A10/D2

0000 0000 0125

A10/D2

25×10

0000 0000 0126

FILE COPY

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

MAYOR
KEN SCHULTZ

CHIEF ADMINISTRATIVE OFFICER
GENE ROMO

DEPUTY CAO PUBLIC SERVICES
FRANK MARTINEZ

DEPUTY CAO PLANNING/DEVELOPMENT
BILL MUELLER

January 27, 1988

Dorothy Chavez-Dolan
Tierra Engineering Consultants
105 Sixth Street, SW
Albuquerque, New Mexico 87102

RE: DRAINAGE PLAN FOR PARADISE HEIGHTS, RECEIVED JANUARY 18, 1988 FOR MASTER PLAN APPROVAL (A-10/D2)

Dear Dorothy:

The above referenced submittal, revised January 15, 1988 is approved as the Master Drainage Plan to be followed by subsequent development plans. Any requirements by AMAFCA must also be incorporated in future plans.

If Basins J, L1 or L2 develop prior to downstream infrastructures such as streets and storm drains being in place, then an interim plan will be required.

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

Cordially,

Roger A. Green PE

Roger A. Green, P.E.
C.E./Hydrology Section

xc: Dan Sabo, AMAFCA
Marshall Cross, BCD

RAG/bsj

AN EQUAL OPPORTUNITY EMPLOYER

25×10

0000 0000 0127

TIERRA ENGINEERING CONSULTANTS, INC.

CIVIL AND SOILS ENGINEERING
LAND SURVEYS AND DEVELOPMENTS

DRAINAGE PLAN
FOR
PARADISE HEIGHTS

OCTOBER 1987

PREPARED BY: TIERRA ENGINEERING CONSULTANTS, INC.

SPONSOR: BELLAMAH COMMUNITY DEVELOPMENT
ALBUQUERQUE, NEW MEXICO
(505) 884-6606

RECEIVED
JAN 18 1988
HYDROLOGY SECTION

RICHARD CATANACH P.E.

REV. 1-15-88

632 PASEO DE PERALTA SANTA FE, NEW MEXICO 87501 505/982-2845
105 6TH STREET SW ALBUQUERQUE, NEW MEXICO 87102 505/242-2270

25×

0000 0000 0128

DRAINAGE INFORMATION SHEET

A10/D2

PROJECT TITLE: Drainage Plan Paradise Heights ZONE ATLAS/DRNG. FILE #: A-10 & A-11

LEGAL DESCRIPTION: Tract A, Units Three, Four, Five & Six

CITY ADDRESS: North of Calabacillas Arroyo, West of proposed Unser Blvd

ENGINEERING FIRM: Tierra Engineering Consultants CONTACT: Dorothy Chavez-Dolan

ADDRESS: 105 6th Street S.W. Suite 202 PHONE: 242-2280

OWNER: Bellamah Community Development CONTACT: Marshall Cross

ADDRESS: P.O. Box 3300, Albuq, NM 87190 PHONE: 884-6606

ARCHITECT: N/A CONTACT: N/A

ADDRESS: PHONE:

SURVEYOR: N/A CONTACT: N/A

ADDRESS: PHONE:

CONTRACTOR: N/A CONTACT: N/A

ADDRESS: PHONE:

PRE-DESIGN MEETING:

X YES

__ NO

X COPY OF CONFERENCE RECAP SHEET PROVIDED

DRB NO.

EPC NO.

PROJ. NO.

RECEIVED JAN 18 1988 HYDROLOGY SECTION

TYPE OF SUBMITTAL:

__ DRAINAGE REPORT

__ DRAINAGE PLAN

X CONCEPTUAL GRADING & DRAINAGE PLAN

__ GRADING PLAN

__ EROSION CONTROL PLAN

__ ENGINEER'S CERTIFICATION

CHECK TYPE OF APPROVAL SOUGHT:

__ 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

X OTHER _____ (SPECIFY)

DATE SUBMITTED: Jan. 18, 1988

BY: Dorothy Chavez-Dolan

25 × 10

0000 0000 0 124

TABLE OF CONTENTS

		Page
I	Introduction	1
II	Site Description	1
III	Analysis Procedure	2
IV	The Calabacillas Arroyo	4
V	Drainage Basins	4
VI	Discharge into the Calabacillas	6
VII	Temporary Erosion Control	6

TABLES

1	Fractions Impervious
2	Hydrological Flow Parameters
3	Street Flow Characteristics
4	Temporary Desiltation Pond Sizing

PLATES

1	Vicinity Map
2	Offsite Drainage
3	Hydrology within the Calabacillas Watershed
4	Recommended Improvements Calabacillas Watershed
5	Temporary Drainage Control

APPENDICES

A	Fractions Impervious Calculations
	Roughness Coefficient Calculations
B	MODSCS Output
	Rational Method Computations
C	Street Flow Analysis Calculations
D	Temporary Desiltation Pond Sizing Calculations
E	Storm Drain Calculations

25×10

0000 0000 0130

"MASTER DRAINAGE PLAN FOR PARADISE HEIGHTS UNITS THREE, FOUR, FIVE, SIX & TRACT A"

I INTRODUCTION

Bellamah Community Development is currently planning development of Units Three, Four, Five, Six and Tract A of Paradise Heights. The study area in which these units are contained, consists of approximately 568 acres and is within Bernalillo County. The purpose of this report is to present an overall drainage plan which is acceptable to both the City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority. As each tract or unit of Paradise Heights is developed, individual site-specific drainage plans will be required.

The "Master Drainage Study for Paradise Hills, New Mexico" prepared by Leverton, Denney Engineers Inc., September 1975, contains this area within its drainage networks. Since the drainage basin was delineated based on proposed layouts, some of which are no longer are being considered, we have opted to delineate the drainage basin based on the existing topography and the proposed collector and arterial streets. This allows phased development of the area independent of the development of all the tracts with emphasis on the proposed permanent facilities within the affected basin. Plate 1 contains platted alignment of McMahon Boulevard and Westside Boulevard. Plates 3, 4 and 5 show the proposed alignments of these two streets which at this writing were still being reviewed by the City of Albuquerque Transportation Department.

The development of the Paradise Heights area will occur over a time span of several years and all units or tracts will ultimately drain to proposed permanent facilities. These facilities however, must be constructed in phases that will promote continuity in development with a cohesive final product.

For this reason, development and sale of individual units/tracts should be allowed to proceed based on the submittal of interim drainage plans incorporating detention ponding and other temporary measures to protect downstream residents from increase in rates of runoff due to development.

II SITE DESCRIPTION

Paradise Heights Units Three and Four are located north of the Calabacillas arroyo. Tract A, Units Five and Six are located between the North Fork and West Fork of the arroyo. This study area is bordered on the east by Paradise North; the north by undeveloped land within Sandoval County; and the west by undeveloped land.

25×

0000 0000 0131

The area is intersected by a natural drainage divide north of the Calabacillas arroyo. The northeasterly portion drains naturally to Paradise North and on to the Black's Arroyo which is located to the Northwest of McMahon Boulevard. The remainder of the area drains to the Calabacillas Arroyo. The area which drains to Black's Arroyo has been addressed in the report entitled "Drainage Plan for Paradise North" February, 1986, prepared by Community Sciences Corporation. A temporary alternate drainage control plan for that portion which drains naturally to the Black's Arroyo watershed was proposed in that report.

Slopes vary from 1% to as much as 25%, with the steeper slopes being along portions of the arroyo embankment. Soils are primarily Bluepoint loamy fine sand with smaller areas being of the loamy fine gravel to very gravelly sand variety and the fine sandy loam, sandy loam, loamy fine sand and sandy loam variety. References 2.4 Geology portion of Erosion study April 1983. The SCS Hydrologic Soil Group "A" is predominant in this area with a smaller percentage of Group "B".

III ANALYSIS PROCEDURE

To comply with the City of Albuquerque and AMAFCA design criteria, all hydrological analysis is based on the 100 year frequency 6-hour duration storm as represented on Plate 22.2 D-1 of the Development Review Manual, a reproduction of the Albuquerque and surrounding areas from the NOAA Atlas for New Mexico. The applicable 6-hour rainfall is 2.2 inches.

Both the MODSCS computer model and the Rational Method were used for hydrologic analysis of this site. The model provided a more realistic analysis of the larger offsite basins and also had the capability of routing hydrographs through channels; time translating hydrographs in time for summation with other basins, and merging basins. Therefore the model was used in analyzing the offsite basins and routing their flows through onsite basins to the Calabacillas Arroyo. The Rational Method was used for the smaller onsite basins which were not directly impacted by the Offsite Basins.

The MODSCD computer model is a modified form of the soil Conservation Service Triangular unit hydrograph method. Fractions impervious were assigned based upon anticipated land uses within the zoning designations for each Tract or Unit. Where zoning is non-existent, the fraction impervious was determined by expanding the land use designation to include commercial development. Refer to Table 1.

25×10

0000 0000 0132

For the rational method:

$Q = CIA$
C = Runoff Coefficient
I = Intensity In/Hr
A = Area in acres

A weighted "C" value was calculated for the onsite basins using an average lot size and one-half residential Street width. Appendix A contains these calculations. Intensity was calculated by:

$$I_{6\text{-hour}} = P\ 6.84\ T_c^{-.51}$$

P = 6-hour rainfall in inches
T_c = time of concentration in minutes

A minimum time of concentration of 10 minutes was used for those less than 10 minutes.

Time of concentration was calculated using the Kirpich equation:

$$T_c = 0.0078 \frac{L^{0.77}}{S^{0.385}}$$

Appendix B contains the computer model output and Rational Method computations. A Summary of flow parameters and peak flow rates are given in Table 2.

Street flow analysis was based on the street flow criteria specified by the City of Albuquerque Drainage Ordinance; Section 7 entitled "Surface use of streets for Drainage and Flood Control Purposes".

1. 100 yr. storm
   (a) Storm runoff not to exceed a depth of 0.87 feet within the street right-of-ways or 0.2 feet above top of curb.
2. 10 yr. storm
   (a) Local/Collector Street
      1. Storm runoff not to exceed a depth of 0.50 feet.
      2. Velocity times depth is less than 6.5
   (b) Arterial Streets
      1. Storm runoff not to exceed a depth of 0.50 feet
      2. Velocity times depth is less than 6.5
      3. One 12 foot drive lane in each direction is free of flowing or standing water.

25×10

0000 0000 0133

Street velocities were determined using the Manning equation for uniform street flow. See Table 3 for street flow characteristics.

