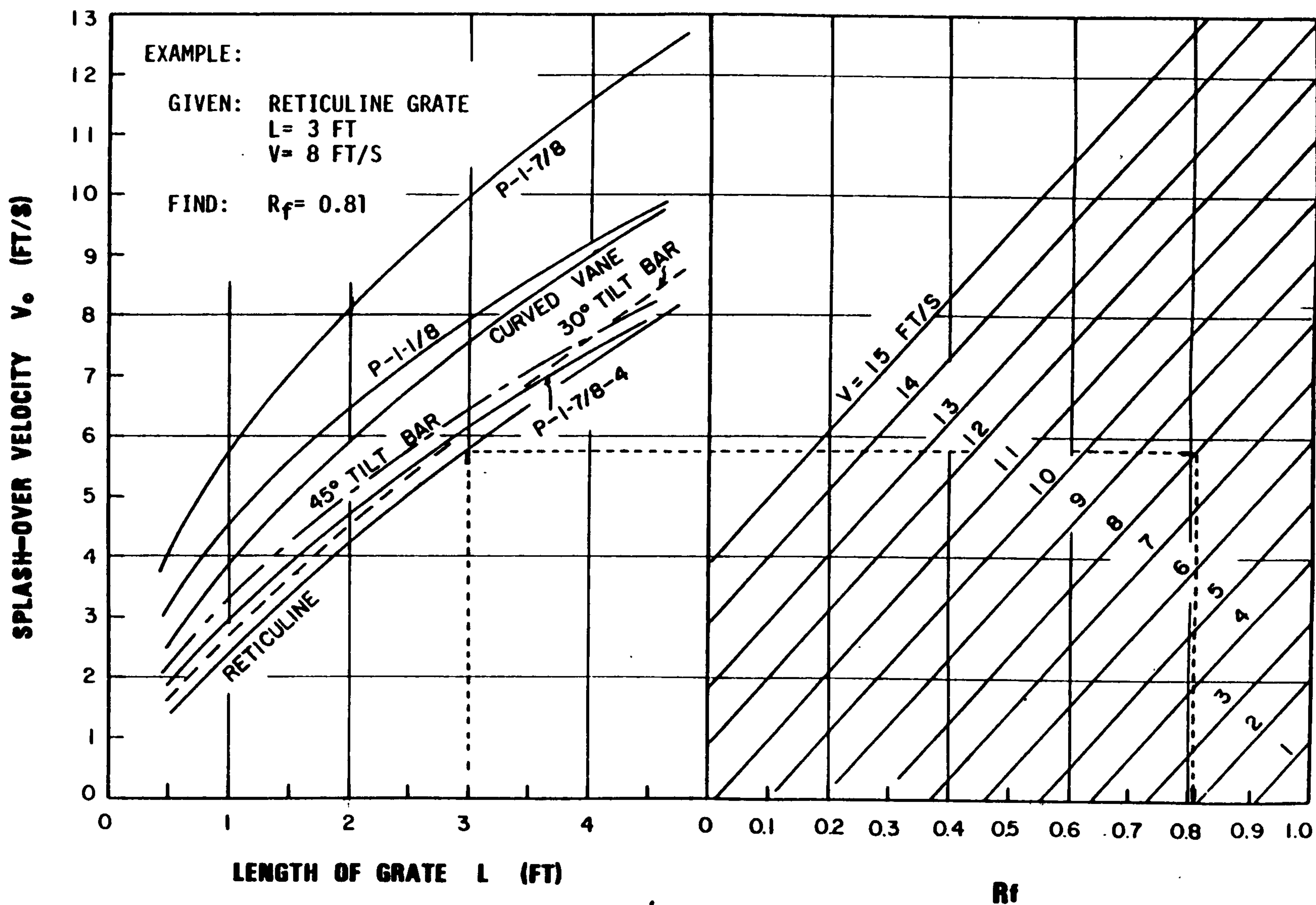


CHART 7. Grate inlet frontal flow interception efficiency.

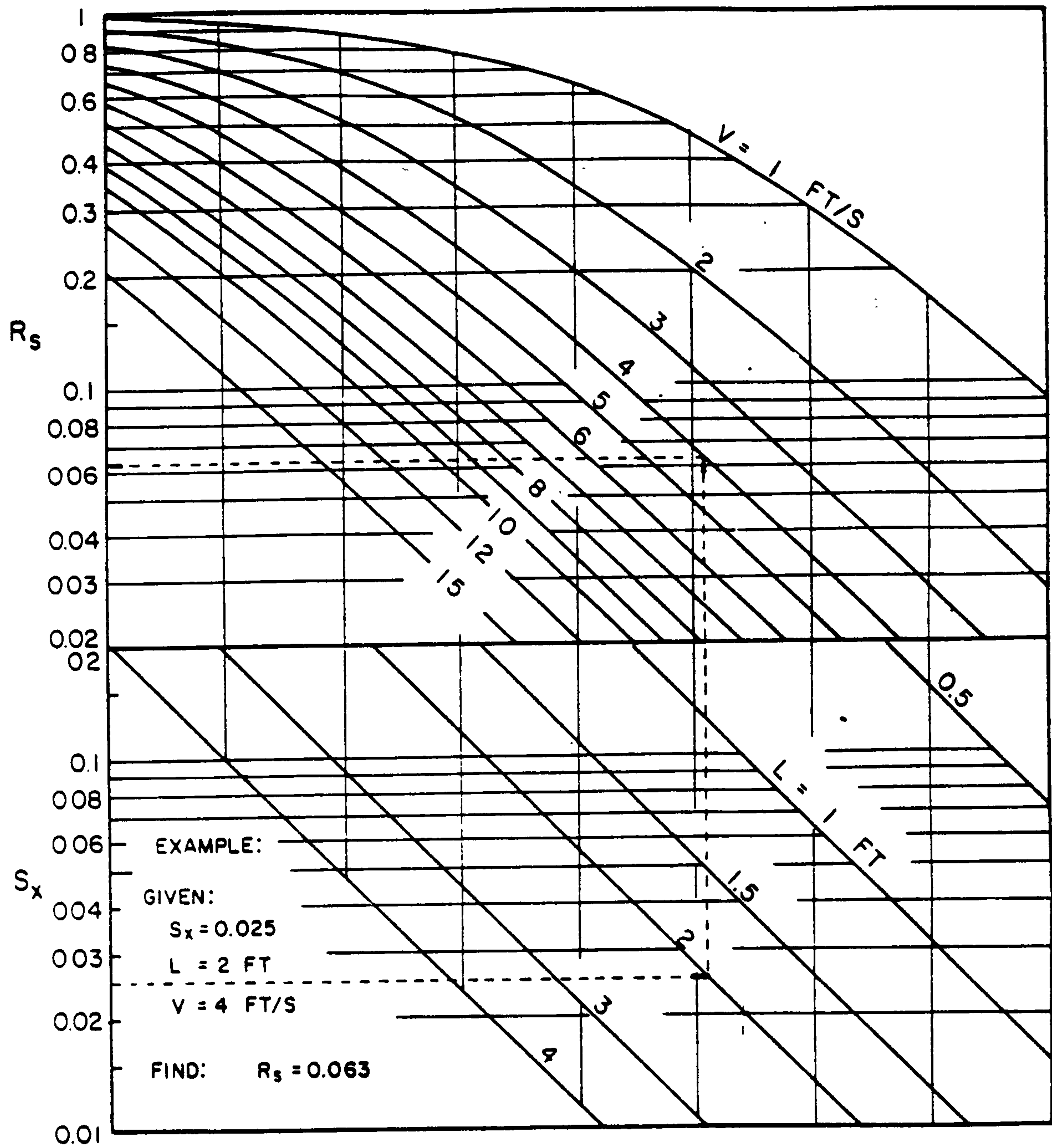


CHART 8. Grate inlet side flow interception efficiency.

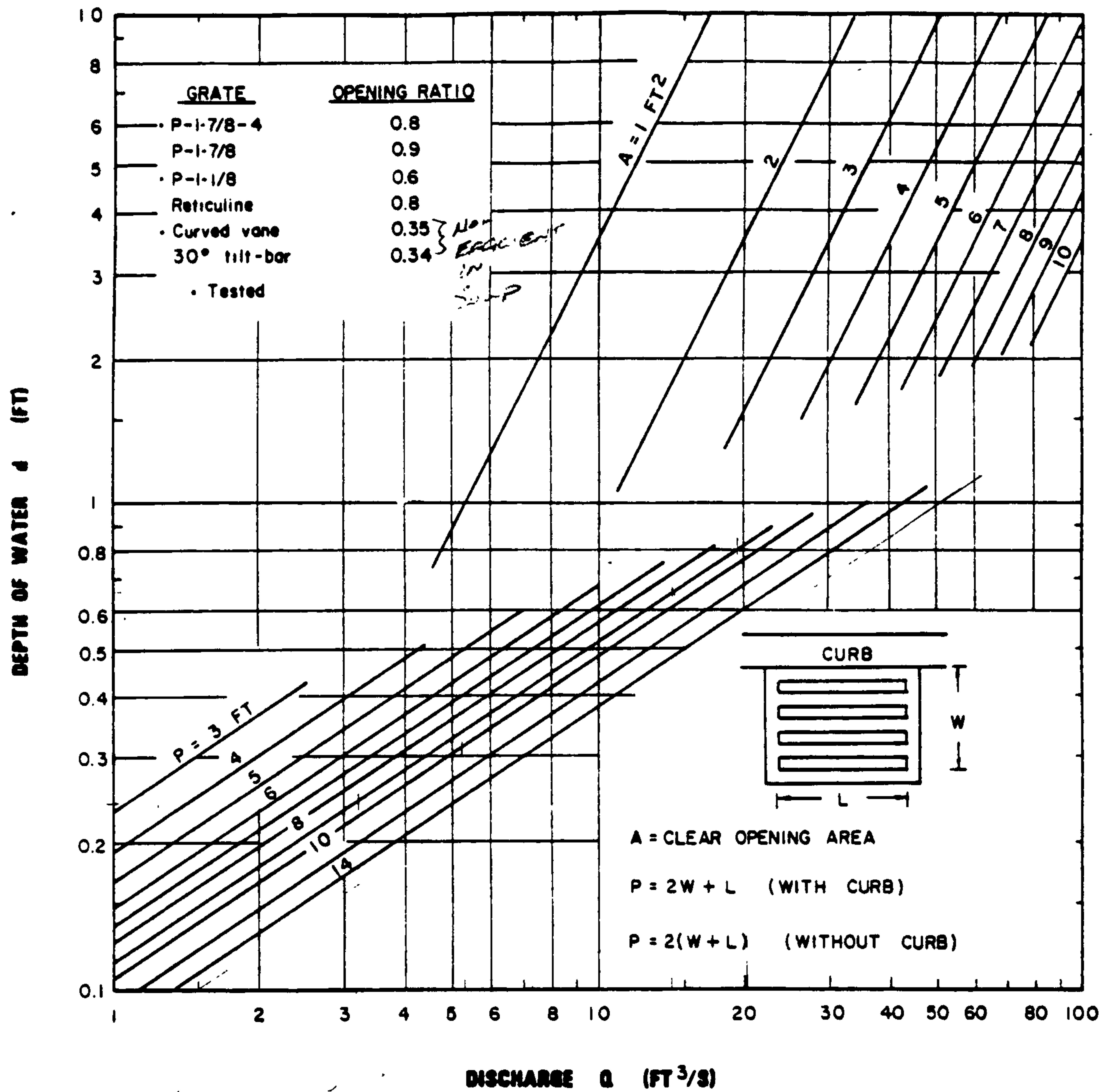


CHART 11. Grate inlet capacity in sump conditions.

Figure IV-17. (Reference IV-4)

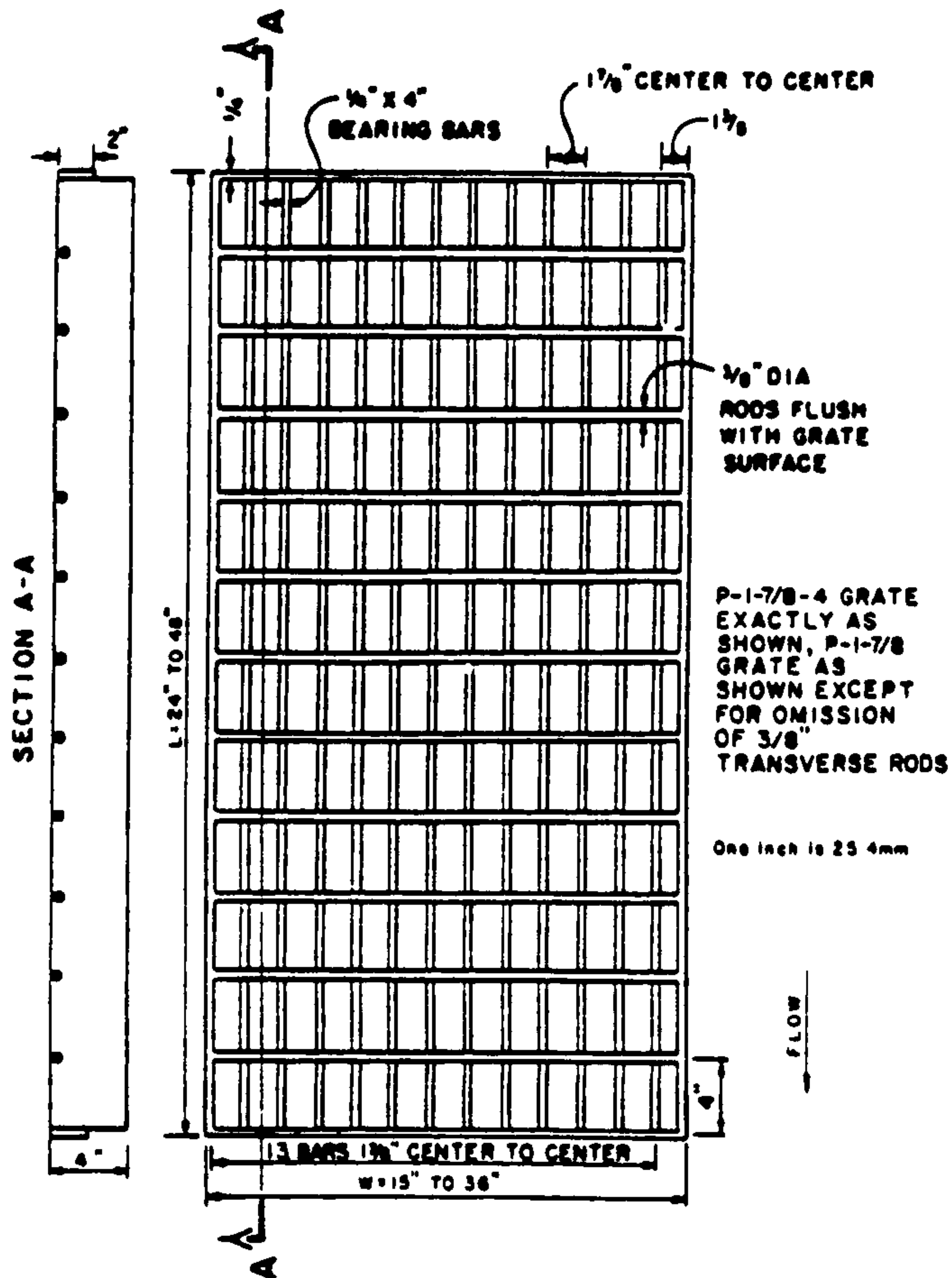


Figure 8. P-1-7/8 and P-1-7/8-4 grates.

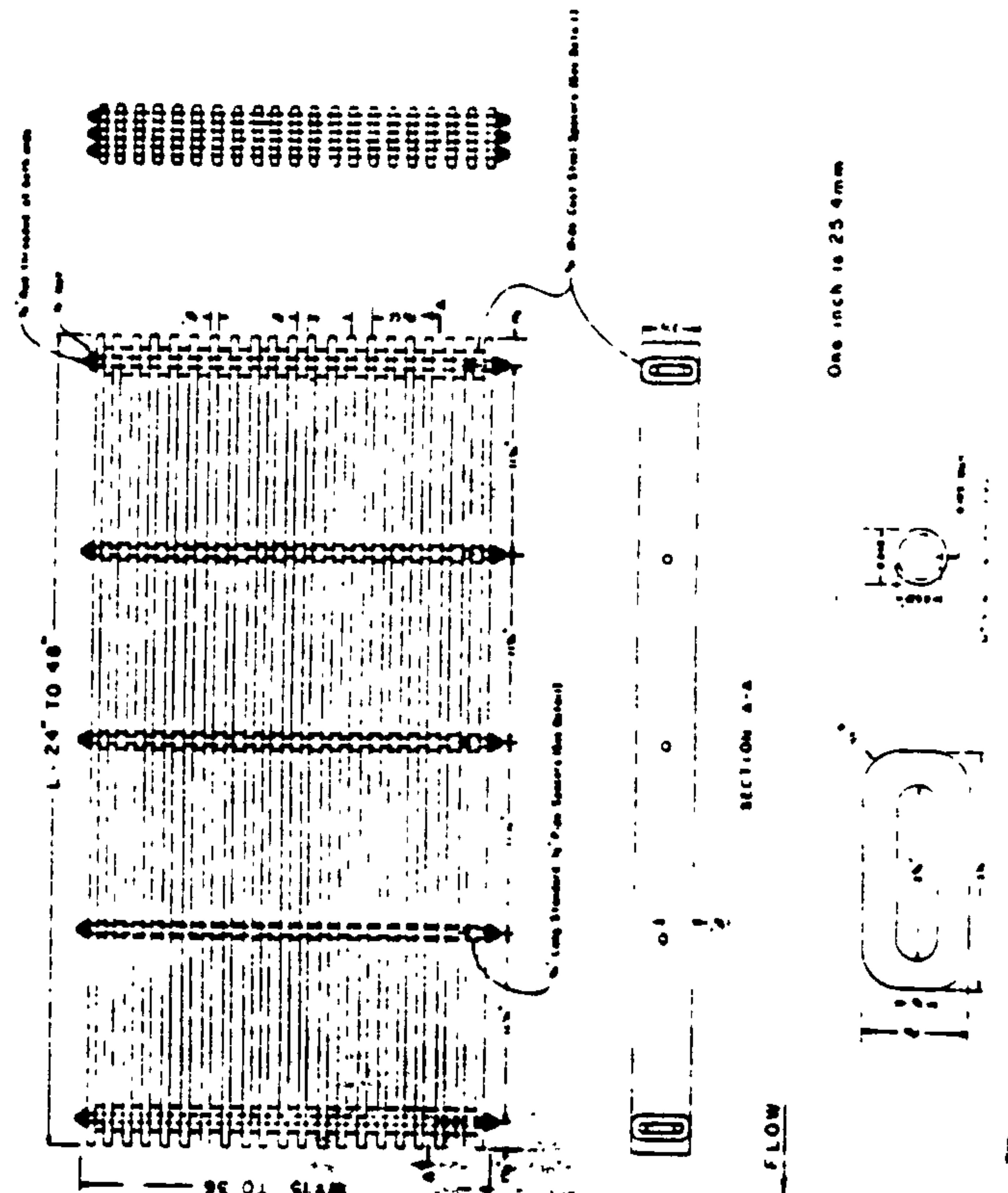


Figure 9. P-1-1/8 grate.

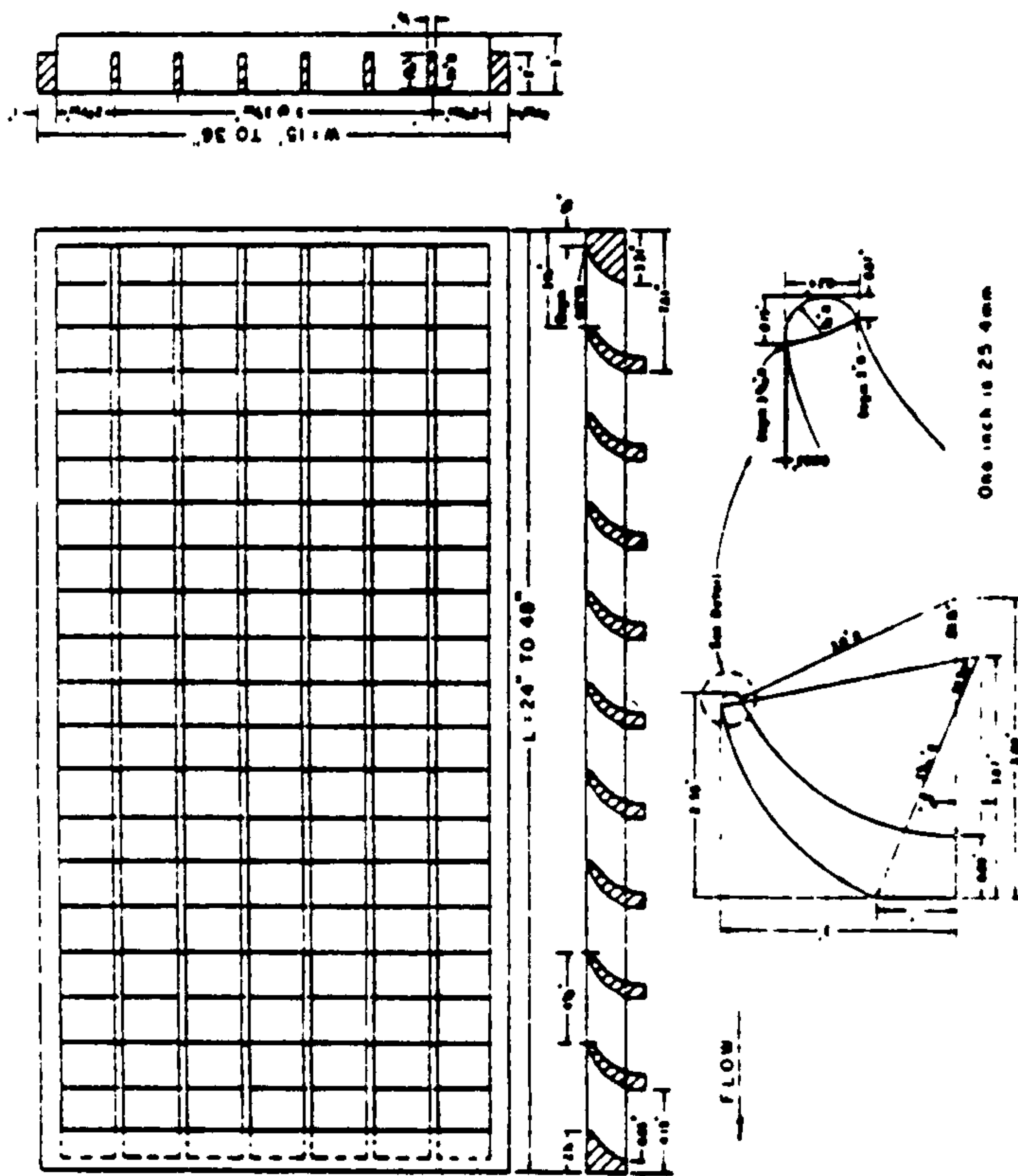


Figure 10. Curved vane grate.

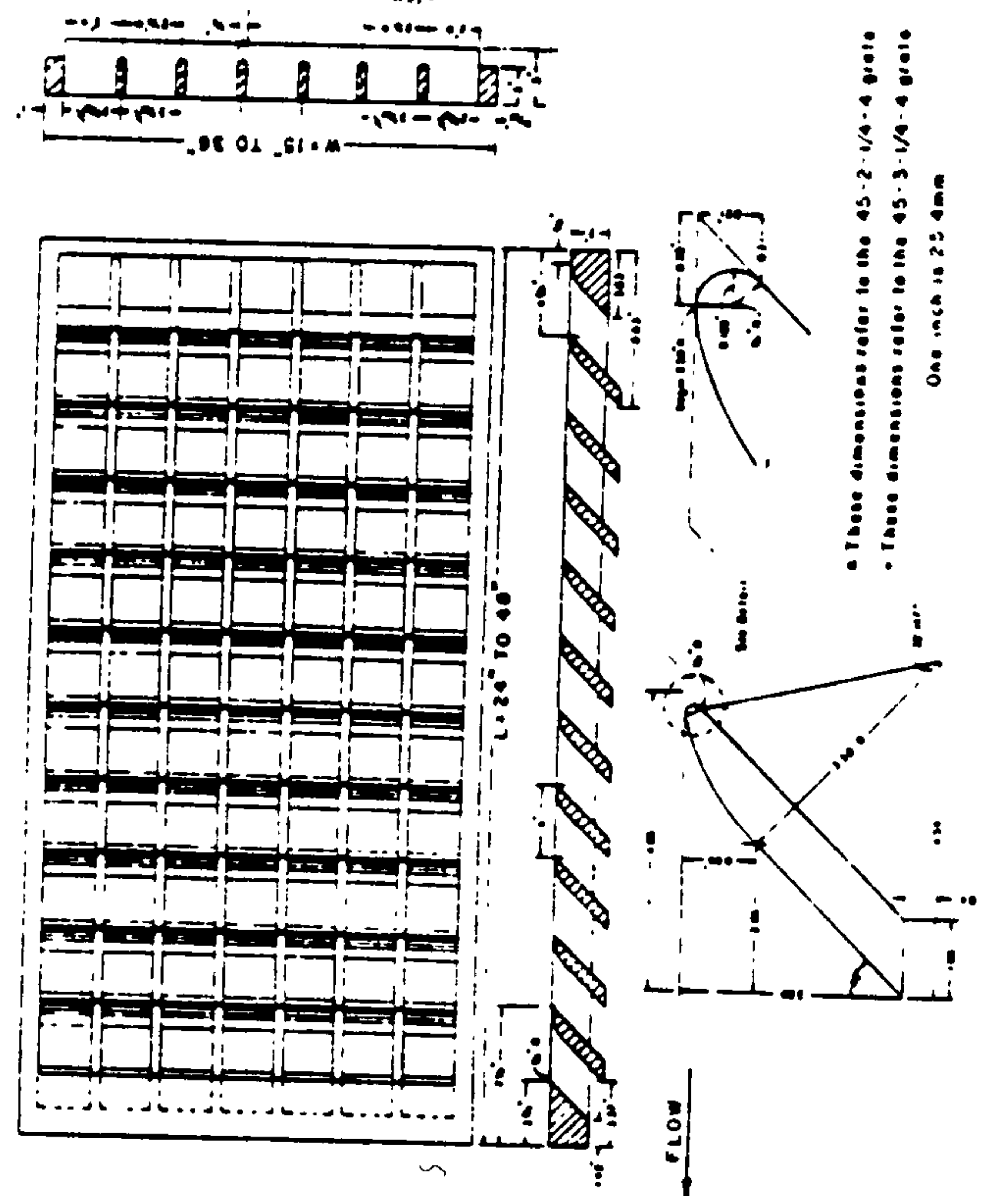


Figure 11. 45° Tilt-bar grate.

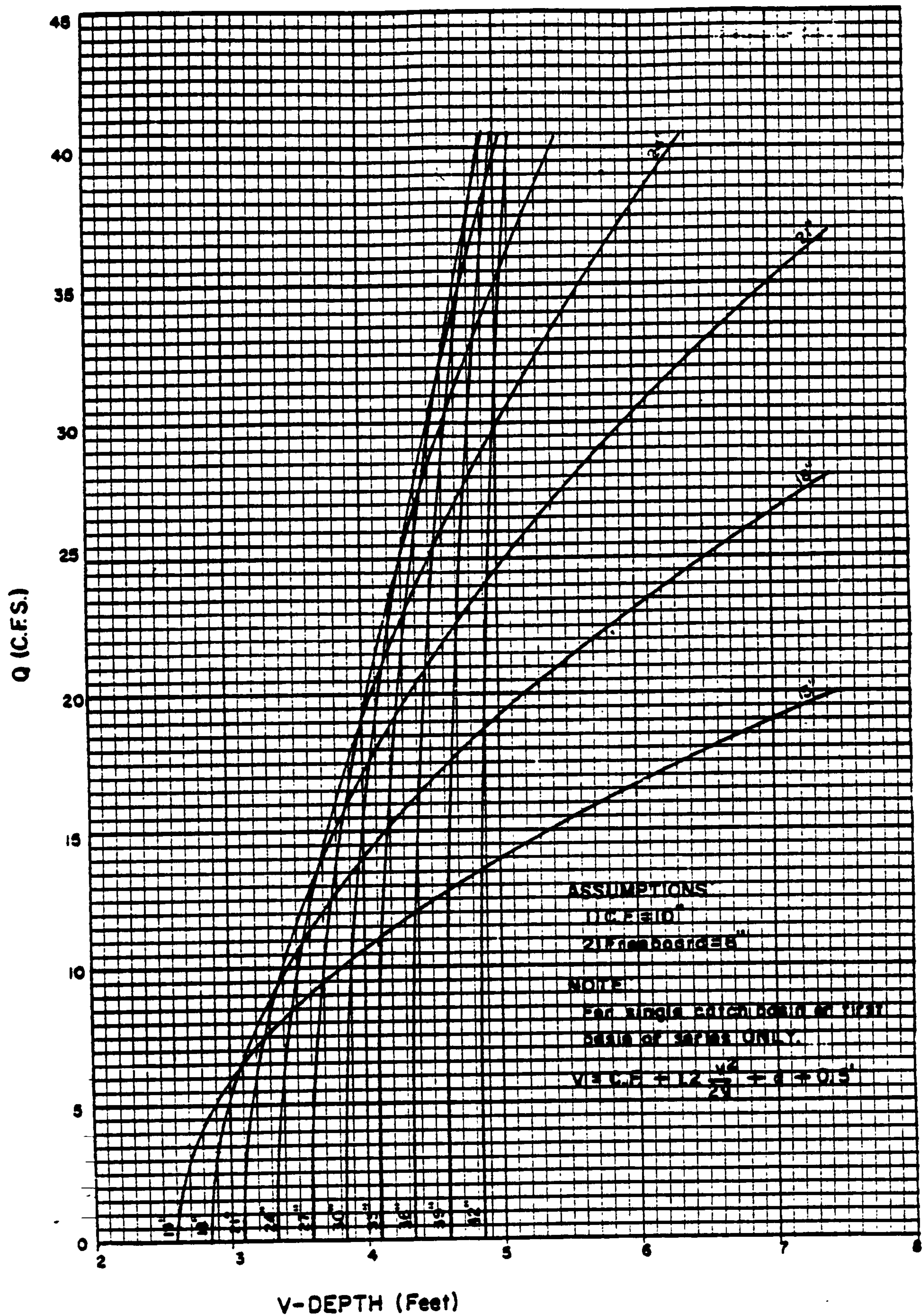


FIG. 11

CONVEYANCE FACTORS—R.C. PIPE OR BOX

0.78 1.23 PIPE 12 15 A (sq. ft.) DIA. (in.)		EQUIVALENT BOX			36 65 CONVEYANCE FACTOR PIPE OR BOX K
1.77	18	Manning's: $S_f = \left(\frac{Q}{K}\right)^2$ $K = \frac{1.486}{n} (AR^{2/3})$ $n = .013$			105
2.41	21				158
3.14	24				226
3.98	27				310
4.91	30				410
5.94	33				529
7.07	36	3'-0"	2'-6"	7.50	666
8.30	39	3'-3"	2'-9"	8.80	825
9.62	42	3'-6"	2'-11"	10.21	1006
11.04	45	3'-9"	3'-2"	11.72	1209
12.57	48	4'-0"	3'-4"	13.34	1436
14.19	51	4'-3"	3'-7"	15.06	1690
15.90	54	4'-6"	3'-9"	16.87	1965
17.72	57	4'-9"	4'-0"	18.80	2273
19.63	60	5'-0"	4'-2"	20.83	2604
21.65	63	5'-3"	4'-4"	22.98	2964
23.76	66	5'-6"	4'-7"	25.21	3357
25.97	69	5'-9"	4'-10"	27.55	3782
28.27	72	6'-0"	5'-0"	30.00	4234
30.68	75	6'-3"	5'-3"	32.55	4720
33.18	78	6'-6"	5'-5"	35.21	5242
35.79	81	6'-9"	5'-8"	37.97	5796
38.49	84	7'-0"	5'-10"	40.83	6388
41.28	87	7'-3"	6'-1"	43.80	7012
44.18	90	7'-6"	6'-3"	46.87	7676
47.17	93	7'-9"	6'-6"	50.05	8380
50.27	96	8'-0"	6'-8"	53.34	9119
53.46	99	8'-3"	6'-11"	56.31	9899
56.75	102	8'-6"	7'-1"	60.21	10719
60.13	105	8'-9"	7'-4"	63.34	11582
63.62	108	9'-0"	7'-6"	67.50	12486
67.20	111	9'-3"	7'-9"	70.88	13427
70.88	114	9'-6"	7'-11"	75.21	14427
74.66	117	9'-9"	8'-2"	78.83	15457
78.54	120	10'-0"	8'-4"	83.33	16537
82.52	123	10'-3"	8'-7"	87.11	17649
86.59	126	10'-6"	8'-9"	91.87	18856
90.76	129	10'-9"	9'-0"	95.89	20065
95.03	132	11'-0"	9'-2"	100.83	21324
99.40	135	11'-3"	9'-5"	105.08	22634
103.87	138	11'-6"	9'-7"	110.21	24032
108.43	141	11'-9"	9'-10"	114.61	25434
310	144	12'-0"	10'-0"	120.00	26891

FIG. 12

Appendix C: Circular Channel Ratios

Experiments have shown that n varies slightly with depth. This figure gives velocity and flow rate ratios for varying n (solid line) and constant n (broken line) assumptions.

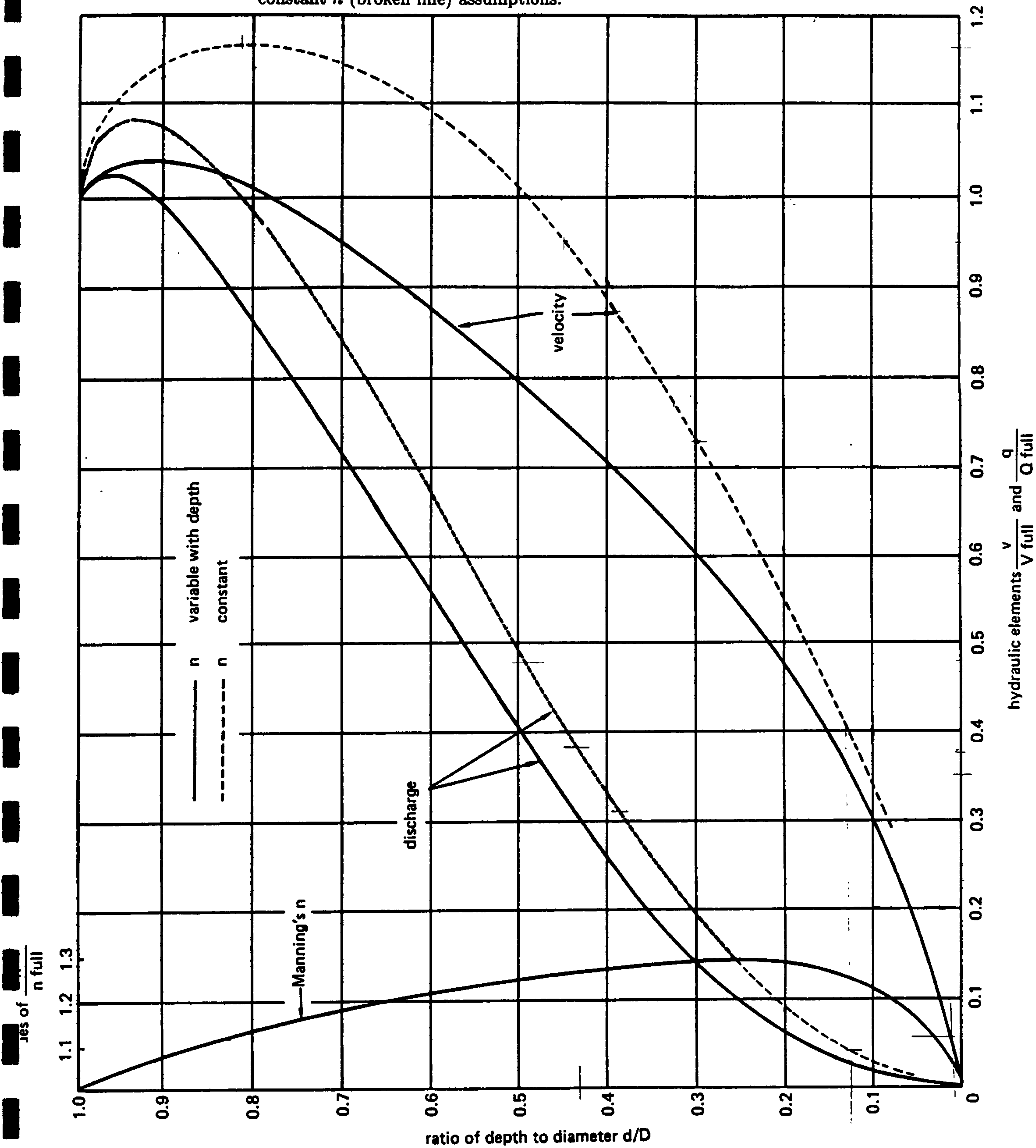


FIG. 13

TABLE 22.3 B-1
VALUES OF MANNING'S n

	n
Reinforced Concrete Pipe	.013
Poured Concrete	.013
No-joint cast in place concrete pipe	.014
Reinforced Concrete Box	.015
Reinforced Concrete Arch	.015
Streets	.017
Flush Grouted Rip-Rap	.020
Corrugated Metal Pipe	.025
Grass Lined Channels (sodded & irrigated)	.025
Earth Lined Channels (smooth)	.030
Arroyo Channels	.030
Wire Tied Rip-Rap	.040
Medium Weight Dumped Riprap	.045
Grouted Rip-Rap (exposed rock)	.045
Arroyo Overbank	.045
Jetty Type Rip-Rap ($D_{50} > 24"$)	.050

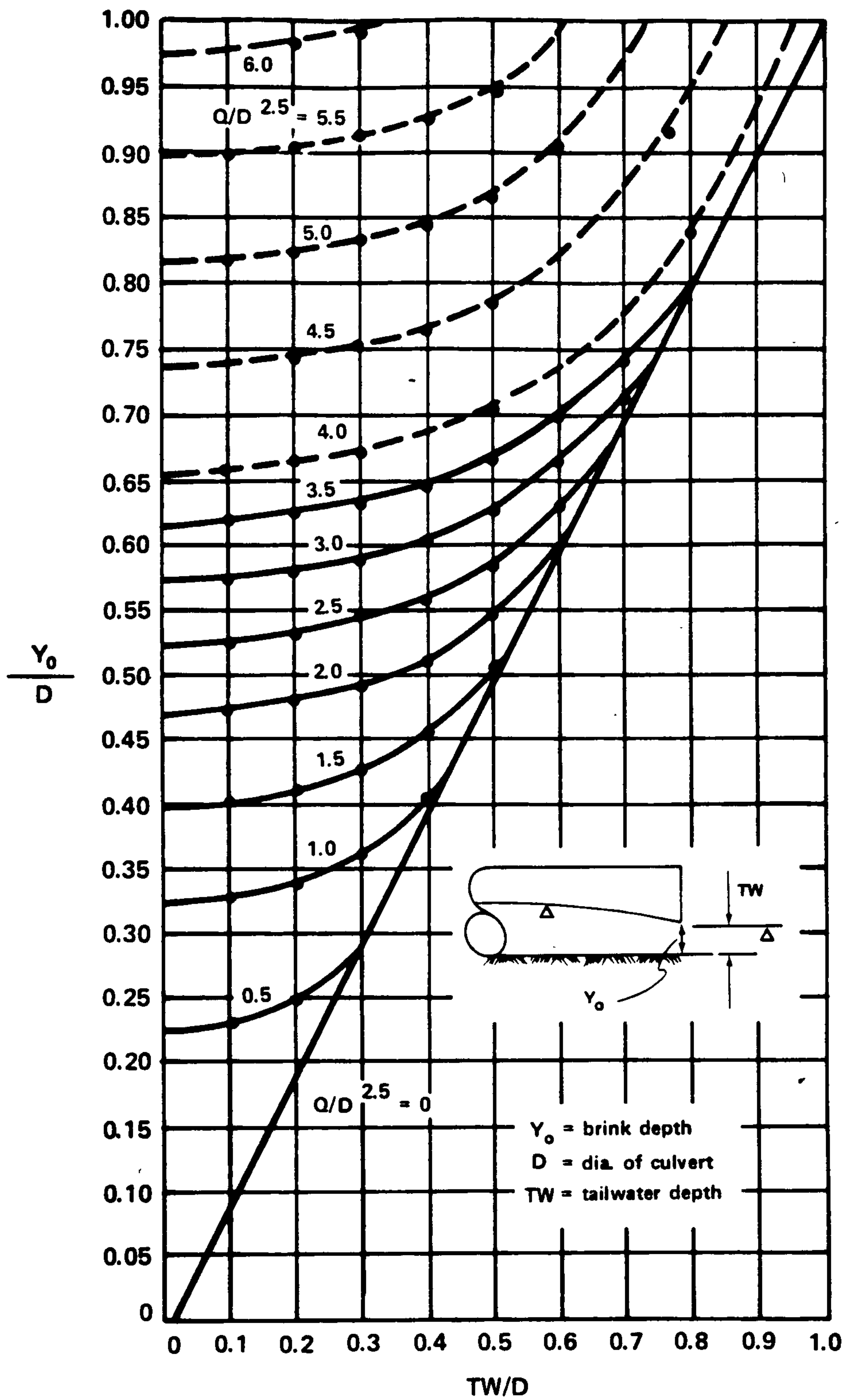


Figure III-10 Dimensionless Rating Curve for the Outlets of Circular Culverts on Horizontal and Mild Slopes from Reference III-2