IV THE CALABACILLAS ARROYO

Plates 3, 4 and 5 were developed from a reproduction of the Federal Emergency Management Agency (FEMA) for the study area. The 100-year and 500-year boundary are delineated with the darker shading and lighter shading, respectively. Based on the reports by Leedshill - Herkenhoff Inc. and Simons, Li and Associates Inc., the prudent line was added to the plate.

The prudent lines define the limits of development as the boundaries within which there is potential short-term and long-term erosion. Potential short-term erosion is defined as the lateral erosion of the channel banks that could occur during a single 100-year flood event. Long-term erosion is defined as the lateral erosion of the channel banks that could occur during the next twenty-five years.

Therefore, the prudent line doesn't necessarily coincide with the 100-year flood boundary. This was taken into consideration when delineating the drainage basins.

V DRAINAGE BASINS

The drainage basins were delineated based on the following:

1. Existing topography
2. Proposed major street alignments
3. Proposed street layouts with the Tracts or Units
4. Prudent limits and 100-year flood boundary

The drainage basins and the proposed routing of their developed flows are summarized as follows:

Offsite Basin 1, Basins A1 and W1 will be diverted by storm drain to the Calabacillas.

Flows from Basin A2 will flow within interior streets and discharge directly to the Calabacillas. Specific points of discharge will have to be proposed on a site development plan for this area.

The interior streets of Basins B & C will carry the storm flows. At the confluence point of Basin B it's proposed to convey the flows of Basin B and C through a drainage easement.

Basin D, which is not Bellamah owned land, drains directly into the Calabacillas. Offsite Basin 2 drains through the

25×10

0000 0000 0134

northwest of **Basin D**. It is proposed that these offsite flows be diverted to a specific point of discharge through a drainage easement. The onsite flows should be diverted to drain near or coincide with the crossing of the arroyo, Gates Street NW. Again, a site plan for this area will have to be proposed which will specify points of discharge. See Plate 1 for proposed location of Gates Street NW.

Storm flows from **Basin E** flow directly into the Calabacillas. Specific points of discharge can take the form of a drainage rundown.

The storm flows from **Basin F1**, east of the proposed storm drain system will be diverted by street flow through **Basin F2** and both basins will drain into the Calabacillas.

Storm flows from **Basin W2** will flow into the Calabacillas. **Offsite Basin 5** as exists, drains to the west branch of the Calabacillas. When developed it will continue to drain to the west branch of the Calabacillas but will need to be diverted such that offsite flows do not impact onsite to Basin B.

Storm flows from **Basin G** and **offsite Basin 3**, land not owned by Bellamah, will drain as previously planned - by drainage easements established on Paradise Unit 4, Block 1 into the Calabacillas. See Plate 1 for location of easements.

Storm flows from **offsite Basin 4** were channel routed through **Basin H2** to the Calabacillas.

Storm flows from **Basin H1** were merged with **Basin H2** to discharge at a specific point. These flows will be diverted to the Calabacillas with drainage easement establish on Paradise Heights Unit 4, Block 2. See Plate 1 for location of platted easement. Method of discharge will have to be specified in a proposed site development plan.

Basin I flows will be diverted to the Calabacillas by internal streets. Specific points of discharge to be proposed by a site development plan.

Basin J, L1 & L2 naturally drain away from the Calabacillas to Blacks Arroyo. Storm flows from this area was addressed in the "Drainage Plan for Paradise North". Storm flows from these basins will drain into the proposed storm drain system of McMahon Boulevard.

Basin K storm flows will drain to the Calabacillas through several discharge points as determined by a proposed site development plan.

25×10

0000 0000 0135

Basin M drains directly to the Calabacillas with specific points of discharge to be proposed by a site development plan.

Basin N drains directly into the Calabacillas with method of discharge to be specified by a site development plan.

VI DISCHARGE INTO THE CALABACILLAS

Storm flows will be discharged into the Calabacillas Arroyo at several locations in the study area. Options for energy dissipators where produced in the "Master Drainage Plan for Paradise North" February 1986 by Community Sciences Corporation. The following excerpt has been reproduced from that report. It summarizes Mr. Bob Mussetter's (of Simons & Li Inc.) response on restrictions on discharge structures which will be required to ensure that the validity of their prudent limit study is retained.

"1) Discharge structures should be designed to release flows at velocities compatible with the main arroyo flows.

2) Direction and proximity of discharge should be established to enter main flows such that directional velocity components are similar, and such that released flows will not impinge on opposite arroyo banks.

3) Discharge structures should function to mitigate local scour to whatever extent is practical. Aprons which spread low flows out into sections having shallow, low velocity release characteristics are one example how this criteria might be achieved.

4) Soft (rip rap) type structures are more desirable than rigid outfalls due to their flexibility when support characteristics change. When rigid structures are used, they should be somewhat receded into the main arroyo embankment, or designed to fail completely if a loss of adjacent foundational support is experienced (e.g. non rigid pipe joints etc.).

It is our understanding that if these criteria are followed in a qualitative fashion then the overall conclusions of an aggredation/degradation analysis remain valid."

VII TEMPORARY EROSION CONTROL

Construction of the major roads (McMahon Blvd., Westside Blvd., Unser Blvd.) and their drainage systems will require protection from silt build up from the undeveloped basins. To minimize the amount of silt being transported by the storm runoff, the use of desiltation pond is proposed. The locations of these proposed ponds are shown on Plate 5.

25×10

0000 0000 0136

The temporary desiltation ponds were sized using the Storage Volume for Detention Basins program contained in the Technical Release 55, "Urban Hydrology for small watersheds" (TR-55). Design criteria is as follows:

$Q_{IN} = Q_{10}$

Q_{OUT} = 20 to 25% of Q_{10}

24-hour rainfall = 2.6 inches and Runoff Curve Number for area/or Direct runoff in inches computed from DPM Plate 22.2 C-4.

Ponds are sized to handle a percentage of volume. The exit velocity from the detention ponds were calculated using the flow existing the pond and the Broad-crested weir equation:

$$Q=CLH^{1.5}$$

Q = flow exiting the desiltation pond, Q_{10}
C = 3.0
L = Length of weir (width of pond)
H = Height of flow over weir

$$Q=VA$$

Q = % of flow exiting the desiltation pond
A = Cross sectional area of flow over weir
= L x H
V = Velocity of flow exiting pond

Acceptable exit velocity is 2 fps or less. See Appendix D for calculations.

25×10

0000 0000 0 137

REFERENCES

1. "Master Drainage Study for Paradise Hills, New Mexico", Leverton, Denney Engineer Inc., September 1975.

2. "Erosion Study to Determine Boundaries for Adjacent Development - Calabacillas Arroyo, Bernalillo County, New Mexico", Simons, Li & Associates Inc., April 1983.

3. "Master Drainage Plan for Paradise North" Community Sciences Corporation, February 1986.

4. "Bank Stability Study West Branch Calabacillas Arroyo" Leedshill - Herkenhoff Inc., June 1986.

5. MODSCS computer model - use & reference was granted by Community Science Corporation. October, 1987.

6. Technical Release 55, "Urban Hydrology for Small Watersheds" (TR-55).

25×10

0000 0000 0138

TABLE 1

FRACTION IMPERVIOUS

LAND USE DESIGNATION	FRACTION IMPERVIOUS
R-1	*
OFFSITE AREA	0.60
⇓	
RESIDENTIAL	0.56
COMMERCIAL	0.85
UNDEVELOPED	0.10

WEIGHTED FRACTION IMPERVIOUS OF OFFSITE AREA:

AREA	% IMPERV.		
75 %	0.56	=	.42
20 %	0.85	=	.17
5 %	0.10	=	.01
100 %			0.60

* FRACTION IMPERVIOUS FOR R-1 LAND USE DETERMINED FROM TYPICAL "LOT LAYOUT" SEE APPENDIX A

25×10

TABLE 2

HYDROLOGIC FLOW PARAMETERS

AREA POINT DESIGNATION	AREA SQ. MI	AREA ACRE	CONTRIBUTING AREAS	FRACTION IMPERV	CN PERVIOUS	T_c MIN	C	I. IN/HR	Q_{10} CFS	Q_{100} CFS	COMMENTS
OFFSITE 1	.3873	247.9	OFFSITE 1	0.60	66	42				299.7	DIVERTED BY STORM DRAIN TO CALABACILLAS
OFFSITE 2	.1184	75.8	OFFSITE 2	0.60	66	13				172.0	TO CALABACILLAS BY CHANNEL
OFFSITE 3	.1766	113.0	OFFSITE 3	0.60	66	16				228.3	DIVERTED THROUGH EASEMENTS
OFFSITE 4											
4-1	.5531	354.0	4-1	0.60	66	37					FLOWS TO CALA-BACILLAS W/IN CHANNEL THRU BASIN H-2
4-2	.5469	350.0	4-1 to 4-2	.60	66	32					
4-3	.4844	310.0	4-1 to 4-3	.60	70	41					
4-4	.5313	340.0	4-1 to 4-4	.60	70	29					
										828.6	- ACCUMULATIVE PEAK FLOW
OFFSITE 5	.0276	17.68	OFFSITE 5	.60	66	9				44.5	FLOWS INTO CALABACILLAS

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE

25X10

0000 0000 0139

TABLE 2 CON'T
HYDROLOGIC FLOW PARAMETERS

AREA POINT DESIGNATION	AREA SQ. MI	AREA ACRE	CONTRIBUTING AREAS	GROSS AREA SQ MI	FRACTION IMPERV	CN PERV	Tc MIN	C	I IN/HR	Q_{10}	Q_{100}	COMMENTS
A1	.0496	31.74	A1		.56	66	20			35.7	54.4	DIVERTED TO CALABACILLAS BY STORM DRAIN
A2	.0814	52.11	A2		.56	61	14			69.9	106.4	FLOWS INTO CALABACILLAS - SPECIFIC POINT
B	.0276	17.68	B		.56	61	8			26.3	40.0	INTO CALABACILLAS
C	.0246	15.73	C		.56	61	5			23.5	35.7	SPECIFIC POINT
			B & C	.0798						49.7	75.7	ACCUMULATIVE PEAK ← FLOW
D	.0849	54.35	D	.2033	.56	70	13			80.7	122.9	INTO CALABACILLAS NEAR CROSSING
G	.0254	16.24	G	.2020		66	14			22.9	34.9	" " "
H1	.0187	11.99	H1		.56	66	8					
H2	.0648	41.49										W/IN CHANNEL
			OFF 4, H1, H2	2.1992			9			545.9	830.9	ACCUMULATIVE PEAK FLOW
W1	.0096	5.94	W1		.56	66	14			13.1	19.9	DIVERTED BY STORM DRAIN
W2	.0093	6.00	W2		.56	66	16			10.2	15.5	DIRECTLY INTO CALABACILLAS
E	.0196	12.57	E		.56		4	.56	4.65	21.5	32.7	FLOWS DIRECTLY CALABACILLAS
F1	.0150	9.58	F1		.56		9	.56	4.65	16.4	25.0	FLOWS THRU F2 TO CALABACILLAS
F2	.0135	8.61	F2		.51		7	.56	4.65	14.7	22.4	FLOWS DIRECTLY CALABACILLAS
			F1 & F2	18.19						29.0	44.1	ACCUMULATIVE PEAK FLOW
I	.0603	38.57	I		.56		10	.56	4.65	65.7	100.0	FLOWS DIRECTLY CALABACILLAS
J	.0358	22.90	J		.56		6	.56	4.65	39.2	59.6	REPORT BY OTHERS
K	.0429	27.43	K		.56		6	.56	4.65	46.9	71.4	FLOWS DIRECTLY CALABACILLAS
L1	.0588	37.65	L1		.56		11	.56	4.65	61.9	94.2	REPORT BY OTHERS
L2	.0400	25.60	L2		.56		14	.56	4.65	36.9	56.2	REPORT BY OTHERS
M	.0614	39.31	M		.56		9	.56	4.65	67.3	102.4	FLOWS DIRECTLY CALABACILLAS
N	.0737	47.18	N		.56		12	.56	4.65	74.8	113.9	FLOWS DIRECTLY CALABACILLAS

REV 1-13-88

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE

25X10

TABLE 3

STREET FLOW CHARACTERISTICS

POINT/ DESIGNATION	ASSUMED STREET WIDTH	ESTIMATED STREET SLOPE	Q_{100} CFS	100yr DEPTH FT	Q_{10} CFS	10 YR DEPTH FT	10 YR VELOC. FPS	10 YR V x D	COMMENTS
D	32'	1.80%	122.9	0.73	80.8	0.62	5.29	3.28	OK OFF 2 FLOWS CARRIED BY DRAIN. EASM'T. BASIN D FLOWS ONLY
G	32'	1.14%	34.9	0.49	22.9	0.42	3.25	1.37	OK BASIN-G ONSITE FLOWS ONLY
G	32'	1.14%	114.5	0.77	74.9	0.62	5.29	3.28	OK OFF 3 CARRIED BY DRAIN EASM'TS 228.3 ÷ 2 EASM'TS = 114 CFS
W1	86'	1.62%	19.9	0.36	13.1	0.31	3.14	0.97	OK ONLY STREET FLOW, DIVERTED TO STORM DRAIN
W2	86'	1.46%	15.5	0.33	10.2	0.28	2.84	0.79	OK ONLY STREET FLOW DRAINS TO CALABACILLAS
K	86'	7.40%	71.4	0.44	46.9	0.37	7.63	2.82	OK ALL STORM FLOW ASSUMED TO STREET - THIS NOT LIKELY IF MORE THAN ONE POINT OF DISCHARGE
F1	32'	1.85%	25.0	0.40	16.39	0.34	3.58	1.22	OK
F2	32'	1.85%	44.1	0.49	28.97	0.42	4.13	1.73	OK

NOTE: 32' STREET WIDTH APPLIES TO RESIDENTIAL STREETS WHICH ARE NOT GOVERNED BY 10 YR → 0.5' DEPTH WHICH APPLIES TO ARTERIAL & COLLECTOR STREETS

REV. 1-13-88

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE

25X

TABLE 4

POND LOCATION	Q_{10} CFS	Q_{OUT}	Volume Pond	V_{EXIT}	D x L x W POND DIMENSIONS
J	39.2	9.8	.1 ac ft	1.0 fps	3 x 38 x 38
F1	16.4	4	.2 ac ft	1.9 fps	3 x 54 x 54
L1	61.9	15.5	.3 ac-ft	1.3 fps	3 x 66 x 66
L2	36.9	9.2	.2 ac-ft	1.2 fps	3 x 54 x 54

SEE APPENDIX D FOR COMPUTER OUTPUT INFORMATION & EXIT VELOCITY CALCULATIONS

REV. 1-13-88

NATIONAL 42-381 50 SHEETS 5 SQUARE 42-382 100 SHEETS 5 SQUARE 42-389 200 SHEETS 5 SQUARE

25X10

0000 0000 0143

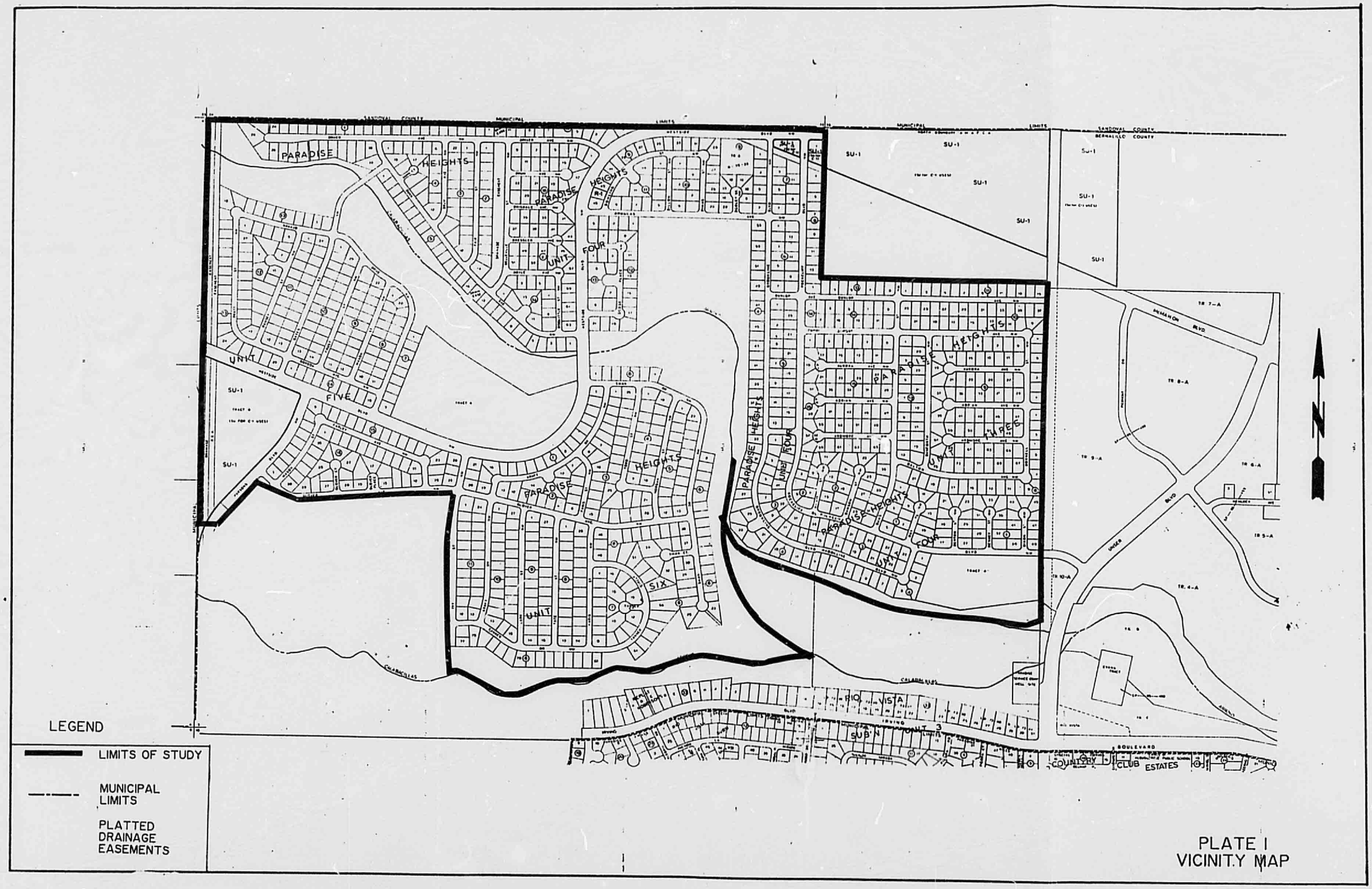


PLATE I
VICINITY MAP

25×10 32×10 25×10

0000 0000 0144

FROM PLATE 22.2 C-2

AVG LOT SIZE	FRACTION IMPERVIOUS
1/8 ac	.65
1/4 ac	.38

AVERAGE LOT SIZES:

120' X 55' = 6600 SF
120' X 60' = 7200 SF

AVG = 6900 SF

= 0.1584 ac

≐ 1/6 ac

BY INTEROPOLATION:

$$\frac{.1250}{.0833} = \frac{.27}{X}$$

X = .18 + .38 = .56

25×10

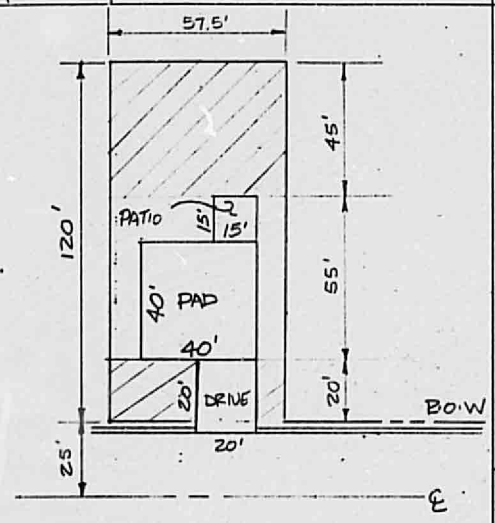
0000 0000 0145

APPENDIX A

WEIGHTED "C"

RUNOFF COEFFICIENT

CALCULATIONS



AVG LOT SIZE

120 x 55
120 x 60 } 120 x 57.5'

AREA TO BE ANALYIZED

(120 + 25) x 57.5 = 8338 SF

AREAS

STREET	57.5 x 16	1650 SF
SIDEWALK	37.5 x 4	
DRIVE	29 x 20	
LAWN	37.5 x 20	3338 SF
	57.5 x 45	
ROOF	1600	1825 SF
PATIO	225	
UNDEVELOPED		1525 SF

CONDITION	C		AREAS	"C" WEIGHTED
STREETS, DRIVES, WALKS	.95	x	1650/8338	.1880
ROOFS	.90	x	1825/8338	.1970
UNDEVELOPED	.40	x	1525/8338	.1001
LAWNS, LANDSCAPING	.25	x	3338/8338	.0732
				.5582
				≐ 0.56