III-15

Table III-2.—Uniform flow in circular sections flowing partly full. From Reference III-3.

d = depth of flow D = diameter of pipe A = area of flow R = hydraulic radius					Q = discharge in cubic feet per second by Manning's formula n = Manning's coefficient S = slope of the channel bottom and of the water surface				
$\frac{d}{D}$	$\frac{A}{D^2}$	$\frac{R}{D}$	$\frac{Qn}{D^{8/3}S^{1/2}}$	$\frac{Qn}{d^{8/3}S^{1/2}}$	$\frac{d}{D}$	$\frac{A}{D^2}$	$\frac{R}{D}$	$\frac{Qn}{D^{8/3}S^{1/2}}$	$\frac{Qn}{d^{8/3}S^{1/2}}$
0.01	0.0013	0.0066	0.00007	15.04	0.51	0.4027	0.2531	0.239	1.442
0.02	0.0037	0.0132	0.00031	10.57	0.52	0.4127	0.2562	0.247	1.415
0.03	0.0069	0.0197	0.00074	8.56	0.53	0.4227	0.2592	0.255	1.388
0.04	0.0106	0.0262	0.00138	7.38	0.54	0.4327	0.2621	0.263	1.362
0.05	0.0147	0.0325	0.00222	6.55	0.55	0.4426	0.2649	0.271	1.336
0.06	0.0192	0.0389	0.00328	5.95	0.56	0.4526	0.2676	0.279	1.311
0.07	0.0242	0.0451	0.00455	5.47	0.57	0.4625	0.2703	0.287	1.286
0.08	0.0294	0.0513	0.00604	5.09	0.58	0.4724	0.2728	0.295	1.262
0.09	0.0350	0.0575	0.00775	4.76	0.59	0.4822	0.2753	0.303	1.238
0.10	0.0409	0.0635	0.00967	4.49	0.60	0.4920	0.2776	0.311	1.215
0.11	0.0470	0.0695	0.01181	4.25	0.61	0.5018	0.2799	0.319	1.192
0.12	0.0534	0.0755	0.01417	4.04	0.62	0.5115	0.2821	0.327	1.170
0.13	0.0600	0.0813	0.01674	3.86	0.63	0.5212	0.2842	0.335	1.148
0.14	0.0668	0.0871	0.01952	3.69	0.64	0.5308	0.2862	0.343	1.126
0.15	0.0739	0.0929	0.0225	3.54	0.65	0.5404	0.2882	0.350	1.106
0.16	0.0811	0.0985	0.0257	3.41	0.66	0.5499	0.2900	0.358	1.084
0.17	0.0885	0.1042	0.0291	3.28	0.67	0.5594	0.2917	0.365	1.064
0.18	0.0961	0.1097	0.0327	3.17	0.68	0.5687	0.2933	0.373	1.044
0.19	0.1039	0.1152	0.0365	3.06	0.69	0.5780	0.2948	0.380	1.024
0.20	0.1118	0.1206	0.0406	2.96	0.70	0.5872	0.2962	0.388	1.004
0.21	0.1199	0.1259	0.0448	2.87	0.71	0.5964	0.2975	0.395	0.985
0.22	0.1281	0.1312	0.0492	2.79	0.72	0.6054	0.2987	0.402	0.966
0.23	0.1365	0.1364	0.0537	2.71	0.73	0.6143	0.2998	0.409	0.947
0.24	0.1449	0.1416	0.0585	2.63	0.74	0.6231	0.3008	0.416	0.928
0.25	0.1535	0.1466	0.0634	2.56	0.75	0.6319	0.3017	0.422	0.910
0.26	0.1623	0.1516	0.0686	2.49	0.76	0.6405	0.3024	0.429	0.891
0.27	0.1711	0.1566	0.0739	2.42	0.77	0.6489	0.3031	0.435	0.873
0.28	0.1800	0.1614	0.0793	2.36	0.78	0.6573	0.3036	0.441	0.856
0.29	0.1890	0.1662	0.0849	2.30	0.79	0.6655	0.3039	0.447	0.838
0.30	0.1982	0.1709	0.0907	2.25	0.80	0.6736	0.3042	0.453	0.821
0.31	0.2074	0.1756	0.0966	2.20	0.81	0.6815	0.3043	0.458	0.804
0.32	0.2167	0.1802	0.1027	2.14	0.82	0.6893	0.3043	0.463	0.787
0.33	0.2260	0.1847	0.1089	2.09	0.83	0.6969	0.3041	0.468	0.770
0.34	0.2355	0.1891	0.1153	2.05	0.84	0.7043	0.3038	0.473	0.753
0.35	0.2450	0.1935	0.1218	2.00	0.85	0.7115	0.3033	0.477	0.736
0.36	0.2546	0.1978	0.1284	1.958	0.86	0.7186	0.3026	0.481	0.720
0.37	0.2642	0.2020	0.1351	1.915	0.87	0.7254	0.3018	0.485	0.703
0.38	0.2739	0.2062	0.1420	1.875	0.88	0.7320	0.3007	0.488	0.687
0.39	0.2836	0.2102	0.1490	1.835	0.89	0.7384	0.2995	0.491	0.670
0.40	0.2934	0.2142	0.1561	1.797	0.90	0.7445	0.2980	0.494	0.654
0.41	0.3032	0.2182	0.1633	1.760	0.91	0.7504	0.2963	0.496	0.637
0.42	0.3130	0.2220	0.1706	1.724	0.92	0.7560	0.2944	0.497	0.621
0.43	0.3229	0.2258	0.1779	1.689	0.93	0.7612	0.2921	0.498	0.604
0.44	0.3328	0.2295	0.1854	1.655	0.94	0.7662	0.2895	0.498	0.588
0.45	0.3428	0.2331	0.1929	1.622	0.95	0.7707	0.2865	0.498	0.571
0.46	0.3527	0.2366	0.201	1.590	0.96	0.7749	0.2829	0.498	0.553
0.47	0.3627	0.2401	0.208	1.559	0.97	0.7785	0.2787	0.494	0.535
0.48	0.3727	0.2435	0.216	1.530	0.98	0.7817	0.2735	0.489	0.517
0.49	0.3827	0.2468	0.224	1.500	0.99	0.7841	0.2666	0.483	0.496
0.50	0.3927	0.2500	0.232	1.471	1.00	0.7854	0.2500	0.463	0.463

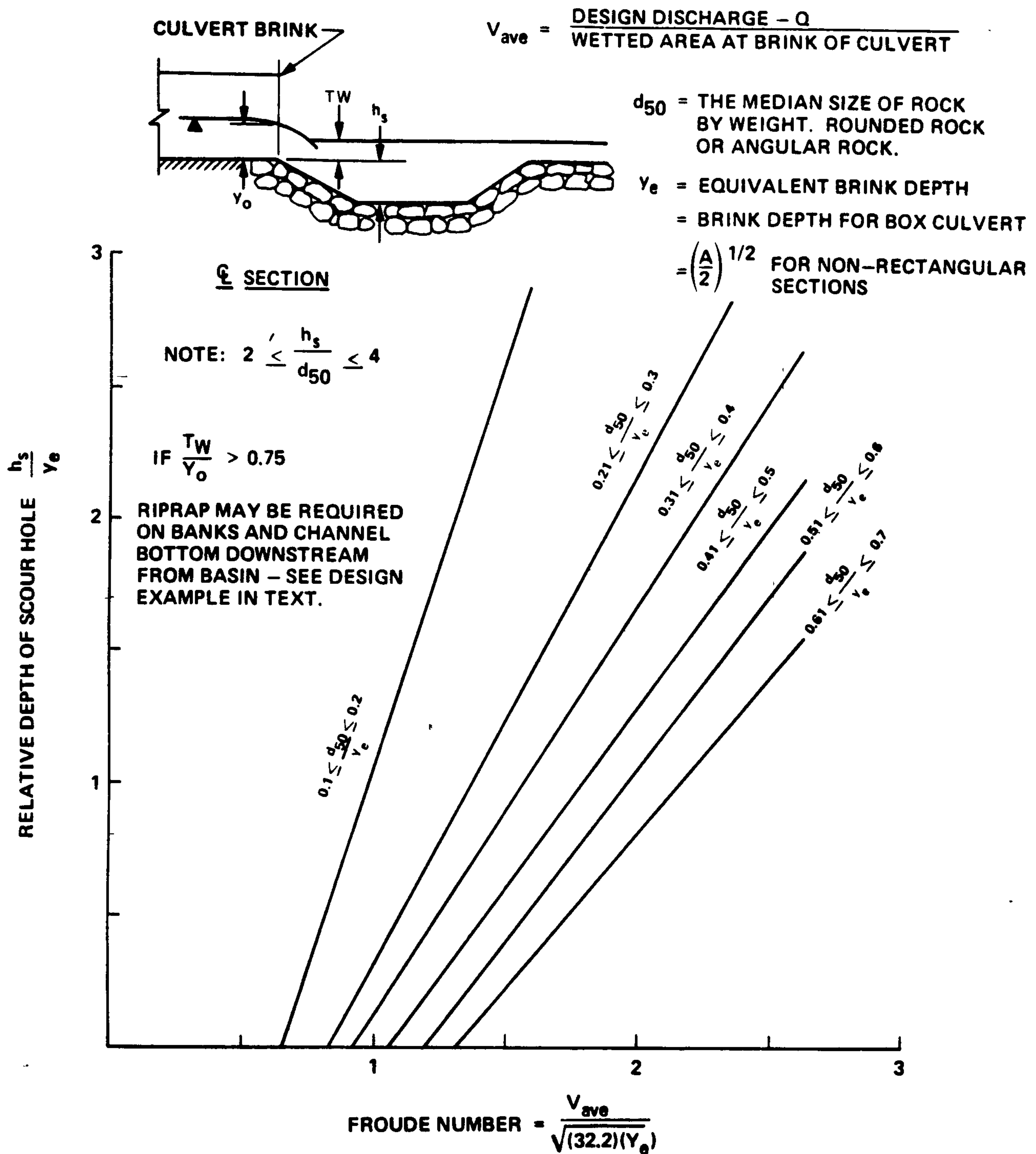


FIGURE X1-2. RELATIVE DEPTH OF SCOUR HOLE VERSUS FROUDE NUMBER AT BRINK OF CULVERT WITH RELATIVE SIZE OF RIPRAP AS A THIRD VARIABLE

XI-14

EXHIBIT 'A'



UNCLASSIFIED PROPERTY CODE
1-945-005

MAP AMENDED THROUGH
MARCH 1986

M-15-Z
CITY OF ALBUQUERQUE
PLANNING DEPARTMENT

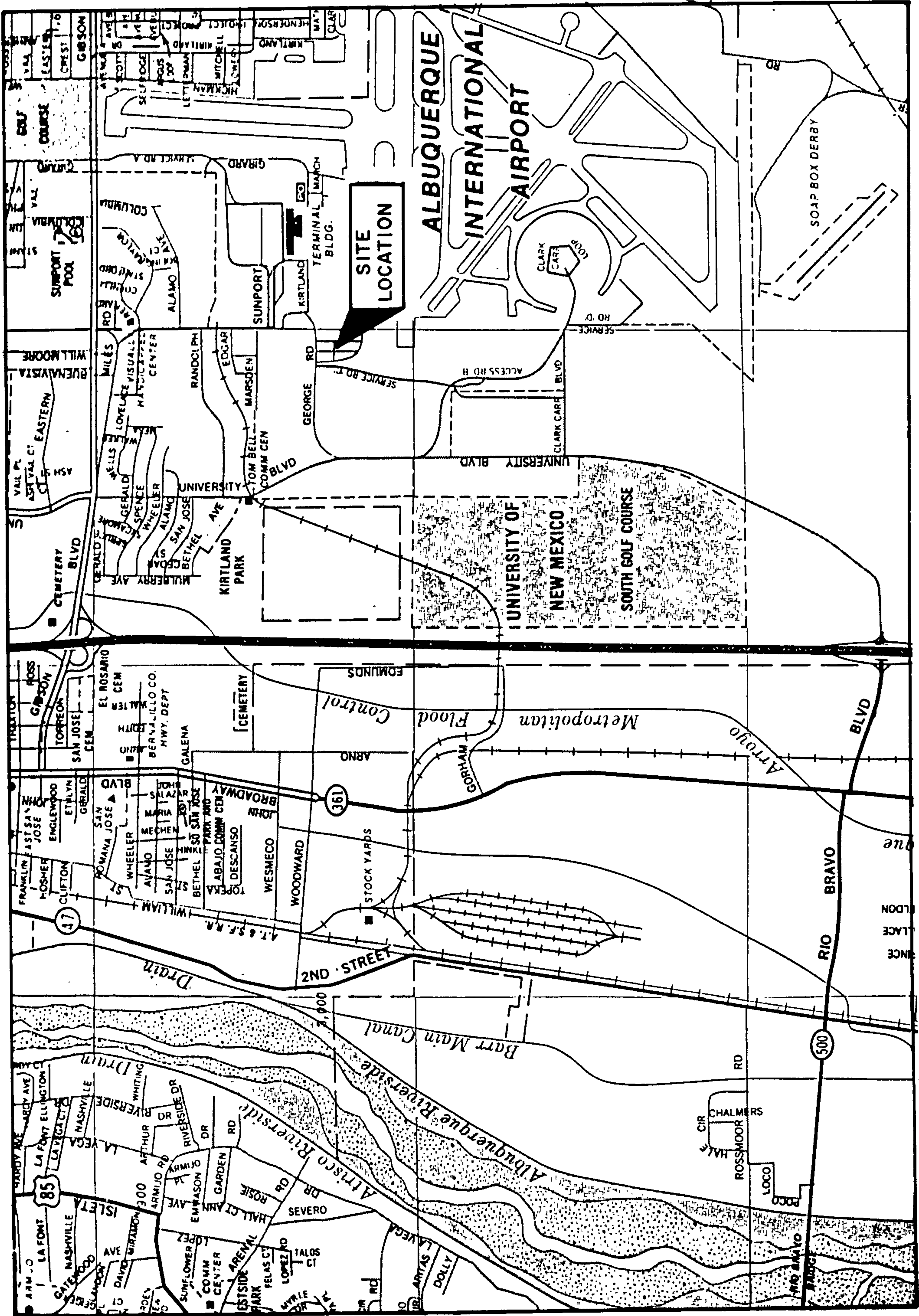
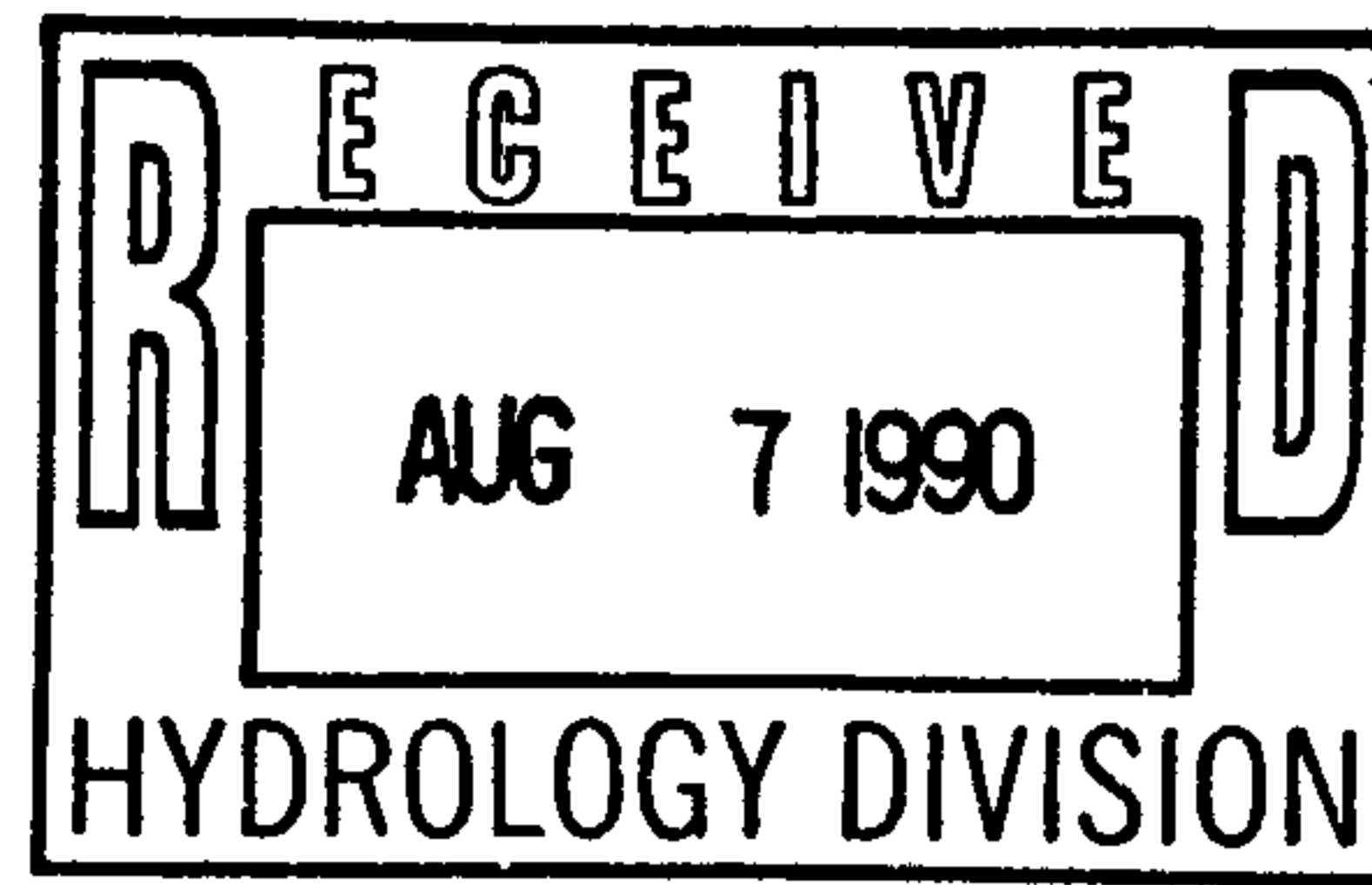


EXHIBIT 'A1'

LOCATION MAP

RE: AIRPORT MAIL FACILITY
DRAINAGE PLAN



The purpose of this letter report and accompanying documentation is to develop a site specific drainage plan for the above referenced site. The general area drainage was addressed in the report entitled "Conceptual Drainage Report and Submittal for Site Development Plan Approval for the Postal Facility Located at the Albuquerque International Airport", prepared by Molzen-Corbin and Associates and dated November, 1989. This report addressed the 5 acre postal facility site as well as the offsite drainage that impacted the site.

This report will address the 5 acre site as it relates to the approved grading plan. This grading plan rerouted some of the runoff from the proposed flow paths outlined in the earlier report. The total runoff from the site is relatively unchanged from the total proposed in the conceptual plan, but the areas and routing differ because of the final grading plan.

This site is to be 95% impervious area of building and pavement and 5% landscaping area. This is consistent with the earlier report.

The grading of the site differs in minor respects from the conceptual report. The reader is referred to the accompanying calculations and drainage plan sheet. The calculations for the drainage basin runoff areas were based upon DPM criteria for a 100 year, 6 hour storm of 2.3 inches. Time of concentration times were 10 minutes for each basin because of the short hydraulic lengths. Inlet capacity calculations were assumed to have a 50% clogging factor for all type D storm inlets. Pipe capacities were based on normal depth calculations.

The analysis results were consistent with the previous report. There was minor rerouting of storm flows, the greatest amount being the roof area which was discharged directly to the storm drain rather than routed overland to an offsite area as originally defined. This resulted in a reduction of flow travelling off of the southwest corner of the site from 12.4 cfs to 5.3 cfs.

The attached calculations conclude that the proposed inlets and storm drain lines have sufficient capacity for the design storm for both on- and off-site drainage. The amount of runoff that was originally anticipated to flow off-site has been reduced. Off-site flows that were originally intended to be routed through the site storm drain system have been accommodated.

 LEEDSHILL - HERKENHOFF, INC. ALBUQUERQUE SANTA FE PHOENIX SAN DIEGO SAN FRANCISCO ENGINEERING COMPUTATIONS	NAME OF PROJECT AIRMAIL FACILITY			SHEET NUMBER OF
	COMPUTED BY: JE	CHECKED BY:	JOB NUMBER	DATE:

COMPARISON OF MOLETT-FORRELL DRAINAGE REPORT (NOV 84) TO L-H GRADING PLAN

LH Area 1a - previously a portion of M-C area B

Area 1a will drain via roadover to M-C area F

$$\text{Area} = 4,683 \text{ sf} = 0.11 \text{ ac}$$

$T_c = 10 \text{ min}$
 $I = 5.29 \text{ in}$ } same for all drainage basins because of short travel lengths

$C_n = 0.95$ - all paved area

$$Q = .95(5.29)(0.11) = 0.6 \text{ cfs to area F}$$

LH Area 1b - previously a portion of M-C areas A2 and B

Area 1b will drain to single 'D' inlet in parking lot

$$\text{Area} = 61,800 \text{ sf} = 1.42 \text{ ac}$$

$C_n = 0.95$ - all paved area

$$Q = .95(5.29)(1.42) = 7.1 \text{ cfs}$$

Capacity of single 'D' inlet on very flat grade

per page 22.3 L-5 of DPM, D inlet can capture 14 cfs at a ponding depth of 1', this allows for 50% clogging factor

check - grate el = 98.5, finish floor 3, OK to pond to 1' depth

LH Area 2 - previously a portion of M-C area A2

Area 2 will drain to single D inlet in parking lot

$$\text{Area} = 29,400 \text{ sf} = 0.67 \text{ ac}$$

$C_n = 0.95$ - all paved area

$$Q = .95(5.29)(.67) = 3.4 \text{ cfs}$$

per calculations for area 1b, single D inlet has sufficient capacity.

LH Area 3 - previously M-C area C, however area C has included area of roof that now drains directly to storm drain

$$\text{M-C area C} = 96,000 \text{ sf} = 2.2 \text{ ac}$$

$$\text{LH area 3} = 45,700 \text{ sf} = 1.05 \text{ ac}$$

Therefore reduce amount of runoff that goes overland to M-C area D.

$C_n = 0.95$ all paved area

$$Q = .95(5.29)(1.05) = 5.3 \text{ cfs to offsite area D}$$



LEEDSHILL - HERKENHOFF, INC.
ALBUQUERQUE SANTA FE
PHOENIX
SAN DIEGO SAN FRANCISCO
ENGINEERING COMPUTATIONS

NAME OF PROJECT
AIRMAIL FACILITY

COMPUTED BY:
JF

CHECKED BY:

JOB NUMBER

SHEET NUMBER
OF

DATE:

Area 4 - previously MC area A2

Area 4 will drain to single 'D' inlet in parking lot

Area 4 contains 0.2 ac of landscaped area

Offsite drainage from east corner from 0.4 acres outside of property line

Total area = $0.86 + .2 + 0.4 = 1.46$ ac.

$$C_n = \left(\frac{.2}{1.46}\right)(.25) + \left(\frac{1.26}{1.46}\right).95 = .85$$

$$Q = .85(5.29)(1.46) = 6.6 \text{ cfs}$$

per calculations for area 1c, single "D" will be sufficient.

CONCLUSION

Per calculations developed for conceptual plan are greater than or equal to the volumes calculated for the actual grading plan, primarily because flows are rerouted or in the case of the roof drainage, flow goes directly into storm drain.

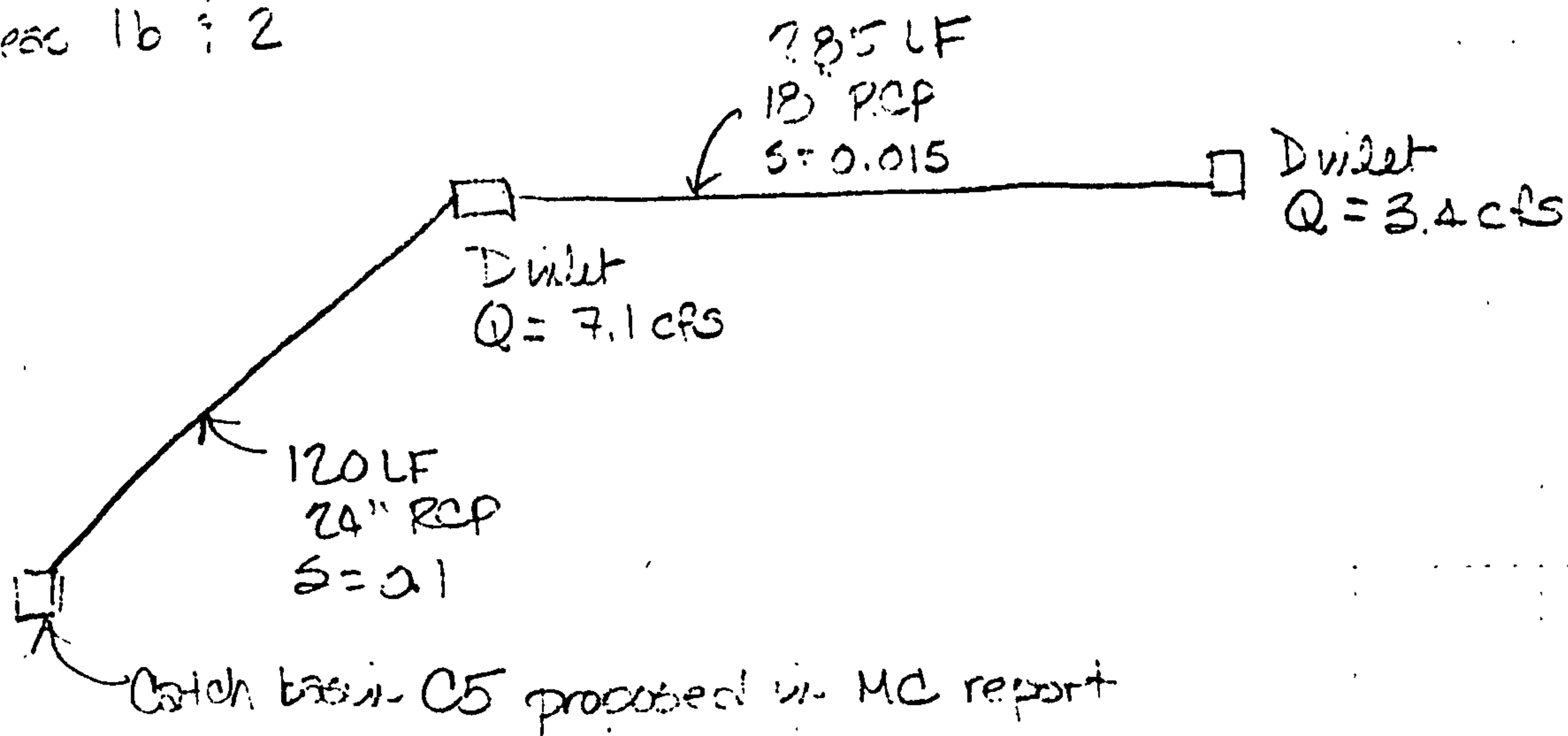
Per area 2

Area = 1 ac

$$Q = 0.95(5.29)(1) = 5 \text{ cfs directly to storm drain}$$

Verdict that storm drain proposed will have sufficient capacity for all flows developed and pertinent off-site flows that will be discharged to storm drain.

Areas 1b & 2





LEEDSHILL - HERKENHOFF, INC.
ALBUQUERQUE SANTA FE
 PHOENIX
SAN DIEGO SAN FRANCISCO
ENGINEERING COMPUTATIONS

NAME OF PROJECT

SHEET NUMBER

OF

COMPUTED BY:

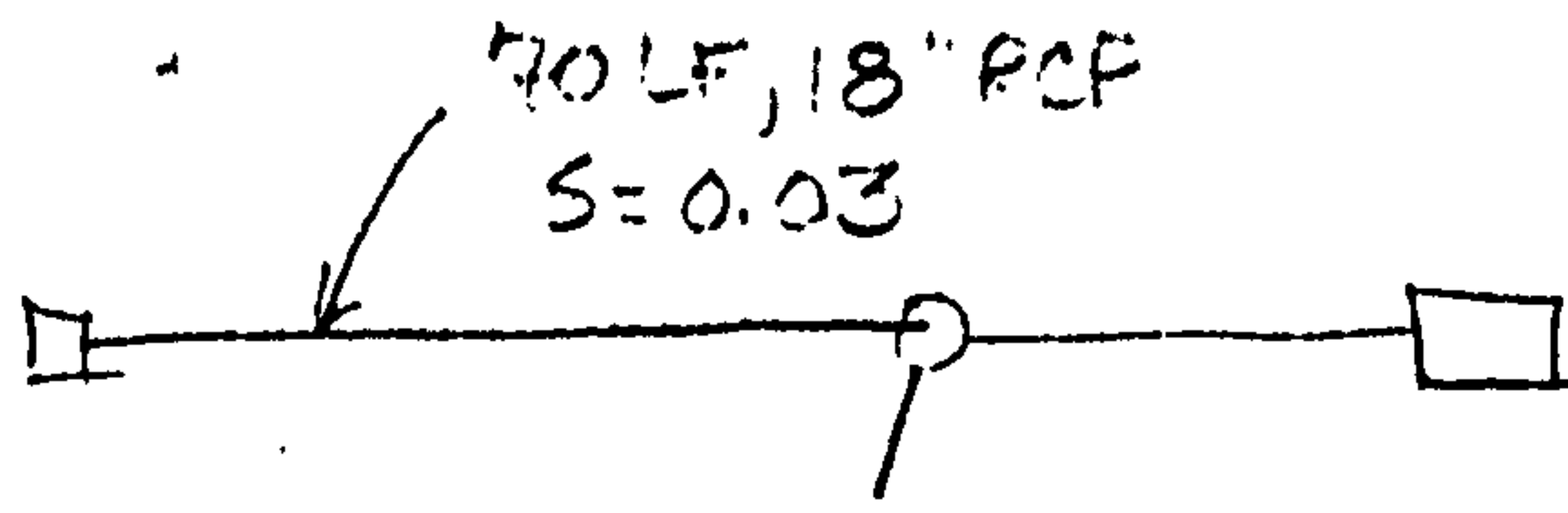
CHECKED BY:

JOB NUMBER

DATE:

Area 4 and roof drain

Drainlet
 $Q = 6.6 \text{ cfs}$



Offsite flows
to proposed inlet (NIC)

$Q_{\text{area A}_2} = 3.2 \text{ cfs}$

$Q_{\text{roof}} = 0.3 \text{ cfs}$

$Q_{\text{total}} = 3.5 \text{ cfs}$

Roof
 $Q = 5 \text{ cfs}$

Existing 18" storm drain
 $S \sim 0.04$

Existing 18" storm drain
 $S \sim 0.04$

All storm drain lines are flowing less than full, therefore have
adequate capacity for all on- and off-site flows.

Pipe calculations are attached.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

August 1, 1990
AREA 4 AND ROOF DRAIN
LINE FROM AREA 4 TO MANHOLE

PROGRAM INPUT DATA:
DESCRIPTION

	VALUE
Flow Rate (cubic feet per second).....	6.6
Channel Bottom Slope (feet per foot).....	0.0300
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Diameter (feet).....	1.50

PROGRAM RESULTS:
DESCRIPTION

	VALUE
Normal Depth (feet).....	0.63
Flow Velocity (feet per second).....	9.47
Froude Number (Flow is Super-Critical).....	2.430
Velocity Head (feet).....	1.39
Energy Head (feet).....	2.02
Cross-Sectional Area of Flow (square feet).....	0.70
Top Width of Flow (feet).....	1.48

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

August 1, 1990
AREA 1b AND 2
LINE BETWEEN INLETS

PROGRAM INPUT DATA:
DESCRIPTION

	VALUE
Flow Rate (cubic feet per second).....	3.4
Channel Bottom Slope (feet per foot).....	0.0150
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Diameter (feet).....	1.50

PROGRAM RESULTS:
DESCRIPTION

	VALUE
Normal Depth (feet).....	0.53
Flow Velocity (feet per second).....	6.15
Froude Number (Flow is Super-Critical).....	1.743
Velocity Head (feet).....	0.59
Energy Head (feet).....	1.11
Cross-Sectional Area of Flow (square feet).....	0.55
Top Width of Flow (feet).....	1.43

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

August 1, 1990
AREA 1b AND 2
LINE TO INLET C5

PROGRAM INPUT DATA:
DESCRIPTION

	VALUE
Flow Rate (cubic feet per second).....	10.5
Channel Bottom Slope (feet per foot).....	0.0100
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Diameter (feet).....	2.00

PROGRAM RESULTS:
DESCRIPTION

	VALUE
Normal Depth (feet).....	0.96
Flow Velocity (feet per second).....	7.05
Froude Number (Flow is Super-Critical).....	1.440
Velocity Head (feet).....	0.77
Energy Head (feet).....	1.73
Cross-Sectional Area of Flow (square feet).....	1.49
Top Width of Flow (feet).....	2.00

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 7709
(713) 895-8322. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

August 1, 1990
AREA 4 AND ROOF DRAIN
EXISTING LINE BETWEEN MANHOLES

PROGRAM INPUT DATA:
DESCRIPTION

	VALUE
Flow Rate (cubic feet per second).....	11.1
Channel Bottom Slope (feet per foot).....	0.0400
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Diameter (feet).....	1.50

PROGRAM RESULTS:
DESCRIPTION

	VALUE
Normal Depth (feet).....	0.78
Flow Velocity (feet per second).....	12.04
Froude Number (Flow is Super-Critical).....	2.705
Velocity Head (feet).....	2.25
Energy Head (feet).....	3.03
Cross-Sectional Area of Flow (square feet).....	0.92
Top Width of Flow (feet).....	1.50

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A complete program manual is available.

CIRCULAR CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

August 1, 1990
AREA 4 AND ROOF DRAIN
EXISTING LINE BETWEEN MANHOLES
INCLUDES ROOF DRAINAGE

PROGRAM INPUT DATA:
DESCRIPTION

	VALUE
Flow Rate (cubic feet per second).....	16.5
Channel Bottom Slope (feet per foot).....	0.0400
Manning's Roughness Coefficient (n-value).....	0.0130
Channel Diameter (feet).....	1.50

PROGRAM RESULTS:
DESCRIPTION

	VALUE
Normal Depth (feet).....	1.00
Flow Velocity (feet per second).....	13.20
Froude Number (Flow is Super-Critical).....	2.475
Velocity Head (feet).....	2.71
Energy Head (feet).....	3.70
Cross-Sectional Area of Flow (square feet).....	1.25
Top Width of Flow (feet).....	1.41

CIRCULAR CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.5 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A complete program manual is available.

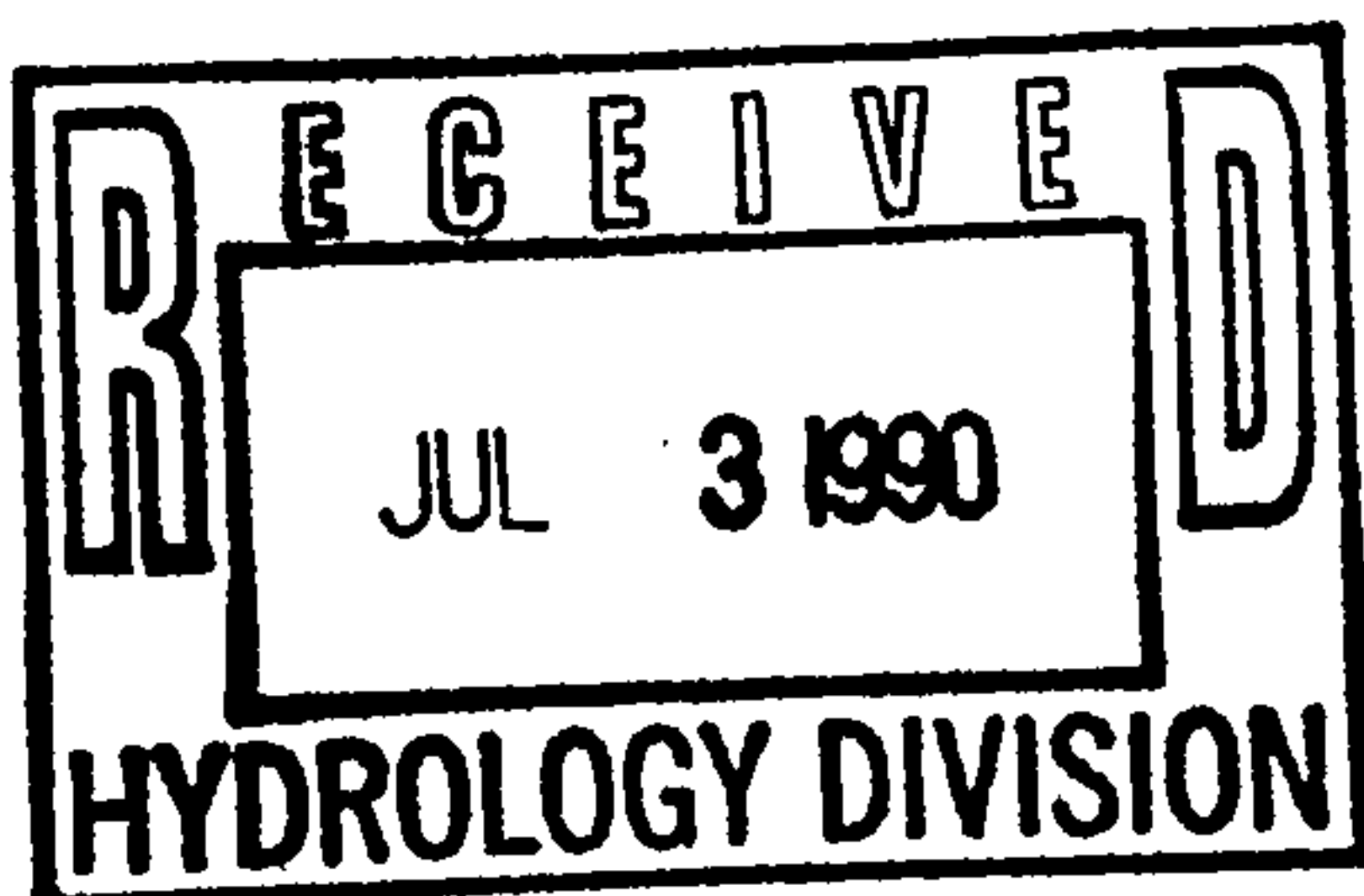
**CONCEPTUAL DRAINAGE REPORT
AND SUBMITTAL FOR
SITE DEVELOPMENT PLAN APPROVAL
FOR THE
POSTAL FACILITY LOCATED AT
THE ALBUQUERQUE INTERNATIONAL AIRPORT**

NOVEMBER 1989

**PREPARED FOR
CITY OF ALBUQUERQUE
AVIATION DEPARTMENT**

**PREPARED BY
MOLZEN-CORBIN & ASSOCIATES
2701 MILES ROAD, S.E.
ALBUQUERQUE, NEW MEXICO 87106
(505) 242-5700**

FILE NO. ABQ62-13.D03



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103



March 5, 1990

Thornton Schwenk, P.E.
Molzen-Corbin & Associates
2701 Miles Road, S.E.
Albuquerque, NM 87106

RE: THE POSTAL FACILITY LOCATED AT THE ALBUQUERQUE
INTERNATIONAL AIRPORT (COA PROJECT NO. CIP 3372.91)
(M-15/D27)

Dear Mr. Schwenk,

This letter is to confirm the status of the project referred to above.

Building Permit sign-off by the Hydrology Section will require the offsite basins which contribute flows to this area to be identified on a topographical drawing, the contributing flows quantified, and the Final Report certified by a Professional Engineer that it was prepared by him or under his immediate supervision, per previous correspondence dated January 2, and January 31, 1990.

As the Aviation Department has assumed maintenance responsibility for the area downstream of the site, and plans to landscape it within the next year or two, an asphalt or concrete lined channel from the storm drain outlet to the inlet at Yale Boulevard will not be necessary.

The Work Order drawings have been signed with the assurances of Mr. Greg Byres that the storm drains are sized properly to handle the offsite flows. After a telephone conversation with Mr. Byres last week, I realized that he was under the impression that all of the required information was contained in the report. It is not, and I thought I should communicate this to your office prior to your request for Building Permit.

If you have any questions, please call me at 768-2650.

Cordially,

Stuart Reeder

G. Stuart Reeder, P.E.
C.E./Hydrology Section

WP+1530



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 31, 19⁹⁰~~89~~

Hans H. Coucheron-Aamot, P.E.
Molzen-Corbin & Associates
2701 Miles Road, S.E.
Albuquerque, New Mexico 87106

RE: CONCEPTUAL DRAINAGE REPORT FOR THE POSTAL FACILITY LOCATED
AT THE ALBUQUERQUE INTERNATIONAL AIRPORT, SUBMITTED
JANUARY 10, 1989, FOR SITE DEVELOPMENT PLAN APPROVAL (DRB
89-549) (M-15/D27)

Dear Mr. Coucheron-Aamot

Your submittal, referred to above, with your engineer's stamp dated 1-9-90, is approved for site development plan sign-off by the Hydrology Section.

For building permit sign-off, kindly provide the following information:

1. a completed Exhibit B which shows the offsite basin(s); from the contours shown on Exhibit C, Areas B, A1, A2, and E1 all appear to receive some offsite flows. These flows should be quantified. Page 1 of the report is vague as to how the areas east of the site drain.
2. a certified, stamped, signed and dated report. The plans were sealed, but the report was not.

I believe that the discharge from the rip-rap energy dissipator will be erosive. The downstream slope is as high as 10.9%, and averages almost 7% overall. If the Aviation Department understands that it is acquiring maintenance responsibilities in that area and is willing to assume them, our office has no problem with this approach. If they wish for the project to be relatively maintenance free, however, I recommend that you consider an asphalt rundown from the rip-rap basin to the concrete basin.

If you have any questions, or if I can be of any assistance, please call me at 768-2650.

Cordially,

Stuart Reeder
G. Stuart Reeder, P.E.
C.E./Hydrology

xc: Bob Gill, Aviation Dept., COA
David Klien, Leedshill-Herkenhoff

GSR

(WP+1530)

AN EQUAL OPPORTUNITY EMPLOYER

Greg B.

January 9, 1990

Mr. G. Stuart Reeder, P.E.
Hydrology Division
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

**RE: Conceptual Drainage Report for the Postal
Facility Located at Albuquerque
International Airport DRB**

ABQ62-13 D03

Dear Mr. Reeder:

Enclosed is a resubmittal of the conceptual drainage report for the above-mentioned project. The comments you forwarded to Mr. Kent Freier on January 2, 1990 have been dealt with in this latest submittal. Along with your comments, additional comments from Mr. Clifford E. Anderson of AMAFCA have also been incorporated into this submittal.

The following is a brief discussion of each of the comments:

1. The 36" storm drain crosses the site from east to west. There are two catch basins and one manhole along this line. The line was installed around 1986. This line will be completely removed and replaced with an 18" RCP line. The 18" line will handle the flow due to the change in topography of the tributaries. The 18" line will only pick up a fraction of the area that the 36" storm drain was designed for.
2. The offsite flows both overland and in the existing storm drain system are shown in the analysis. The information on the existing 24" storm drain was obtained from the building plans for the Provisioning Building, Project No. 8666 by BPLW, dated March 1988.
3. An additional section was added to the report for Erosion Control. All slopes related to this project will be protected from runoff by a curb at the shoulder of each slope. The only runoff will be the water that lands on the slope and does not permeate the surface.
4. The runoff analysis for the existing site was recalculated in this latest submittal. See submittal for calculations.
5. It was determined that the discharge from the proposed storm drain system was erosive. Therefore, a riprap energy basin was designed for the discharge instead of the previously designed discharge structure. See the submittal for calculations.

Mr. G. Stuart Reeder, P.E.
January 9, 1990
Page 2

6. With the use of the riprap energy basin, the water velocity can be reduced to a non-erosive velocity. Storm water leaving the energy basin will sheet flow in a westerly direction along the existing flow circuits.
7. Between the discharge structure and University Boulevard, the water sheet flows along the surface. On the east side of University Boulevard there is a holding basin with a concrete spillway for controlled discharge. Crossing University Boulevard is a 52" RCP that opens into a developed arroyo. This arroyo flows in a westerly direction to the South Diversion Channel.

AMAFCA Comments, January 2, 1990:

1. The latest submittal has been certified by Mr. Hans H. Coucheron-Aamot, P.E.
2. The runoff analysis for existing conditions has been recalculated in this latest submittal. There is asphalt paving throughout the site. This paving has become deteriorated with the traffic caused by construction crews when the site was used as a holding area for the contractors working on the airport terminal. There is, in fact, a holding basin and spillway directly below the site. This facility should handle the 10 percent increase in runoff from the site. Lastly, there is no private property between the site and the developed arroyo east of University Boulevard. All parcels adjacent to the site are owned by the City of Albuquerque and maintained by the Aviation Division.
3. A riprap energy basin has been designed in lieu of the discharge structure previously submitted. Water leaving this basin will be travelling at a non-erosive velocity.

Thank you for your time and consideration of this matter. If you have any questions, or need additional information, please contact me at 242-5700.

Sincerely,

MOLZEN-CORBIN & ASSOCIATES

Greg Byres

GB:dh
Enclosure

January 2, 1990



Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

2600 PROSPECT N.E. - ALBUQUERQUE, N.M. 8710
TELEPHONE (505) 884-2213

To: Fred Aguirre, Hydrologist
Public Works Dept.
City of Albuquerque

Sheet 1 of 2

From: Clifford E. Anderson, Drainage Engineer
AMAFCA Cliff E. Anderson

Re: DRB-89-410 Conceptual Drainage Report
and Submittal for Site Development Plan
Approval for the Postal Facility Located at
the Albuquerque International Airport. by
Molzen-Corbin & Associates (M-15).

The area described in this report is
subject to AMAFCA's Drainage Policy (Resolution
No. 1980-15). We anticipate that the City
will take the lead in reviewing this drainage
report in accordance with the City/AMAFCA
Designee Agreement. The following are AMAFCA's
comments on the report:

- a. The drainage report and drainage plan
should be certified by a registered
professional engineer. Personal inspection
of the site and a statement on the
accuracy of existing contours are included
on AMAFCA's certification requirements.

DRB-89-410
January 2, 1990
Sheet 2 of 2

b.

The analysis of existing conditions indicates that most of the site

is impervious to infiltration ($C=0.95$

and $CN=98$). The "Existing Site, Existing

and Proposed Utilities" map (Sheet C-6 of 9)

indicates that on a small portion of

the site is existing asphalt paving.

It does not appear that the existing

conditions analysis is an accurate reflection

of the existing conditions map. The

existing condition analysis is used to

justify a free discharge for developed

conditions. There are no constructed facilities

immediately downstream of this project and

increased flows (frequency and quantity) could

damage private property downstream.

c.

The drainage plan proposes to collect

storm water in a storm sewer and

discharge it at a point west of the

site. The outlet velocities appear to

be erosive at this location. No protection

of the outlet structure or downstream

channel is proposed on the plan. It is

not clear that this concentration of flows

will not damage downstream property.



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

KEN SCHULTZ
MAYOR

January 2, 1989⁹⁰

Kent S Freier, P.E.
Molzen-Corbin & Associates
2701 Miles Road, S.E.
Albuquerque, NM 87106

RE: CONCEPTUAL DRAINAGE REPORT FOR THE POSTAL FACILITY LOCATED
AT THE ALBUQUERQUE INTERNATIONAL AIRPORT, SUBMITTED
DECEMBER 11, 1989, FOR SITE DEVELOPMENT PLAN APPROVAL (DRB
89-549) (M-15/D27)

Dear Mr. Freier,

I have reviewed your submittal, referred to above, and have the following comments:

1. The contractor is authorized to proceed with the excavation, removal of the old landfill debris, and rough grading of the site. Prior to any excavation, the contractor will need to secure a Topsoil Disturbance Permit from the Environmental Health Department.
2. On page one of the report, you refer to an existing 36" storm sewer which has two catch basins and one manhole, and to an existing 24" storm drain located on the east side of the site, both of which are said to be shown on Exhibit B. Exhibit B, however, shows an existing 24" storm sewer located along the south boundary, and an "existing 8" line" coming into the site from the east to existing catch basin C7, eventually joining a proposed 18" storm sewer. Further, none of these facilities are shown on the current drainage facilities map. Please verify the existence and location of these facilities, whether private or public, and correct the report.

Exhibit "G" shows the 36" line, but it is not clear how the proposed 18" line (shown on "B") will carry the flow of the 36", and whether the 36" line is to be abandoned, as it appears to run under a proposed building.

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

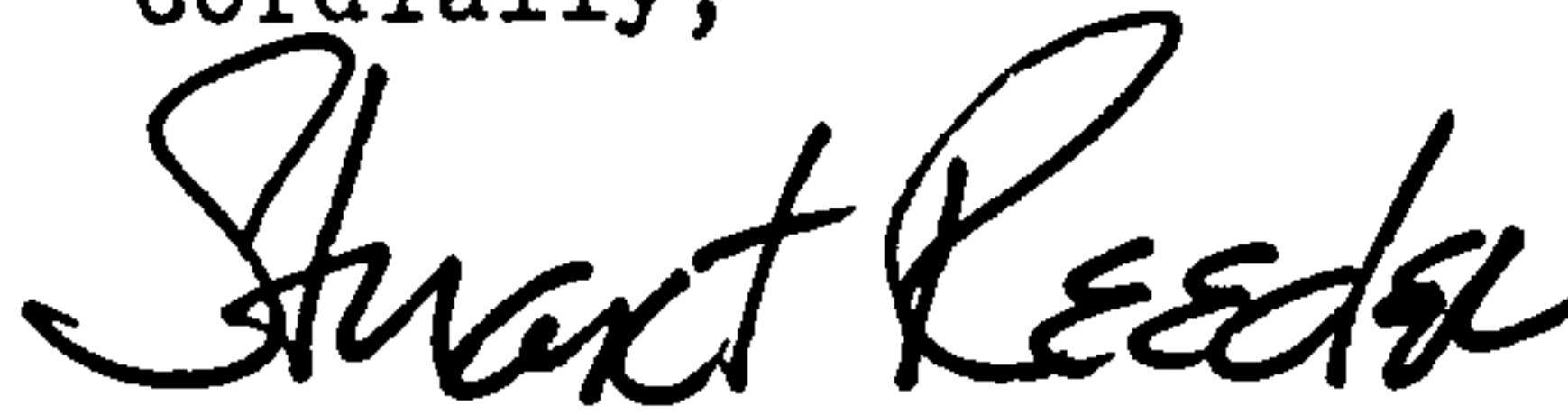
AN EQUAL OPPORTUNITY EMPLOYER

Kent S Freier, P.E.
January 2, 1989
page 2

3. Please address the offsite flows which affect this site, both overland and in the storm drain systems.
4. When slopes exceed three feet in height, we require that the maximum slope not be greater than 3:1, unless the slope is protected from erosion and failure through City Engineer approved means (DPM Ch. 22.5.A). Proposed slopes on the west side of the new access road appear to meet this criterion, but should be called out on the drawing as 3:1 maximum. Proposed slopes on the east side of the access road appear to be 2:1. Please indicate how you intend for the contractor or landscape architect to stabilize this slope.
5. The runoff analysis for the existing site is for an area of 347,130 square feet. The runoff analysis for the proposed site is for an area of 391,025 square feet. It is not clear from the Exhibits G and B which area(s) were added or deleted.
6. Please provide calculations to show that a cutoff wall is not necessary for the discharge structure shown on Exhibit B.
7. Please provide either calculations to show that the velocity downstream of the discharge structure is non-erosive, or your proposal to protect that area from washing out.
8. How will drainage from this site cross University Boulevard to get to the South Diversion Channel ?

If you have any questions, or if I can be of any assistance, please call me at 768-2650.

Cordially,



G. Stuart Reeder, P.E.
C.E./Hydrology

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
UTILITY DEVELOPMENT DIVISION/HYDROLOGY SECTION

PRE-DESIGN CONFERENCE

RECEIVED
SEP 20 1989
LEEDSHILL-HERKENHOFF, INC.

DRAINAGE FILE/ZONE ATLAS PAGE NO.: M-15 DATE: September 14, 1989

EPC NO.: _____ DRB NO.: _____ ZONE: _____

SUBJECT: U.S. Postal Service

STREET ADDRESS: Albuquerque Airport; George Street

LEGAL DESCRIPTION: _____

APPROVAL REQUESTED: _____ PRELIMINARY PLAT _____ FINAL PLAT
_____ SITE DEVELOPMENT PLAN X BUILDING PERMIT
_____ GRADING/PAVING PERMIT X OTHER
Work Order

ATTENDANCE: WHO REPRESENTING
Stuart Reeder City of Albuquerque

FINDINGS:
This area has been analysed, both as to existing and (future) developed conditions in
Restudy of the Albuquerque Master Drainage Study, Volume II, 1987, by Bohannon-Huston,
Inc.

The Drainage Report for this area should make use of the AMDS update, and identify:
- the entire drainage basin;
- any and all offsite flows which enter the basin and particularly this site;
- the downstream capacity of the facilities conveying storm runoff to the south
diversion channel; and,
- the necessity for ponding (free discharge is to be preferred where it is practi-
cable).

Consideration must be given to the underlying strata when ponding - ponding over an
area of landfill is not acceptable due to the potential for groundwater contamination.

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: GS Reeder SIGNED: _____
TITLE: CE / HYDROLOGY DIV. TITLE: _____
DATE: 15 SEP 89 DATE: _____

****NOTE**** PLEASE PROVIDE A COPY OF THIS PRE-DESIGN FORM WITH THE DRAINAGE SUBMITTAL.

TABLE OF CONTENTS

	<u>Page Number</u>
I. Purpose	1
II. Site Location and Existing Conditions	1
III. Proposed Condition	2
IV. Flood Zone	4
V. Erosion Control	4
VI. Design Criteria	5
VI. References	6

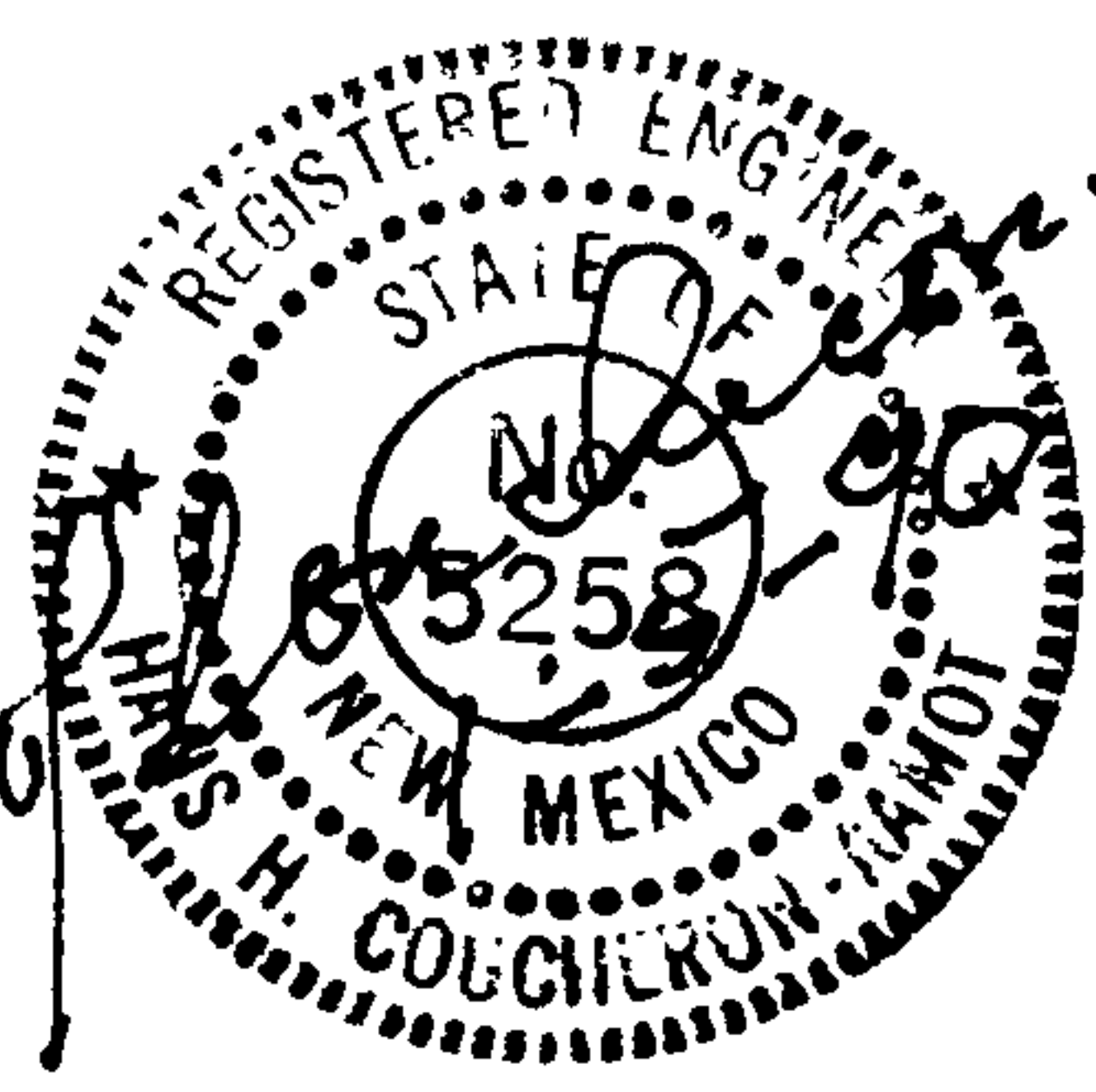
Appendix A: Calculations

EXHIBITS

- A. Vicinity Map
- A1. Location Map
- B. Existing Site and Utilities
- C. Proposed Drainage and Grading Plan

James T. [Signature]

James T. [Signature]



REGISTERED ENGINEER
STATE OF NEW MEXICO
NO. 5258
JAMES H. COUCHERON - P.E.

I. PURPOSE

The purpose of this report is to provide a drainage and storm sewer analysis for a building site located at the Albuquerque International Airport. This report, and the enclosed material will compose a submittal for site development plan approval.

II. SITE LOCATION AND EXISTING CONDITION

The proposed building site is located west of the Terminal Building at the Albuquerque International Airport and bounded on the north by George Road, City of Albuquerque Zone Atlas Map M-15-Z, Municipal Addition No. 9. See Exhibit "A".

The existing site is presently atop an abandoned landfill. The surface was comprised of paved parking aprons and hangers for private aircraft. This parcel of land was recently abandoned and used as a holding area for contractors working on the Albuquerque International Terminal Building. When the site was developed for private aircraft a 36" storm sewer was installed. There are two catch basins and one manhole along this line. The tributaries for the two catch basins are within the property limits and a small portion of the parking lot east of the site. The line daylights on the west side of the site. No water is presently retained on site, this will also be true of the proposed site. During the years since this line was installed the topography in the tributaries has been altered and storm water is now routed to other catch areas. In the course of this project the 36" line will be removed and a new appropriately sized line will replace it. There is also a 24" storm drain located

on the south side of the site. All existing tributaries for this line are east and south of the site.

The flow at the outlet of the 24" line is calculated to be 11.78 CFS at 3.7 ft./sec. This information was obtained from plans for construction of the Airline Provisioning Building Project No. 8666 dated March 1988, Sheet C2B.

The total runoff from the existing site, including the 24" storm drain, and the 36" storm drain is 1.351 acre feet. The runoff for the 24" is approximate using information from construction drawings for the Provisioning Building (Appendix A).

III. PROPOSED CONDITION

Proposed development of the site will occur in three stages. First, the site will be excavated, removing all landfill material from the site. This landfill material will be relocated west of the site and covered with clean material, as per New Mexico Health and Environmental Department Operational Procedures.

The second stage will consist of refilling the site with structural fill and liner material which will be borrowed from within the airport property. The final grade for the site is shown on Exhibit "C". Along with the site development there will also be a 1250 foot long access road. This road will be 40 feet wide, face of curb to face of curb and have a cross slope of 2% from the crown to lip of gutter.

The third stage of development will consist of the construction of a new postal facility and parking area. This final stage of development will leave the site covered with 95% paved area and building. The area of the postal facility and parking area site will be 5 acres. With the development of the site and road a total area of 8 acres will be affected.

The finished site will have pavement and building covering 95% of the area, the remaining 5% will be landscaped.

The total runoff from the proposed development will be 1.51 acre feet for a 100 year, six-hour storm which will be routed to the west in a storm drainage system where it will daylight and travel along the surface to natural arroyos. (Appendix A) The point of discharge for the new system will be near the same location as the existing 36" storm drain discharge which is to be completely removed during excavation. See Exhibit "C" for plan of new system.

The storm water that is discharged out of this proposed storm drain system will sheet flow in a westerly direction approximately 2,200 feet along an existing flow line where it will be picked up by a newly constructed holding basin. The storm water is then control released over a concrete spillway to a 52" RCP under University Boulevard. The water is then directed through existing channels and arroyos to the south diversion channel. This path is the same as what presently exists for this site and the provisioning building.

IV. FLOOD ZONE

The FEMA flood maps indicate no flood zones in the area of the proposed site.

Albuquerque Master Drainage Study Volume II by Bohannon-Huston, Inc.

This study shows a flood hazard area near the proposed site. Topography in this area has changed since the aerial photographs were taken and new building structures have been built. There is now an airline provisioning building where the flood hazard area is shown on Map M-15 and a 24" storm sewer which daylights west of the flood hazard area.

The proposed grading and drainage of the site under consideration does not allow for long-term detention or ponding within the site and will incorporate the existing 24" storm sewer, the detention of water within the site may have adverse affects on the new structures due to the possibility of water entrapment within the newly excavated area.

V. EROSION CONTROL

There are several slopes involved in this project which exceed the minimums provided for in the City of Albuquerque Development Process Manual (Chapter 22.5.A). All slopes are protected from runoff with a curb at the shoulder of the slope. This is true along the access road and the west side of the site. The only

runoff down a slope is at the southwest corner of the site where a concrete rundown is provided.

For erosion protection of the slopes, seeding will be performed upon completion of final grading. The following will be specified for seeding.

<u>Species</u>	<u>Pure Live Seed Per Acre</u>
Sand proposed	1.0
Giant sand proposed	1.0
Side oats grama	4.0
Alkali salaton	1.0

Seeding should be done by the drilling method. The depth should be between 1/4" and 1/2". Fertilizer should not be used in this area. The site should also be mulched with 5000 lb. per acre of hay crimped into the soil with a serated disk.

VI. DESIGN CRITERIA

The design criteria used for drainage analysis was the rational method as outlined in the City of Albuquerque Development Process Manual, Volume II, Chapter 22.

The six-hour, 100 year rainfall value of 2.3 inches was used for computing runoff values. (Plate 22.2 D-1) (Fig. 1)

The rational formula is as follows:

$$Q = CiA$$

Q = Rate of runoff in cubic feet per second

C = Coefficient of runoff (dimensionless)

i = Rainfall intensity in inches per hour

A = Drainage area in acres

The value for i for a 100 year rainfall is determined by the following formula:

i = Rainfall value x I

$$I = 6.84 T_c^{0.51}$$

T_c = Time of concentration in minutes

$$T_c = .0078 (L)^{.77} / (S)^{.385} \quad (\text{Kirpich Equation})$$

Where L = the length of the basin in feet measured from the most hydraulically remote point to the analysis point in question, and S = watershed slope determined by dividing the differences in elevation from the most hydraulically remote point to the analysis point in question by the length (L). The minimum T_c will be 10 minutes for the peak runoff calculation.

VII. REFERENCES

1. City of Albuquerque, Development Process Manual, Volume II, Design Criteria, Chapter 22.

2. A Practical Approach to Designing Storm Sewer System, by Ronald L. Rossmiller, Ph.D., P.E., ASCE

CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. _____ OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

APPENDIX A CALCULATIONS

MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. _____ OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

EXISTING CONDITIONS

ANALYSIS POINT 1 (FIRST BASIN ALONG 36" STORM DRAIN)

AREAS INCLUDED IN THIS ANALYSIS ARE:

AREA A1 (SEE EXHIBIT "B")

$$\text{AREA} = 27,574 \text{ FT}^2 = .633 \text{ ACRES}$$

$$T_c = 1.80 \text{ MIN} \quad \text{USE } 10 \text{ MIN}$$

$$I = 2.3 \text{ IN} \quad (\text{PLATE 22.2 D-1})$$

$$i = 5.29 \text{ IN} \quad (\text{PLATE 22.2 D-2})$$

$$CN = 98 \quad (\text{PLATE 22.2 C-2})$$

$$R = 2.1 \quad (\text{PLATE 22.2 C-4})$$

$$C = .95$$

$$Q = C i A = .95(5.29)(.633) = \underline{\underline{3.18 \text{ CFS}}}$$

ANALYSIS POINT 2 (SECOND CATCH BASIN ALONG 36" STORM DRAIN)

AREAS INCLUDED IN THIS ANALYSIS ARE (SEE EXHIBIT B)

AREA A2

EAST 1/2 OF AREA B

EAST 1/2 OF AREA C

$$\text{AREA} = 140,346 \text{ FT}^2 \quad 3.22 \text{ ACRES}$$

$$T_c = 4.63 \text{ MIN} \quad \text{USE } 10 \text{ MIN}$$

$$I = 2.3 \text{ IN} \quad (\text{PLATE 22.2 D-1})$$

$$i = 5.29 \text{ IN} \quad (\text{PLATE 22.2 D-2})$$

$$CN = 91 \quad (\text{PLATE 22.2 C-2})$$

$$R = 1.4 \quad (\text{PLATE 22.2 C-4})$$

$$C = \frac{1.288(.40) + 1.932(.95)}{3.22} = .73$$

$$Q = C i A = .73(5.29)(3.22) = \underline{\underline{12.43 \text{ CFS}}}$$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 2 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

EXISTING CONDITIONS CONT.

ANALYSIS POINT 3 (EXISTING DISCHARGE OF 36" STORM SEWER)

AREAS INCLUDED IN THIS ANALYSIS ARE (SEE EXHIBIT 'B')

AREA D

AREA E

AREA F

WEST 1/2 OF AREA B

WEST 1/2 OF AREA C

$$AREA = 323,105 \text{ FT}^2 = 5.12 \text{ ACRES}$$

$$T_c = 7.14 \text{ MIN} \quad \text{USE } 10 \text{ MIN}$$

$$I = 3.3 \text{ IN} \quad (\text{PLATE 22.2 D-1})$$

$$S = 5.29 \text{ IN} \quad (\text{PLATE 22.2 D-2})$$

$$CA = 75$$

$$Z = .8 \quad (\text{PLATE 22.2 C-4})$$

$$C = .40$$

$$Q = CAI = .40(5.29)(5.12) = \underline{\underline{1.083 \text{ CFS}}}$$



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 3 OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

EXISTING CONDITIONS CONT.

RUNOFF CALCULATIONS

ANALYSIS POINT 1

$$V = \frac{R(A)}{12} = \frac{2.1(.633)}{12} = .1107 \text{ ACRE FT.}$$

ANALYSIS POINT 2

$$V = \frac{R(A)}{12} = \frac{1.4(3.22)}{12} = .375 \text{ ACRE FT.}$$

ANALYSIS POINT 3

$$V = \frac{R(A)}{12} = \frac{.8(5.12)}{12} = .341 \text{ ACRE FT.}$$

OFFSITE FLOWS

AT ANALYSIS POINT 1 THERE IS AN 8" DRAIN LINE THAT ENTERS THE 36" STORM DRAIN THIS IS A ROOF DRAIN FROM THE WEATHER STATION EAST OF THE SITE.

$$\text{AREA} = 3000 \text{ FT}^2 \pm = .0689 \text{ ACRES}$$

$$R = 2.1 \text{ (PLATE 22.2 (4))}$$

$$C = .90$$

$$i = 5.25 \text{ IN. (PLATE 22.2 (4))}$$

$$Q = C i A = .90(5.25)(.0689) = .325 \text{ CFS}$$

$$V = \frac{R(A)}{12} = \frac{2.1(.0689)}{12} = .012 \text{ ACRE FT.}$$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 4 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

EXISTING CONDITIONS CONT.

OFFSITE FLOWS

24" STORM DRAIN SOUTH AND EAST OF SITE.

AREA = 2.93 ACRES

$Q_{100} @ \text{OUTLET} = 11.78 \text{ CFS @ } 3.7 \text{ FT/SEC.}$

$R = 2.1$

$$Y = \frac{2(A)}{12} = \frac{2(2.93)}{12} = \underline{\underline{.5127 \text{ ACRES FT.}}}$$

TOTAL RUNOFF INCLUDING ONSITE AND OFFSITE FLOWS:

$$.1107 + .375 + .341 + .012 + .5127 = \underline{\underline{1.351 \text{ ACRES FT}}}$$

MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



RUNOFF ANALYSIS FOR PROPOSED SITE "ULTIMATE DEVELOPEMENT"

100 YR./ 6 HR. STORM
2.3 INCH

BASIN	AREA (SQ. FT.)	L (FT.)	S (FT./FT.)	C	Tc (MIN.)	i (100) (IN.)	CN	R	VOL (100) (ACRE FT.)	Q (100) (CFS)	i (10) (IN.)	Q (10) (CFS)
A1	27,574	190	0.0263	0.95	1.80	5.29	98	2.1	0.1108	3.1812	3.81	2.2912
A2	45,831	300	0.0083	0.95	3.99	5.29	98	2.1	0.1841	5.2875	3.81	3.8082
B	126,966	485	0.0226	0.95	3.92	5.29	98	2.1	0.5101	14.6480	3.81	10.5499
C	62,065	680	0.0294	0.95	4.60	5.29	98	2.1	0.2493	7.1604	3.81	5.1571
D	61,662	1260	0.0615	0.95	5.57	5.29	98	2.1	0.2477	7.1139	3.81	5.1236
E	43,200	1080	0.0194	0.95	7.70	5.29	98	2.1	0.1736	4.9840	3.81	3.5896
F	23,727	450	0.0333	0.25	3.19	5.29	71	0.8	0.0363	0.7204	3.81	0.5188
TOTAL AREA 391,025									TOTAL RUNOFF	1.5119		

$T_c = .0078 \left(\frac{L^{.77}}{S^{.385}} \right)$ MINIMUM OF 10 MIN. USED IN CALCULATIONS

$I = 2.3 \text{ IN. (PLATE 22.2 D-1)}$

$i = I (\text{VALUE FROM PLATE 22.2 D-2}) \quad \text{VALUE} = 2.3$

$CN = \text{CURVE NUMBER FROM PLATE 22.2 C-2}$

$R = \text{RUNOFF IN INCHES (PLATE 22.2 C-4)}$

$Vol = \frac{R(A)}{12}$

$Q = C i A$

CALCULATED BY _____ DATE _____
 CHECKED BY _____ DATE _____
 SHEET NO. 3 OF _____

CLIENT _____ PROJECT NO. _____
 PROJECT _____
 SUBJECT _____

STREET FLOW AND COMBINATION INLETS (TYPE 'A' CATCH BASIN)

PEAK FLOW FOR AREA E = 5.03 CFS

PEAK FLOW FOR 1/2 STREET = $5.03 \text{ CFS} / 2 = 2.515 \text{ CFS}$

CROSS SLOPE OF STREET = 2% (S_x) $\equiv \frac{1}{50} = 50$

MANNINGS $n = .017$ (FIG. 15)

SLOPE OF ROAD = 4% ABOVE INLET (S_0)

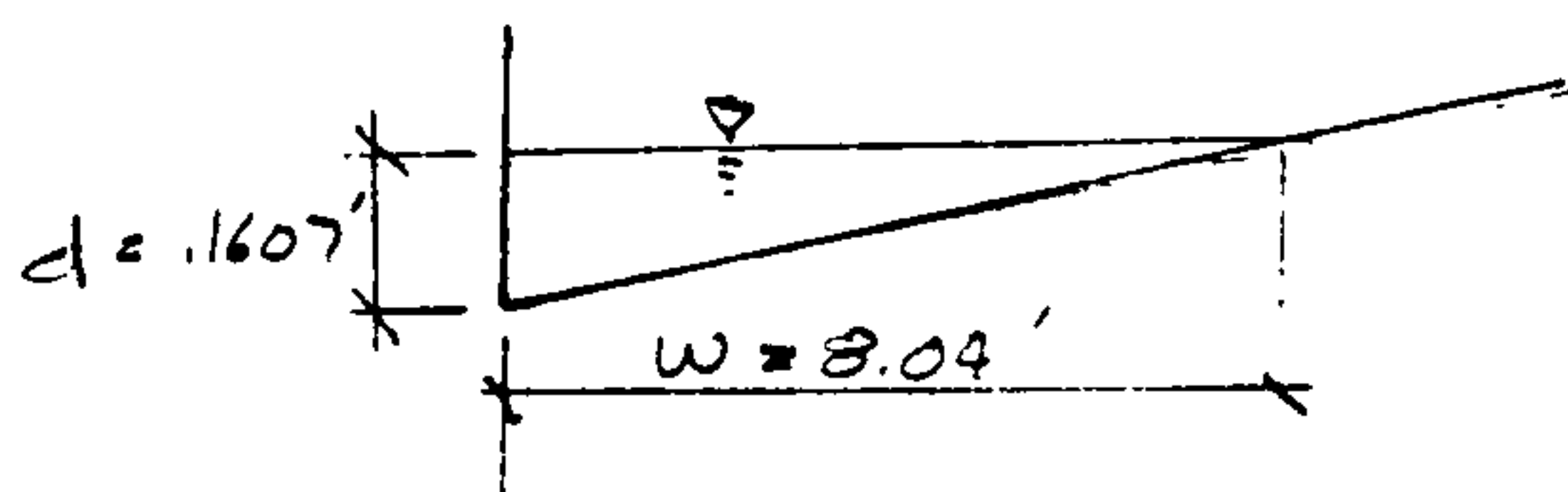
USING TYPE A CATCH BASIN WITH A 2' x 2' GATE OPENING

$$d = \left[\frac{nQ}{.56 \equiv S_0^{1/2}} \right]^{3/8}$$

d = DEPTH @ CURB

$$d = \left[\frac{.017 (2.515)}{.56 \equiv S_0^{1/2}} \right]^{3/8} = .1607 \text{ FT}$$

$$W = \text{WIDTH OF SPREAD} = Z d = 50 (.1607) = 8.04 \text{ FT}$$



CALCULATED BY _____ DATE _____
 CHECKED BY _____ DATE _____
 SHEET NO. 4 OF _____

CLIENT _____ PROJECT NO. _____
 PROJECT _____
 SUBJECT _____

INLET @ C3

$$n = .017$$

$$S_o = .04 \text{ FT/FT}$$

$$S_x = .02 \text{ FT/FT}$$

$$Q = 2.515 \text{ CFS}$$

$$\text{SIZE OF GRATE} = 2' \times 2'$$

$$T = W = \text{WIDTH OF SPREAD} = 3.04'$$

$$W = \text{WIDTH OF GRATE} = 2 \text{ FT}$$

$$W/T = 2/3.04 = .658$$

$$S_o/S_x = .04/.02 = 2$$

E_o = RATIO OF FRONTAL FLOW TO GUTTER FLOW (FIG. 6)

$$E_o = .64$$

$$V = \frac{1.486}{n} R^{2/3} S_x^{1/2}$$

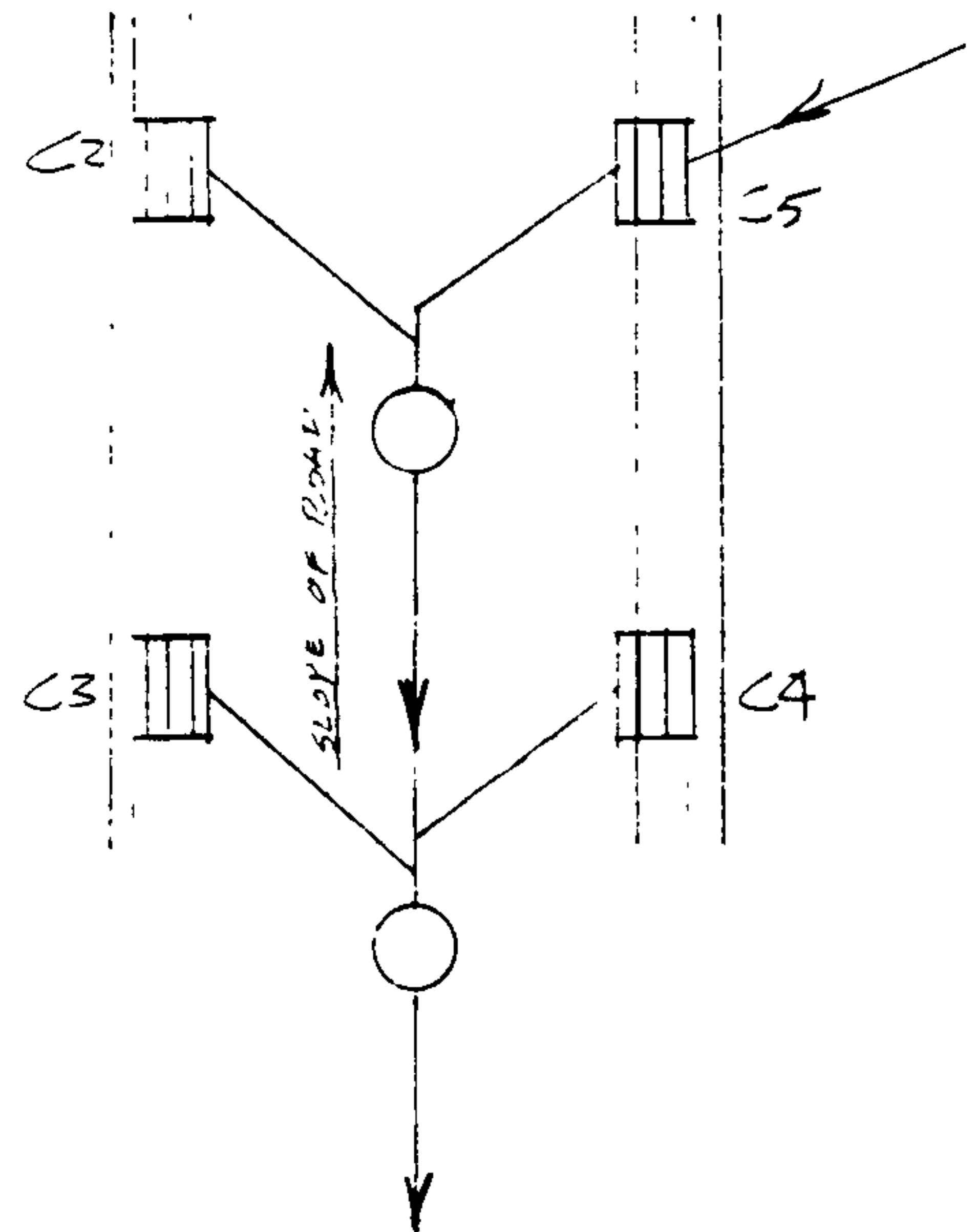
$$V = \frac{1.486}{.017} \left(\frac{.640}{3.2} \right)^{2/3} (.04)^{1/2} = 3.21 \text{ FT/SEC}$$

R_F = FRONTAL FLOW EFFICIENCY (FIG. 7)

$$R_F = 1$$

R_S = SIDE FLOW EFFICIENCY (FIG. 8)

$$R_S = .08$$



CALCULATED BY _____ DATE _____
 CHECKED BY _____ DATE _____
 SHEET NO. 5 OF _____

CLIENT _____ PROJECT NO. _____
 PROJECT _____
 SUBJECT _____

$$E = \text{EFFICIENCY} = R_f(E_o) + R_s(1 - E_o)$$

$$E = (.63) + .03(1 - .63) = .6683$$

$$Q_{IN} = E(Q) = .6683(2515) = \underline{\underline{1.68 \text{ CFS}}}$$

INLET @ LZ

$$n = .017$$

$$S_o = .04 \text{ FT/FT}$$

$$S_x = .03 \text{ FT/FT}$$

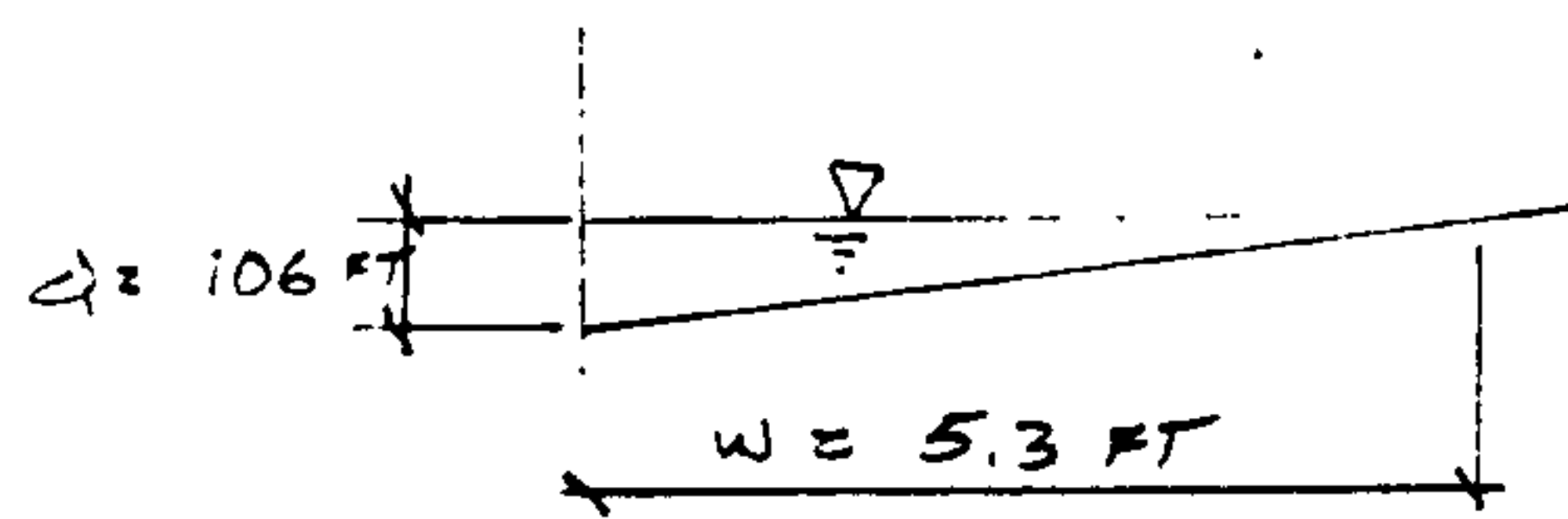
$$Q = 2515 - 1.68 = .833 \text{ CFS}$$

$$\text{SIZE OF GATE} = 2' \times 3'$$

d = DEPTH OF CURB

$$d = \left[\frac{nQ}{.56 \sqrt{S_o}^{1/2}} \right]^{3/8} = \left[\frac{.017 (.833)}{.56(50)(\sqrt{.04}} \right]^{3/8} = .106 \text{ FT}$$

$$W = \text{WIDTH OF SPREAD} = 5d = 5(.106) = 5.3 \text{ FT}$$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 6 OF _____