25 x 10

0000 0000 0146

AREA/POINT DESIGNATION = OFF1
AREA = .3873 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 42 MINUTES
FRAC IMPERV= .6
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
260	299.7

VOL = 981937.8 CF

POINT OFF1 ADDED TO MAIN FLOWS

TIME	Q(CFS)
170	0.1
175	0.2
180	0.2
185	0.4
190	0.5
195	1.5
200	2.5
205	5.2
210	7.8
215	17.6
220	27.4
225	52.4
230	77.4
235	125.7
240	174.0
245	217.0
250	259.9
255	279.8
260	299.7
265	278.8
270	258.0
275	228.4
280	198.7
285	165.0
290	131.4
295	101.3
300	71.3

25×10

0000 0000 0147

305	50.6
310	30.0
315	24.4
320	18.9
325	16.5
330	14.2
335	13.8
340	13.3
345	12.9
350	12.6
355	12.0
360	11.5
365	10.7
370	9.8
375	8.7
380	7.7
385	6.3
390	4.9
395	3.9
400	2.8
405	2.1
410	1.3
415	0.9
420	0.4

AREA/POINT DESIGNATION = W1
AREA = 9.599999E-03 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 8 MINUTES
FRAC IMPERV= .81
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
240	19.9

VOL = 31168.49 CF

25×10

0000 0000 0148

POINT W1 ADDED TO MAIN FLOWS

TIME	Q(CFS)
170	0.1
175	0.2
180	0.3
185	0.4
190	0.6
195	1.6
200	3.1
205	6.3
210	9.2
215	20.7
220	32.6
225	58.6
230	88.6
235	143.4
240	194.0
245	231.1
250	266.7
255	284.2
260	302.7
265	280.1
270	258.6
275	228.9
280	199.2
285	165.5
290	131.8
295	101.8
300	71.8
305	51.1
310	30.4
315	24.8
320	19.2
325	16.9
330	14.6
335	14.1
340	13.6
345	13.2
350	12.8
355	12.3
360	11.8
365	10.8
370	9.9
375	8.7
380	7.7
385	6.3
390	4.9
395	3.9
400	2.8
405	2.1
410	1.3
415	0.9

25×10

0000 0000 0149

COMBINE FLOWS OF HYDROGRAPHS TO ARRIVE AT PEAK FLOW

TIME	ALREADY COMBINED OFF1/W1 CFS	A1 1 CFS	ACCUM. PEAK FLOW CFS	
170	.1			
175	.2			
180	.3			
185	.4			
190	.6	.1		
195	1.6	.2		
200	3.1	.6		
205	6.3	1.4		
210	9.2	2.6		
215	20.7	4.8		
220	32.6	8.2		
225	58.6	12.7		
230	88.6	20.6	109.2	
235	143.4	32.2	175.6	
240	194.0	47.4	241.4	
245	231.1	54.4	285.5	
250	266.7	53.1	319.8	
255	284.2	44.3	328.5	
260	302.7	34.3	337.0	* PEAK
265	280.1	23.1	303.2	
270	258.6	13.4	272.0	
275	228.9	7.3	236.2	
280	199.2	4.8	204.0	
285	165.5	3.1		
290	131.8	2.2		
295	101.8	2.1		
300	71.8	2.0		
305	51.1	1.9		
310	30.4	1.8		
315	24.8	1.7		
320	19.2	1.6		
325	16.9	1.6		
330	14.6	1.6		
335	14.1	1.5		
340	13.6	1.6		
345	13.2	1.6		
350	12.8	1.5		
355	12.3	1.5		
360	11.8	1.4		
365	10.8	1.3		

25×10

0000 0000 0150

AREA/POINT DESIGNATION = OFF2
AREA = .1184 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 13 MINUTES
FRAC IMPERV= .6
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
243	172.0

VOL = 300184.5 CF

POINT OFF2 ADDED TO MAIN FLOWS

TIME	Q(CFS)
170	0.1
175	0.2
180	0.2
185	0.3
190	0.5
195	0.6
200	3.0
205	7.4
210	10.7
215	20.3
220	35.7
225	47.3
230	79.5
235	131.4
240	172.0
245	160.5
250	108.8
255	67.7
260	40.7
265	23.5
270	12.3
275	6.8
280	5.5
285	5.1
290	4.9
295	4.9
300	4.9

25×10

305	4.6
310	4.1
315	3.6
320	3.6
325	3.8
330	4.0
335	4.0
340	3.7
345	3.4
350	3.2
355	2.9
360	2.7
365	2.1
370	1.1
375	0.4

25×10

0000 0000 0152

AREA/POINT DESIGNATION = OFF3
AREA = .1766 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 16 MINUTES
FRAC IMPERV= .6
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
244	228.3

VOL = 447741.3 CF

POINT OFF3 ADDED TO MAIN FLOWS

TIME	Q(CFS)
170	0.2
175	0.2
180	0.3
185	0.4
190	0.6
195	1.1
200	3.1
205	7.5
210	13.7
215	24.1
220	40.9
225	61.2
230	97.5
235	155.0
240	213.0
245	228.3
250	194.7
255	142.7
260	93.6
265	54.7
270	30.5
275	18.6
280	10.9
285	8.1
290	7.6
295	7.4
300	7.3

25×10

0000 0000 0153

305	7.0
310	6.5
315	5.9
320	5.6
325	5.6
330	5.8
335	5.8
340	5.7
345	5.4
350	5.0
355	4.6
360	4.3
365	3.6
370	2.5
375	1.4
380	0.6
385	0.1

25×10

0000 0000 0154

AREA/POINT DESIGNATION = OFF4-1
AREA = .5531 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 37 MINUTES
FRAC IMPERV= .6
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
261	447.3

VOL = 1402298 CF

POINT OFF4-1 ADDED TO MAIN FLOWS

TIME	Q(CFS)
165	0.1
170	0.2
175	0.3
180	0.4
185	0.6
190	1.0
195	2.2
200	4.4
205	8.2
210	17.0
215	29.1
220	49.2
225	71.4
230	130.4
235	192.9
240	269.1
245	341.9
250	409.6
255	440.2
260	447.3
265	414.2
270	372.7
275	318.1
280	263.3
285	208.0
290	155.1
295	105.7

25×10

0000 0000 0155

300	70.6
305	45.1
310	33.6
315	25.6
320	22.8
325	20.5
330	19.7
335	19.1
340	18.7
345	18.2
350	17.6
355	16.9
360	16.1
365	14.9
370	13.5
375	11.8
380	9.9
385	7.7
390	5.9
395	4.3
400	3.0
405	1.9
410	1.2
415	0.5

DEPTH-1 = 1.02 FT.
DEPTH-2 = 0 FT.
SIDESLOPE-1 = 57 HORZ/VERT
SIDESLOPE-2 = 39 HORZ/VERT
WIDTH = 0 FT.
N = .033
SLOPE = .01 FT./FT.
REACH LENGTH = 5000 FT.

POINT OFF4-1 CHANNEL ROUTED TO POINT OFF4-2

TIME	Q(CFS)
185	0.1
190	0.2
195	0.3
200	0.6
205	1.4
210	2.2
215	2.9
220	3.7
225	14.2
230	24.7
235	35.3
240	45.8
245	83.8
250	140.1
255	196.5
260	252.8
265	304.6

25×10

0000 0000 0156

270	338.2
275	371.8
280	405.5
285	445.8
290	400.7
295	344.3
300	288.0
305	231.4
310	183.3
315	147.2
320	111.0
325	74.9
330	38.7
335	34.4
340	30.1
345	25.8
350	21.5
355	19.4
360	18.9
365	18.3
370	17.7
375	17.0
380	15.9
385	14.7
390	13.5
395	12.4
400	10.7
405	8.8
410	7.0
415	5.1
420	3.7
425	2.8
430	2.0
435	1.1
440	0.2

AREA/POINT DESIGNATION = OFF4-2
AREA = 5469 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 32 MINUTES
FRAC IMPERV= .6
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
256	492.1

VOL = 1386578 CF

25×10

0000 0000 0154

POINT OFF4-2 ADDED TO MAIN FLOWS

TIME	Q(CFS)
165	0.1
170	0.2
175	0.4
180	0.6
185	0.9
190	1.2
195	2.7
200	5.2
205	10.9
210	20.7
215	36.6
220	60.3
225	103.1
230	175.5
235	265.5
240	367.2
245	487.0
250	602.4
255	688.5
260	708.1
265	711.1
270	684.3
275	652.6
280	617.4
285	595.4
290	497.6
295	402.9
300	329.5
305	262.5
310	208.1
315	168.8
320	131.5
325	94.5
330	57.7
335	53.0
340	48.2
345	43.4
350	38.5
355	35.7
360	34.5
365	32.5
370	30.4
375	27.8
380	24.4
385	21.0
390	18.1
395	15.4
400	12.5
405	9.9
410	7.4

25×10

0000 0000 0158

415	5.1
420	3.7
425	2.8
430	2.0
435	1.1
440	0.2

DEPTH-1 = 1.02 FT.
DEPTH-2 = 0 FT.
SIDESLOPE-1 = 11 HORZ/VERT
SIDESLOPE-2 = 35 HORZ/VERT
WIDTH = 0 FT.
N = .033
SLOPE = .0153 FT./FT.
REACH LENGTH = 8500 FT.