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

$$T = W = \text{WIDTH OF SPREAD} = 5.3 \text{ FT}$$

$$W = \text{WIDTH OF GRATE} = 2 \text{ FT}$$

$$W/T = 2/8.04 = .2488$$

$$S_{01}/S_x = .04/.02 = 2$$

$$E_0 = \text{RATIO OF FRONTAL FLOW TO GATE FLOW (FIG. 6)}$$

$$E_0 = .64$$

$$V = \frac{1.486}{n} (R^{2/3}) (S_0^{1/2})$$

$$V = \frac{1.486}{.017} \left(\frac{.2309}{5.406} \right)^{2/3} (.04)^{1/2} = 2.43 \text{ FT/SEC}$$

$$R_F = \text{FRONTAL FLOW EFFICIENCY (FIG. 7)}$$

$$R_F = 1$$

$$R_S = \text{SIDE FLOW EFFICIENCY (FIG. 8)}$$

$$R_S = .15$$

$$E = \text{EFFICIENCY} = R_F(E_0) + R_S(1-E_0)$$

$$E = 1(.64) + .15(1-.64) = .694$$

$$Q_{IN} = E(Q) = .694(.833) = \underline{\underline{.578 \text{ CFS}}}$$



CALCULATED BY _____ DATE _____
 CHECKED BY _____ DATE _____
 SHEET NO. 7 OF _____

CLIENT _____ PROJECT NO. _____
 PROJECT _____
 SUBJECT _____

GRATE SIZES
 (SUMP CONDITION)

(FIG. 9)

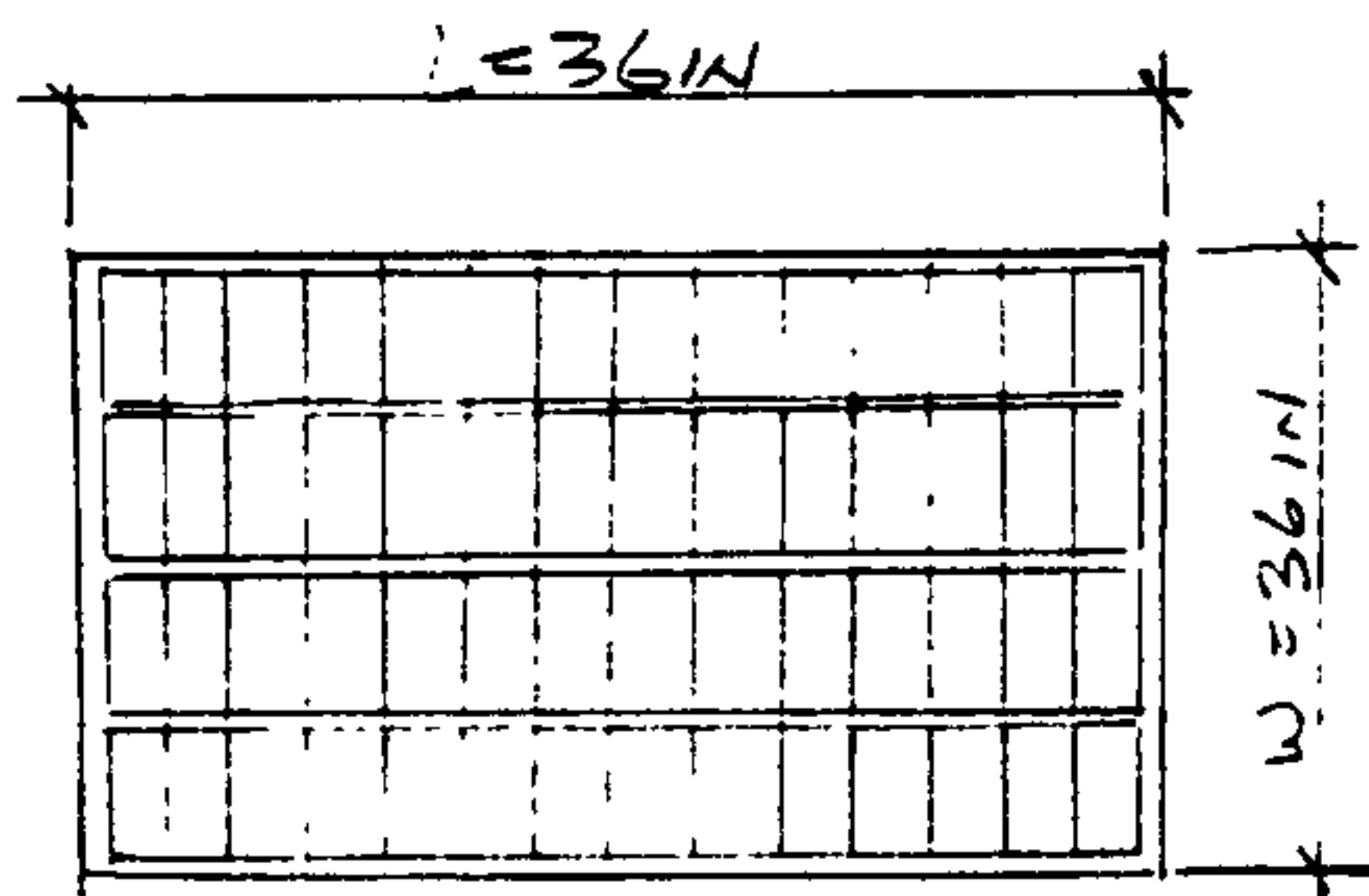
BASIN	GRATE	Q IN	CLOGGING FACTOR	L	A (OPEN)
A ₁	C ₇	3.7 cfs	.5	.25 FT	7 FT ²
B	C ₁	14.65 cfs	.5	.67 FT	9 FT ²
D, A ₂ , C	C ₆	14.5 cfs	.5	.8 FT	9 FT ²

$$P = 2(W + L) \quad P = 2(3 + 3) = 12 \text{ (WITHOUT CURBS)}$$

$$\text{W/ CLOGGING FACTOR} = .5 \quad P = 2(1.5 + 3) = 9 \text{ FT (WITHOUT CURBS)}$$

USE GRATE SIZE OF 9 FT² OPEN AREA

$$P = 1-7/8$$



$$\text{TOTAL AREA} = 3 \text{ FT} \times 3 \text{ FT} = 9 \text{ FT}^2$$

$$\text{OPEN AREA} = 9 (.9) = 8.1 \text{ FT}^2$$

MOLZEN-CORBIN

& Associates



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 8 OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

CHECK MINIMUM V DEPTH FOR CATCH BASINS

CF14

CATCH BASIN C3

$Q = 1.68 \text{ CFS}$ (SET CONNECTING PIPE @ .03% SLOPE)
 $D = 18"$
 $V = 3.8 \text{ FT}$

CATCH BASIN C2

$Q = .578$
 $D = 18"$ (SET CONNECTING PIPE @ .03% SLOPE)
 $V = 2.8 \text{ FT}$

CATCH BASIN C1

$Q = 14.65 \text{ CFS}$
 $D = 18"$
 $V = 4.1 \text{ FT}$

CATCH BASIN C6

$Q = 19.56$
 $D = 24"$
 $V = 4 \text{ FT}$

CATCH BASIN C7

$Q = 3.2$
 $D = 18$
 $V = 3.8 \text{ FT}$

MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 9 OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

JUNCTION LOSS

$$Q_1 = 31 \text{ CFS}$$

$$Q_2 = 50.17 \text{ CFS}$$

$$Q_3 = 19.17 \text{ CFS}$$

$$A_1 = A_2 = A_3 = 3.14 \text{ FT}^2$$

$$V_1 = \frac{Q_1}{A_1} = \frac{31}{3.14} = 9.87 \text{ FT/SEC}$$

$$V_2 = \frac{Q_2}{A_2} = \frac{50.17}{3.14} = 15.97 \text{ FT/SEC}$$

$$V_3 = \frac{Q_3}{A_3} = \frac{19.17}{3.14} = 6.17 \text{ FT/SEC}$$

$$A_{AVG} = 3.14$$

$$h_j = \frac{Q_2 V_2 - Q_1 V_1 - Q_3 V_3}{3 (AVG A)}$$

$$h_j = \frac{50.17(15.97) - 31(9.87) - 19.17(6.17)(.707)}{32.2(3.14)}$$

$$h_j = 4.07 \text{ FT}$$



SHEET 1 OF 2
BY
DATE 1/01/89

TABLE 8
MINOR LOSSES AND HYDRAULIC GRADE LINE,

PROJECT POST OFFICE SITE

① STRUCTURE NO.	② TYPE (MH OR C.B.)	③ MAX ELEVATION H.G.L.	④ D ₂ /D ₁	⑤	⑥ V	⑦ H _f	⑧ H _j	⑨ H _{mh}	⑩ E.G.L.	⑪ H _v	⑫ H.G.L.	⑬ INVERT ELEVATION	⑭ DEPTH
D1	DISCHARGE	70							73.96		70.0	68.0	4.70
M3	MH	90				3.675	4.27	.198	77.64	3.56	73.68	71.67	18.33
M7	MH	87.2				.59		.0287	82.45	.575	81.32	72.36	14.94
M1	MH	85				1.267		.0177	85.78	.394	85.13	72.53	12.47
C1	CB	75.5				1.52	.15		87.47	1.34	86.13	74.0	21.5
M3	MH	90				2.44			81.50		80.37	71.67	18.33
M4	MH	95						.0756	84.34		82.83	74.11	20.89
C6	CB	90				2.8			87.21	1.12	85.29	76.51	13.09

* GIVEN

⑧ H_j = HEAD LOSS AT JUNCTION = COL. 5 X COL. 11

⑨ ~~H_{mh} = HEAD LOSS AT MH = 0.02 - ALWAYS.~~

⑩ E.G.L. = ENERGY GRADE LINE.

⑪ H_v = VELOCITY HEAD = $V^2 \div 64.4$

⑫ H.G.L. = HYDRAULIC GRADE LINE = E.G.L. - H_v

① NOT LESS THAN 1 FT. BELOW BOTTOM OF SLAB.

④ RATIO OF LARGER TO SMALLER PIPE DIAMETER.

⑤ FROM CHART 7.

⑥ VELOCITY FROM TABLE 6

⑦ HEAD LOSS DUE TO FRICTION FROM TABLE 7

$$h_b = K_b \left[\frac{V^2}{2g} \right]$$

$$H_{inh} = .05 \left(\frac{V^2}{2g} \right)$$

$$K_b = .20 \sqrt{\frac{45}{10}} = .1414$$

CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 13 OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

DEPTH OF CATCH BASIN LT IS TOO DEEP
SET LINE @ .04% SLOPE

$$Q = 4.22 \text{ CFS} \quad D = 18''$$
$$S = .040 \text{ FT/FT}$$

$$Q_{\text{FULL}} = \frac{1.486}{n} R^{2/3} S^{1/2} A$$

$$Q_{\text{FULL}} = \frac{1.486}{.015} (2.44)^{2/3} (.040)^{1/2} (1.767) = 21.0 \text{ CFS}$$

$$\frac{Q}{Q_{\text{FULL}}} = \frac{4.22}{21.0} = .20$$

$$\frac{d}{D} = .30 \quad d = 1.5(.3) = .45 \text{ FT} \quad (\text{FIG. 13})$$

$$\frac{V}{V_{\text{FULL}}} = .73 \quad (\text{FIG. 13})$$

$$V_{\text{FULL}} = \frac{Q}{A} = \frac{21.0}{1.767} = 11.88 \text{ FT/SEC}$$

$$V = .73(11.88) = \underline{8.67 \text{ FT/SEC}}$$

$$\text{INV @ LT} = 98.71$$



CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. 14 OF _____

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

DEPTH OF CG IS TOO DEEP SET LINE BETWEEN
114 AND CG @ .05 FT/FT

$$Q = 36.77$$

$$S = .05 \text{ FT/FT}$$

$$Q_{\text{FULL}} = \frac{1.486}{1} (R)^{2/3} (S)^{1/2} (A)$$

$$Q_{\text{FULL}} = \frac{1.486}{.013} (.5)^{2/3} (.05)^{1/2} (3.14) = 50.58 \text{ cfs}$$

$$\frac{Q}{Q_{\text{FULL}}} = \frac{36.77}{50.58} = .529$$

$$\frac{d}{D} = .52$$

$$\frac{V}{V_{\text{FULL}}} = 1$$

$$V_{\text{FULL}} = \frac{Q}{A} = \frac{50.58}{3.14} = 16.1 \text{ FT/SEC}$$

$$\text{INV @ CG} = 86.11$$



CONCLUSIONS FROM CALCULATIONS

STRUCTURE	TYPE	INV. ELEV.	LENGTH (FT.)	SLOPE (FT/FT)	SIZE (IN.)	Q(100) (CFS)	V(100) (FT/SEC)	Q(10) (CFS)	V(10) (FT/SEC)
D1	DISCHARGE	68.00	75.00	0.0490	24	50.17	15.97	36.41	11.59
M3	MHI	71.67	82.00	0.0072	24	19.17	6.11	14.14	4.5
M2	MHI	72.26	55.00	0.0049	24	15.81	5.04	11.99	3.8
M1	MHI	72.53	80.00	0.0190	18	14.65	8.29	10.55	5.97
C1	CE:	74.00							
M3	MHI	71.67	130.00	0.0188	24	31.01	9.87	22.27	7.09
M4	MHI	74.11	200.00	0.0140	24	26.77	8.52	19.28	6.14
C6	CE:	76.91							
M4	MHI	74.11	335.00	0.0400	18	4.22	8.67	3.01	7.72
M5	MHI	87.51	220.00	0.0400	18	4.22	8.67	3.01	7.72
M6	MHI	96.31	60.00	0.0400	18	4.22	8.67	3.01	7.72
C7	CE:	98.71							

CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SHEET NO. _____ 1 _____ OF _____ 3

CLIENT _____ PROJECT NO. _____
PROJECT _____
SUBJECT _____

DISCHARGE ENERGY BASIN CALCULATION

GIVEN 24" RCP STORM DRAIN

(HYDRAULIC ENGINEERING CIRCULAR
No. 14) U.S.D.O.T

$$S_0 = .0490 \text{ FT/FT}$$

$$n = .013$$

$$D_0 = 2 \text{ FT}$$

$$Q = 50.17 \text{ CFS}$$

$$V = 15.97 \text{ FT/SEC}$$

$$T_w = 1 \text{ FT}$$

$$Q/D^{2.5} = 50.17 / 2^{2.5} = 8.37$$

$$T_w/D = 1/2 = .5$$

$$Y_0/D = 1 \quad (\text{FIG. 16})$$

$$Y_0 = 1(2) = 2 \text{ FT}$$

$$A = .7854(4) = 3.14 \text{ FT}^2$$

(.7854 FROM FIG. 17)

$$V_0 = Q/A = 50.17 / 3.14 = 15.97 \text{ FT/SEC}$$

$$Y_e = (A/2)^{1/2} = \sqrt{3.14/2} = 1.25 \text{ FT}$$

$$Fr = \frac{V_0}{\sqrt{g(Y_e)}} = \frac{15.97}{\sqrt{32.2(1.25)}} = 2.52$$



CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SHEET NO. 2 OF 3

CLIENT _____ PROJECT NO. _____

PROJECT _____

SUBJECT _____

FOR LOCALLY AVAILABLE RIPRAP $0.35 < d_{50}/Y_e < .45$ DESIGN FOR $2 < h_s/d_{50} < 4$ TRY $d_{50}/Y_e = .45$

$$d_{50} = .45 (1.25) = .563$$

$$h_s/Y_e = 1.95 \quad (F=14.18)$$

$$h_s = 1.95 (1.25) = 2.43$$

$$h_s/d_{50} = 2.43 / .563 = 4.31$$

 $4.31 > 4 \therefore$ will NOT WORKTRY $d_{50}/Y_e = .51$

$$d_{50} = .51 (1.25) = .6375$$

$$h_s/Y_e = 1.7$$

$$h_s = 1.7 (1.25) = 2.13$$

$$h_s/d_{50} = 2.13 / .6375 = 3.34$$

 $3.34 < 4 \therefore$ O.K.

MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



CALCULATED BY _____ DATE _____
 CHECKED BY _____ DATE _____
 SHEET NO. 3 OF 3

CLIENT _____ PROJECT NO. _____
 PROJECT _____
 SUBJECT _____

$$L_s = 10 (h_s) = 10 (2.13) = 21.3 \text{ FT}$$

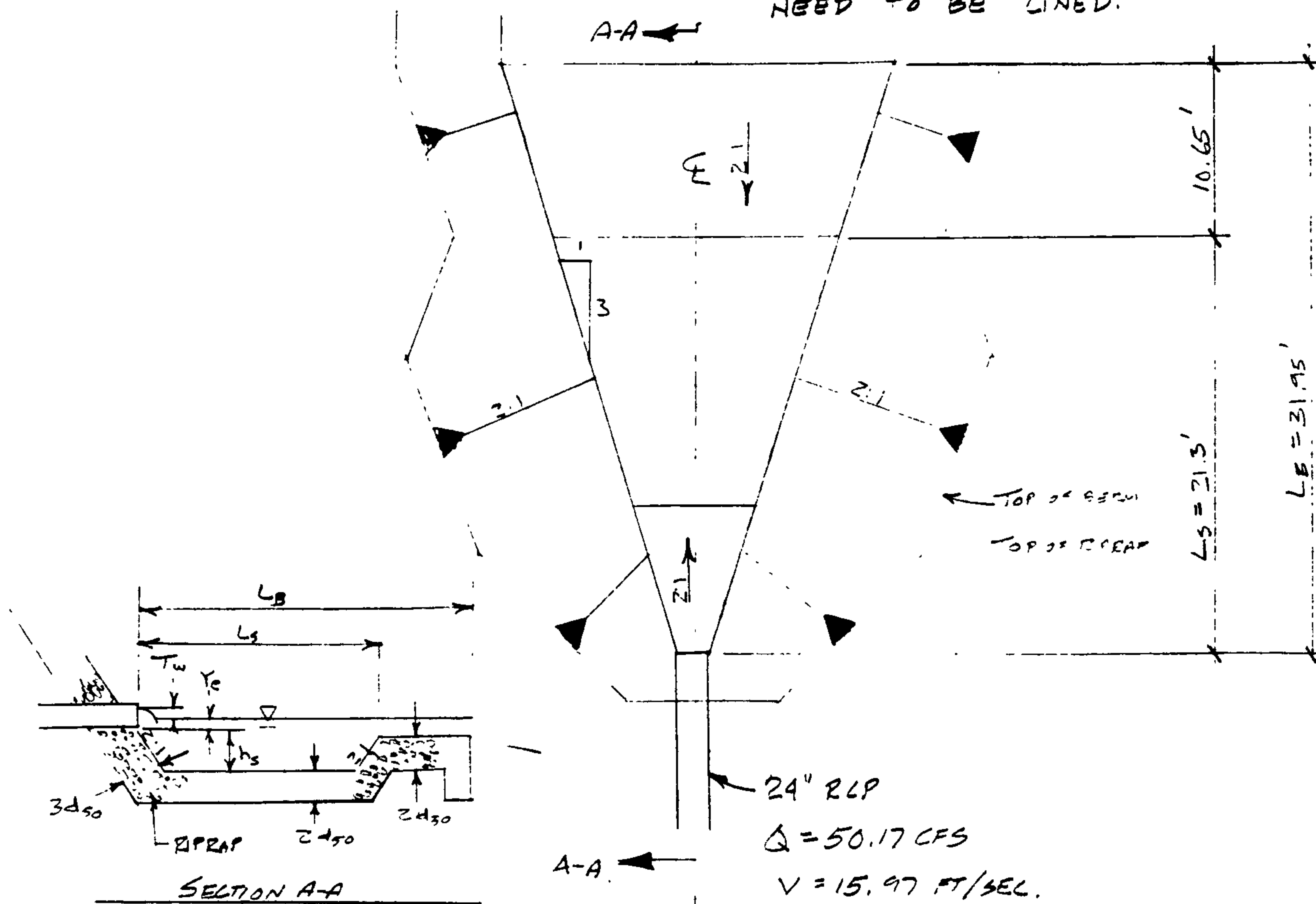
$$L_s = 3 (w_s) = 3 (2) = 6 \text{ FT} \quad \text{USE } 21.3 \text{ FT}$$

$$L_s = 15 (h_s) = 15 (2.13) = 31.95 \text{ FT}$$

$$L_s = 4 (w_s) = 4 (2) = 8 \text{ FT} \quad \text{USE } 31.95 \text{ FT}$$

$$d_{50} = .2375 \text{ FT} \quad \text{USE } 3"$$

$$T_w / Y_o = 1/2 = .5 < .75 \quad \text{CHANNEL BELOW BASIN DOES NOT NEED TO BE LINED.}$$



MOLZEN-CORBIN

& Associates

505-242-5700

ALBUQUERQUE • NEW MEXICO • LAS CRUCES

505-525-2397



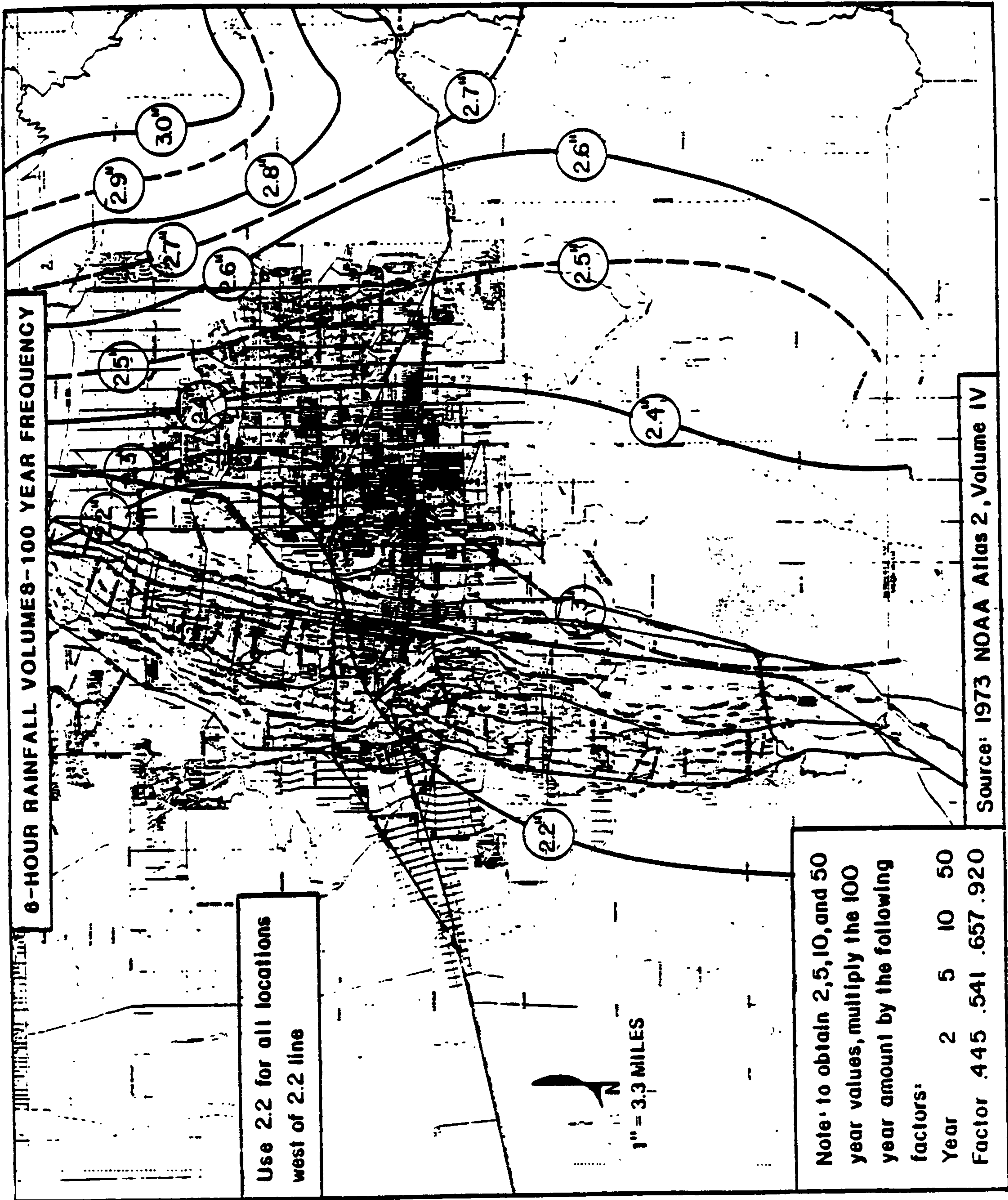
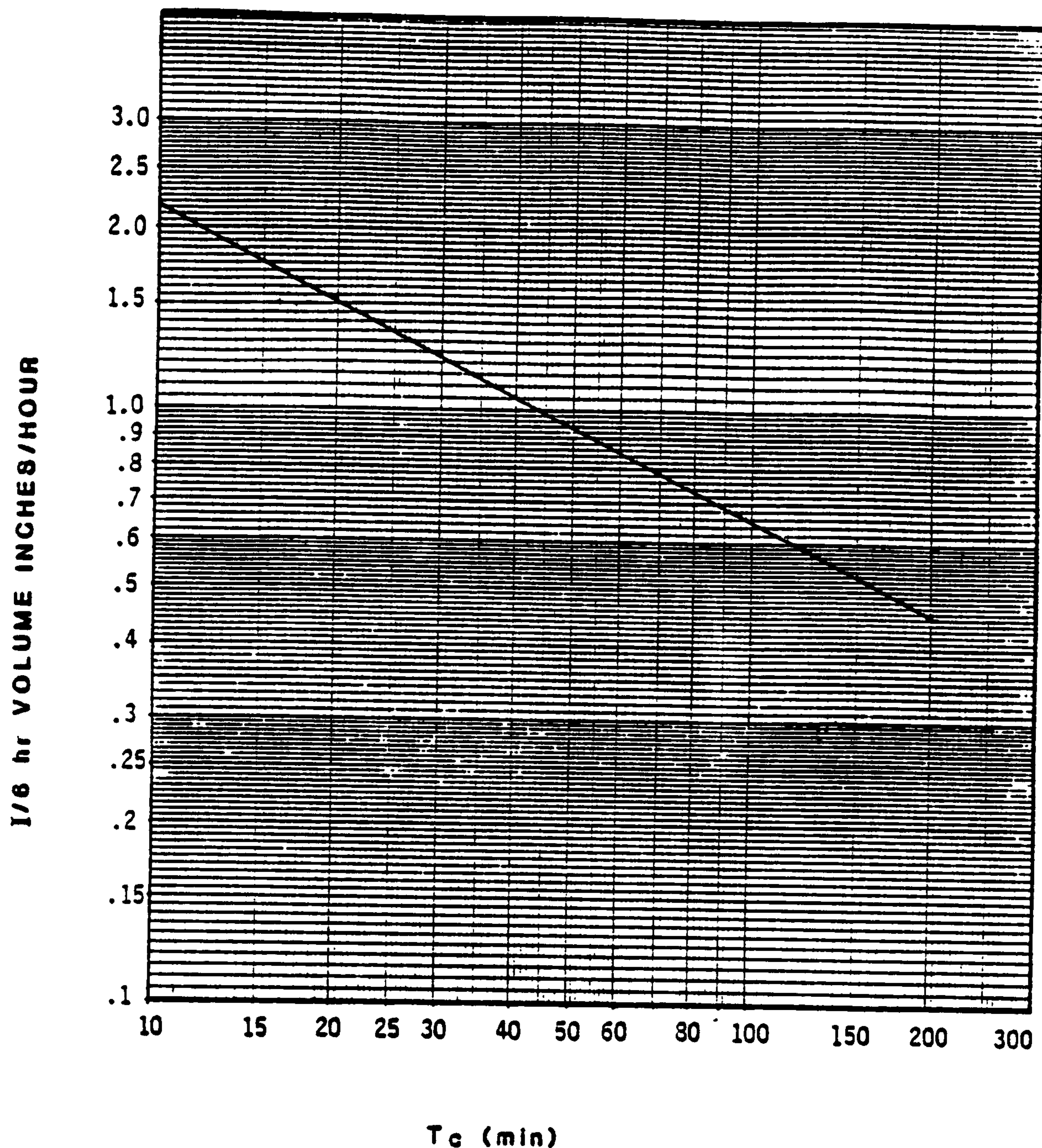


FIG. 1

DIMENSIONLESS RAINFALL INTENSITIES

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



note: To get actual intensities, multiply rainfall volume from plate D-1 by value from curve. Use reduction factors on Plate D-1 for other than 100-yr.

FIG. 2

RUNOFF CURVE NUMBER (CN) CALCULATION

LAND USE DESCRIPTION	Hydrologic Soil Group				Present Area				Future Area			
	A	B	C	D	A	B	C	D	A	B	C	D
Cultivated land ^{1/} : without conservation treatment	72	61	69	81								
: with conservation treatment	62	71	78	81								
: BEST condition	68	78	85	88								
Pasture or range land: fair condition	64	70	80	85								
: good condition	58	61	74	80								
Meadow: good condition	30	58	71	78								
Wood or Forest land: thin stand, poor cover, no mulch	45	66	77	83								
: good cover ^{2/}	25	65	70	77								
Open Space, lawns, parks, golf courses, cemeteries, etc.	38	61	74	80								
good condition: grass cover on 75% or more of the area	48	68	78	84								
fair condition: grass cover on 50% to 75% of the area	58	82	84	86								
Commercial and business areas (85% impervious)	81	88	91	93								
Industrial districts (72% impervious)												
Residential ^{3/}												
Average lot size												
1/8 acre or less	77	85	90	92								
1/4 acre	81	75	83	87								
1/3 acre	87	72	81	88								
1/2 acre	84	70	80	85								
1 acre	81	68	78	84								
Paved parking lots, roofs, driveways, etc. ^{5/}	98	98	98	98								
Streets and roads:												
paved with curbs and storm sewers ^{2/}	68	84	88	88								
gravel	78	86	89	91								
dirt	72	82	87	89								

Present CN _____
Runoff Volume = _____ in
-DA(AC) = $8Q(1+I)$ - _____ ac ft.

Future CN _____
Runoff Volume = _____ in
-DA(AC) = $8Q(1+I)$ - _____ ac ft.

Area, Acres _____
Project _____
Approved By _____
Date _____

1/ For a more detailed description of agricultural land use curve numbers, refer to National Engineering Handbook, Section 4, Hydrology, Chapter 8, August 1972.

2/ Good cover is protected from grazing and litter and brush cover soil

3/ Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

4/ The remaining pervious areas (lawns) are considered to be in good pasture condition for these curve numbers.

5/ In some warmer climates of the country, a curve number of 98 may be used

FIG. 3

PLATE 22.2 C-2

HYDROLOGY: SOLUTION OF RUNOFF EQUATION

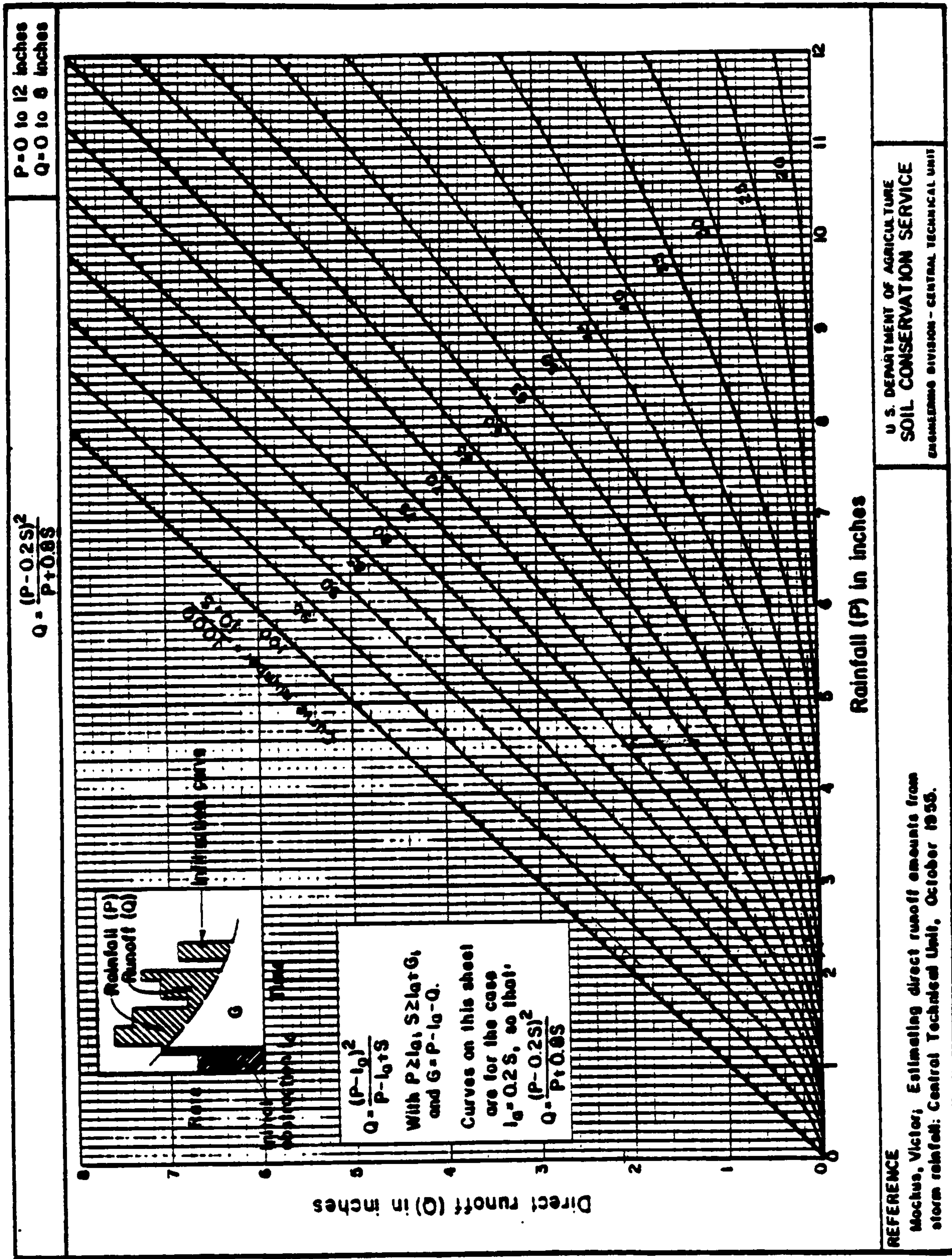


FIG. 4

B. Nomograph solution

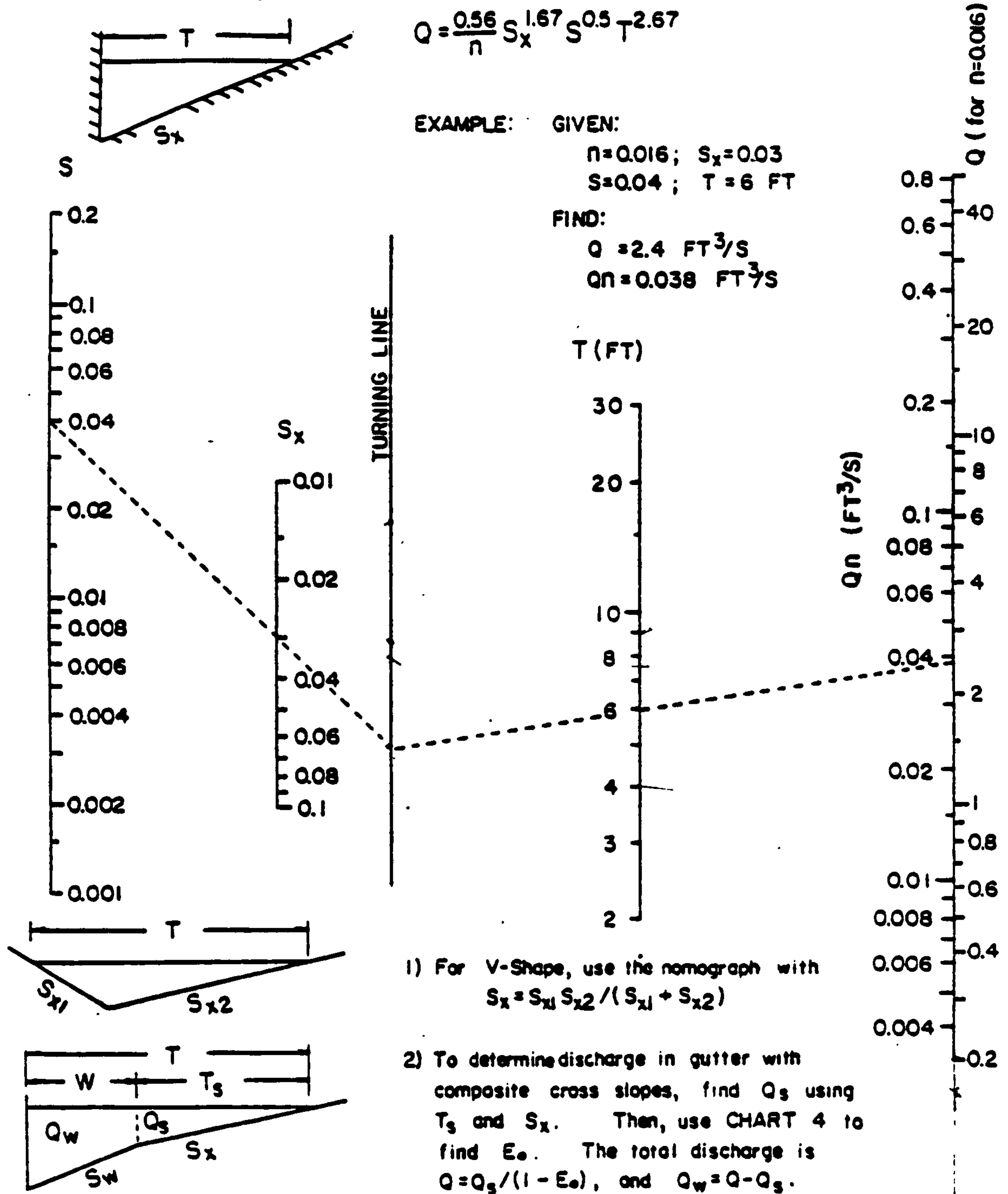


CHART 3. Flow in triangular gutter sections.

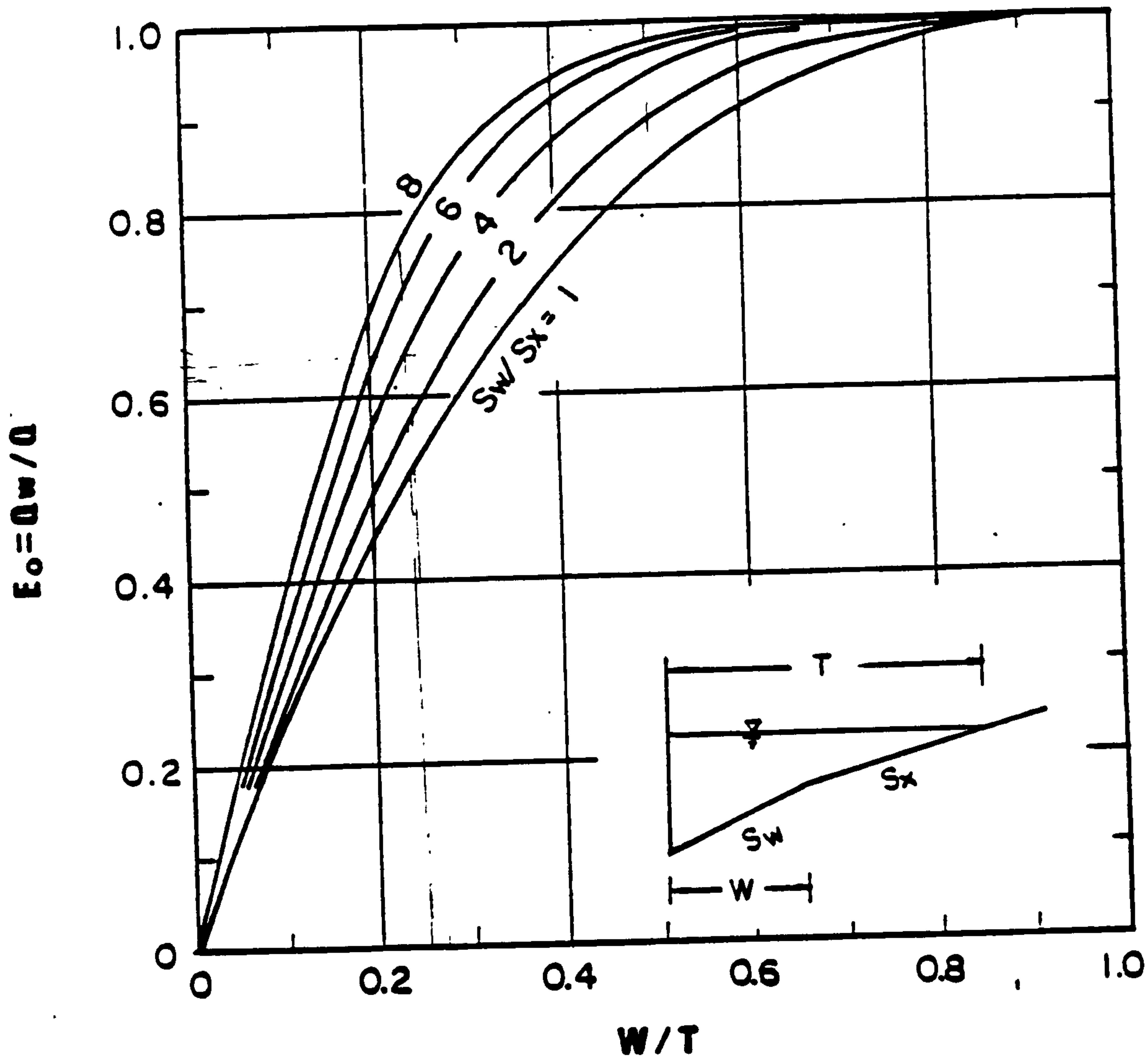


CHART 4. Ratio of frontal flow to total gutter flow.

FIG. 7

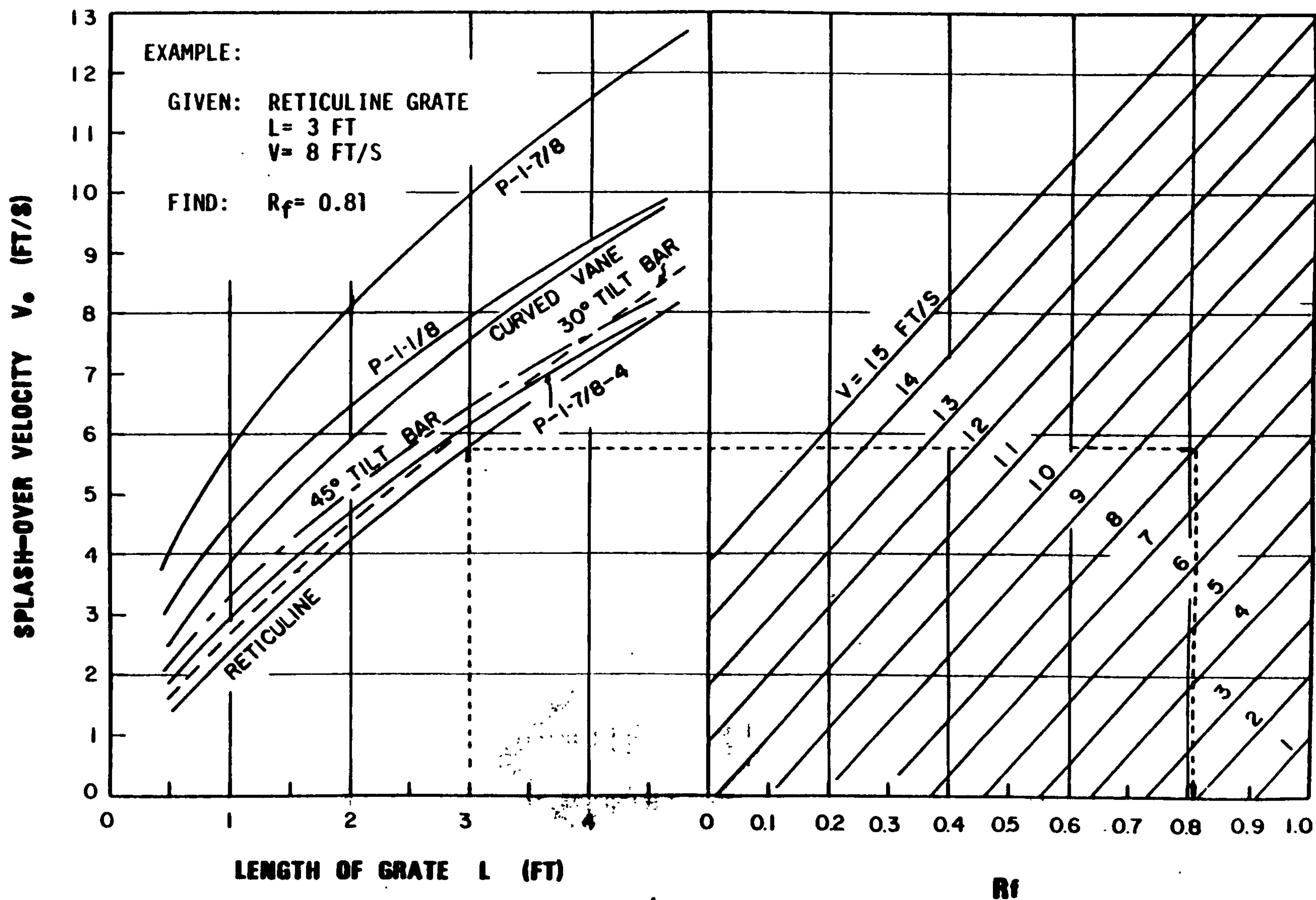


CHART 7. Grate inlet frontal flow interception efficiency.

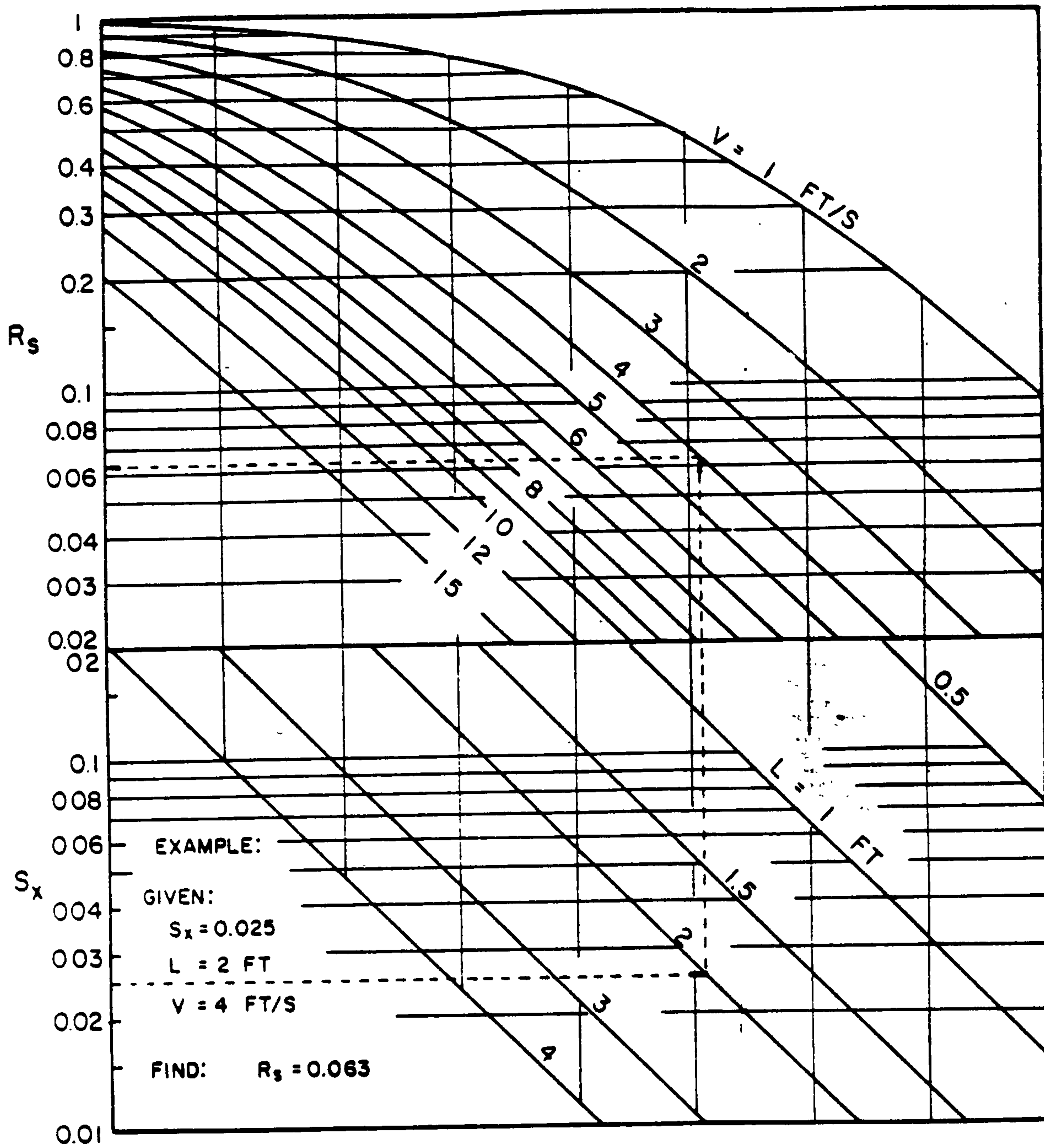


CHART 8. Grate inlet side flow interception efficiency.

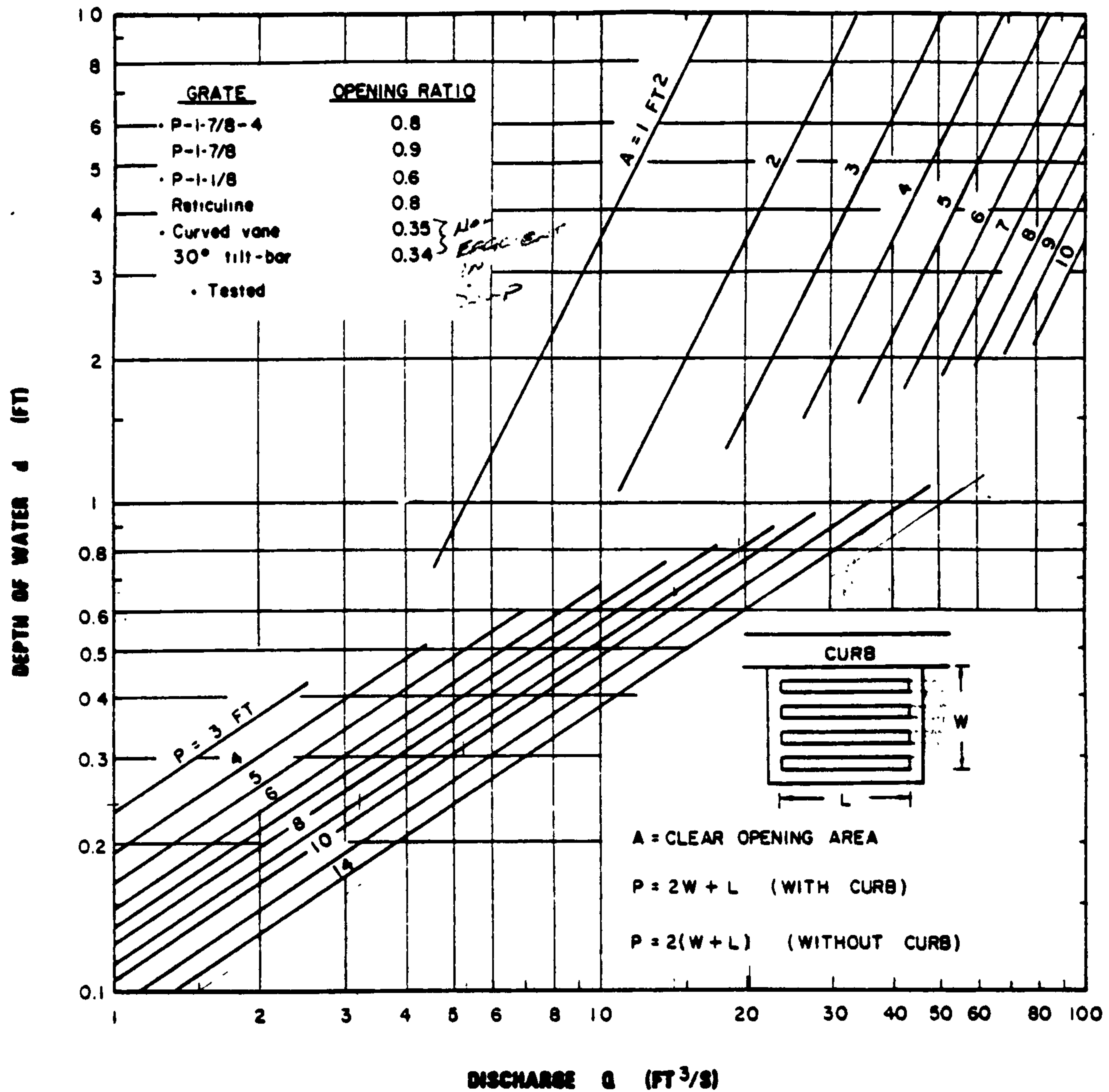


CHART 11. Grate inlet capacity in sump conditions.

Figure IV-17. (Reference IV-4)

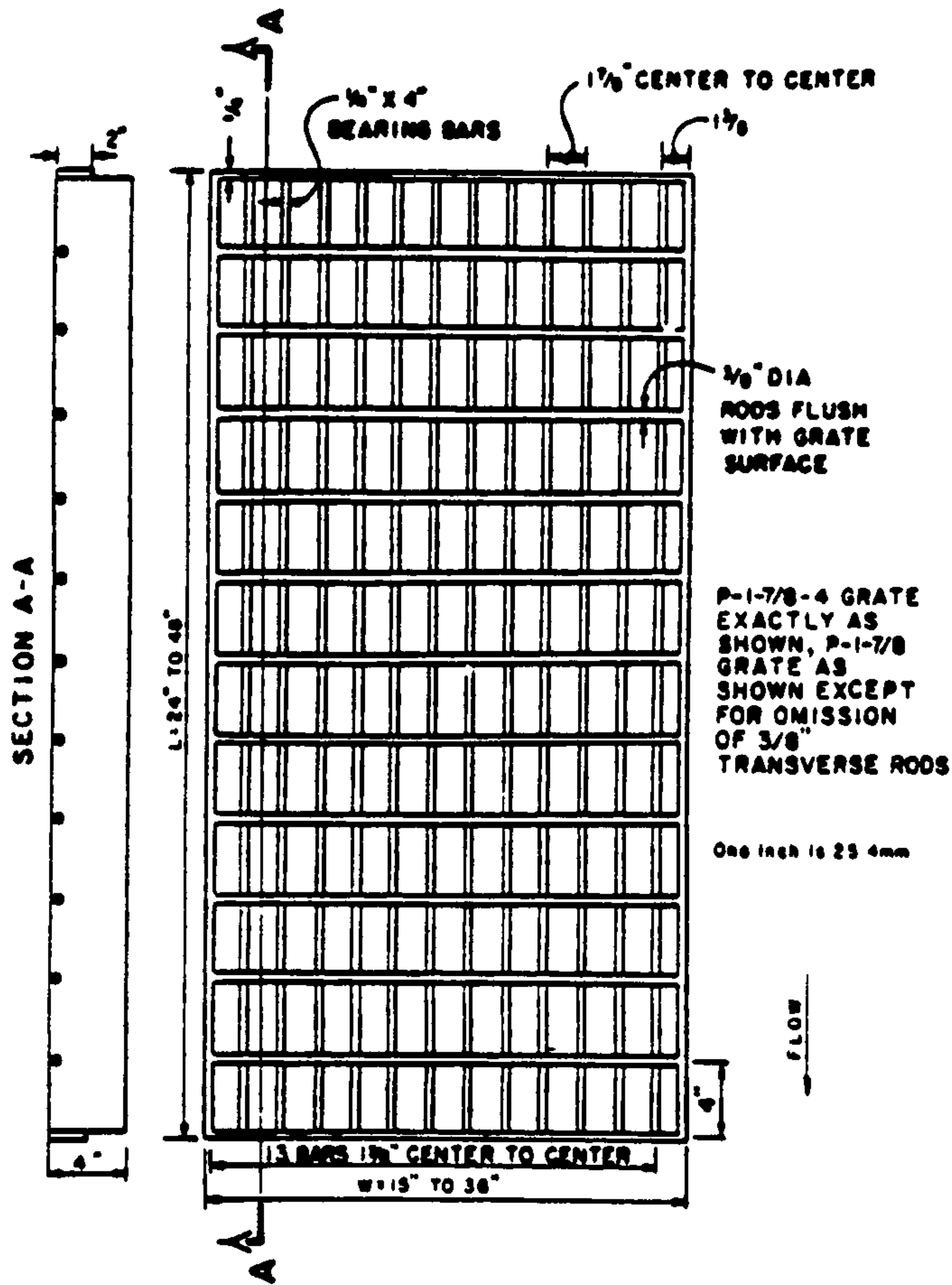


Figure 8. P-1-7/8 and P-1-7/8-4 grates.

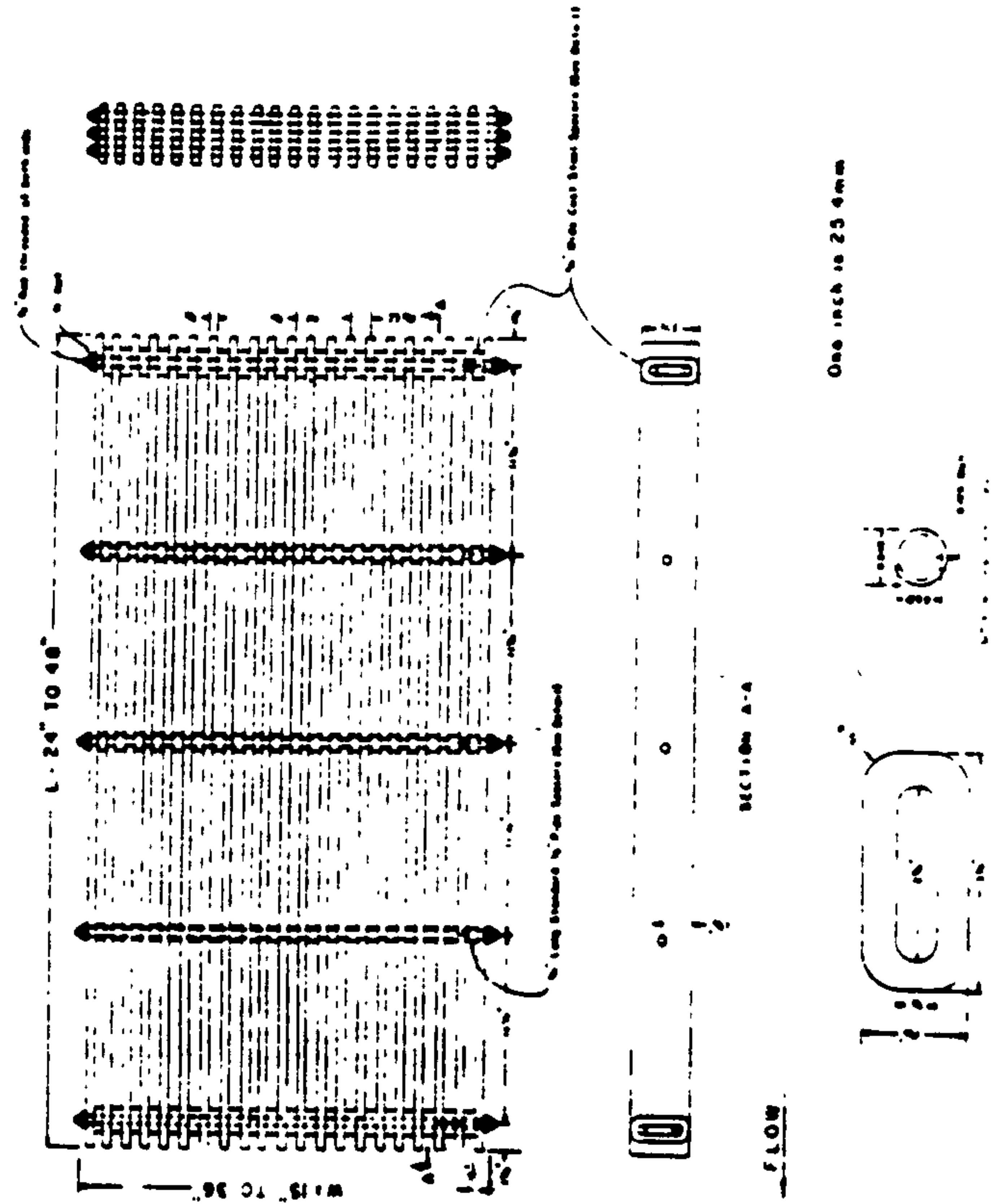


Figure 9. P-1-1/8 grate.

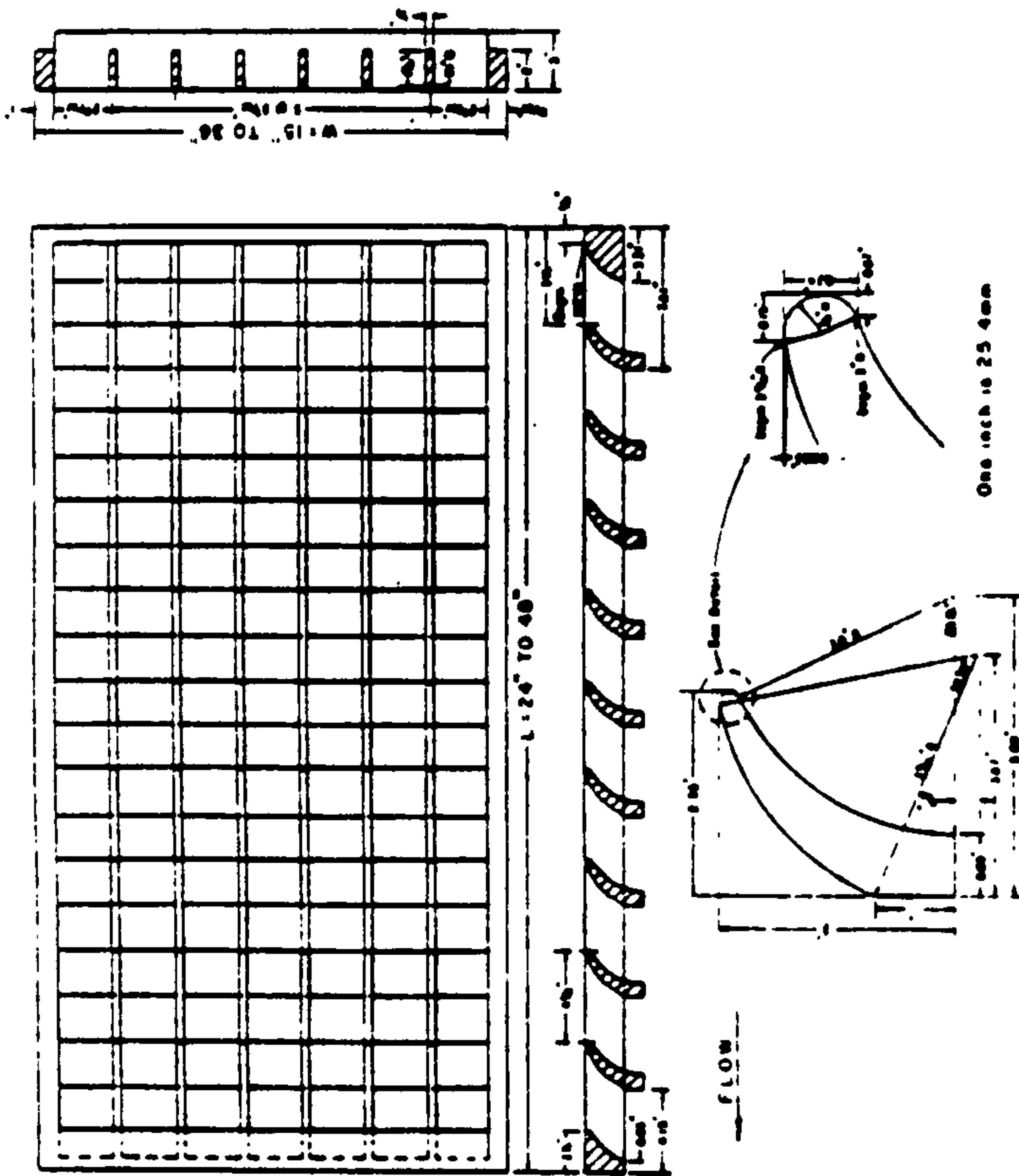


Figure 10. Curved vane grate.

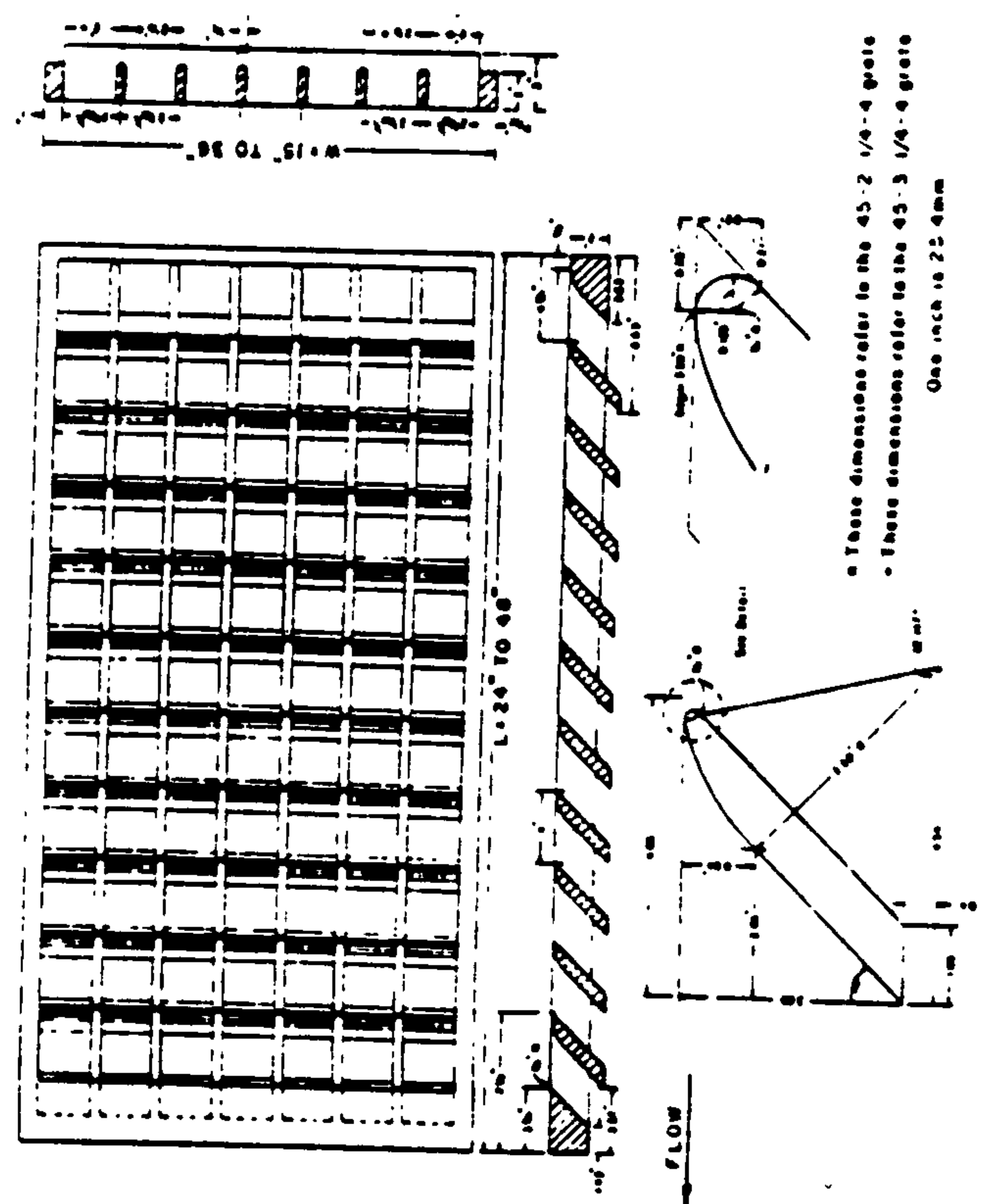
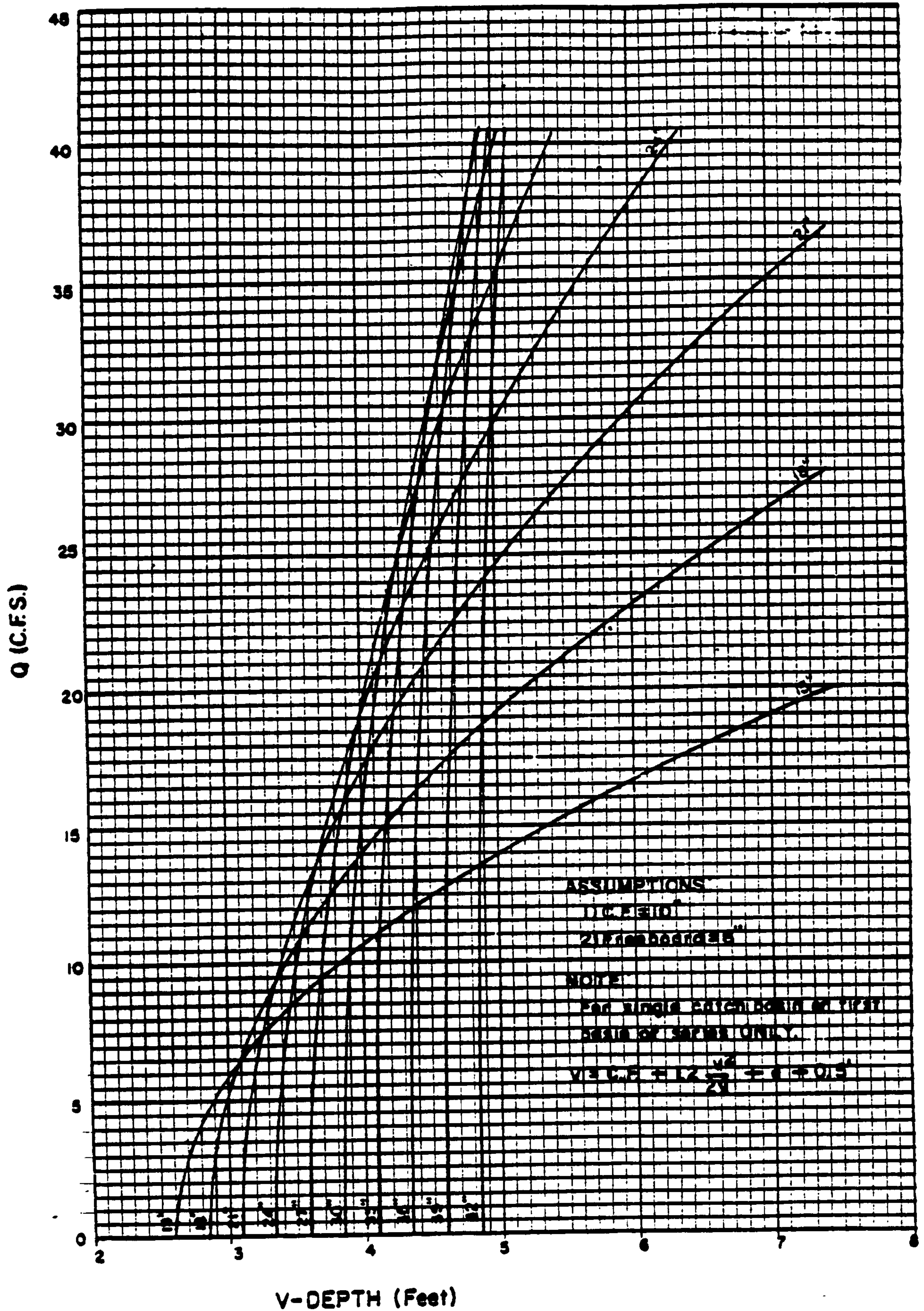


Figure 11. 45° Tilt-bar grate.



CONVEYANCE FACTORS—R.C. PIPE OR BOX

0.78 1.23 A (sq. ft.)	PIPE DIA. (in.)	EQUIVALENT BOX			36 65 CONVEYANCE FACTOR PIPE OR BOX K
		H	W	A (sq. ft.)	
1.77	18	Manning's: $S_f = \left(\frac{Q}{K}\right)^2$ $K = \frac{1.486}{n} (AR^{2/3})$ $n = .013$			105
2.41	21				158
3.14	24				226
3.98	27				310
4.91	30				410
5.94	33				529
7.07	36	3'-0"	2'-6"	7.50	666
8.30	39	3'-3"	2'-9"	8.80	825
9.62	42	3'-6"	2'-11"	10.21	1006
11.04	45	3'-9"	3'-2"	11.72	1209
12.57	48	4'-0"	3'-4"	13.34	1436
14.19	51	4'-3"	3'-7"	15.06	1690
15.90	54	4'-6"	3'-9"	16.87	1965
17.72	57	4'-9"	4'-0"	18.80	2273
19.63	60	5'-0"	4'-2"	20.83	2604
21.65	63	5'-3"	4'-4"	22.98	2964
23.76	66	5'-6"	4'-7"	25.21	3357
25.97	69	5'-9"	4'-10"	27.55	3782
28.27	72	6'-0"	5'-0"	30.00	4234
30.68	75	6'-3"	5'-3"	32.55	4720
33.18	78	6'-6"	5'-5"	35.21	5242
35.79	81	6'-9"	5'-8"	37.97	5796
38.49	84	7'-0"	5'-10"	40.83	6388
41.28	87	7'-3"	6'-1"	43.80	7012
44.18	90	7'-6"	6'-3"	46.87	7676
47.17	93	7'-9"	6'-6"	50.05	8380
50.27	96	8'-0"	6'-8"	53.34	9119
53.46	99	8'-3"	6'-11"	56.31	9899
56.75	102	8'-6"	7'-1"	60.21	10719
60.13	105	8'-9"	7'-4"	63.34	11582
63.62	108	9'-0"	7'-6"	67.50	12486
67.20	111	9'-3"	7'-9"	70.88	13427
70.88	114	9'-6"	7'-11"	75.21	14427
74.66	117	9'-9"	8'-2"	78.83	15457
78.54	120	10'-0"	8'-4"	83.33	16537
82.52	123	10'-3"	8'-7"	87.11	17649
86.59	126	10'-6"	8'-9"	91.87	18856
90.76	129	10'-9"	9'-0"	95.89	20065
95.03	132	11'-0"	9'-2"	100.83	21324
99.40	135	11'-3"	9'-5"	105.08	22634
103.87	138	11'-6"	9'-7"	110.21	24032
108.43	141	11'-9"	9'-10"	114.61	25434
3.10	144	12'-0"	10'-0"	120.00	26891

FIG. 12

Appendix C: Circular Channel Ratios

Experiments have shown that n varies slightly with depth. This figure gives velocity and flow rate ratios for varying n (solid line) and constant n (broken line) assumptions.

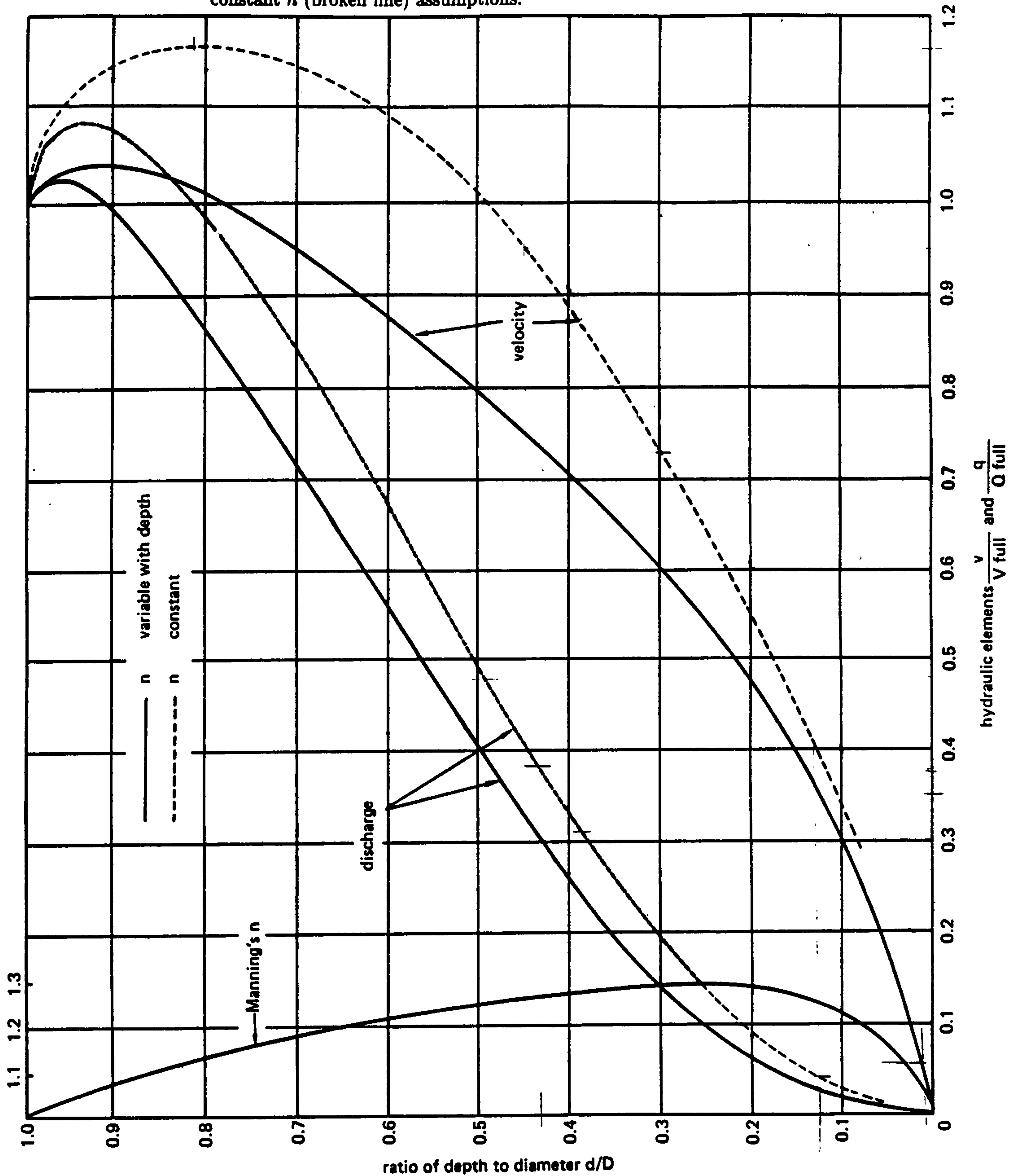


TABLE 22.3 B-1
VALUES OF MANNING'S n

	n
Reinforced Concrete Pipe	.013
Poured Concrete	.013
No-joint cast in place concrete pipe	.014
Reinforced Concrete Box	.015
Reinforced Concrete Arch	.015
Streets	.017
Flush Grouted Rip-Rap	.020
Corrugated Metal Pipe	.025
Grass Lined Channels (sodded & irrigated)	.025
Earth Lined Channels (smooth)	.030
Arroyo Channels	.030
Wire Tied Rip-Rap	.040
Medium Weight Dumped Riprap	.045
Grouted Rip-Rap (exposed rock)	.045
Arroyo Overbank	.045
Jetty Type Rip-Rap ($D_{50} > 24"$)	.050

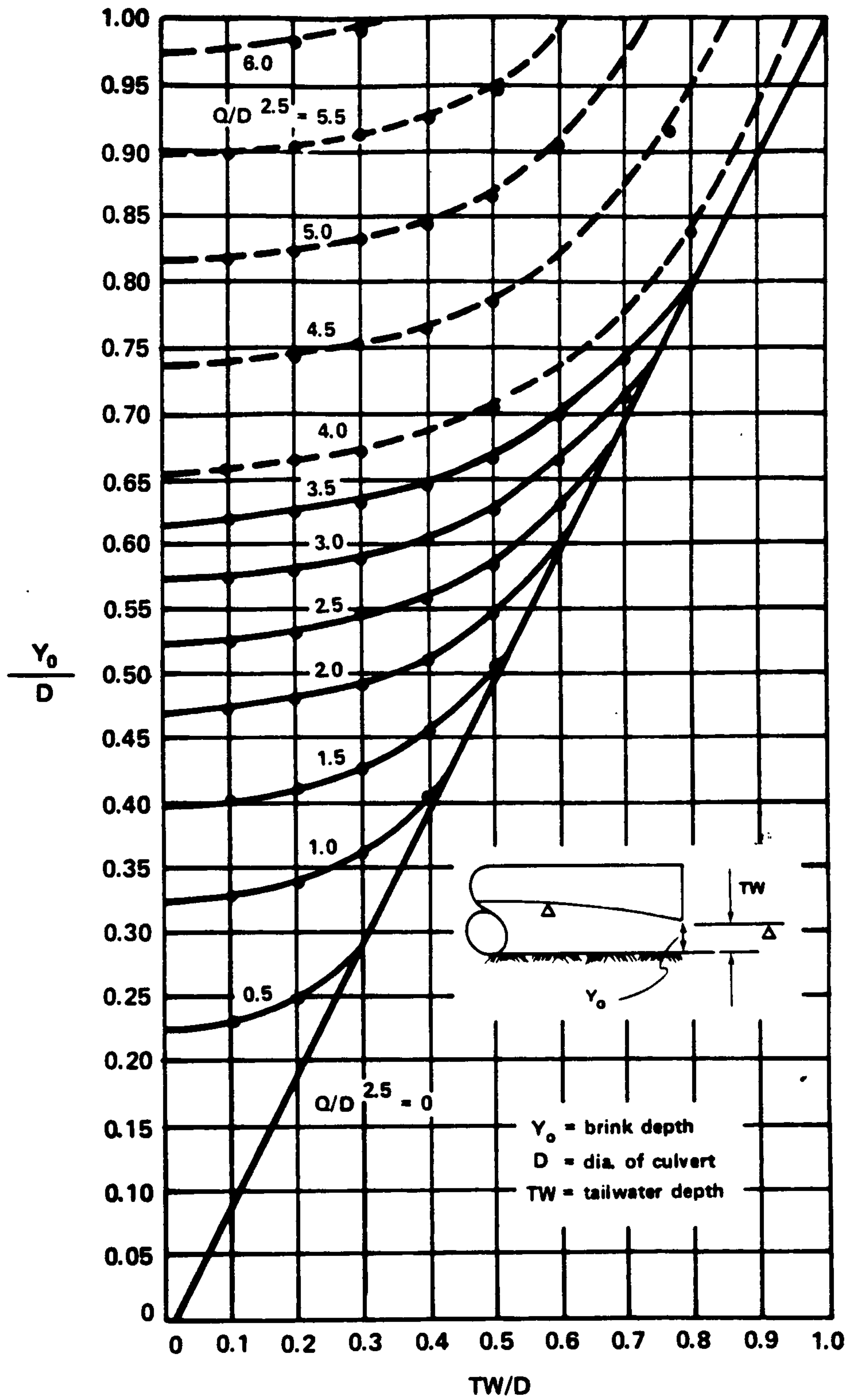


Figure III-10 Dimensionless Rating Curve for the Outlets of Circular Culverts on Horizontal and Mild Slopes from Reference III-2