POINT OFF4-2 CHANNEL ROUTED TO POINT OFF4-3

TIME	Q(CFS)
185	0.1
190	0.2
195	0.3
200	0.4
205	0.5
210	0.6
215	4.0
220	7.5
225	10.9
230	14.3
235	17.8
240	21.2
245	78.9
250	136.5
255	194.2
260	251.9
265	309.6
270	367.2
275	424.4
280	481.5
285	538.6
290	595.8
295	652.9
300	710.0
305	646.6
310	583.2
315	519.8
320	456.4
325	393.0
330	329.6
335	284.4
340	239.1
345	193.8
350	148.6
355	103.3

25×10

0000 0000 0159

360	58.1
365	54.1
370	50.2
375	46.3
380	42.3
385	38.4
390	34.5
395	31.7
400	29.0
405	26.3
410	23.5
415	20.8
420	18.1
425	15.7
430	13.3
435	10.9
440	8.5
445	6.1
450	3.7

AREA/POINT DESIGNATION = OFF4-3
AREA = .4844 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 41 MINUTES
FRAC IMPERV= .6
CN (PERVIOUS)= 70
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
260	389.7

VOL = 1274904 CF

POINT OFF4-3 ADDED TO MAIN FLOWS

TIME	Q(CFS)
170	0.1
175	0.2
180	0.3
185	0.6
190	0.9
195	2.2
200	3.6
205	7.0

25×10

0000 0000 0 160

210	10.4
215	26.1
220	41.8
225	77.2
230	112.7
235	178.9
240	245.0
245	359.1
250	473.1
255	557.3
260	641.6
265	672.5
270	703.4
275	722.1
280	740.9
285	754.3
290	767.7
295	785.6
300	803.5
305	713.0
310	622.6
315	551.9
320	481.2
325	414.7
330	348.3
335	302.4
340	256.5
345	210.8
350	165.0
355	119.1
360	73.2
365	68.1
370	63.1
375	57.7
380	52.4
385	46.6
390	40.9
395	36.8
400	32.6
405	29.0
410	25.3
415	21.9
420	18.6
425	15.7
430	13.3
435	10.9
440	8.5
445	6.1
450	3.7

25×10

0000 0000 0161

DEPTH-1 = 1.02 FT.
DEPTH-2 = 0 FT.
SIDESLOPE-1 = 35 HORZ/VERT
SIDESLOPE-2 = 94 HORZ/VERT
WIDTH = 0 FT.
N = .033
SLOPE = .02 FT./FT.
REACH LENGTH = 6000 FT.

POINT OFF4-3 CHANNEL ROUTED TO POINT OFF4-4

TIME	Q(CFS)
185	0.1
190	0.2
195	0.3
200	0.5
205	0.7
210	1.4
215	3.7
220	6.1
225	8.5
230	19.2
235	42.7
240	66.1
245	89.5
250	147.1
255	227.6
260	308.1
265	388.5
270	462.3
275	534.3
280	606.4
285	678.4
290	711.2
295	744.1
300	776.9
305	803.2
310	780.3
315	761.3
320	742.2
325	700.3
330	624.2
335	548.0
340	471.9
345	409.4
350	355.9
355	302.4
360	249.0
365	203.4
370	159.7
375	116.0
380	72.4
385	67.1

25×10

0000 0.000 0 162

225	110.0
230	192.6
235	312.3
240	438.3
245	566.4
250	681.4
255	740.3
260	777.7
265	786.9
270	781.0
275	771.0
280	760.8
285	777.7
290	773.9
295	785.2
300	807.6
305	828.6
310	802.8
315	782.5
320	762.3
325	719.6
330	643.0
335	566.5
340	490.0
345	427.0
350	372.9
355	318.7
360	264.2
365	217.2
370	171.6
375	125.6
380	79.6
385	72.1
390	65.2
395	58.6
400	52.4
405	46.8
410	41.5
415	36.5
420	32.1
425	28.5
430	24.9
435	21.4
440	18.4
445	15.7
450	13.1
455	10.4
460	7.8

25×10

0000 0000 0163

390	61.9
395	56.6
400	51.4
405	46.4
410	41.4
415	36.5
420	32.1
425	28.5
430	24.9
435	21.4
440	18.4
445	15.7
450	13.1
455	10.4
460	7.8

AREA/POINT DESIGNATION = OFF4-4
AREA = .5313 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 29 MINUTES
FRAC IMPERV= .6
CN (PERVIOUS)= 70
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
252	534.2

VOL = 1398341 CF

POINT OFF4-4 ADDED TO MAIN FLOWS

TIME	Q(CFS)
165	0.2
170	0.3
175	0.4
180	0.6
185	0.9
190	1.4
195	2.4
200	5.9
205	11.4
210	19.1
215	41.8
220	69.9

25×10

0000 0000 0164

DEPTH-1 = 1.02 FT.
DEPTH-2 = 0 FT.
SIDESLOPE-1 = 14 HORZ/VERT
SIDESLOPE-2 = 14 HORZ/VERT
WIDTH = 0 FT.
N = .033
SLOPE = .0371 FT./FT.
REACH LENGTH = 1750 FT.

POINT OFF4-4 CHANNEL ROUTED TO POINT H2

TIME	Q(CFS)
170	0.2
175	0.3
180	0.5
185	0.7
190	1.0
195	1.6
200	3.1
205	7.0
210	13.1
215	25.1
220	47.4
225	77.9
230	130.8
235	220.3
240	337.6
245	464.4
250	588.1
255	687.5
260	747.7
265	779.5
270	784.2
275	778.6
280	769.0
285	764.2
290	774.8
295	777.7
300	789.7
305	812.8
310	828.5
315	799.3
320	778.5
325	753.7
330	700.9
335	627.7
340	551.2
345	477.4
350	417.1
355	362.0
360	307.8
365	254.8
370	208.2

25×10

0000 0000 0165

375	162.4
380	116.4
385	78.2
390	70.8
395	63.9
400	57.4
405	51.3
410	45.8
415	40.5
420	35.6
425	31.3
430	27.8
435	24.2
440	20.8
445	17.8
450	15.2
455	12.6
460	9.9
465	5.9

AREA/POINT DESIGNATION = H2
AREA = .0648 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 9 MINUTES
FRAC IMPERV= .56
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
240	98.8

VOL = 155509.7 CF

POINT H2 ADDED TO MAIN FLOWS

TIME	Q(CFS)
165	0.1
170	0.3
175	0.4
180	0.6
185	0.9
190	1.4
195	2.1
200	5.7

25×10

0000 0000 0166

205	12.4
210	19.5
215	39.4
220	71.6
225	106.7
230	184.9
235	307.4
240	436.4
245	535.2
250	623.5
255	711.2
260	764.1
265	786.2
270	787.5
275	781.6
280	771.7
285	766.8
290	777.4
295	780.3
300	792.3
305	815.1
310	830.4
315	801.1
320	780.4
325	755.8
330	703.1
335	629.7
340	553.1
345	479.2
350	418.7
355	363.5
360	309.2
365	255.7
370	208.4
375	162.4
380	116.4
385	78.2
390	70.8
395	63.9
400	57.4
405	51.3
410	45.8
415	40.5
420	35.6
425	31.3
430	27.8
435	24.2
440	20.8
445	17.8
450	15.2
455	12.6
460	9.9
465	5.9

25×10

0000 0000 0167

AREA/POINT DESIGNATION = H1
AREA = .0187 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 8 MINUTES
FRAC IMPERV= .56
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
240	28.5

VOL = 44877.05 CF

POINT H1 ADDED TO MAIN FLOWS

TIME	Q(CFS)
165	0.2
170	0.3
175	0.5
180	0.6
185	1.0
190	1.4
195	2.2
200	6.5
205	14.0
210	21.4
215	43.5
220	78.5
225	115.0
230	200.5
235	332.6
240	464.9
245	555.6
250	633.7
255	718.1
260	768.8
265	788.2
270	788.5
275	782.5
280	772.4
285	767.5
290	778.2
295	781.0

25×10

0000 0000 0168

300	793.0
305	815.7
310	830.9
315	801.6
320	781.0
325	756.5
330	703.7
335	630.3
340	553.6
345	479.7
350	419.1
355	363.9
360	309.6
365	255.9
370	208.5
375	162.4
380	116.4
385	78.2
390	70.8
395	63.9
400	57.4
405	51.3
410	45.8
415	40.5
420	35.6
425	31.3
430	27.8
435	24.2
440	20.8
445	17.8
450	15.2
455	12.6
460	9.9
465	5.9

25×10

0000 0000 0169

AREA/POINT DESIGNATION = OFF5
AREA = .0276 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 9 MINUTES
FRAC IMPERV= .6
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
240	44.5

VOL = 69975.45 CF

POINT OFF5 ADDED TO MAIN FLOWS

TIME	Q(CFS)
190	0.1
195	0.2
200	1.2
205	2.5
210	2.9
215	6.5
220	11.0
225	13.1
230	24.5
235	39.3
240	44.5
245	31.8
250	15.8
255	10.5
260	7.3
265	3.0
270	1.5
275	1.4
280	1.2
285	1.1
290	1.1
295	1.1
300	1.1
305	1.0
310	0.8
315	0.8
320	0.9

25×10

325	0.9
330	1.0
335	0.9
340	0.8
345	0.8
350	0.7
355	0.6
360	0.6
365	0.4

```
DEPTH-1(GUESS =  .87  FT.
DEPTH-2 = -.32  FT.
SIDESLOPE-1 =  0  HORZ/VERT
SIDESLOPE-2 =  0  HORZ/VERT
WIDTH =  32  FT.
N =  .017
SLOPE =  .0393  FT./FT.
REACH LENGTH =  1500  FT.
```

25×10

0000 0000 0171

AREA/POINT DESIGNATION = A1
AREA = .0496 SQ MI
1 HR RAIN = 1.9 INCHES
6 HR RAIN = 2.2 INCHES
TC= 20 MINUTES
FRAC IMPERV= .56
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

TIME	Q(CFS)
245	54.4

VOL = 119032.2 CF

POINT A1 ADDED TO MAIN FLOWS

TIME	Q(CFS)
190	0.1
195	0.2
200	0.4
205	1.4
210	2.6
215	4.8
220	8.2
225	12.7
230	20.6
235	32.2
240	47.4
245	54.4
250	53.1
255	44.3
260	34.3
265	23.1
270	13.4
275	7.3
280	4.8
285	3.1
290	2.2
295	2.1
300	2.0
305	1.9
310	1.8
315	1.7
320	1.6

25×10

A10/D2

0000 0000 0172

325	1.5
330	1.6
335	1.6
340	1.5
345	1.5
350	1.4
355	1.3
360	1.2
365	1.1
370	0.8
375	0.5
380	0.3
385	0.2

DEPTH-1(GUESS = .87 FT.
DEPTH-2 = -.32 FT.
SIDESLOPE-1 = 0 HORZ/VERT
SIDESLOPE-2 = 0 HORZ/VERT
WIDTH = 32 FT.
N = .017
SLOPE = .0224 FT./FT.
REACH LENGTH = 2500 FT.

25×10

0000 0000 0173

```
AREA/POINT DESIGNATION = A2
AREA =          .0814  SQ MI
1 HR RAIN =     1.9  INCHES
6 HR RAIN =     2.2  INCHES
TC=  14  MINUTES
FRAC IMPERV=  .56
CN (PERVIOUS)= 61
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

     TIME      Q(CFS)

     243       106.4

VOL =  186992.9   CF
```

25×10

0000 0000 0174

```
AREA/POINT DESIGNATION = B
AREA =          .0276  SQ MI
1 HR RAIN =     1.9  INCHES
6 HR RAIN =     2.2  INCHES
TC=  8  MINUTES
FRAC IMPERV=  .56
CN (PERVIOUS)= 61
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

     TIME       Q(CFS)

     240         40.0

VOL =  63402.98   CF
```

25×10

0000 0000 0175

```
AREA/POINT DESIGNATION = C
AREA =          .0246  SQ MI
1 HR RAIN =     1.9  INCHES
6 HR RAIN =     2.2  INCHES
TC=  5  MINUTES
FRAC IMPERV=  .56
CN (PERVIOUS)= 61
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

    TIME       Q(CFS)

    240          33.7

VOL =  56511.36   CF
```

25×10

0000 0000 0 176

```
AREA/POINT DESIGNATION = G
AREA =          .0254  SQ MI
1 HR RAIN =     1.9  INCHES
6 HR RAIN =     2.2  INCHES
TC=  14  MINUTES
FRAC IMPERV=  .56
CN (PERVIOUS)= 66
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

    TIME      Q(CFS)

     243        34.9

VOL =  60955.98   CF
```

25×10

0000 0000 0 177

```
AREA/POINT DESIGNATION = D
AREA =          .0849  SQ MI
1 HR RAIN =     1.9  INCHES
6 HR RAIN =     2.2  INCHES
TC=  13  MINUTES
FRAC IMPERV=  .56
CN (PERVIOUS)= 70
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

    TIME       Q(CFS)

    243        122.9

VOL = 212766.5   CF
```

25×10

0000 0000 0178

```
AREA/POINT DESIGNATION = W2
AREA =          .0093  SQ MI
1 HR RAIN =     1.9  INCHES
6 HR RAIN =     2.2  INCHES
TC=  16  MINUTES
FRAC IMPERV=   .81
CN (PERVIOUS)= 64
CN (IMPERVIOUS)= 95

PEAK ONLY OUTPUTTED

    TIME       Q(CFS)

     244          15.5

VOL. =  30194.46   CF
```

25×10

0000 0000 0179

APPENDIX B

25×10

RATIONAL METHOD COMPUTATIONS

BASIN E

C = 0.56
A = 12.57 ac
S = .0547
L_c = 750 FT

$$T_c = 0.0078 \frac{750^{.77}}{.0547^{.385}} = 3.9 \text{ min}$$

$$\doteq 10 \text{ min}$$

$$I = 2.2 \times 6.84 (10)^{-.51} = 4.65 \text{ in/hr}$$

$$Q = CIA = .56 \times 4.65 \times 12.57$$

$$= 32.73 \text{ CFS}$$

BASIN F1

C = 0.56
A = 9.58
S = 0.0237
L_c = 1500 FT

$$T_c = .0078 \frac{(1500)^{.77}}{.0237^{.385}} = 9.2 \doteq 10 \text{ min}$$

$$I = 2.2 \times 6.84 (10)^{-.51} = 4.65 \text{ in/hr}$$

$$Q = .56 \times 4.65 \times 9.58$$

$$= 24.95 \text{ CFS}$$

* F1 TIME TRANSLATED THROUGH F2, SEE CALCULATIONS THIS APPEND.

BASIN F2

C = 0.56
A = 8.61 AC
S = 0.016
L_c = 875 FT

$$T_c = \frac{.0078(875)^{.77}}{0.016^{.385}} = 7.1 \doteq 10 \text{ minutes}$$

I 4.65 in/hr as previous

$$Q = 0.56 \times 4.65 \times 8.61$$

$$= 22.42 \text{ cfs}$$

BASIN I

C = 0.56
A = 38.57 AC
S = 0.0467
L_c = 2375 FT

$$T_c = \frac{.0078(2375)^{.77}}{(.0467)^{.385}} = 10.1 \text{ min}$$

$$I = 4.63 \text{ in/hr}$$

$$Q = 0.56 \times 4.63 \times 38.57 = 100.01 \text{ CFS}$$

REV. 1-13-88

42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
NATIONAL

25 × 10

0000 0000 0181

RATIONAL METHOD COMPUTATIONS

BASIN J

$C = 0.56$
$A = 22.90$ ac
$S = .0456$
$L_c = 1250$ FT

$$T_c = \frac{.0078(1250)^{.77}}{.0456^{.385}} = 6.2 \doteq 10 \text{ min}$$

$$I = 2.2 \times 6.84(10)^{-.51} = 4.65 \text{ IN/HR}$$

$$Q = .56 \times 4.65 \times 22.90 = 59.64 \text{ CFS}$$

BASIN K

$C = 0.56$
$A = 27.43$ ac
$S = .074$
$L_c = 1500$ FT

$$T_c = \frac{.0078(1500)^{.77}}{.074^{.385}} = 5.9 = 10$$

$$I = 4.65 \text{ IN/HR}$$

$$Q = .56 \times 4.65 \times 27.43 = 71.43 \text{ CFS}$$

BASIN L1

$C = 0.56$
$A = 37.65$ ac
$S = .0432$
$L_c = 2500$ FT

$$T_c = \frac{.0078(2500)^{.77}}{.0432^{.385}} = 10.81 \text{ min}$$

$$I = 2.2 \times 6.84(10.8)^{-.51} = 4.47 \text{ IN/HR}$$

$$Q = .56 \times 4.47 \times 37.65 = 94.23 \text{ CFS}$$

BASIN L2

$C = 0.56$
$A = 25.60$ ac
$S = .0292$
$L_c = 2875$ FT

$$T_c = \frac{.0078(2875)^{.77}}{(.0292)^{.385}} = 14.00 \text{ min}$$

$I = 3.91$
$Q = 56.16$ CFS

25×10

APPENDIX B

BASIN M

C = 0.56
A = 39.31 ac
S = 0.053
L_c = 2125 FT

$$T_c = \frac{.0078(2125)^{.77}}{(.053)^{.385}} = 8.8 \doteq 10 \text{ min}$$

I = 4.65 IN/HR

Q = .56 x 4.65 x 39.31 = 102.37 CFS

BASIN N

C = 0.56
A = 47.18
S = 0.036
L_c = 2500 FT

$$T_c = \frac{.0078(2500)^{.77}}{(.036)^{.385}} = 11.6 \text{ min}$$

$$I = 2.2 \times 6.84 (11.6)^{-.51} = 4.31 \text{ IN/HR}$$

Q = .56 x 4.31 x 47.18 = 113.72 cfs

25 x 10

0000 0000 0183

APPENDIX B

HYDROGRAPH COMPUTATION WORKSHEET

DATE 1-13-88
COMPUTED BY DRCD
CHECK BY DRCD

PROJECT PARADISE HEIGHTS

LOCATION BASIN F1 *

ANALYSIS POINT # _____

(DR. AREA) A = _____ ACRES

T_c _____ MIN

POINT RAINFALL ____ IN. FROM PLATE 22.2 D-1

CN = _____ FROM PLATES 22.2 C-2, 22.2 C-3

RUNOFF VOLUME R = ____ IN. FROM PLATE 22.2 C-4

COMPUTED T_p = _____ MIN. $T_p = T_c$
(Rounded to even minute)

$q_p = \frac{45.4A}{T_p}$ = _____ CFS./INCH OF RUNOFF

$(R \times q_p) = Q_{peak}$ = _____ CFS

t(COLUMN)=(t/T_p) $t=T_p(t/T_p)$

$y = \frac{Q}{Q_{peak}}$ $Q = y(Q_{peak})$

* Q_{100} = 24.95 CFS
T_c ≐ 10 minutes

	(t/T_p)	t (min.)	y	Q (cfs)
1	0	0	0	0
2	.1	1	.03	0.75
3	.2	2	.10	2.50
4	.3	3	.190	4.74
5	.4	4	.310	7.73
6	.5	5	.470	11.73
7	.6	6	.660	16.47
8	.7	7	.820	20.46
9	.8	8	.930	23.20
10	.9	9	.990	24.70
11	1.0	10	1.00	24.95
12	1.1	11	.990	24.70
13	1.2	12	.930	23.20
14	1.3	13	.860	21.46
15	1.4	14	.780	19.46
16	1.5	15	.680	17.00
17	1.6	16	.560	13.97
18	1.7	17	.460	11.48
19	1.8	18	.390	9.73
20	1.9	19	.330	8.23
21	2.0	20	.280	6.99
22	2.2	22	.207	5.16
23	2.4	24	.147	3.67
24	2.6	26	.107	2.67
25	2.8	28	.077	1.92
26	3.0	30	.055	1.37
27	3.2	32	.040	1.00
28	3.4	34	.029	0.72
29	3.6	36	.021	0.52
30	3.8	38	.015	0.37
31	4.0	40	.011	0.27
32	4.5	45	.005	0.12
33	5.0	50	.000	0

V_{avg} = V_{F1} = 4.37 fps, V_{F2} = 3.73 fps } = 4.05

Time translated $\frac{L}{V_{avg}} = \frac{875}{4.05}$ = 216 sec = 3.6 min. = 4 min

PLATE 22.2 F-1

25×10

0000 0000 0 184

APPENDIX B

HYDROGRAPH COMPUTATION WORKSHEET

DATE 1-13-88
COMPUTED BY DRCD
CHECK BY DRCD

PROJECT PARADISE HEIGHTS

LOCATION BASIN F2*

ANALYSIS POINT # _____

(DR. AREA) A = _____ ACRES

T_c _____ MIN

POINT RAINFALL ____ IN. FROM PLATE 22.2 D-1

CN = _____ FROM PLATES 22.2 C-2, 22.2 C-3

RUNOFF VOLUME R = ____ IN. FROM PLATE 22.2 C-4

COMPUTED T_p = _____ MIN. (Rounded to even minute) $T_p = T_c$

$q_p = \frac{45.4A}{T_p}$ = _____ CFS./INCH OF RUNOFF

$(R \times q_p) = Q_{peak}$ = _____ CFS

t(COLUMN)=(t/T_p) $t=T_p(t/T_p)$

$y = \frac{Q}{Q_{peak}}$ $Q = y(Q_{peak})$

*Q_{100} = 22.42 CFS
T_c = 10 minutes

	(t/T_p)	t (min.)	y	Q (cfs)
1	0	0	0	0
2	.1	1	.03	0.67
3	.2	2	.10	2.24
4	.3	3	.190	4.26
5	.4	4	.310	6.95
6	.5	5	.470	10.54
7	.6	6	.660	14.80
8	.7	7	.820	18.38
9	.8	8	.930	20.85
10	.9	9	.990	22.20
11	1.0	10	1.00	22.42
12	1.1	11	.990	22.20
13	1.2	12	.930	20.85
14	1.3	13	.860	19.28
15	1.4	14	.780	17.49
16	1.5	15	.680	15.25
17	1.6	16	.560	12.56
18	1.7	17	.460	10.31
19	1.8	18	.390	8.74
20	1.9	19	.330	7.40
21	2.0	20	.280	6.28
22	2.2	22	.207	4.64
23	2.4	24	.147	3.30
24	2.6	26	.107	2.40
25	2.8	28	.077	1.73
26	3.0	30	.055	1.23
27	3.2	32	.040	0.90
28	3.4	34	.029	0.65
29	3.6	36	.021	0.47
30	3.8	38	.015	0.34
31	4.0	40	.011	0.25
32	4.5	45	.005	0.11
33	5.0	50	.000	0