III-15

Table III-2.—Uniform flow in circular sections flowing partly full. From Reference III-3.

d = depth of flow D = diameter of pipe A = area of flow R = hydraulic radius					Q = discharge in cubic feet per second by Manning's formula n = Manning's coefficient S = slope of the channel bottom and of the water surface				
$\frac{d}{D}$	$\frac{A}{D^2}$	$\frac{R}{D}$	$\frac{Qn}{D^{8/3}S^{1/2}}$	$\frac{Qn}{d^{8/3}S^{1/2}}$	$\frac{d}{D}$	$\frac{A}{D^2}$	$\frac{R}{D}$	$\frac{Qn}{D^{8/3}S^{1/2}}$	$\frac{Qn}{d^{8/3}S^{1/2}}$
0.01	0.0013	0.0066	0.00007	15.04	0.51	0.4027	0.2531	0.238	1.442
0.02	0.0037	0.0132	0.00031	10.57	0.52	0.4127	0.2562	0.247	1.415
0.03	0.0069	0.0197	0.00074	8.56	0.53	0.4227	0.2592	0.255	1.388
0.04	0.0106	0.0262	0.00138	7.38	0.54	0.4327	0.2621	0.263	1.362
0.05	0.0147	0.0325	0.00222	6.55	0.55	0.4426	0.2649	0.271	1.336
0.06	0.0192	0.0389	0.00328	5.95	0.56	0.4526	0.2676	0.279	1.311
0.07	0.0242	0.0451	0.00455	5.47	0.57	0.4625	0.2703	0.287	1.286
0.08	0.0294	0.0513	0.00604	5.09	0.58	0.4724	0.2728	0.295	1.262
0.09	0.0350	0.0575	0.00775	4.76	0.59	0.4822	0.2753	0.303	1.238
0.10	0.0409	0.0638	0.00967	4.46	0.60	0.4920	0.2776	0.311	1.215
0.11	0.0470	0.0695	0.01181	4.25	0.61	0.5018	0.2799	0.319	1.192
0.12	0.0534	0.0755	0.01417	4.04	0.62	0.5115	0.2821	0.327	1.170
0.13	0.0600	0.0813	0.01674	3.86	0.63	0.5212	0.2842	0.335	1.148
0.14	0.0668	0.0871	0.01952	3.69	0.64	0.5308	0.2862	0.343	1.126
0.15	0.0739	0.0929	0.0225	3.54	0.65	0.5404	0.2882	0.350	1.105
0.16	0.0811	0.0985	0.0257	3.41	0.66	0.5499	0.2900	0.358	1.084
0.17	0.0885	0.1042	0.0291	3.28	0.67	0.5594	0.2917	0.366	1.064
0.18	0.0961	0.1097	0.0327	3.17	0.68	0.5687	0.2933	0.373	1.044
0.19	0.1039	0.1152	0.0365	3.06	0.69	0.5780	0.2948	0.380	1.024
0.20	0.1118	0.1206	0.0406	2.96	0.70	0.5872	0.2962	0.388	1.004
0.21	0.1199	0.1259	0.0448	2.87	0.71	0.5964	0.2975	0.395	0.985
0.22	0.1281	0.1312	0.0492	2.79	0.72	0.6054	0.2987	0.402	0.966
0.23	0.1365	0.1364	0.0537	2.71	0.73	0.6143	0.2998	0.409	0.947
0.24	0.1449	0.1416	0.0585	2.63	0.74	0.6231	0.3008	0.416	0.928
0.25	0.1535	0.1466	0.0634	2.56	0.75	0.6319	0.3017	0.422	0.910
0.26	0.1623	0.1516	0.0686	2.49	0.76	0.6406	0.3024	0.429	0.891
0.27	0.1711	0.1566	0.0739	2.42	0.77	0.6493	0.3031	0.435	0.873
0.28	0.1800	0.1614	0.0793	2.36	0.78	0.6573	0.3036	0.441	0.856
0.29	0.1890	0.1662	0.0849	2.30	0.79	0.6655	0.3039	0.447	0.838
0.30	0.1982	0.1709	0.0907	2.25	0.80	0.6736	0.3042	0.453	0.821
0.31	0.2074	0.1756	0.0966	2.20	0.81	0.6815	0.3043	0.458	0.804
0.32	0.2167	0.1802	0.1027	2.14	0.82	0.6893	0.3043	0.463	0.787
0.33	0.2260	0.1847	0.1089	2.09	0.83	0.6969	0.3041	0.468	0.770
0.34	0.2355	0.1891	0.1153	2.05	0.84	0.7043	0.3038	0.473	0.753
0.35	0.2450	0.1936	0.1218	2.00	0.85	0.7115	0.3033	0.477	0.736
0.36	0.2546	0.1978	0.1284	1.958	0.86	0.7186	0.3026	0.481	0.720
0.37	0.2642	0.2020	0.1351	1.915	0.87	0.7254	0.3018	0.485	0.703
0.38	0.2739	0.2062	0.1420	1.875	0.88	0.7320	0.3007	0.489	0.687
0.39	0.2836	0.2102	0.1490	1.835	0.89	0.7384	0.2995	0.491	0.670
0.40	0.2934	0.2142	0.1561	1.797	0.90	0.7445	0.2980	0.494	0.654
0.41	0.3032	0.2182	0.1633	1.760	0.91	0.7504	0.2963	0.496	0.637
0.42	0.3130	0.2220	0.1705	1.724	0.92	0.7560	0.2944	0.497	0.621
0.43	0.3229	0.2258	0.1779	1.689	0.93	0.7612	0.2921	0.498	0.604
0.44	0.3328	0.2295	0.1854	1.655	0.94	0.7662	0.2895	0.498	0.588
0.45	0.3428	0.2331	0.1929	1.622	0.95	0.7707	0.2866	0.498	0.571
0.46	0.3527	0.2366	0.201	1.590	0.96	0.7749	0.2829	0.498	0.553
0.47	0.3627	0.2401	0.208	1.559	0.97	0.7786	0.2787	0.494	0.535
0.48	0.3727	0.2435	0.216	1.530	0.98	0.7817	0.2735	0.489	0.517
0.49	0.3827	0.2468	0.224	1.500	0.99	0.7841	0.2686	0.483	0.499
0.50	0.3927	0.2500	0.232	1.471	1.00	0.7854	0.2500	0.483	0.483

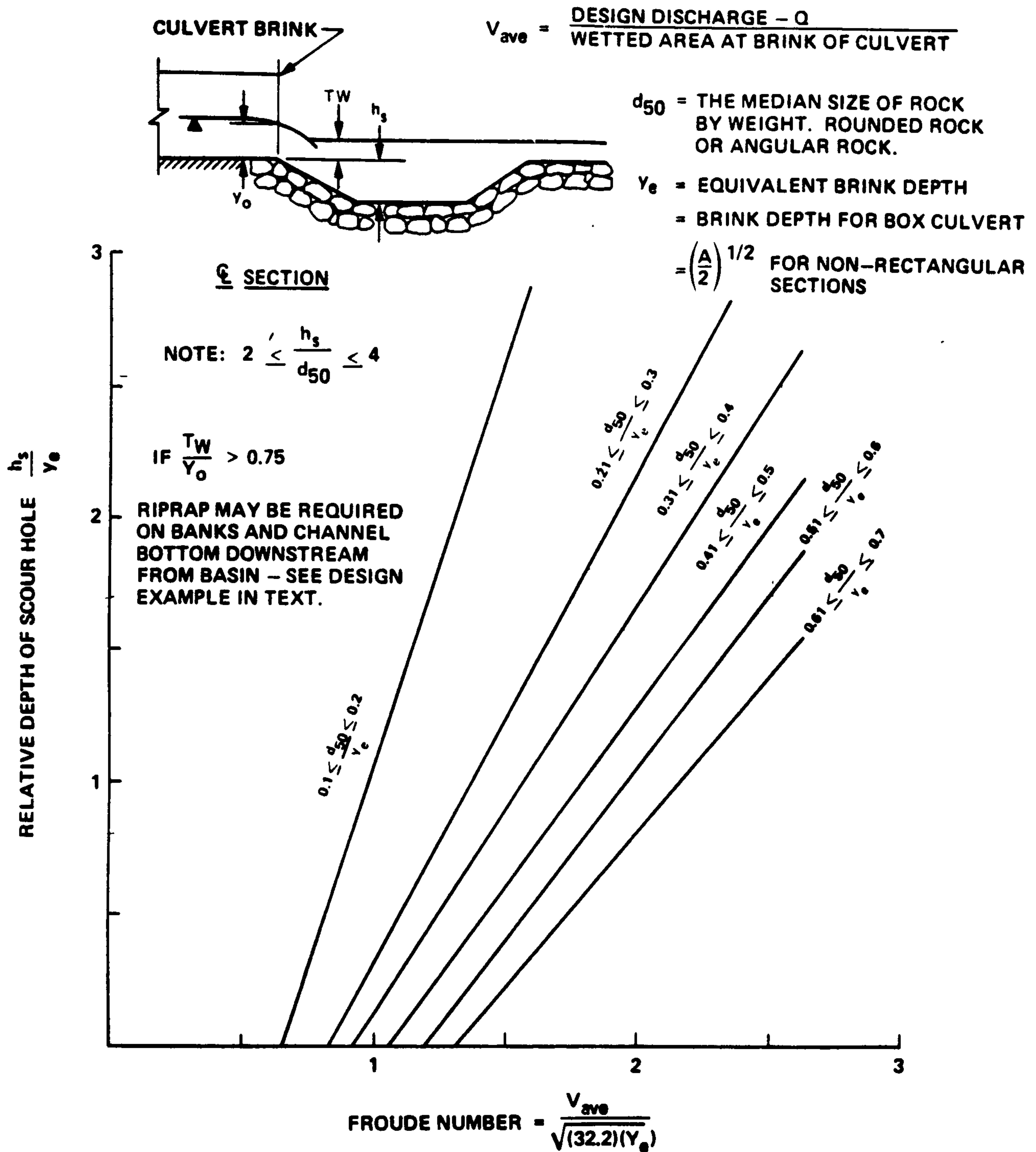
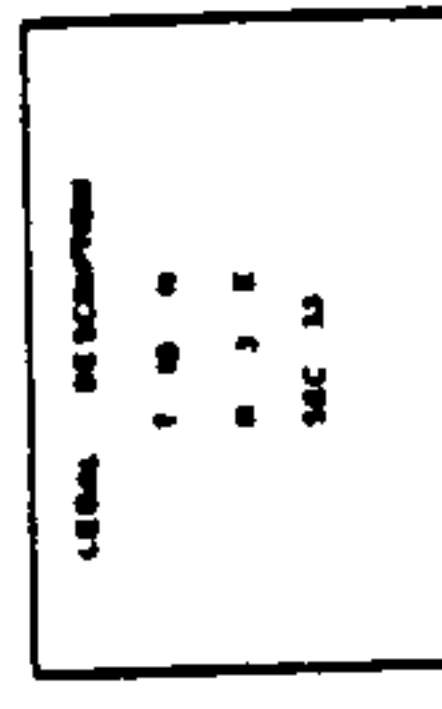


FIGURE X1-2. RELATIVE DEPTH OF SCOUR HOLE VERSUS FROUDE NUMBER AT BRINK OF CULVERT WITH RELATIVE SIZE OF RIPRAP AS A THIRD VARIABLE

XI-14

EXHIBIT 'A'



800-928-1 / 2000 4th District, Pennsylvania

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 10-05-2006 BY 60322 UCBAW

M-15-Z
CITY OF ALBUQUERQUE
PLANNING DEPARTMENT

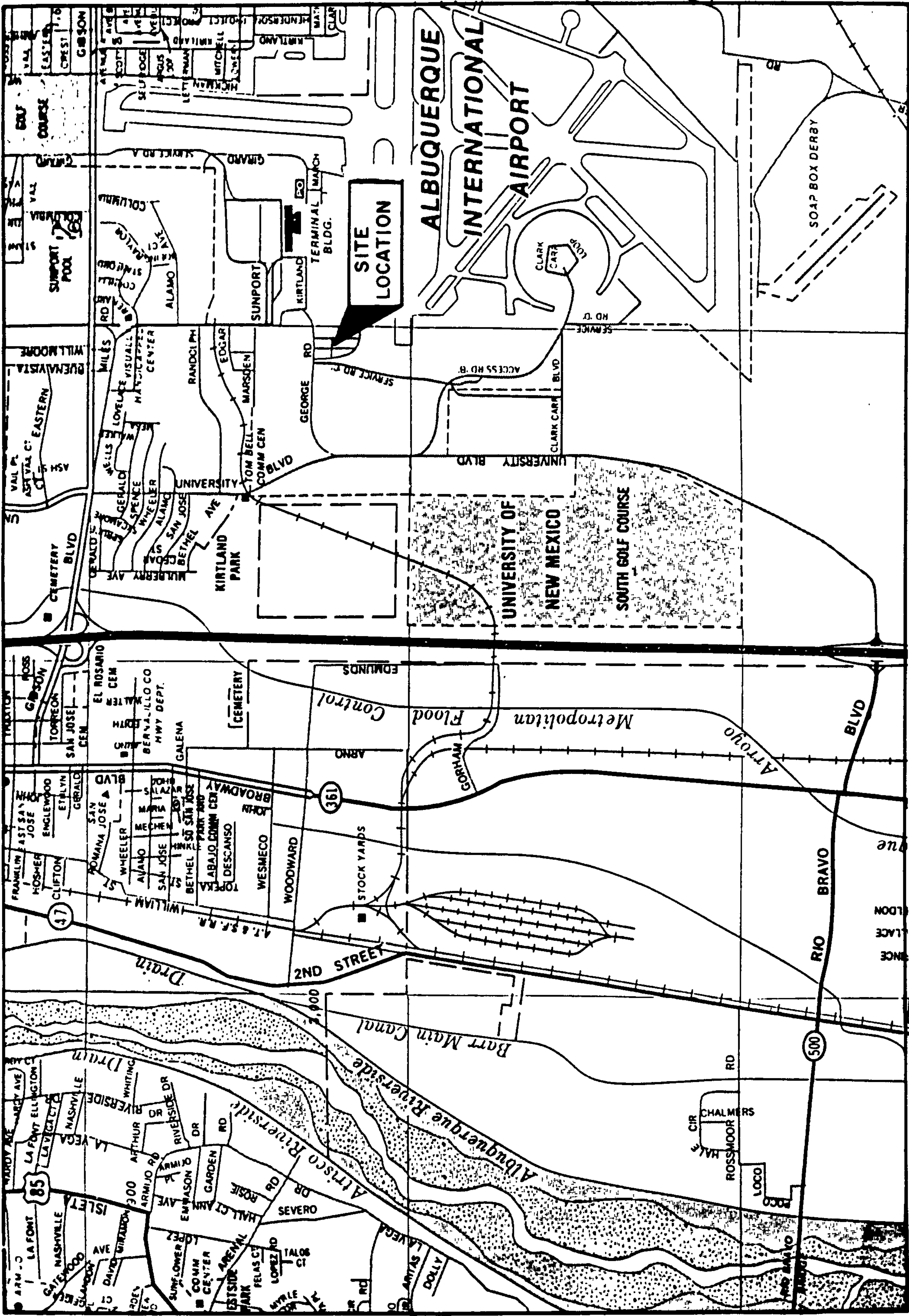


EXHIBIT 'A1'

LOCATION MAP



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

July 16, 1991

James Topmiller
Bohannon-Huston, Inc.
7500 Jefferson Street, NE
Albuquerque, New Mexico 87109

RE: ENGINEER'S CERTIFICATION FOR AIRPORT MAIL FACILITY
(M-15/D27) ENGINEER'S STATEMENT DATED JUNE 28, 1991

Dear Mr. Topmiller:

Based on the information provided on your submittal of June 28, 1991,
Engineer's Certification for the referenced site is acceptable.

If I can be of further assistance, please feel free to call me at 768-2650.

Cordially,

Bernie J. Montoya, C.E.
Engineering Assistant

xc: Alan Martinez

BJM/bsj
(WP+1530)

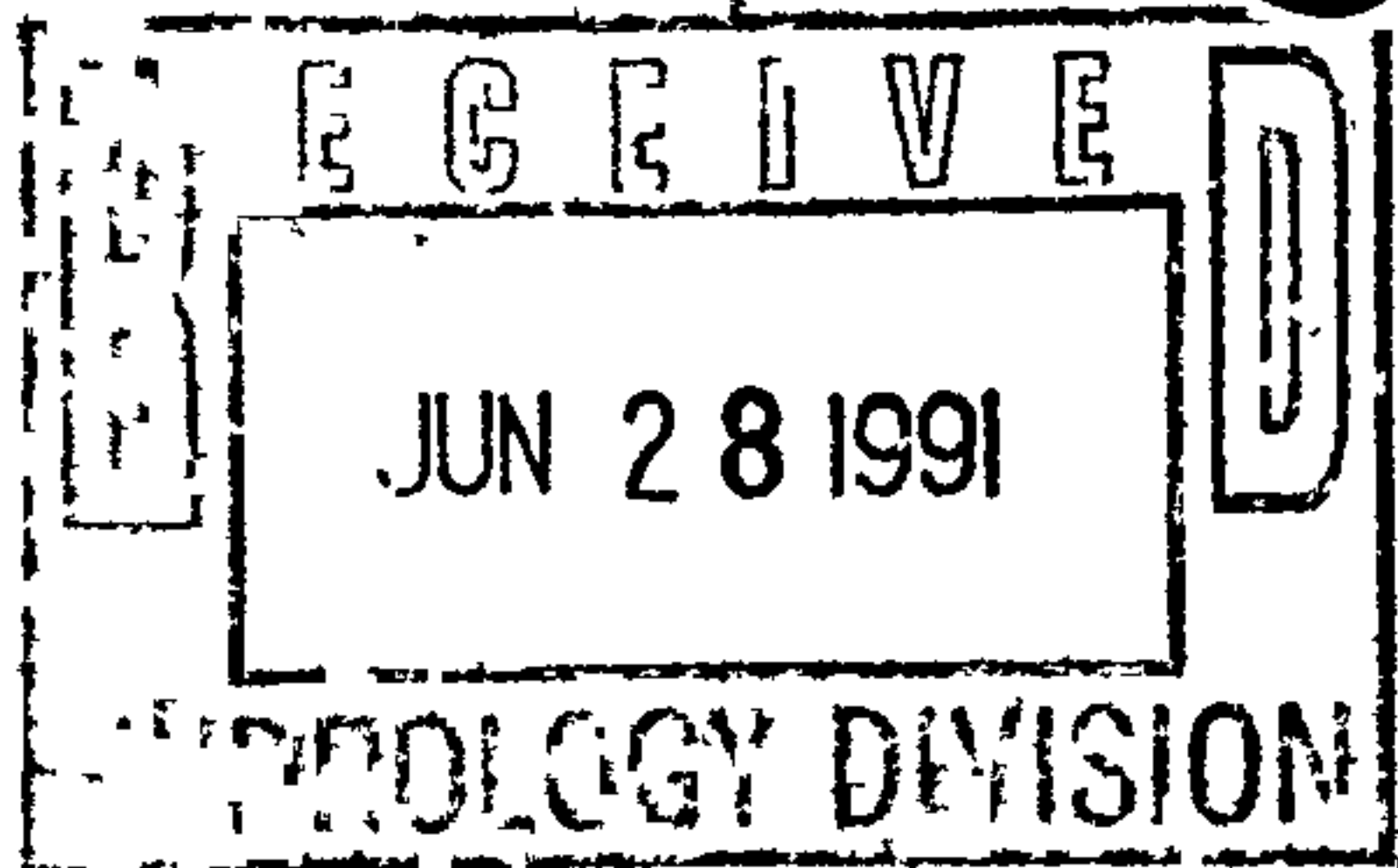
PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER



June 28, 1991

Fred Aguirre, P.E.
Hydrology Division
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Re: Drainage Certification for Airport Mail Facility

Dear Fred:

Enclosed are plans identifying as-built site grades, drainage pipe sizes and inverts for the above referenced site. A drainage certification is provided on the plans stating that substantial compliance with the City's approved drainage plan has been met for the site grades and drainage improvements. The certification is based on field survey data and personal site inspection.

Based on this submittal, we are requesting that permanent certificates of occupancy be granted for the facility. If we can answer any questions or provide any additional information, please feel free to contact me.

Sincerely,

James R. Topmiller, P.E.
Project Manager
Community Development and Planning

Enclosures

cc: Mr. Mark Mullane

JRT

Job No. 91206.02

PRINCIPALS

LARRY W. HUSTON

MICHAEL M. EMERY, P.E.

BRIAN G. BURNETT, P.E.

BOHANNAN-HUSTON INC.



COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

PROJECT TITLE: AIRPORT MAIL FACILITY ZONE ATLAS/DRNG. FILE #: M-15/D27

DRB #: _____ EPC #: _____ WORK ORDER #: _____

LEGAL DESCRIPTION: _____

CITY ADDRESS: GEORGE ROADENGINEERING FIRM: BOHANNAN-HUSTON, INC. CONTACT: JAMES TOPMILLERADDRESS: 7500 JEFFERSON NE 87109 PHONE: 823-1000

OWNER: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

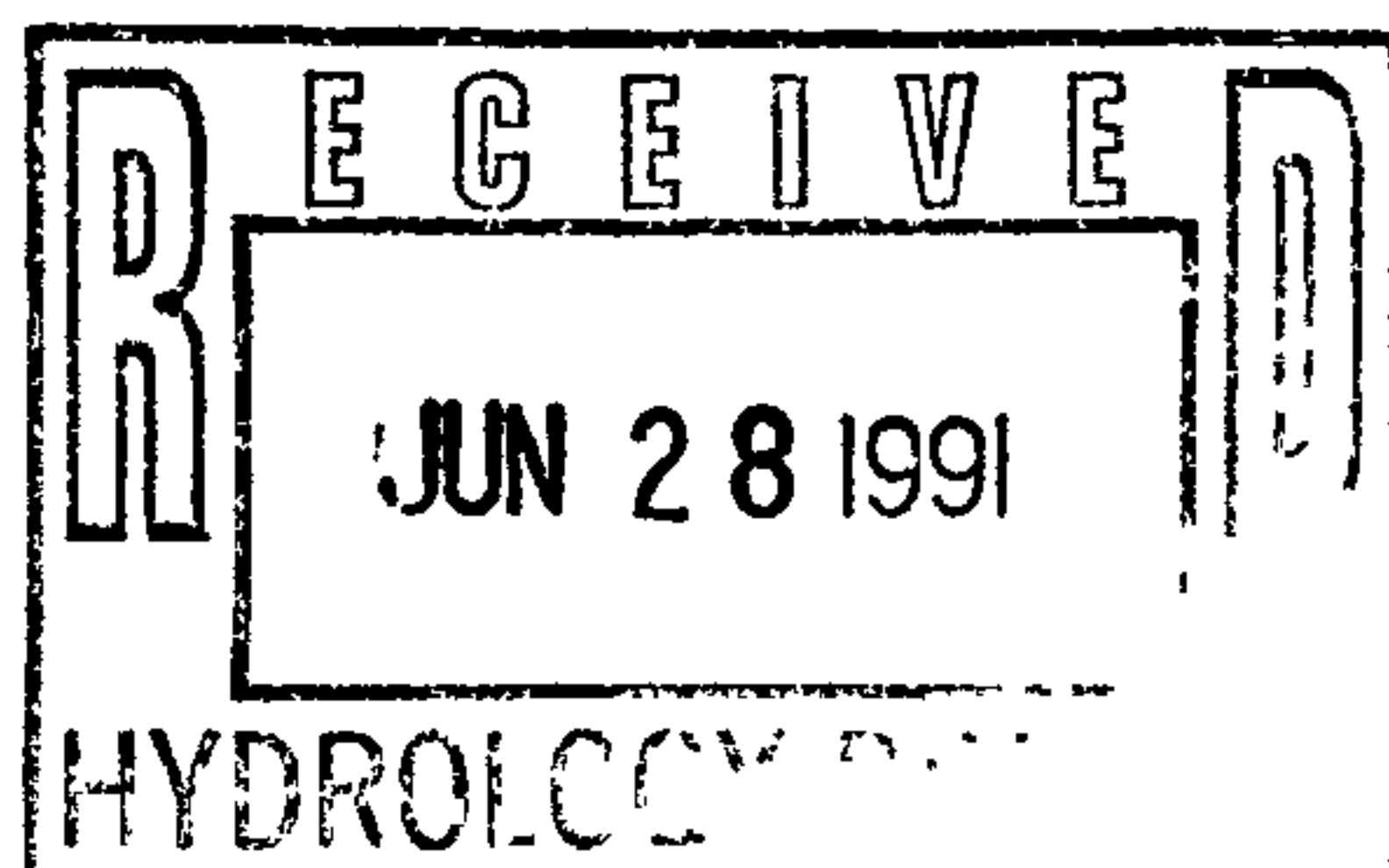
ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

- ☐ DRAINAGE REPORT
☐ DRAINAGE PLAN
☐ CONCEPTUAL GRADING & DRAINAGE PLAN
☐ GRADING PLAN
☐ EROSION CONTROL PLAN
☒ ENGINEER'S CERTIFICATION
☐ OTHER _____

PRE-DESIGN MEETING:

- ☐ YES
☐ NO
☐ COPY PROVIDED



CHECK TYPE OF APPROVAL SOUGHT:

- ☐ SKETCH PLAT APPROVAL
☐ PRELIMINARY PLAT APPROVAL
☐ S. DEV. PLAN FOR SUB'D. APPROVAL
☐ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
☐ SECTOR PLAN APPROVAL
☐ FINAL PLAT APPROVAL
☐ FOUNDATION PERMIT APPROVAL
☐ BUILDING PERMIT APPROVAL
☒ CERTIFICATE OF OCCUPANCY APPROVAL
☐ GRADING PERMIT APPROVAL
☐ PAVING PERMIT APPROVAL
☐ S.A.D. DRAINAGE REPORT
☐ DRAINAGE REQUIREMENTS
☐ OTHER _____ (SPECIFY)

DATE SUBMITTED: 6-28-91BY: JAMES TOPMILLER



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 23, 1991

Mr. Mark S. Holstad, P.E.
Project Engineer
Greiner, Inc.
5971 Jefferson Blvd.NE
Suite 101
Albuquerque, New Mexico 87109

RE: Albuquerque International Airport, GEORGE ROAD DRAINAGE PLAN/JOB # 4135

Dear Mark:

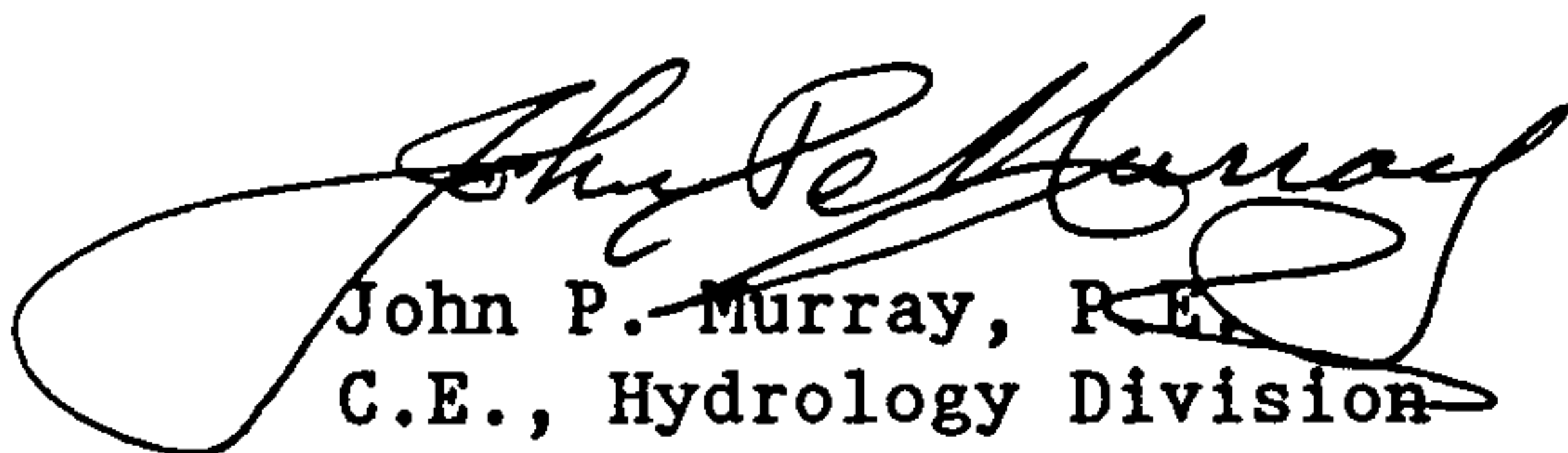
This drainage plan is in conjunction with project entitled "Old Terminal Road & Parking Lot Improvements." Reference is made to Greiner's letter of December 20, 1990 re Drainage Analysis - Old Terminal Road and Parking Lot Improvements.

The subject drainage plan, submitted on January 15, 1991, satisfies the immediate need for JOB # 4135. The existing drainage patterns and runoff are not appreciably altered and/or increased by the proposed project.

As Mr. Fred Aguirre of the Hydrology Development Section has discussed with you on a number of occasions, there still is a need for a drainage plan which addresses/integrates the hydrology and drainage of the overall area to be developed, whether it be public or not.

This approval should not be construed to obviate that requirement.

Sincerely,


John P. Murray, P.E.
C.E., Hydrology Division

xc: Dennis Parker, Aviation Dept.

Fred Aguirre

Steve Boberg

Roger Green

✓ File M15/D27

WP+2441

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER

Postal Facility

DRAINAGE INFORMATION SHEET

MIS/D 27

PROJECT TITLE: George Road ZONE ATLAS/DRAINAGE FILE # M-16

LEGAL DESCRIPTION: Albuquerque Int'l Airport Tract A-1 municipal Addition
CITY ADDRESS: George Road No. 9

ENGINEERING FIRM: Greiner Inc. CONTACT: Mark Holstad

ADDRESS: 5971 Jefferson Blvd, NE PHONE: 345-3999

OWNER: City of Albuquerque CONTACT: Dennis Parker

ADDRESS: Albuquerque International Airport PHONE: 842-4366

ARCHITECT: N/A CONTACT: —

ADDRESS: — PHONE: —

SURVEYOR: City of Albuquerque CONTACT: Jan Fiala

ADDRESS: P.O. Box 1293 PHONE: 764-1612

CONTRACTOR: N/A CONTACT: —

ADDRESS: — PHONE: —

PRE-DESIGN MEETING:

— YES

X NO

— COPY OF CONFERENCE
RECAP SHEET PROVIDED

DRB NO. —

EPC NO. —

PROJECT NO. —

TYPE OF SUBMITTAL:

— DRAINAGE REPORT

X DRAINAGE PLAN

— CONCEPTUAL GRADING & DRAIN PLAN

— GRADING PLAN

— EROSION CONTROL PLAN

— ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL SOUGHT:

— SECTOR PLAN APPROVAL

— SKETCH PLAT APPROVAL

— PRELIMINARY PLAT APPROVAL

— SITE DEVELOPMENT PLAN APPROVAL

— FINAL PLAT APPROVAL

— BUILDING PERMIT APPROVAL

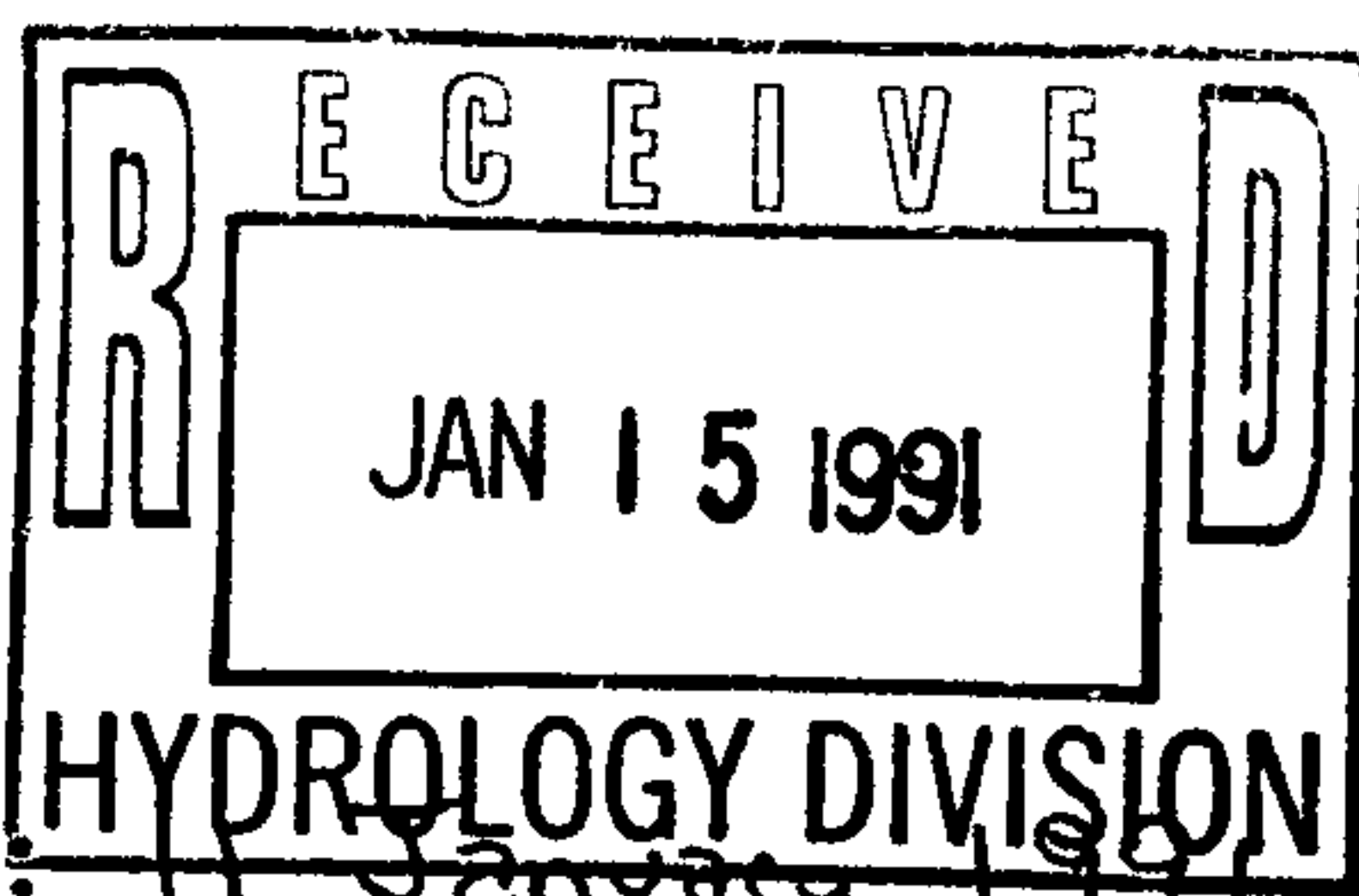
— FOUNDATION PERMIT APPROVAL

— CERTIFICATE OF OCCUPANCY
APPROVAL

— ROUGH GRADING PERMIT APPROVAL

X GRADING/PAVING PERMIT APPROVAL

— OTHER — (SPECIFY):



DATE SUBMITTED: 11 January 1991

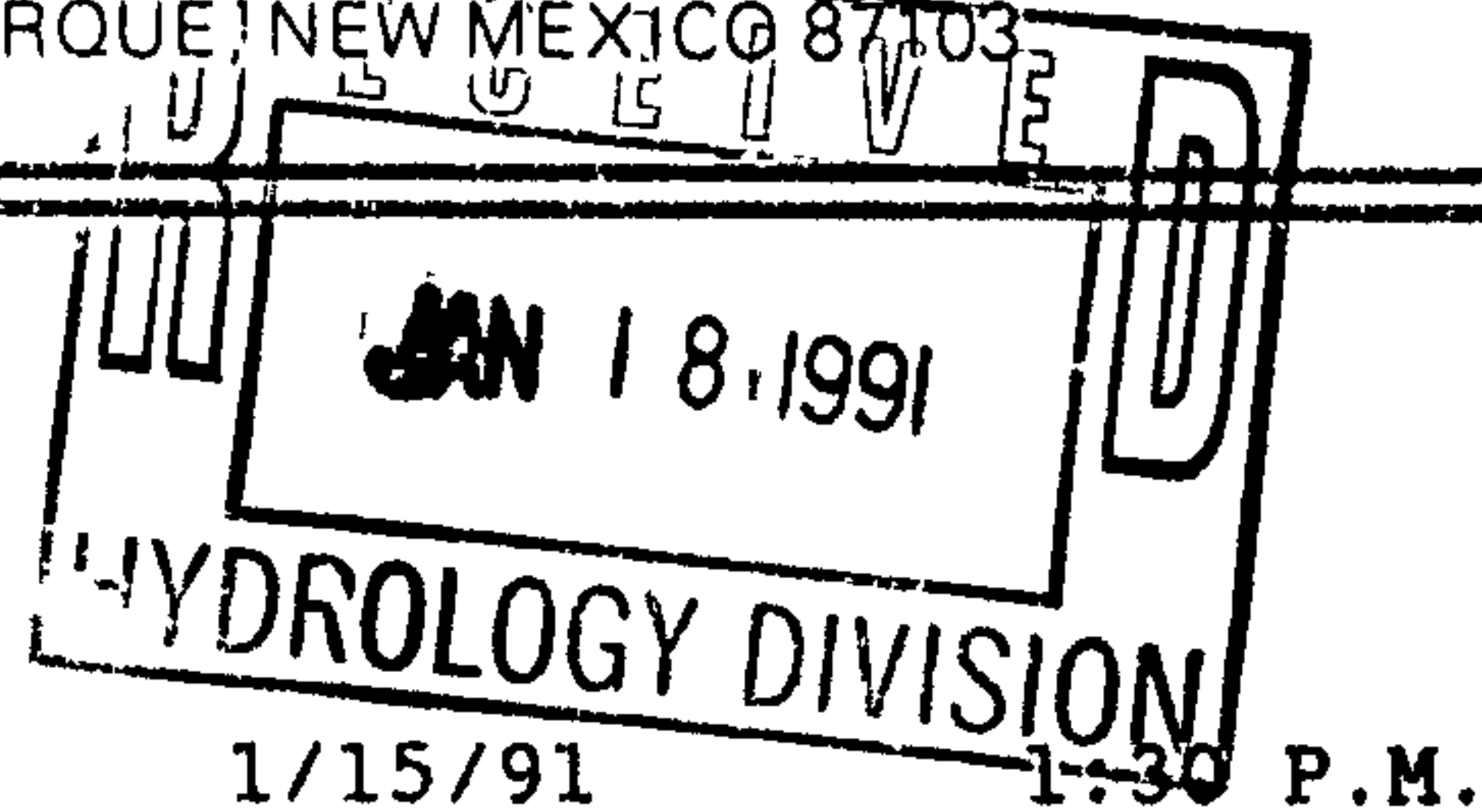
BY: Mark Holstad



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE NEW MEXICO 87103

M15/D27



PROJECT REVIEW COMMITTEE MEETING

1/15/91

1:30 P.M.

PROJECT: Albuquerque International Airport
Parking Lot - George Road

PROJECT NO.: 4135.90

CONSULTANT: Greiner Engineering

ATTENDEES: Roger Green, DRC Chairman
Richard Dourte, Transportation
Andre Houle, Construction
Ed Adams, Transportation
John Murray, Hydrology
Joe Luehring, Utility Coordinator
Dennis Parker, Aviation
Mark Holstead, Consultant
Bill Perkins, Campbell, Okuma, Perkins Assoc.

COMMENTS:

1. Written comment provided by Greg Olson. Greg will follow up on possibility of Water Systems relocating the Post Office fire hydrant.
2. Written comments provided by Joe Luehring.
3. Marked up plan sets provided by Ed Adams.
4. No representative from Parks & Recreation was present or comments received.
5. Add traffic control note on Sheet 10 to keep one lane open at all times. Delete bid item for this.
6. Drainage plan must be approved by the Hydrology Section prior to plan set approval.
7. Combine asphalt bid items where possible.
8. Need pay item for imported subgrade, adjusting manholes, valve boxes, and fire hydrants.

Resubmit for a signature session meeting after comments are addressed. Submit five (5) plan sets and three (3) contract documents. Return all marked up plan sets.

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER

JOHN MURRAY
HYDROLOGY

7
Greiner

Dev O
(file) M15/D27
Greiner, Inc.
5900 Jefferson Blvd., N.E.
Suite 101
Albuquerque, New Mexico 87109
(505) 345-3999
FAX: (505) 345-8393
Rcvd@DRL
12/27
JH

December 20, 1990

Mr. Fred Aguirre, PE
Public Works Department
Hydrology Division
City of Albuquerque
P. O. Box 1293
Albuquerque, NM 87103

**RE: DRAINAGE ANALYSIS
OLD TERMINAL ROAD AND PARKING LOT IMPROVEMENTS**

Dear Fred:

In accordance with your request, we have analyzed the area that will drain to George Road from Yale Blvd. west. This analysis was consistent with the following previous studies which cover adjacent projects:

1. Drainage Report for Master Plan Improvements Program
Albuquerque International Airport, Greiner, October 1986
2. Conceptual Drainage Report and Submittal for Site
Development plan approval for the Postal Facility located
at Albuquerque International Airport, Molzen-Corbin &
Associates, November 1989.

The results of this analysis gave the following flows:

1. George Road at the south extension of Yale Blvd.
Q-10 = 12.7 cfs
Q-100 = 19.3 cfs
2. George Road at the west side of the Post Office site
Q-10 = 14.7 cfs
Q-100 = 22.2 cfs

These flows are within the capacity of the proposed street section, however, there will not be a free lane in each direction during a 10 year flood event. As previously discussed, this will be acceptable because George Road is being considered as a private road in this case. The above flow rates are to be added to the construction plans.

Greiner

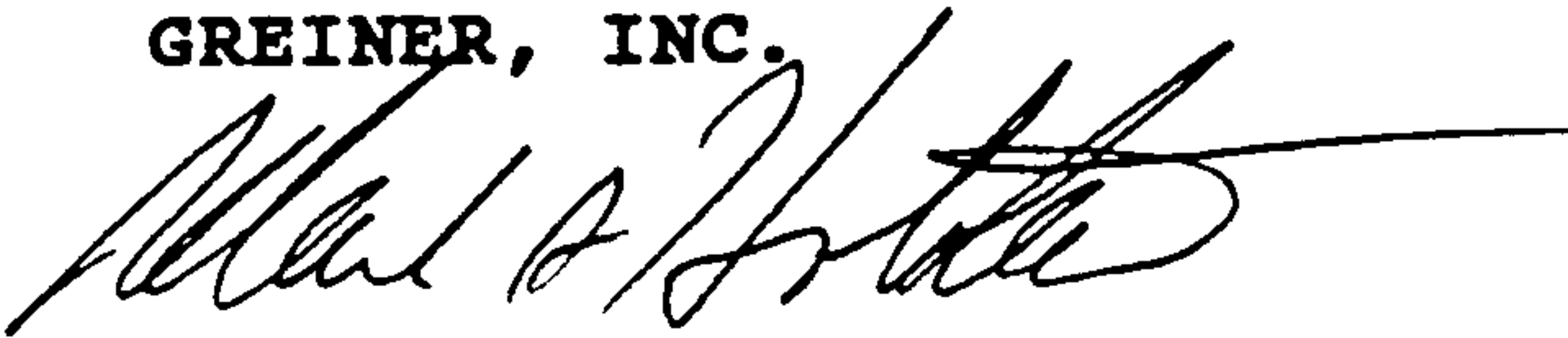
Mr. Fred Aguirre, PE
December 20, 1990
Page 2

The project area was included in the previous downstream analysis in the Drainage Report for Sunport Park, Phase I dated August 1990 by Andrews, Asbury and Roberts. The proposed improvements are in substantial agreement with this report.

Please advise if you have any additional questions.

Sincerely,

GREINER, INC.



Mark S. Holstad, PE
Project Manager

MSH:cs

JN G0033.00

POST OFFICE/DRAIN



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

PROJECT REVIEW COMMITTEE MEETING

11/14/90

3:00 P.M.

PROJECT: ~~Albuquerque International Airport~~
Parking Lot - George Road

PROJECT NO.: 3931

CONSULTANT: Greiner Engineering

ATTENDEES: Roger Green, DRC Chairman
Ed Adams, Transportation
Joe Luehring, Utility Coordinator
John Murray, Hydrology
Mary Lee Dereske, Water/Wastewater
Dennis Parker, Aviation
Fred Aguirre, Hydrology
Bill Perkins, Campbell, Okuma, Perkins Assoc.
Laurie Aguilar, Campbell, Okuma, Perkins Assoc.
Mark Holstad, Consultant
Beverly Ortiz, Consultant

Roger

COMMENTS:

1. Schedule a utility coordinator meeting on the site.
2. Written comments by Mary Lee Dereske.
3. Call out on revision blocks that entire sheets have been revised.
4. Hydrology Section will work separately with Consultant and Aviation Department on overall drainage schemes of area.
5. Landscaping plans and fire hydrant plans will be added to the plan.
6. Permanent traffic signing should be included unless City Traffic Engineering has jurisdiction.
7. Wall along Yale must be located to provide adequate easement width for 20" waterline.

Schedule a final DRC meeting after comments are addressed and plans are 95% complete. Submit eight (8) plan sets.

WP+124218

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER

FILE COPY



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

September 11, 1990

Joann Azar English
Leedshill-Herkenhoff, Inc.
Post Office Box 1217
Albuquerque, New Mexico 87103

RE: DRAINAGE PLAN FOR UNITED STATES AIRPORT MAIL FACILITY
(M-15/D27) GRADING PLAN WITH ENGINEER'S STAMP DATED
APRIL 9, 1990, SITE UTILITIES PLAN DATED MAY 29, 1990
AND ADDITIONAL COMPUTATIONS DATED AUGUST 29, 1990

Dear Mrs. Azar:

Based on the information provided on your submittal of July 3, 1990, the above referenced plan is approved for Building Permit.

Please attach a copy of this plan to the construction sets prior to sign-off by Hydrology.

Prior to Certificate of Occupancy release, Engineer's Certification per the DPM Checklist will be required. All underground systems must also be certified.

If I can be of further assistance, please feel free to call me at 768-2650.

Cordially,

for Benue J. Montoya
Fred J. Aguirre, P.E.
Hydrologist

BJM:FJA/bsj
(WP+1530)

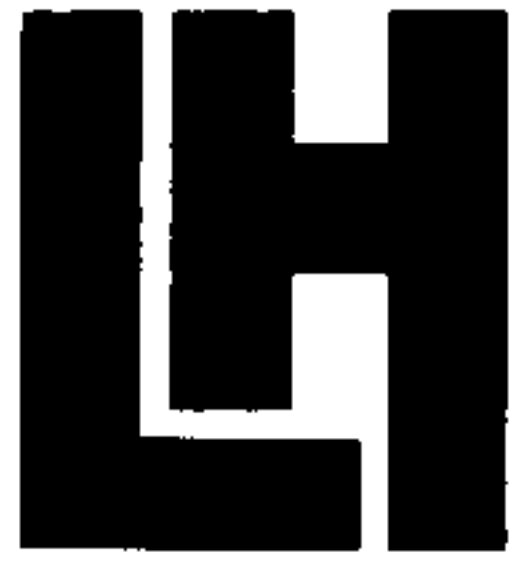
PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER



LEEDSHILL-HERKENHOFF, INC.

500 Copper Avenue N.W.

P. O. Box 1217

Albuquerque, New Mexico 87103

(505) 247-0294

1330-9047.21-90

August 30, 1990

Fred Aguirre, PE
Hydrologist
Public Works Department
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

**RE: USPS - AIRPORT MAIL FACILITY
ALBUQUERQUE, NEW MEXICO
DRAINAGE PLAN
(M-15/D27)**

The following is in response to your letter of August 20, 1990.

1. Area 1a has minimal erosion potential. A rough broom finish on the concrete rundown will be provided. Please refer to the attached calculations.
2. Area 3 will have the concrete rundown deleted and riprap installed in its place. Please refer to the attached calculations.
3. We consider this project to be a private facility. Therefore, the lateral lines that connect to the existing storm sewer system would not be required to be part of the DRC approval process. Included for your reference is a copy of Sheet No. 8, STORM DRAIN - LINE 3, Work Order 3372.91 as prepared by Molzen-Corbin.

Please let me know if you have any questions or comments.

DAVID KLEIN, AIA
Project Manager

cg

Attachments

cc: JoAnn English

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Postal Facility ZONE ATLAS/DRAINAGE FILE # M-15/1027

LEGAL DESCRIPTION: _____

CITY ADDRESS: Albuquerque Airport - George St.

ENGINEERING FIRM: Leedsell-Herbertoff CONTACT: David Klein

ADDRESS: 500 Copper Ave. NW PHONE: 247-0294

OWNER: City of Albuquerque CONTACT: Dennis Parker

ADDRESS: Aviation Dept. PHONE: 842-4366

ARCHITECT: Leedsell-Herbertoff CONTACT: David Klein

ADDRESS: 500 Copper Ave. NW PHONE: 247-0294

SURVEYOR: Molger-Corbin CONTACT: Greg Byers

ADDRESS: 2701 Miller Rd. PHONE: 242-5700

CONTRACTOR: Waynes Corp. CONTACT: Mark Mullane

ADDRESS: 2906 Broadway NE PHONE: 345-8591

PRE-DESIGN MEETING:

☐ YES

DRB NO. _____

☐ NO

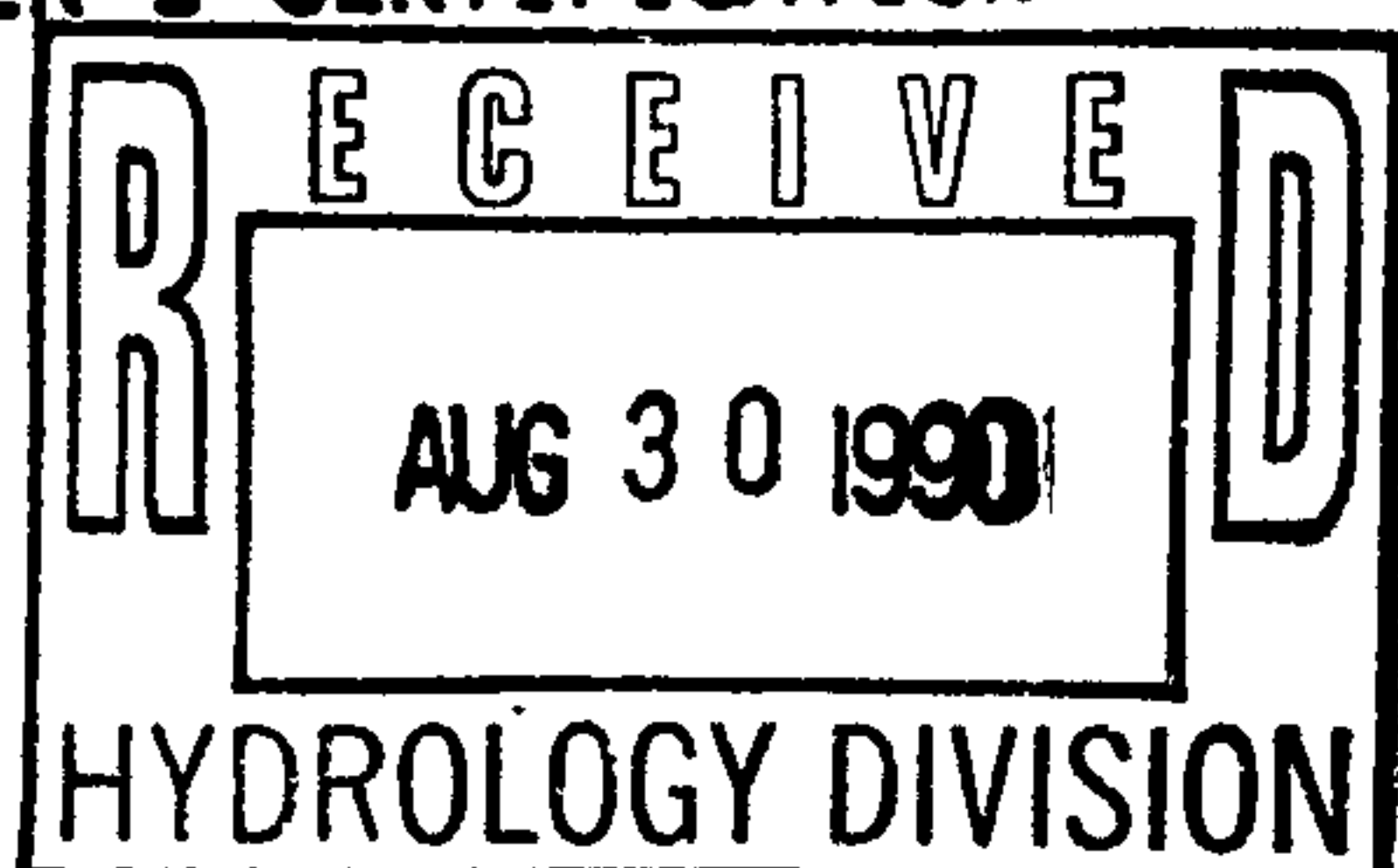
EPC NO. _____

☐ COPY OF CONFERENCE
RECAP SHEET PROVIDED

PROJECT NO. _____

TYPE OF SUBMITTAL:

- ☒ DRAINAGE REPORT - Supplement
- ☐ DRAINAGE PLAN
- ☐ CONCEPTUAL GRADING & DRAIN PLAN
- ☐ GRADING PLAN
- ☐ EROSION CONTROL PLAN
- ☐ ENGINEER'S CERTIFICATION



DATE SUBMITTED: 30 Aug. 90

BY: David Klein

CHECK TYPE OF APPROVAL SOUGHT:

- ☐ SECTOR PLAN APPROVAL
- ☐ SKETCH PLAT APPROVAL
- ☐ PRELIMINARY PLAT APPROVAL
- ☐ SITE DEVELOPMENT PLAN APPROVAL
- ☐ FINAL PLAT APPROVAL
- ☒ BUILDING PERMIT APPROVAL
- ☐ FOUNDATION PERMIT APPROVAL
- ☐ CERTIFICATE OF OCCUPANCY APPROVAL
- ☐ ROUGH GRADING PERMIT APPROVAL
- ☐ GRADING/PAVING PERMIT APPROVAL

OTHER

(SPECIFY).



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

August 20, 1990

Joann Azar-English
Leedshill-Herkenhoff, Inc.
Post Office Box 1217
Albuquerque, New Mexico 87103

RE: DRAINAGE PLAN FOR UNITED STATES AIRPORT MAIL FACILITY
(M-15/D27) RECEIVED AUGUST 7, 1990

Dear Ms. English:

Based on the information provided on your submittal of August 7, 1990, listed are some concerns that will need to be addressed prior to final approval.

1. Area 1a is proposed to be drained through a concrete rundown. What type of erosion protection is proposed within the slope?
2. Area 3 is to be drained through a concrete rundown also. What type of erosion do you propose for this area? The catch basin at the bottom of the pond is silted over, the catch basin must be exposed.
3. Any extensions or tie ins to the existing storm sewer system under work order 3372.91 must be coordinated with DRC.

If I can be of further assistance, please feel free to call me at 768-2650.

Cordially,

for Benjie Montoya
Fred J. Aguirre, P.E.
Hydrologist

BJM:FJA/bsj
(WP+1530)

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER

FILE COPY



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

August 20, 1990

Thorton Schwenk
Molzen-Corbin & Associates
2701 Miles Road, SE
Albuquerque, New Mexico 87106

RE: DRAINAGE PLAN FOR THE POSTAL FACILITY @ THE AIRPORT
OFF-SITE BASINS (M-15/D27) ENGINEER'S STAMP DATED AUGUST 1, 1990

Dear Mr. Schwenk:

Based on the information provided on your submittal of August 3, 1990, the referenced drainage plan for the off-site basins are acceptable.

If I can be of further assistance, please feel free to call me at 768-2650.

Cordially,

Fred J. Aguirre, P.E.
Hydrologist

BJM:FJA/bsj
(WP+1530)

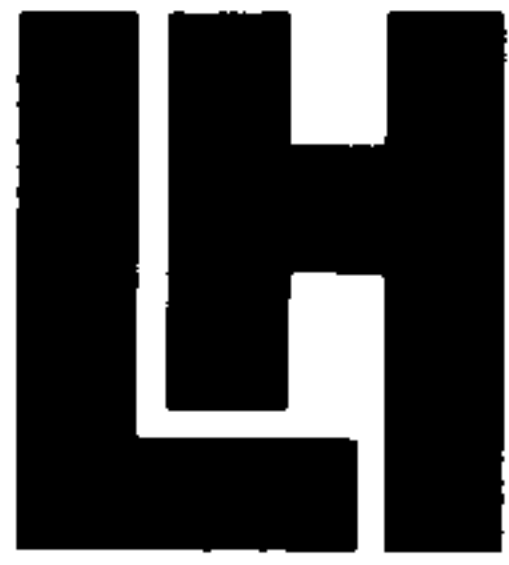
PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER



LEEDSHILL-HERKENHOFF, INC.

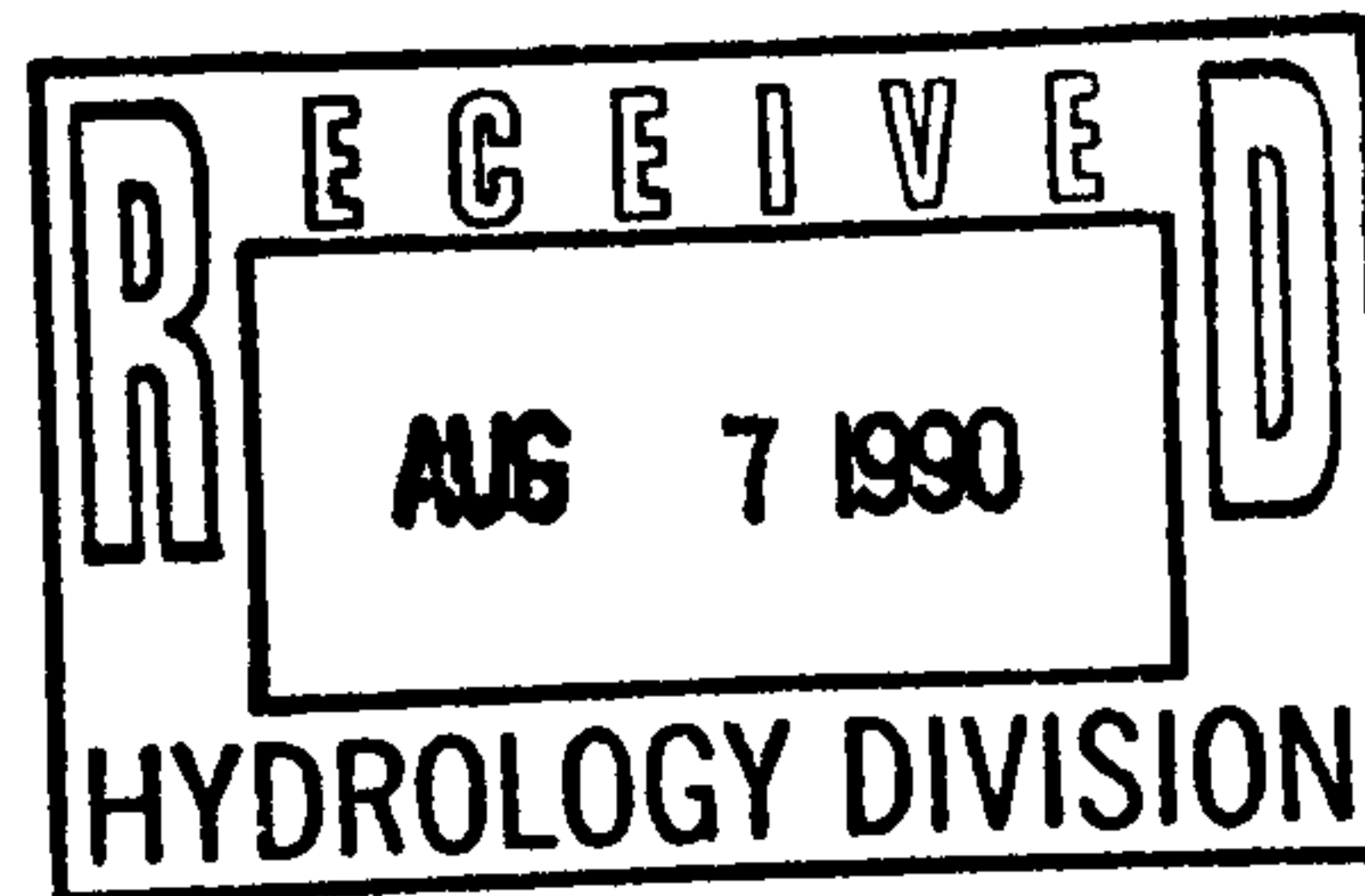
500 Copper Avenue N.W.

P. O. Box 1217

Albuquerque, New Mexico 87103

(505) 247-0294

1198-9047.11-90



August 6, 1990

Fred Aguirre, PE
Hydrologist
Public Works Department
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

**RE: USPS - AIRPORT MAIL FACILITY
ALBUQUERQUE, NEW MEXICO
DRAINAGE PLAN AND REPORT**

In accordance with our meeting of July 25, 1990, enclosed please find two copies of the drainage plan and report prepared for the above referenced project.

Please let me know if you have any questions or comments.

DAVID KLEIN, AIA
Project Manager

cg

Enclosure

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Partial Facility ZONE ATLAS/DRAINAGE FILE # M-15 / D27LEGAL DESCRIPTION: (See attached plan)CITY ADDRESS: 2100 George Rd. SEENGINEERING FIRM: Leedsell-Hardenhoff, Inc. CONTACT: David KleinADDRESS: 500 Copper Ave. NW PHONE: 247-0299Land OWNER: City of Albuquerque CONTACT: Dennis ParkerADDRESS: Aviation Dept. PHONE: 842-4366ARCHITECT: Leedsell-Hardenhoff, Inc. CONTACT: David KleinADDRESS: 500 Copper Ave. NW PHONE: 247-0299SURVEYOR: Molyns-Corbin CONTACT: Greg ByersADDRESS: 2701 Milam Road, SE PHONE: 242-5700CONTRACTOR: N/A CONTACT: _____

ADDRESS: _____ PHONE: _____

PRE-DESIGN MEETING:

☐ YES☐ NO☒ COPY OF CONFERENCE
RECAP SHEET PROVIDEDDRB NO. 89-549

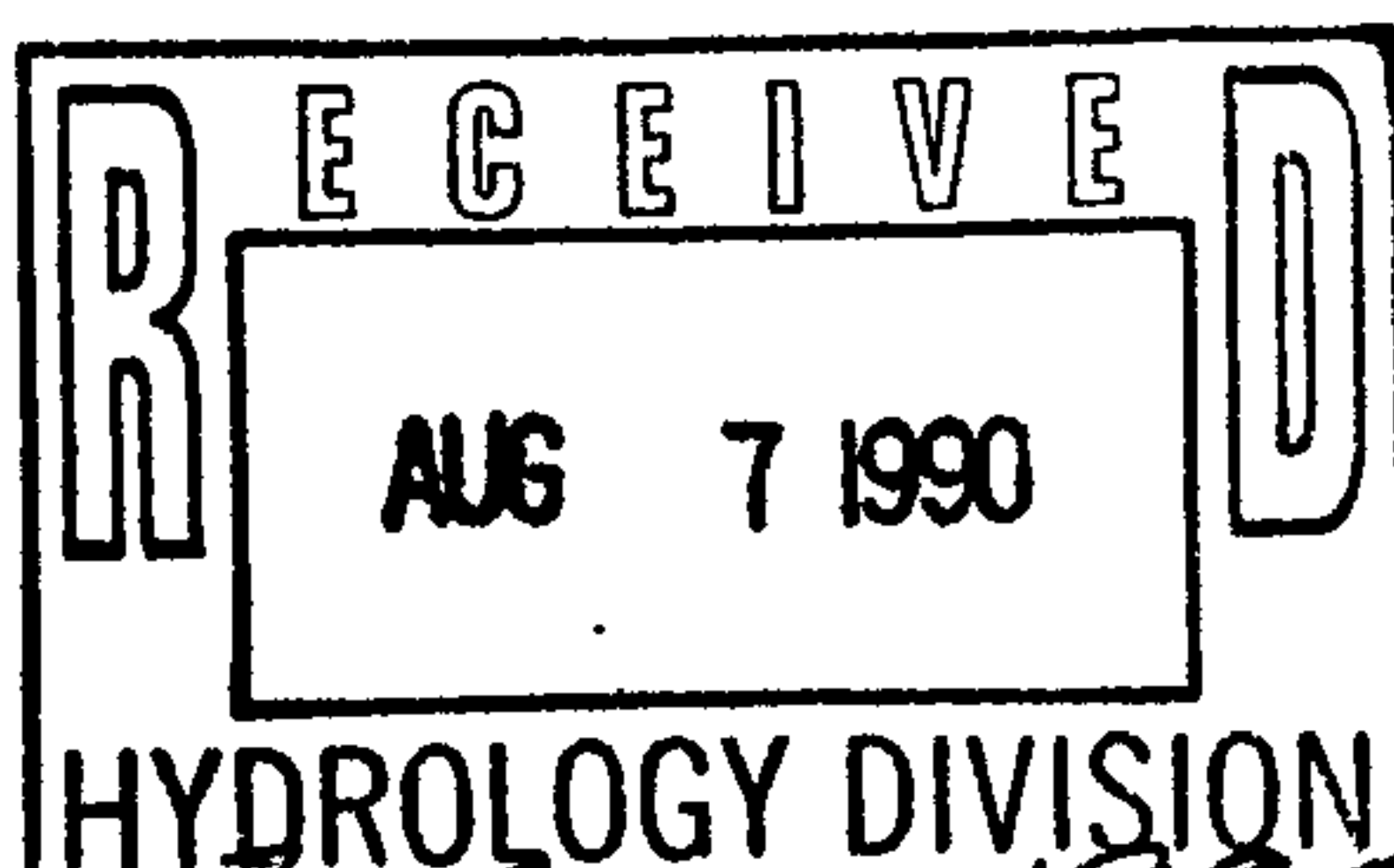
EPC NO. _____

PROJECT NO. C.O.A. project no.
CIP 3372.91

TYPE OF SUBMITTAL:

☒ DRAINAGE REPORT☒ DRAINAGE PLAN☐ CONCEPTUAL GRADING & DRAIN PLAN☐ GRADING PLAN☐ EROSION CONTROL PLAN☐ ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL SOUGHT:

☐ SECTOR PLAN APPROVAL☐ SKETCH PLAT APPROVAL☐ PRELIMINARY PLAT APPROVAL☐ SITE DEVELOPMENT PLAN APPROVAL☐ FINAL PLAT APPROVAL☒ BUILDING PERMIT APPROVAL☐ FOUNDATION PERMIT APPROVAL☐ CERTIFICATE OF OCCUPANCY
APPROVAL☐ ROUGH GRADING PERMIT APPROVAL☐ GRADING/PAVING PERMIT APPROVAL☐ OTHER _____ (SPECIFY).DATE SUBMITTED: 7 Aug. 1990BY: David Klein

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Post Office Site ZONE ATLAS/DRAINAGE FILE # M-15/D27

LEGAL DESCRIPTION: Tract A Municipal Addition No. 9

CITY ADDRESS: George Rd.

ENGINEERING FIRM: Molzen-Corbin & Associates CONTACT: Thornton Schwenk

ADDRESS: 2701 Miles Rd. SE PHONE: 242-5700

OWNER: City of Albuquerque CONTACT: Dennis Parker

ADDRESS: Albuquerque International Airport PHONE: 842-4366

ARCHITECT: Leedshill-Herkenhoff CONTACT: David Klein

ADDRESS: 500 Copper Ave. NW PHONE: 247-0294

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

PRE-DESIGN MEETING:

_____ YES DRB NO. 89-549

_____ NO EPC NO. _____

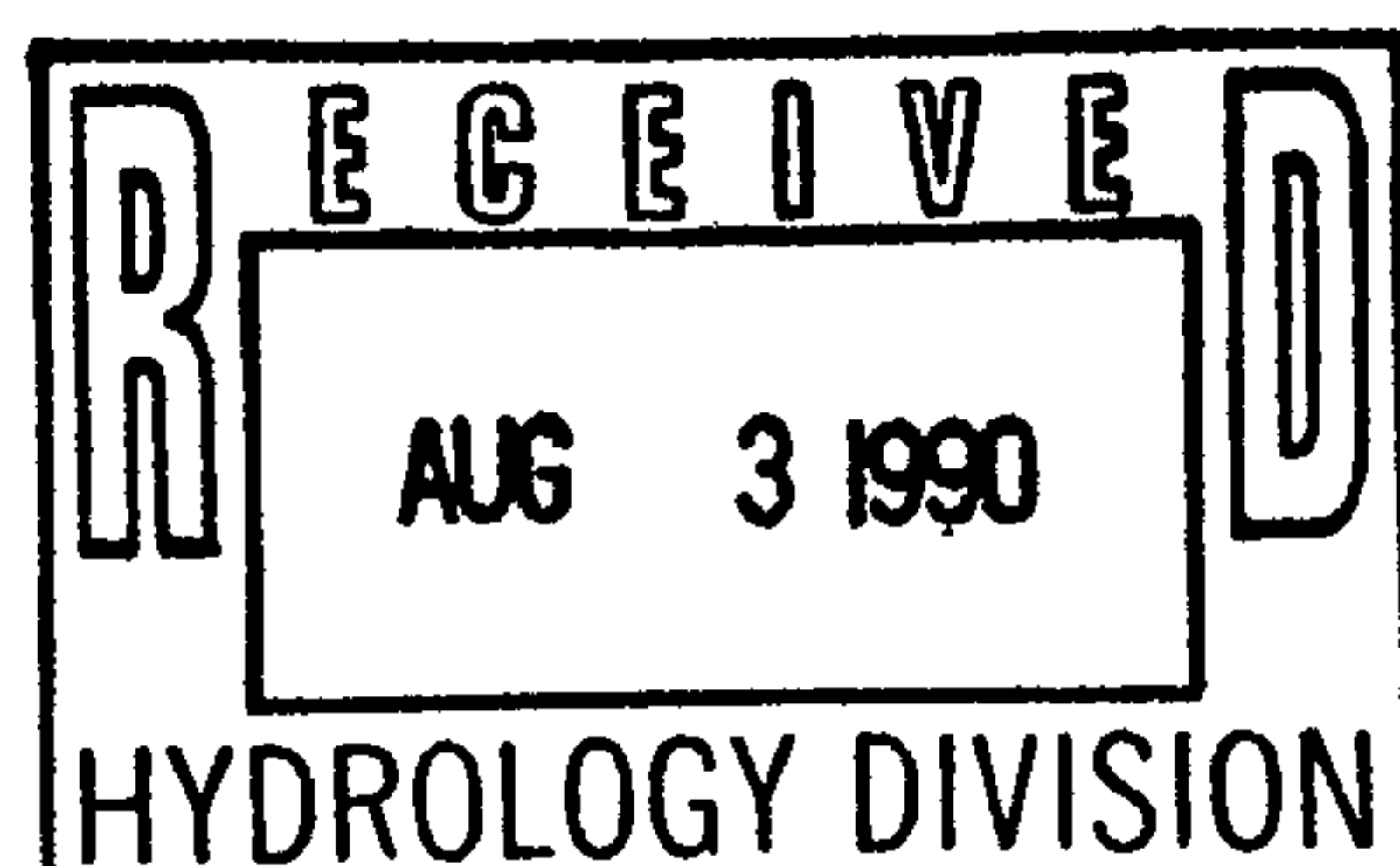
X COPY OF CONFERENCE RECAP SHEET PROVIDED PROJECT NO. CIP 3372.91

TYPE OF SUBMITTAL:

- _____ DRAINAGE REPORT
- X DRAINAGE PLAN *for*
leased property for Aviation Dept.
- _____ CONCEPTUAL GRADING & DRAIN PLAN
- _____ GRADING PLAN
- _____ EROSION CONTROL PLAN
- _____ ENGINEER'S CERTIFICATION

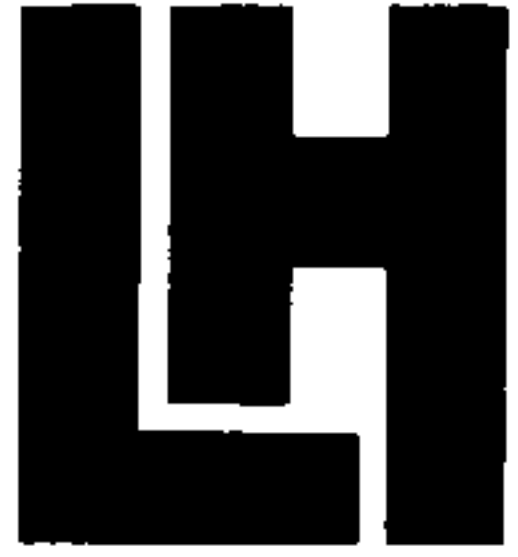
CHECK TYPE OF APPROVAL SOUGHT:

- _____ SECTOR PLAN APPROVAL
- _____ SKETCH PLAT APPROVAL
- _____ PRELIMINARY PLAT APPROVAL
- _____ SITE DEVELOPMENT PLAN APPROVAL
- _____ FINAL PLAT APPROVAL
- ✓ BUILDING PERMIT APPROVAL
for US Post Office Site (Leedshill-Herkenhoff)
- _____ FOUNDATION PERMIT APPROVAL
- _____ CERTIFICATE OF OCCUPANCY APPROVAL
- _____ ROUGH GRADING PERMIT APPROVAL
- _____ GRADING/PAVING PERMIT APPROVAL
- _____ OTHER _____ (SPECIFY)



DATE SUBMITTED: Aug. 3, 1990

BY: Thornton Schwenk

**LEEDSHILL-HERKENHOFF, INC.**

500 Copper Avenue N.W.

P. O. Box 1217

Albuquerque, New Mexico 87103

(505) 247-0294

1178-9047.11-90

August 1, 1990

Fred Aguirre, PE
Hydrologist
Public Works Department
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

**RE: USPS - AIRPORT MAIL FACILITY
ALBUQUERQUE, NEW MEXICO
SITE DEVELOPMENT PLAN**

In accordance with your request, enclosed is the approval sheet for your signature and that of the DRB Chairman.

Please let me know if you have any questions or comments.

DAVID KLEIN, AIA
Project Manager

cg

Enclosure

PRE-DESIGN CONFERENCE

APPROVAL REQUESTED:	<u> </u>	PRELIMINARY PLAT	<u> </u>	FINAL PLAT
	<u> X </u>	SITE DEVELOPMENT PLAN	<u> X </u>	BUILDING PERMIT
		GRADING/PAVING PERMIT		OTHER

FRED J. NGUIRRI
SITE PLAN SIGN-OFF: COMPLIANT AMENDED INFRASTRUCTURE LIST DATED 7/24/90
~~5. SP. TRAIL AT THE DR. J. P. ...~~

BUILDING PERMIT SIGN-OFF REQUIREMENTS:

- SIGNED: Frank J. [Signature]
TITLE: _____
DATE: 7/25/90

SIGNED: Donald W. Korten M-C
TITLE: _____
DATE: 7/25/90 7/25/90

****NOTE** PLEASE PROVIDE A COPY OF THIS PRE-DESIGN FORM WITH THE DRAINAGE SUBMITTAL.**



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

July 10, 1990

Daniel Klein
Leedshill-Herkenhoff, Inc.
500 Copper Avenue, NW
Albuquerque, New Mexico 87102

RE: DRAINAGE PLAN/REPORT FOR THE POSTAL FACILITY LOCATED @
THE ALBUQUERQUE INTERNATIONAL AIRPORT (M-15/D27)
RECEIVED JULY 3, 1990

Dear Mr. Klein:

I have reviewed the original submittal along with the revised submittal and have the following comments:

1. Offsite flows that Mr. Reeder identifies on his January 31, 1990 letter to Mr. Aamot are still not addressed on the most recent submittal. You must indicate at what points the offsite flows enter the proposed site along with the quantities and how they are going to be handled.
2. Item of concern identified on Mr. Reeder's March 5, 1990 letter pertaining to sizing of the storm drains to handle the offsite flows which should have been addressed after Mr. Reeder's January 31, 1990 letter.
3. You must identify offsite flows from Areas B, A1, A2, and E1. Then it must be determined if the proposed and existing pipes will handle the additional offsite flows. Show all calculations.

If I can be of further assistance, please feel free to call me at 768-2650.

Cordially,

Fred J. Aguirre
for Fred J. Aguirre, P.E.
Hydrologist

BJM:FJA/bsj
(WP+1530)

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

AN EQUAL OPPORTUNITY EMPLOYER

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Postal Facility ZONE ATLAS/DRAINAGE FILE # M-15

LEGAL DESCRIPTION: _____

CITY ADDRESS: Albuquerque Airport - George St.ENGINEERING FIRM: Leedsill-Herkenhoff, Inc. CONTACT: David KleinADDRESS: 500 Copper Ave. NW PHONE: 247-0294OWNER: City of AlbuquerqueCONTACT: Dennis Parker
Aviation Dept.ADDRESS: Aviation Dept. PHONE: 842-4366ARCHITECT: Leedsill-Herkenhoff, Inc.CONTACT: David KleinADDRESS: 500 Copper Ave. NWPHONE: 247-0294SURVEYOR: Melgen-CorbinCONTACT: Greg ByresADDRESS: 2701 Malen Rd. SWPHONE: 242-5700CONTRACTOR: N/A

CONTACT: _____

ADDRESS: _____

PHONE: _____

PRE-DESIGN MEETING:

☐ YES☐ NO☒ COPY OF CONFERENCE
RECAP SHEET PROVIDEDDRB NO. 89-549

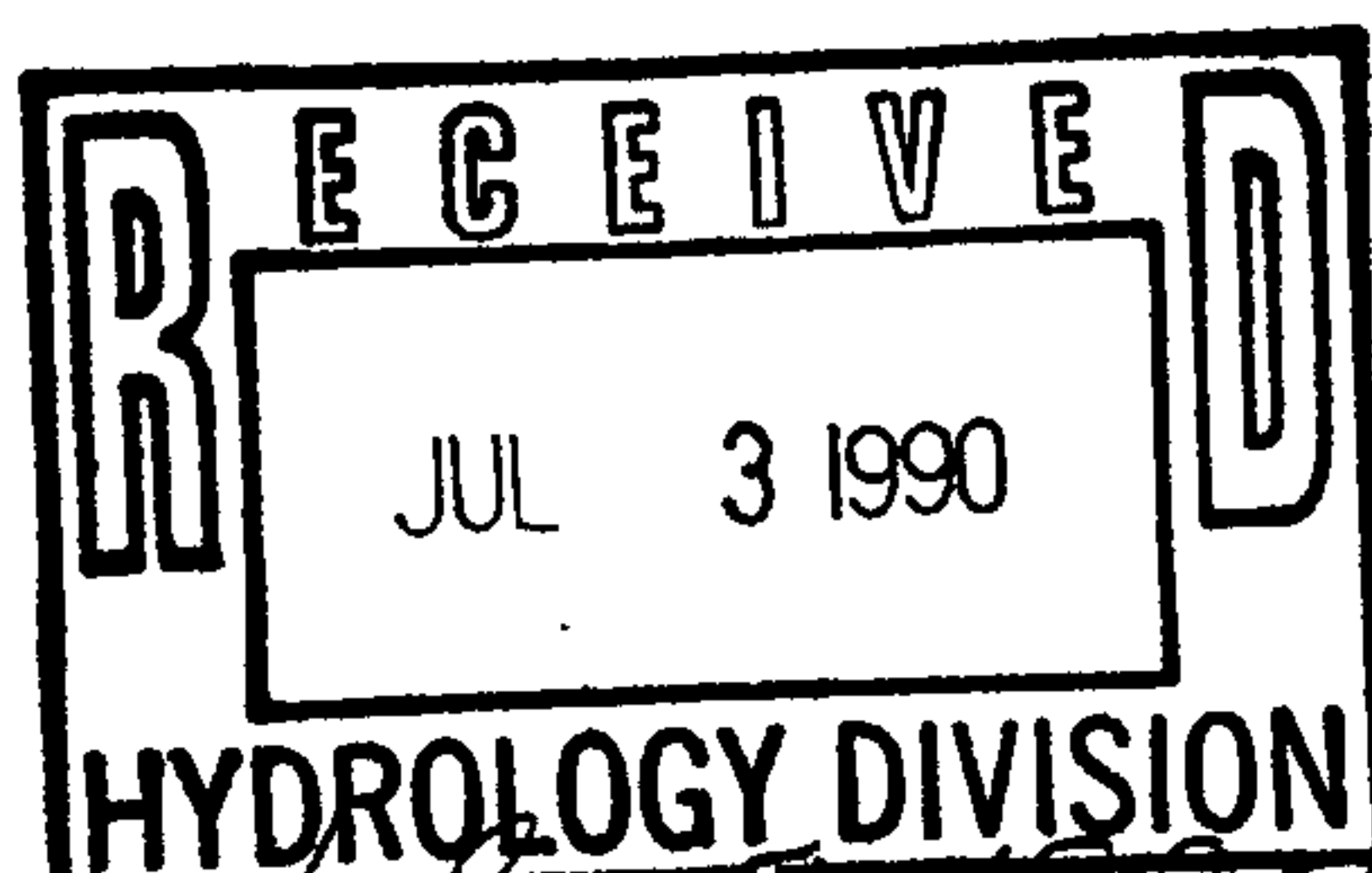
EPC NO. _____

PROJECT NO. C.O.A. Project No.
CIP 3372.91

TYPE OF SUBMITTAL:

☒ DRAINAGE REPORT☐ DRAINAGE PLAN☐ CONCEPTUAL GRADING & DRAIN PLAN☒ GRADING PLAN☐ EROSION CONTROL PLAN☐ ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL SOUGHT:

☐ SECTOR PLAN APPROVAL☐ SKETCH PLAT APPROVAL☐ PRELIMINARY PLAT APPROVAL☐ SITE DEVELOPMENT PLAN APPROVAL☐ FINAL PLAT APPROVAL☒ BUILDING PERMIT APPROVAL☐ FOUNDATION PERMIT APPROVAL☐ CERTIFICATE OF OCCUPANCY
APPROVAL☐ ROUGH GRADING PERMIT APPROVAL☐ GRADING/PAVING PERMIT APPROVAL☐ OTHER _____ (SPECIFY).DATE SUBMITTED: July 3, 1990BY: David Klein

FILE COPY



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

March 5, 1990

Thornton Schwenk, P.E.
Molzen-Corbin & Associates
2701 Miles Road, S.E.
Albuquerque, NM 87106

RE: THE POSTAL FACILITY LOCATED AT THE ALBUQUERQUE
INTERNATIONAL AIRPORT (COA PROJECT NO. CIP 3372.91)
(M-15/D27)

Dear Mr. Schwenk,

This letter is to confirm the status of the project referred to above.