PLATE 22.2 F-1

25×10

0000 0000 0 185

APPENDIX B

1-13-88

BASIN F2 TIME (min)	BASIN F1 TIME (min)	BASIN F2 Q (cfs)	BASIN F1 Q (cfs)	COMPOSITE Q (cfs)	
0	-	0			
1	-	0.67			
2	-	2.24			
3	-	4.26			
4	0	6.95			
5	1	10.54	0.75	11.29	
6	2	14.80	2.50	17.30	
7	3	18.38	4.74	23.12	
8	4	20.85	7.73	28.58	
9	5	22.20	11.73	33.93	
10	6	22.42	16.47	38.89	
11	7	22.20	20.46	42.66	
12	8	20.85	23.20	44.05	* PEAK
13	9	19.28	24.70	43.98	DISCHG
14	10	17.49	24.95	42.44	
15	11	15.25	24.70	39.95	
16	12	12.56	23.20	35.76	
17	13	10.31	21.46	31.77	
18	14	8.74	19.46	28.20	
19	15	7.40	17.00	24.40	
20	16	6.28	13.97	20.25	
22	18	4.64	9.73	14.37	
24	20	3.30	6.99	10.29	
26	22	2.40	5.16	7.56	
28	24	1.73	3.67	5.40	
30	26	1.23	2.67	3.90	
32	28	0.90	1.92	2.82	
34	30	0.65	1.37	2.02	
36	32	0.47	1.00	1.47	
38	34	0.34	0.72	1.06	
40	36	0.25	0.52	0.77	
45	41	0.11	0.24	0.35	
50	46	0	0.10	0.10	
54	50	0	0	0	

25×10

0000 0000 0186

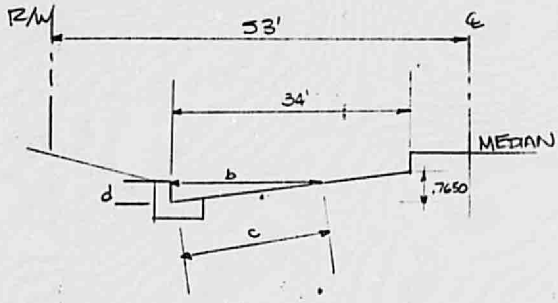
APPENDIX C

25×10

0000 0000 0187

STREET FLOW ANALYSIS CALCULATIONS

COLLECTOR
ARTERIAL STREET SECTION



½ STREET SECTION
2% CROWN
86' F-F includes median

$$b = \frac{34d}{.7650} = 44.4444d$$

$$c = \sqrt{b^2+d^2} = 44.4557$$

$$p = d + c = 45.4557$$

$$A = \tfrac{1}{2}db = 22.2222d^2$$

$$R = A/p = d/2.0455$$

WHEN Q & S HAVE KNOWN
SOLVE FOR d using Mannings Eq.

$$Q = VA$$

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

$$d = \left[4.5 \times 10^{-4} \frac{Q}{S^{1/2}}\right]^{3/8} \qquad V = \frac{\tfrac{1}{2}Q}{20.6186}$$

POINT	SLOPE	Q_{10}	d	V
W1	1.62 %	13.1	.31	3.14
W2	1.46 %	10.2	.28	2.84
K	7.40 %	46.9	.37	7.63

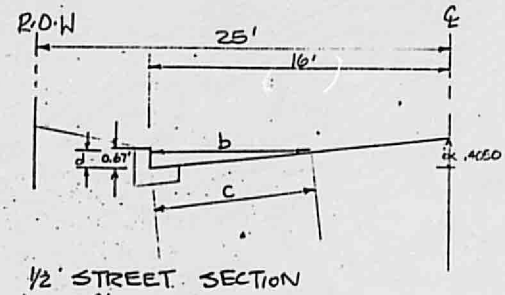
25×10

0000 0000 0188

APPENDIX C

STREET FLOW ANALYSIS CALCULATIONS

RESIDENTIAL STREET SECTION



½ STREET SECTION
2% CROWN

$$b = \frac{16d}{.4050} = 39.5062\,d$$

$$c = \sqrt{b^2+d^2} = 39.5188\,d$$

$$p = d + c = 40.5188\,d$$

$$A = \tfrac{1}{2} d \times b = 19.7531\,d^2$$

$$R = A/p = d/2.0513$$

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

$$\tfrac{1}{2}Q_{PEAK} = VA$$

SOLVING FOR d which is based on Q and the other known information

$$d = \left[4.68\times10^{-4}\,\frac{Q}{S^{1/2}}\right]^{3/8}$$ depth of flow

$$V = \frac{\tfrac{1}{2}Q}{19.7531\,d^2}$$ Velocity

POINT	SLOPE	Q_{10}	d	V
D	1.80	80.8	.62	5.29
G	1.14	22.9	.42	3.25
G	1.14	74.7	.62	5.29

25×10

0000 0000 0189

APPENDIX C

1-13-88

STREET FLOW ANALYSIS

Basins F1 & F2

AVG STREET FLOW @ 1.85%

Q_{100} = 25 cfs F1

Q_{100} = 44.1 cfs Accum F1 & F2

Basin F1 - Q_{100}

$$d = \left[4.68 \times 10^{-4} \frac{25}{(.0185)^{1/2}}\right]^{3/8} = 0.3985 = 0.40'$$

$$V = \frac{\frac{1}{2}Q}{19.7531\, d^2} = \frac{\frac{1}{2}(25)}{19.7531(.40)^2} = 3.18 \text{ FPS}$$

Basin F2 - Q_{100}

$$d = \left[4.68 \times 10^{-4} \frac{44.1}{(.0185)^{1/2}}\right]^{3/8} = 0.4931 = 0.49' = 5.9'$$

$$V = \frac{\frac{1}{2}(44.1)}{19.7531(.49)^2} = 4.59 \text{ FPS}$$

Basin F1 - Q_{10} = 16.39 CFS

$$d = \left[4.68 \times 10^{-4} \frac{16.39}{(.0185)^{1/2}}\right]^{3/8} = 0.34' \qquad V = \frac{\frac{1}{2}(16.39)}{19.7531(.34)^2} = 3.58 \text{ FPS}$$

Basin F2 - Q_{10} = 28.97 CFS

$$d = \left[4.68 \times 10^{-4} \frac{28.97}{(.0185)^{1/2}}\right]^{3/8} = .42 \qquad V = \frac{\frac{1}{2}(28.97)}{19.7531(.42)^2} = 4.13 \text{ FPS}$$

25×

0000 0000 0190

APPENDIX D

25×10

0000 0000 0191

TR-55 STORAGE VOLUME FOR DETENTION BASINS VERSION 1.11

Project: PARADISE HTS MASTER PLAN User: DRCD Date: 01-14-88

County: BERNALILLO State: NM

Subtitle: BASIN J

Drainage Area: 22.9 acres Rainfall Frequency: 10 years

Rainfall-Type: II

24-Hour Rainfall: 2.6 inches Runoff Curve Number: 59

Peak Inflow: 39.2 cfs

Peak Outflow: 9.8 cfs

Runoff Volume: 0.2 inches

Detention Basin Storage Volume: 0.07 inches or 0.1 acre feet

TR-55 STORAGE VOLUME FOR DETENTION BASINS VERSION 1.11

Project: PARADISE HTS MASTER PLAN User: DRCD Date: 01-14-88

County: BERNALILLO State: NM

Subtitle: BASIN J

Drainage Area: 22.9 acres Rainfall Frequency: 10 years

Rainfall-Type: II

Runoff: .18 inches

Peak Inflow: 39.2 cfs

Peak Outflow: 9.8 cfs

Detention Basin Storage Volume: 0.07 inches or 0.1 acre feet

25×10

0000 0000 0192

TR-55 STORAGE VOLUME FOR DETENTION BASINS VERSION 1.11

Project: PARADISE HTS MASTER PLAN User: DRCD Date: 01-14-88

County: BERNALILLO State: NM

Subtitle: BASIN F1

Drainage Area: 9.58 acres Rainfall Frequency: 10 years

Rainfall-Type: II

24-Hour Rainfall: 2.6 inches Runoff Curve Number: 59

Peak Inflow: 16.4 cfs

Peak Outflow: 4 cfs

Runoff Volume: 0.2 inches

Detention Basin Storage Volume: 0.08 inches or 0.1 acre feet

TR-55 STORAGE VOLUME FOR DETENTION BASINS VERSION 1.11

Project: PARADISE HTS MASTER PLAN User: DRCD Date: 01-14-88

County: BERNALILLO State: NM

Subtitle: BASIN F1

Drainage Area: 9.58 acres Rainfall Frequency: 10 years

Rainfall-Type: II

Runoff: .18 inches

Peak Inflow: 16.4 cfs

Peak Outflow: 4 cfs

Detention Basin Storage Volume: 0.08 inches or 0.1 acre feet

25×10

0000 0000 0193

TR-55 STORAGE VOLUME FOR DETENTION BASINS VERSION 1.11

Project: PARADISE HTS MASTER PLAN User: DRCD Date: 01-14-88

County: BERNALILLO State: NM

Subtitle: BASIN L1

Drainage Area: 37.7 acres Rainfall Frequency: 10 years

Rainfall-Type: II

24-Hour Rainfall: 2.6 inches Runoff Curve Number: 59

Peak Inflow: 61.9 cfs

Peak Outflow: 15.5 cfs

Runoff Volume: 0.2 inches

Detention Basin Storage Volume: 0.07 inches or 0.2 acre feet

TR-55 STORAGE VOLUME FOR DETENTION BASINS VERSION 1.11

Project: PARADSISE HTS MASTER PLAN User: DRCD Date: 01-14-88

County: BERNALILLO State: NM

Subtitle: BASIN L1

Drainage Area: 37.7 acres Rainfall Frequency: 10 years

Rainfall-Type: II

Runoff: .18 inches

Peak Inflow: 61.9 cfs

Peak Outflow: 15.5 cfs

Detention Basin Storage Volume: 0.07 inches or 0.2 acre feet

25×10

0000 0000 0194

TR-55 STORAGE VOLUME FOR DETENTION BASINS VERSION 1.11

'roject: PARADISE HTS MASTER HTS User: DRCD Date:

County: BERNALILLO State: NM

ubtitle: BASIN L2

Drainage Area: 25.6 acres Rainfall Frequency: 10 years

ainfall-Type: II

unoff: .2 inches

Peak Inflow: 36.9 cfs

'eak Outflow: 9.2 cfs

Detention Basin Storage Volume: 0.08 inches or 0.2 acre feet

TR-55 STORAGE VOLUME FOR DETENTION BASINS VERSION 1.11

'roject: PARADISE HTS MASTER PLAN User: DRCD Date:

County: BERNALILLO State: NM

ubtitle: BASIN L2

Drainage Area: 25.6 acres Rainfall Frequency: 10 years

ainfall-Type: II

24-Hour Rainfall: 2.6 inches Runoff Curve Number: 59

'eak Inflow: 36.9 cfs

eak Outflow: 9.2 cfs

Runoff Volume: 0.2 inches

etention Basin Storage Volume: 0.07 inches or 0.2 acre feet

ESC - EXIT COMPUTE PROCESS

25×10

0000 0000 0195

APPENDIX D CHECK OF EXIT VELOCITY

BASIN F1

0.1 acre-ft = 4356 CF = 3 x 38 x 38 POND DIMENSIONS

$Q = CLH^{1.5}$

$H = \left[\frac{4}{3 \times 38}\right]^{.67} = 0.1072$

C = .3
L = 38
Q = Q_{OUT} = 4

$Q = VA$ A = L x H = 38 x .1072 = 4.0727 SF

V = 4/4.0727 = .98 fps < 2 fps ok

Will use 3 x 40 x 40 POND

BASIN J

Storage Volume = 0.2 acre ft = 8712 CF = 3 x 54 x 54

$H = \left[\frac{9.8}{3 \times 54}\right]^{.67} = 0.1541$

C = .3
L = 54
Q_{OUT} = 9.8 cfs

A = 54 x .1541 = 8.32 SF

V = Q/A = 15.5/8.32 = 1.86 fps < 2 fps OK

Basin L1

Storage Volume = .3 acre ft = 13068 CF = 3 x 66 x 66

C = .3
L = 66
Q_{OUT} = 15.5

$H = \left[\frac{15.5}{3 \times 66}\right]^{.67} = 0.1830$

A = 66 x .1830 = 12.08 SF

V = Q/A = 15.5/12.08 = 1.28 fps < 2 fps OK

25 x 10

APPENDIX D : CHECK OF EXIT VELOCITY CON'T

Basin L2

0.2 acre-ft = 8712 CF = .3 x 54 x 54

$$H = \left[\frac{9.2}{3 \times 54}\right]^{.67} = .1477$$

C = .3
L = 54
Q_{OUT} = 9.2

A = .1477 x 54 = 7.98 SF

V = Q/A = 9.2 / 7.98 = 1.15 fps < 2 fps OK

25 x 10

0000 0000 0197

APPENDIX E

STORM DRAIN CALCULATIONS

Q_{100} = 299.7 CFS OFFSITE 1
S = 1.5%

FROM NOMOGRAPH FOR CIRCULAR DRAIN FLOWING FULL, n = 0.013

60" DIA. PIPE

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

A = 19.64 SF
S = 1.5%
R = 1.25

Q_{CAP} = 319 > 299.7 OK
V = 16.25 fps

BASINS OFFSITE 1, W1 & A1
MERGED TO OBTAIN PEAK FLOW
= 337 CFS

FROM NOMOGRAPH

GIVEN Q = 337 cfs
S = 1.25%

66" DIA PIPE

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

A = 23.76
R = 1.3750
S = 1.25%

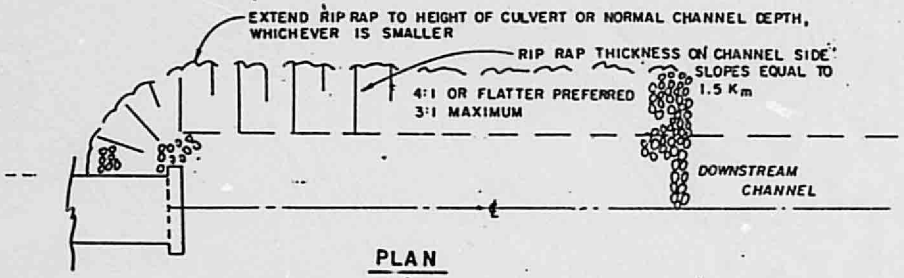
Q_{CAP} = 375 CFS
V = 15.80 fps

~~BASINS OFFSITE 1, W1, A1 & F1~~
~~MERGED TO OBTAIN PEAK FLOW -~~
~~= 362 cfs < 375 cfs~~

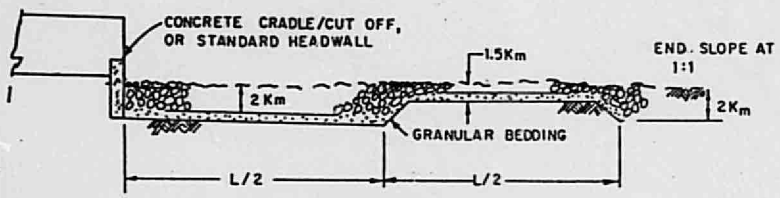
REV. 1-13-88

25×10

APPENDIX E



PLAN



PROFILE

$$L = fe\,\frac{At}{Yt} - w$$

Where: L = length of protection

W = width of conduit

Yt = tail water depth

$fe = \frac{1}{2}\tan\theta$

Where: θ = angle of lateral expansion

$At = Q/V$

Where: Q = design discharge

V = allowable non-eroding velocity in the downstream channel

K_m = the mean stone size in feet

ALTERNATE DISSIPATOR DETAILS

REPRODUCED FROM "DRAINAGE PLAN FOR PARADISE NORTH" FEB. 1986

25X

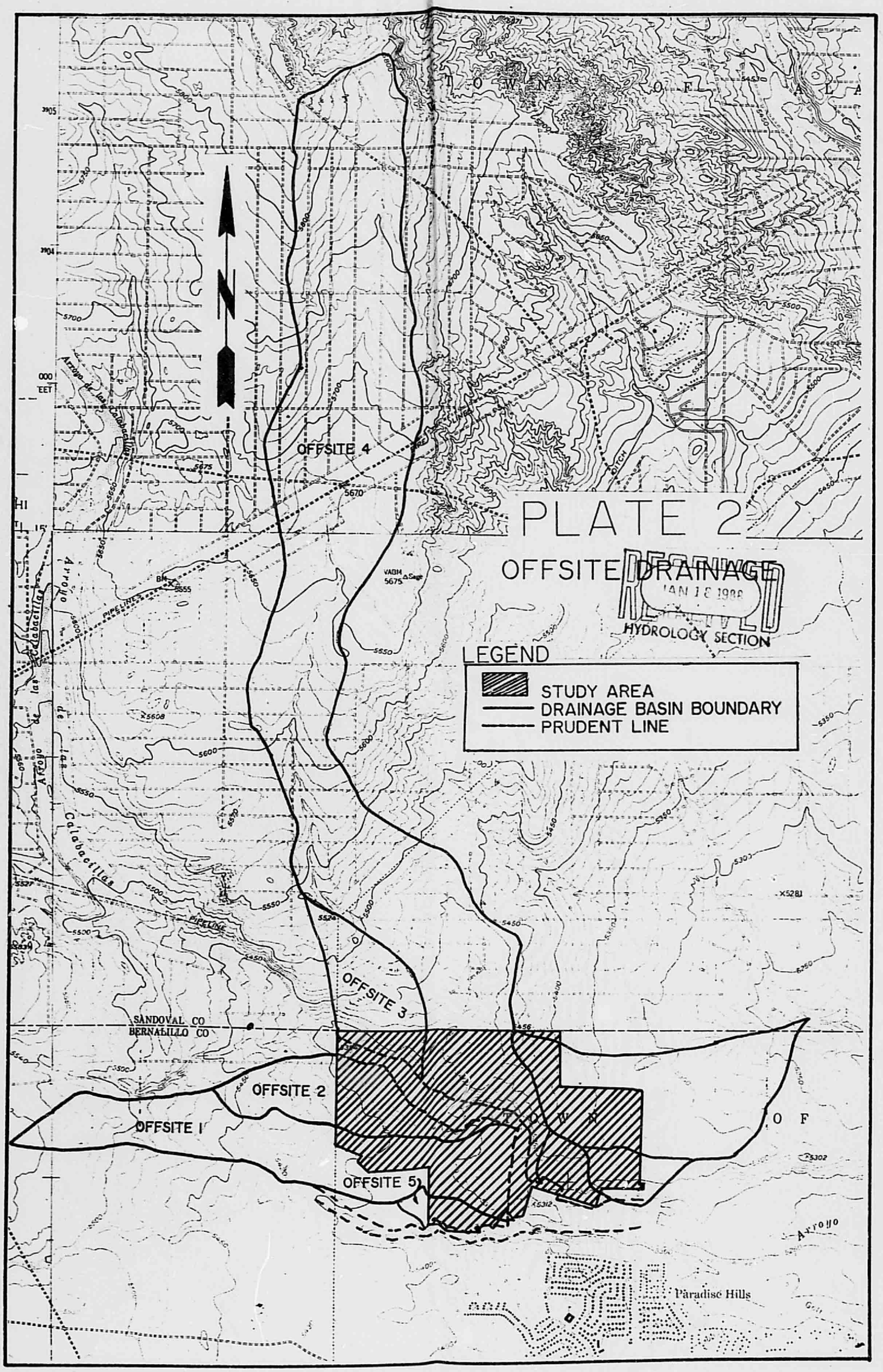


PLATE 2
OFFSITE DRAINAGE
HYDROLOGY SECTION
LEGEND
STUDY AREA
DRAINAGE BASIN BOUNDARY
PRUDENT LINE
OFFSITE 1
OFFSITE 2
OFFSITE 3
OFFSITE 4
OFFSITE 5
SANDOVAL CO
BERNALILLO CO
Calabacillas
Arroyo de las Calabacillas
PIPELINE
DITCH
Arroyo
Paradise Hills
TOWN OF

25X
32X
25X

0000 0000 0200

PLANS/PLATS ON FILE

FILE DESC: A10/D2

PLANS/PLATS 3

25×

0000 0000 0201

25×10