Building Permit sign-off by the Hydrology Section will require the offsite basins which contribute flows to this area to be identified on a topographical drawing, the contributing flows quantified, and the Final Report certified by a Professional Engineer that it was prepared by him or under his immediate supervision, per previous correspondence dated January 2, and January 31, 1990.

As the Aviation Department has assumed maintenance responsibility for the area downstream of the site, and plans to landscape it within the next year or two, an asphalt or concrete lined channel from the storm drain outlet to the inlet at Yale Boulevard will not be necessary.

The Work Order drawings have been signed with the assurances of Mr. Greg Byres that the storm drains are sized properly to handle the offsite flows. After a telephone conversation with Mr. Byres last week, I realized that he was under the impression that all of the required information was contained in the report. It is not, and I thought I should communicate this to your office prior to your request for Building Permit.

If you have any questions, please call me at 768-2650.

Cordially,

Stuart Reeder

G. Stuart Reeder, P.E.
C.E./Hydrology Section

WP+1530

C I T Y O F A L B U Q U E R Q U E

ALBUQUERQUE, NEW MEXICO

INTER-OFFICE CORRESPONDENCE

REF. NO.: WPHYD 1530

February 6, 1990

TO: File M-15/D27

FROM: Stuart Reeder

SUBJECT: Telephone Conversation

Andre pointed out that the crossing structure at University Blvd. was City maintained and, with concentrated flows coming down that steep slope, would silt in after any rain storm large enough to have any runoff.

I called Greg Byres, of Molzen-Corbin, this morning and told him that the project would require, at the minimum, an asphalt rundown to the pipe entrance.

FILE COPY



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 31, 1989

Hans H. Coucheron-Aamot, P.E.
Molzen-Corbin & Associates
2701 Miles Road, S.E.
Albuquerque, New Mexico 87106

RE: CONCEPTUAL DRAINAGE REPORT FOR THE POSTAL FACILITY LOCATED
AT THE ALBUQUERQUE INTERNATIONAL AIRPORT, SUBMITTED
JANUARY 10, 1989, FOR SITE DEVELOPMENT PLAN APPROVAL (DRB
89-549) (M-15/D27)

Dear Mr. Coucheron-Aamot

Your submittal, referred to above, with your engineer's stamp dated 1-9-90, is approved for site development plan sign-off by the Hydrology Section.

For building permit sign-off, kindly provide the following information:

1. a completed Exhibit B which shows the offsite basin(s); from the contours shown on Exhibit C, Areas B, A1, A2, and E1 all appear to receive some offsite flows. These flows should be quantified. Page 1 of the report is vague as to how the areas east of the site drain.
2. a certified, stamped, signed and dated report. The plans were sealed, but the report was not.

I believe that the discharge from the rip-rap energy dissipator will be erosive. The downstream slope is as high as 10.9%, and averages almost 7% overall. If the Aviation Department understands that it is acquiring maintenance responsibilities in that area and is willing to assume them, our office has no problem with this approach. If they wish for the project to be relatively maintenance free, however, I recommend that you consider an asphalt rundown from the rip-rap basin to the concrete basin.

If you have any questions, or if I can be of any assistance, please call me at 768-2650.

Cordially,

Stuart Reeder
G. Stuart Reeder, P.E.
C.E./Hydrology

xc: Bob Gill, Aviation Dept., COA
David Klien, Leedshill-Herkenhoff

GSR

(wp+1530)

AN EQUAL OPPORTUNITY EMPLOYER

THE

[illegible]

DESCRIPTION

VALUE

1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636 2637 2638 2639 2640 2641 2642 2643 2644 2645 2646 2647 2648 2649 2650 2651 2652 2653 2654 2655 2656 2657 2658 2659 2660 2661 2662 2663 2664 2665 2666 2667 2668 2669 2670 2671 2672 2673 2674 2675 2676 2677 2678 2679 2680 2681 2682 2683 2684 2685 2686 2687 2688 2689 2690 2691 2692 2693 2694 2695 2696 2697 2698 2699 2700 2701 2702 2703 2704 2705 2706 2707 2708 2709 2710 2711 2712 2713 2714 2715 2716 2717 2718 2719 2720 2721 2722 2723 2724 2725 2726 2727 2728 2729 2730 2731 2732 2733 2734 2735 2736 2737 2738 2739 2740 2741 2742 2743 2744 2745 2746 2747 2748 2749 2750 2751 2752 2753 2754 2755 2756 2757 2758 2759 2760 2761 2762 2763 2764 2765 2766 2767 2768 2769 2770 2771 2772 2773 2774 2775 2776 2777 2778 2779 2780 2781 2782 2783 2784 2785 2786 2787 2788 2789 2790 2791 2

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
--------------------	----------------------------	---------------------------------	-------------------	-------------------------	---------------------------	----------------------------	-----------------------------

[illegible]

BANK SLOPE: $\frac{5300 - 5203}{1400} = 6.9\%$ AVG. SLOPE

$\frac{5300 - 5240}{550} = 10.9\%$ WORST SLOPE

w/ K= 7.0-13.5 GRASS & LANDSCAPING
10.0-19.5 BARE GROUND

	$S = 6.9\%$	$S = 10.9\%$
K	V_{FPS}	V_{FPS}
7	1.8	2.3
10	2.4	3.3
13.5	3.5	4.5
19.5	5.1	6.4

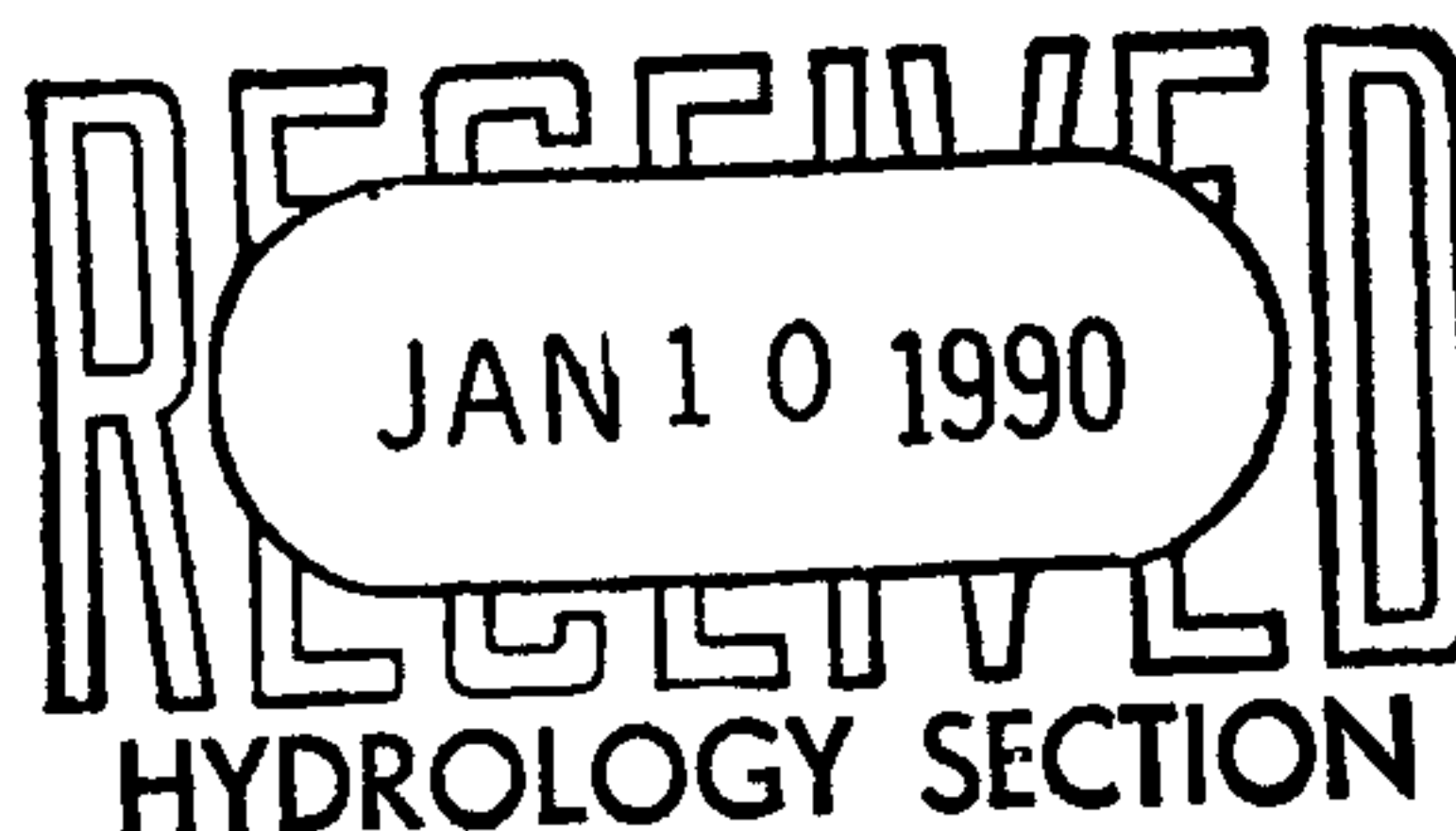
PROJECT TITLE Post Office Site TYPE OF SUBMITTAL Drainage Report
ZONE ATLAS PAGE NO. M-15 CITY ADDRESS George Rd. Albuquerque International Airport
LEGAL DESCRIPTION Tract A1, Municipal Addition No. 9
ENGINEERING FIRM Molzen-Corbin & Associates CONTACT Greg Byres
ADDRESS 2701 Miles Rd. PHONE 242-5700
OWNER City of Albuquerque, Aviation Div. CONTACT Bob Gill
ADDRESS Albuquerque International PHONE 842-4366
ARCHITECT Leedshill-Herkenhoff CONTACT David Kline
ADDRESS Copper Square PHONE 247-0294
SURVEYOR _____ CONTACT _____
ADDRESS _____ PHONE _____
CONTRACTOR _____ CONTACT _____
ADDRESS _____ PHONE _____

PRE-DESIGN MEETING:

☒ YES
☐ NO
☐ COPY OF CONFERENCE RECAP SHEET PROVIDED

PLEASE CHECK TYPE OF APPROVAL EXPECTED WITH THIS SUBMITTAL:

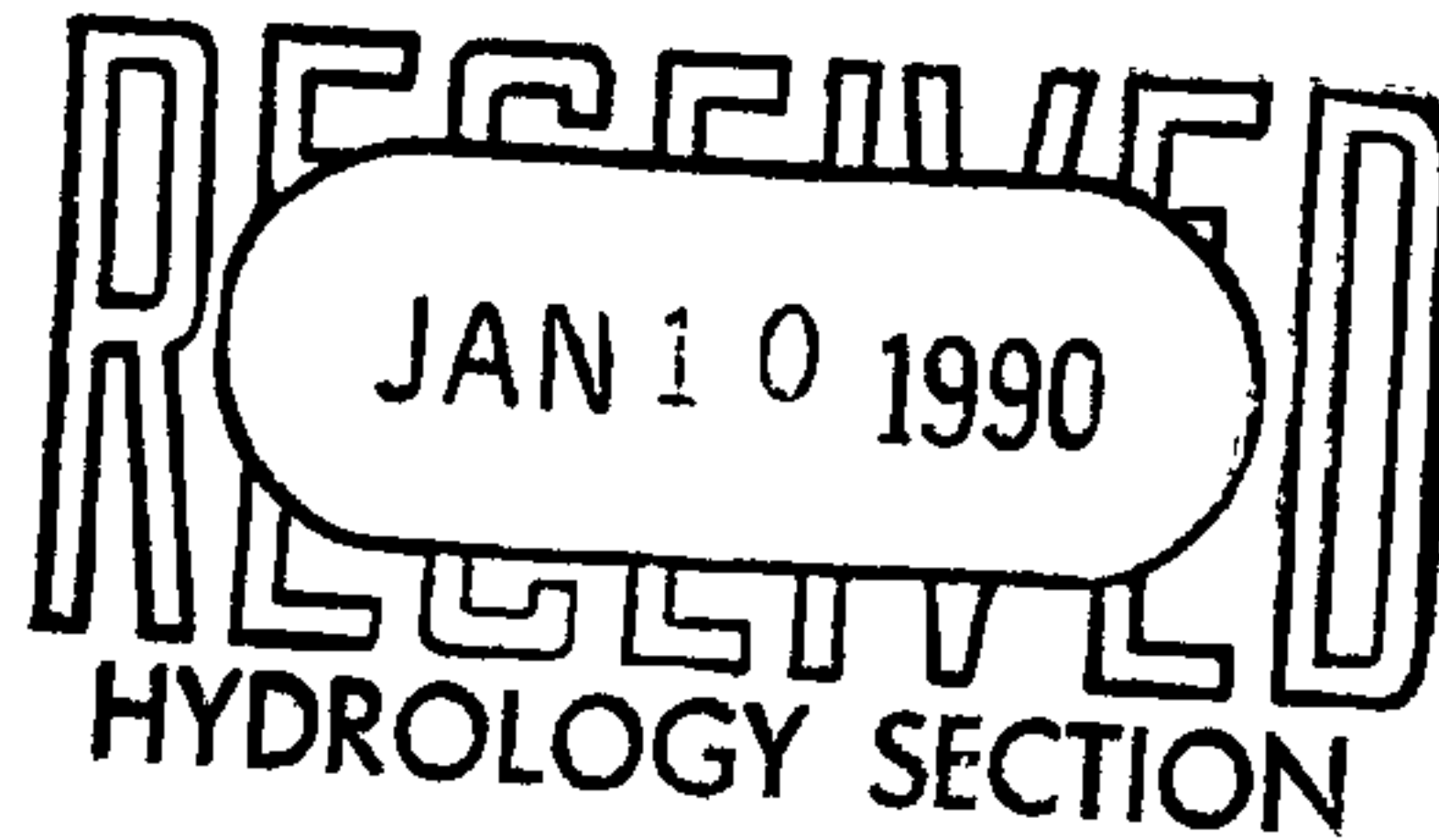
☐ SKETCH PLAT APPROVAL
☐ PRELIMINARY PLAT APPROVAL
☒ SITE DEVELOPMENT PLAN APPROVAL
☐ FINAL PLAT APPROVAL
☐ BUILDING PERMIT APPROVAL
☐ CERTIFICATE OF OCCUPANCY APPROVAL
☐ ROUGH GRADING PERMIT APPROVAL
☐ GRADING/PAVING PERMIT APPROVAL
☐ OTHER _____ (SPECIFY)

DATE SUBMITTED: 1/10/90BY: Molzen-Corbin & Associates



January 9, 1990

Mr. G. Stuart Reeder, P.E.
Hydrology Division
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103



**RE: Conceptual Drainage Report for the Postal
Facility Located at Albuquerque
International Airport**

ABQ62-13 D03

Dear Mr. Reeder:

Enclosed is a resubmittal of the conceptual drainage report for the above-mentioned project. The comments you forwarded to Mr. Kent Freier on January 2, 1990 have been dealt with in this latest submittal. Along with your comments, additional comments from Mr. Clifford E. Anderson of AMAFCA have also been incorporated into this submittal.

The following is a brief discussion of each of the comments:

1. The 36" storm drain crosses the site from east to west. There are two catch basins and one manhole along this line. The line was installed around 1986. This line will be completely removed and replaced with an 18" RCP line. The 18" line will handle the flow due to the change in topography of the tributaries. The 18" line will only pick up a fraction of the area that the 36" storm drain was designed for.
2. The offsite flows both overland and in the existing storm drain system are shown in the analysis. The information on the existing 24" storm drain was obtained from the building plans for the Provisioning Building, Project No. 8666 by BPLW, dated March 1988.
3. An additional section was added to the report for Erosion Control. All slopes related to this project will be protected from runoff by a curb at the shoulder of each slope. The only runoff will be the water that lands on the slope and does not permeate the surface.
4. The runoff analysis for the existing site was recalculated in this latest submittal. See submittal for calculations.
5. It was determined that the discharge from the proposed storm drain system was erosive. Therefore, a riprap energy basin was designed for the discharge instead of the previously designed discharge structure. See the submittal for calculations.

Mr. G. Stuart Reeder, P.E.
January 9, 1990
Page 2

6. With the use of the riprap energy basin, the water velocity can be reduced to a non-erosive velocity. Storm water leaving the energy basin will sheet flow in a westerly direction along the existing flow circuits.
7. Between the discharge structure and University Boulevard, the water sheet flows along the surface. On the east side of University Boulevard there is a holding basin with a concrete spillway for controlled discharge. Crossing University Boulevard is a 52" RCP that opens into a developed arroyo. This arroyo flows in a westerly direction to the South Diversion Channel.

AMAFCA Comments, January 2, 1990:

1. The latest submittal has been certified by Mr. Hans H. Coucheron-Aamot, P.E.
2. The runoff analysis for existing conditions has been recalculated in this latest submittal. There is asphalt paving throughout the site. This paving has become deteriorated with the traffic caused by construction crews when the site was used as a holding area for the contractors working on the airport terminal. There is, in fact, a holding basin and spillway directly below the site. This facility should handle the 10 percent increase in runoff from the site. Lastly, there is no private property between the site and the developed arroyo east of University Boulevard. All parcels adjacent to the site are owned by the City of Albuquerque and maintained by the Aviation Division.
3. A riprap energy basin has been designed in lieu of the discharge structure previously submitted. Water leaving this basin will be travelling at a non-erosive velocity.

Thank you for your time and consideration of this matter. If you have any questions, or need additional information, please contact me at 242-5700.

Sincerely,

MOLZEN-CORBIN & ASSOCIATES



Greg Byres

GB:dh
Enclosure



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 2, 1989

KEN SCHULTZ
MAYOR

Kent S Freier, P.E.
Molzen-Corbin & Associates
2701 Miles Road, S.E.
Albuquerque, NM 87106

RE: CONCEPTUAL DRAINAGE REPORT FOR THE POSTAL FACILITY LOCATED
AT THE ALBUQUERQUE INTERNATIONAL AIRPORT, SUBMITTED
DECEMBER 11, 1989, FOR SITE DEVELOPMENT PLAN APPROVAL (DRB
89-549) (M-15/D27)

Dear Mr. Freier,

I have reviewed your submittal, referred to above, and have the following comments:

1. The contractor is authorized to proceed with the excavation, removal of the old landfill debris, and rough grading of the site. Prior to any excavation, the contractor will need to secure a Topsoil Disturbance Permit from the Environmental Health Department.
2. On page one of the report, you refer to an existing 36" storm sewer which has two catch basins and one manhole, and to an existing 24" storm drain located on the east side of the site, both of which are said to be shown on Exhibit B. Exhibit B, however, shows an existing 24" storm sewer located along the south boundary, and an "existing 8" line" coming into the site from the east to existing catch basin C7, eventually joining a proposed 18" storm sewer. Further, none of these facilities are shown on the current drainage facilities map. Please verify the existence and location of these facilities, whether private or public, and correct the report.

Exhibit "G" shows the 36" line, but it is not clear how the proposed 18" line (shown on "B") will carry the flow of the 36", and whether the 36" line is to be abandoned, as it appears to run under a proposed building.

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

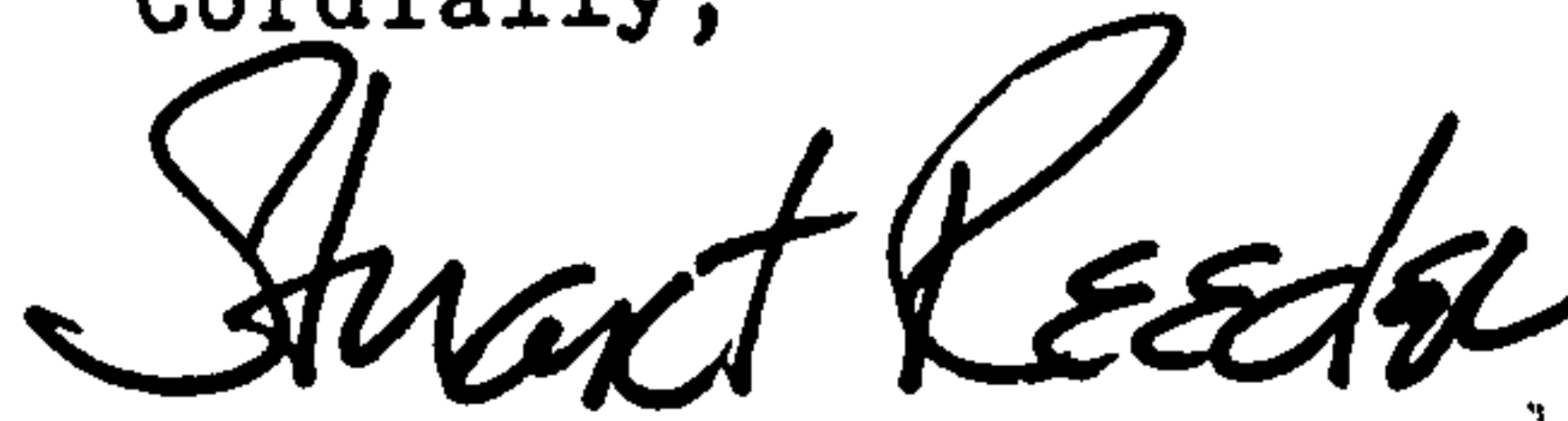
AN EQUAL OPPORTUNITY EMPLOYER

Kent S Freier, P.E.
January 2, 1989
page 2

3. Please address the offsite flows which affect this site, both overland and in the storm drain systems.
4. When slopes exceed three feet in height, we require that the maximum slope not be greater than 3:1, unless the slope is protected from erosion and failure through City Engineer approved means (DPM Ch. 22.5.A). Proposed slopes on the west side of the new access road appear to meet this criterion, but should be called out on the drawing as 3:1 maximum. Proposed slopes on the east side of the access road appear to be 2:1. Please indicate how you intend for the contractor or landscape architect to stabilize this slope.
5. The runoff analysis for the existing site is for an area of 347,130 square feet. The runoff analysis for the proposed site is for an area of 391,025 square feet. It is not clear from the Exhibits G and B which area(s) were added or deleted.
6. Please provide calculations to show that a cutoff wall is not necessary for the discharge structure shown on Exhibit B.
7. Please provide either calculations to show that the velocity downstream of the discharge structure is non-erosive, or your proposal to protect that area from washing out.
8. How will drainage from this site cross University Boulevard to get to the South Diversion Channel ?

If you have any questions, or if I can be of any assistance, please call me at 768-2650.

Cordially,



G. Stuart Reeder, P.E.
C.E./Hydrology

January 2, 1990



Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

2600 PROSPECT N.E. - ALBUQUERQUE, N.M. 8710
TELEPHONE (505) 884-2219

To: Fred Aguirre, Hydrologist
Public Works Dept.
City of Albuquerque

Sheet 1 of 2

From: Clifford E. Anderson, Drainage Engineer
AMAFCA *Cliff E. Anderson*

Re: DRB-89-410 Conceptual Drainage Report
and Submittal for Site Development Plan
Approval for the Postal Facility Located at
the Albuquerque International Airport. by
Molzen-Corbin & Associates (M-15).

The area described in this report is
subject to AMAFCA's Drainage Policy (Resolution
No. 1980-15). We anticipate that the City
will take the lead in reviewing this drainage
report in accordance with the City/AMAFCA
Designee Agreement. The following are AMAFCA's
comments on the report:

- a. The drainage report and drainage plan
should be certified by a registered
professional engineer. Personal inspection
of the site and a statement on the
accuracy of existing contours are included
on AMAFCA's certification requirements.

DKB-89-710
January 2, 1990
Sheet 2 of 2

6. The analysis of existing conditions indicates that most of the site

is impervious to infiltration ($C=0.95$

and $CN=98$). The "Existing Site, Existing and Proposed Utilities" map (Sheet C-6 of 9) indicates that on a small portion of

the site is existing asphalt paving.

It does not appear that the existing

conditions analysis is an accurate reflection of the existing conditions map. The

existing condition analysis is used to

justify a free discharge for developed

conditions. There are no constructed facilities

immediately downstream of this project and

increased flows (frequency and quantity) could

damage private property downstream.

c.

The drainage plan proposes to collect

storm water in a storm sewer and

discharge it at a point west of the

site. The outlet velocities appear to

be erosive at this location. No protection

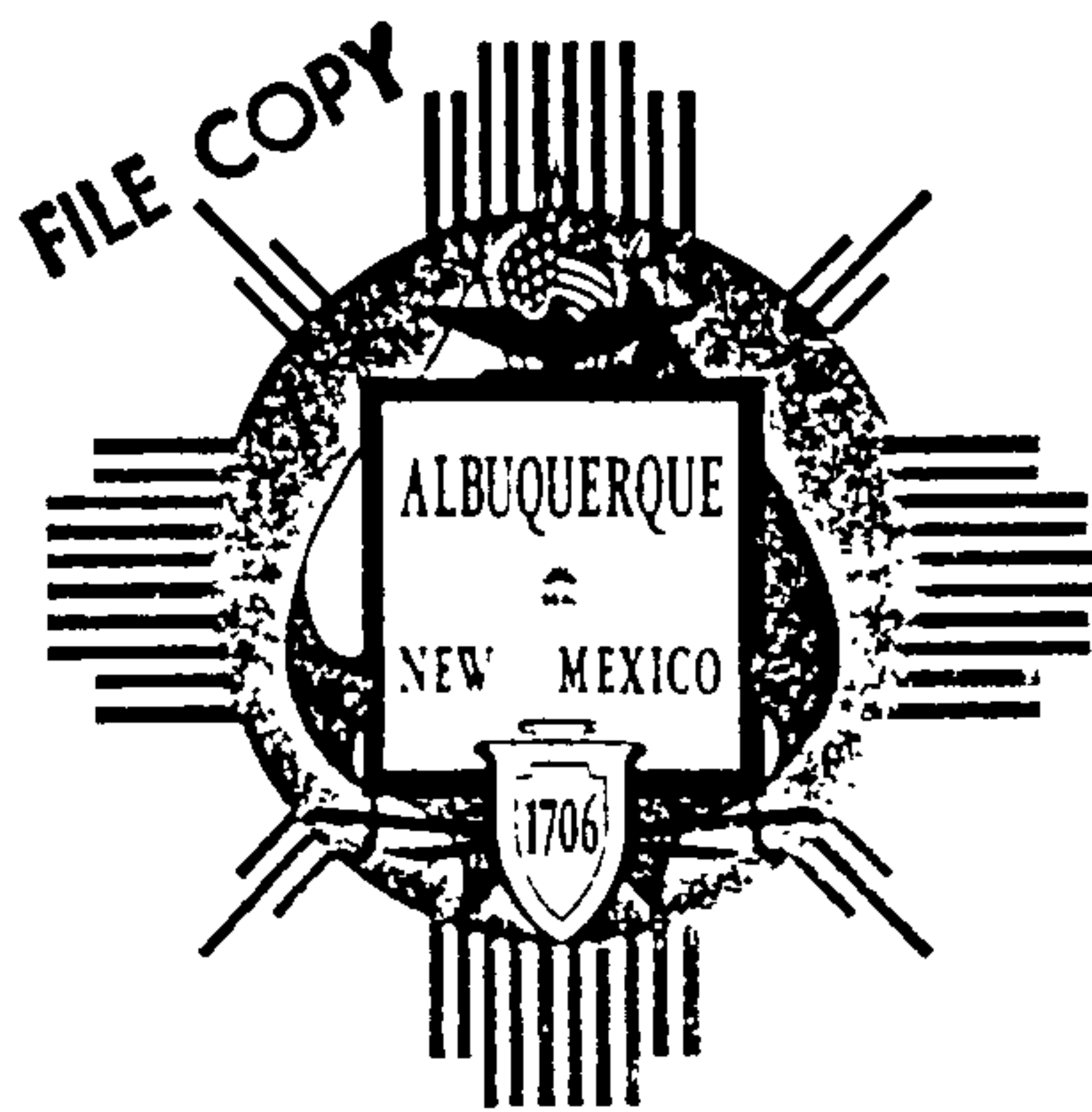
of the outlet structure or downstream

channel is proposed on the plan. It is

not clear that this concentration of flows

will not damage downstream property.

Copy to: Moizen - Corbin & Assoc., 2701 Niles Rd., Alhambra, 87106



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

January 2, 1989

KEN SCHULTZ
MAYOR

Kent S Freier, P.E.
Molzen-Corbin & Associates
2701 Miles Road, S.E.
Albuquerque, NM 87106

RE: CONCEPTUAL DRAINAGE REPORT FOR THE POSTAL FACILITY LOCATED
AT THE ALBUQUERQUE INTERNATIONAL AIRPORT, SUBMITTED
DECEMBER 11, 1989, FOR SITE DEVELOPMENT PLAN APPROVAL (DRB
89-549) (M-15/D27)

Dear Mr. Freier,

I have reviewed your submittal, referred to above, and have the following comments:

1. The contractor is authorized to proceed with the excavation, removal of the old landfill debris, and rough grading of the site. Prior to any excavation, the contractor will need to secure a Topsoil Disturbance Permit from the Environmental Health Department.
2. On page one of the report, you refer to an existing 36" storm sewer which has two catch basins and one manhole, and to an existing 24" storm drain located on the east side of the site, both of which are said to be shown on Exhibit B. Exhibit B, however, shows an existing 24" storm sewer located along the south boundary, and an "existing 8" line" coming into the site from the east to existing catch basin C7, eventually joining a proposed 18" storm sewer. Further, none of these facilities are shown on the current drainage facilities map. Please verify the existence and location of these facilities, whether private or public, and correct the report.

Exhibit "G" shows the 36" line, but it is not clear how the proposed 18" line (shown on "B") will carry the flow of the 36", and whether the 36" line is to be abandoned, as it appears to run under a proposed building.

PUBLIC WORKS DEPARTMENT

Walter H. Nickerson, Jr., P.E.
Assistant Director Public Works

ENGINEERING GROUP

Telephone (505) 768-2500

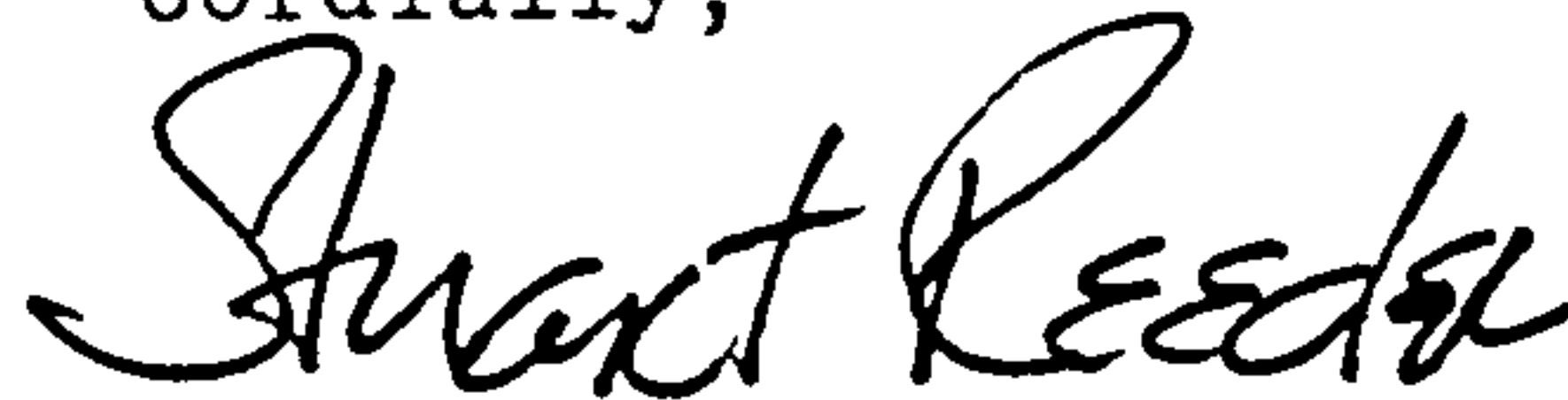
AN EQUAL OPPORTUNITY EMPLOYER

Kent S Freier, P.E.
January 2, 1989
page 2

3. Please address the offsite flows which affect this site, both overland and in the storm drain systems.
4. When slopes exceed three feet in height, we require that the maximum slope not be greater than 3:1, unless the slope is protected from erosion and failure through City Engineer approved means (DPM Ch. 22.5.A). Proposed slopes on the west side of the new access road appear to meet this criterion, but should be called out on the drawing as 3:1 maximum. Proposed slopes on the east side of the access road appear to be 2:1. Please indicate how you intend for the contractor or landscape architect to stabilize this slope.
5. The runoff analysis for the existing site is for an area of 347,130 square feet. The runoff analysis for the proposed site is for an area of 391,025 square feet. It is not clear from the Exhibits G and B which area(s) were added or deleted.
6. Please provide calculations to show that a cutoff wall is not necessary for the discharge structure shown on Exhibit B.
7. Please provide either calculations to show that the velocity downstream of the discharge structure is non-erosive, or your proposal to protect that area from washing out.
8. How will drainage from this site cross University Boulevard to get to the South Diversion Channel ?

If you have any questions, or if I can be of any assistance, please call me at 768-2650.

Cordially,



G. Stuart Reeder, P.E.
C.E./Hydrology

DRAINAGE INFORMATION SHEET

PROJECT TITLE: Post Office Site ZONE ATLAS/DRAINAGE FILE # M-15 1027

LEGAL DESCRIPTION: Tract A Municipal Addition No. 9

CITY ADDRESS: George Rd.

ENGINEERING FIRM: Molzen-Corbin & Associates CONTACT: Greg Byres

ADDRESS: 2701 Miles Rd. PHONE: 242-5700

OWNER: City Of Albuquerque, =NM CONTACT: Bob Gill

ADDRESS: Albuquerque International Airport PHONE: 842-4366

ARCHITECT: Leedshill-Herkenhoff CONTACT: David Klien

ADDRESS: 500 Copper Ave. PHONE: 247-0294

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

PRE-DESIGN MEETING:

☒ YES Copy Attached

☐ NO

☐ COPY OF CONFERENCE
RECAP SHEET PROVIDED

DRB NO. 89-549

EPC NO. _____

PROJECT NO. _____

TYPE OF SUBMITTAL:

☒ DRAINAGE REPORT

☐ DRAINAGE PLAN

☐ CONCEPTUAL GRADING & DRAIN PLAN

☐ GRADING PLAN

☐ EROSION CONTROL PLAN

☐ ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL SOUGHT:

☐ SECTOR PLAN APPROVAL

☐ SKETCH PLAT APPROVAL

☐ PRELIMINARY PLAT APPROVAL

☒ SITE DEVELOPMENT PLAN APPROVAL

☐ FINAL PLAT APPROVAL

☐ BUILDING PERMIT APPROVAL

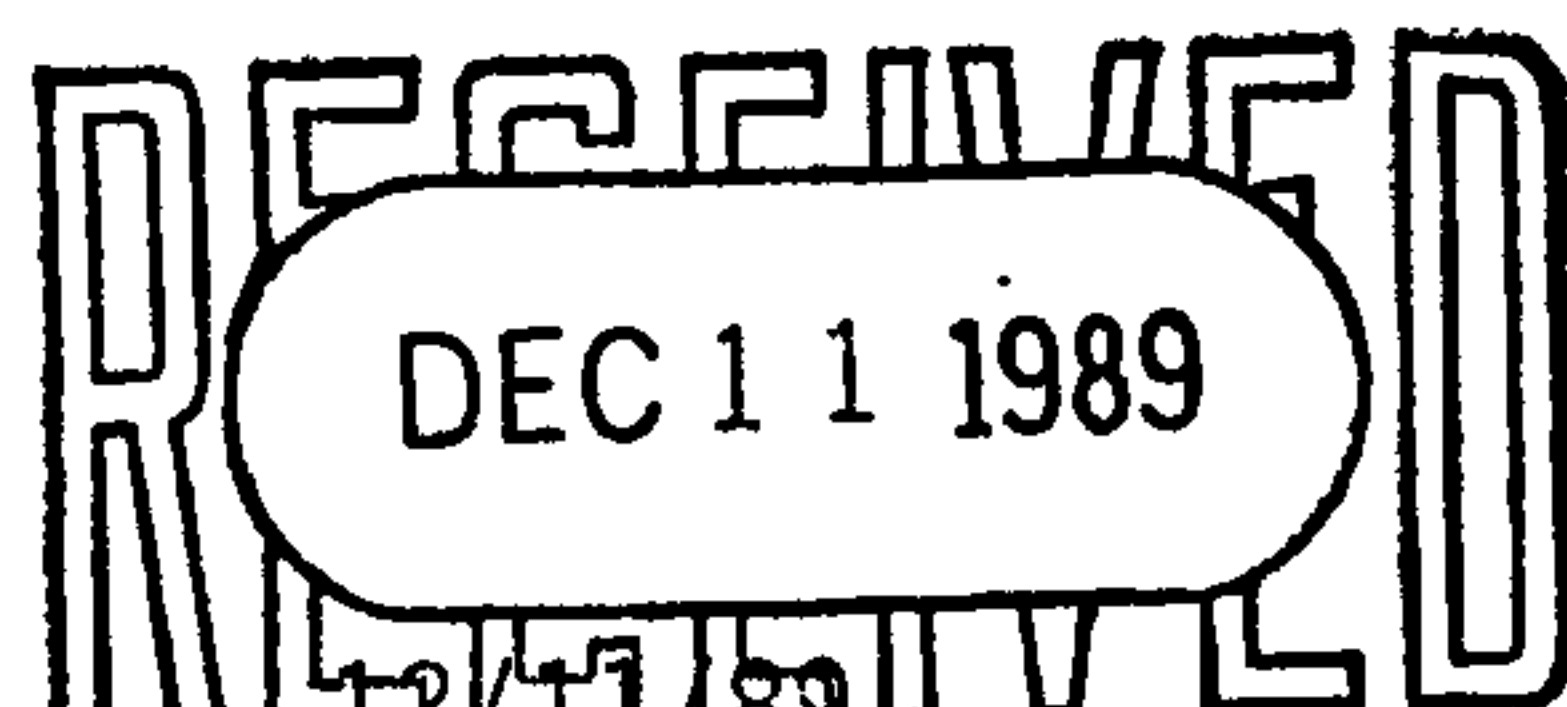
☐ FOUNDATION PERMIT APPROVAL

☐ CERTIFICATE OF OCCUPANCY
APPROVAL

☐ ROUGH GRADING PERMIT APPROVAL

☐ GRADING/PAVING PERMIT APPROVAL

☐ OTHER _____ (SPECIFY)



DATE SUBMITTED: 12/11/89 HYDROLOGY SECTION

BY: Molzen-Corbin & Associates

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
UTILITY DEVELOPMENT DIVISION/HYDROLOGY SECTION

PRE-DESIGN CONFERENCE

DRAINAGE FILE/ZONE ATLAS PAGE NO.: M-15 DATE: September 14, 1989
EPC NO.: _____ DRB NO.: _____ ZONE: _____
SUBJECT: U.S. Postal Service
STREET ADDRESS: Albuquerque Airport: George Street
LEGAL DESCRIPTION: _____

APPROVAL REQUESTED: _____ PRELIMINARY PLAT _____ FINAL PLAT
_____ SITE DEVELOPMENT PLAN X BUILDING PERMIT
_____ GRADING/PAVING PERMIT X OTHER
Work Order

WHO REPRESENTING
ATTENDANCE: Stuart Reeder City of Albuquerque

FINDINGS:

This area has been analysed, both as to existing and (future) developed conditions in
Restudy of the Albuquerque Master Drainage Study, Volume II, 1987, by Bohannon-Huston,
Inc.

The Drainage Report for this area should make use of the AMDS update, and identify:

- the entire drainage basin;
- any and all offsite flows which enter the basin and particularly this site;
- the downstream capacity of the facilities conveying storm runoff to the south
diversion channel; and,
- the necessity for ponding (free discharge is to be preferred where it is practi-
cable).

Consideration must be given to the underlying strata when ponding - ponding over an
area of landfill is not acceptable due to the potential for groundwater contamination.

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: G. S. Reeder SIGNED: _____
TITLE: CE / Hydrology Div. TITLE: _____
DATE: 15 SEP 89 DATE: _____

****NOTE**** PLEASE PROVIDE A COPY OF THIS PRE-DESIGN FORM WITH THE DRAINAGE SUBMITTAL.