FILE COPY

City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

April 18, 1988

Dennis Lorenz, P.E.
Espey, Huston, Inc.
317 Commercial Street, NE
Albuquerque, New Mexico 87102

RE: DRAINAGE PLAN FOR NORTH VALLEY SEPTAGE DISCHARGE FACILITY
(E-16/D7) RECEIVED MARCH 16, 1989

Dear Mr. Lorenz:

The referenced plan dated March 15, 1989, is approved for building permit and S.O. #19 release. Please submit another set of these approved drawings to Hydrology. We will send that set to the Inspection Section for their records.

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

Cordially,

Carlos A. Montoya, P.E.
City/County Floodplain Administrator

CAM/bsj
(WP+804)

7338061

DRAINAGE REPORT
FOR
OSUNA ROAD
SECOND STREET THROUGH
NORTH DIVERSION CHANNEL

Prepared for:

BERNALILLO COUNTY ROAD DEPARTMENT
COUNTY OF BERNALILLO
2400 Broadway SE
Albuquerque, New Mexico 87102

August 1986
Revised January 1988
2nd Revision July 1988

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LIST OF TABLES AND FIGURES

DRAINAGE REPORT

I. Introduction

The Osuna Road Project involves improvement of the two-lane facility to an urban, divided four-lane roadway. The project site is located on Osuna Road between Second Street NW and the AMAFCA North Diversion Channel. Project funding will be provided by contribution from Bernalillo County, State of New Mexico, and the City of Albuquerque. The design drawings will be reviewed by Bernalillo County, NMSHTD, AMAFCA, Corps of Engineers, City of Albuquerque, and MRGCD.

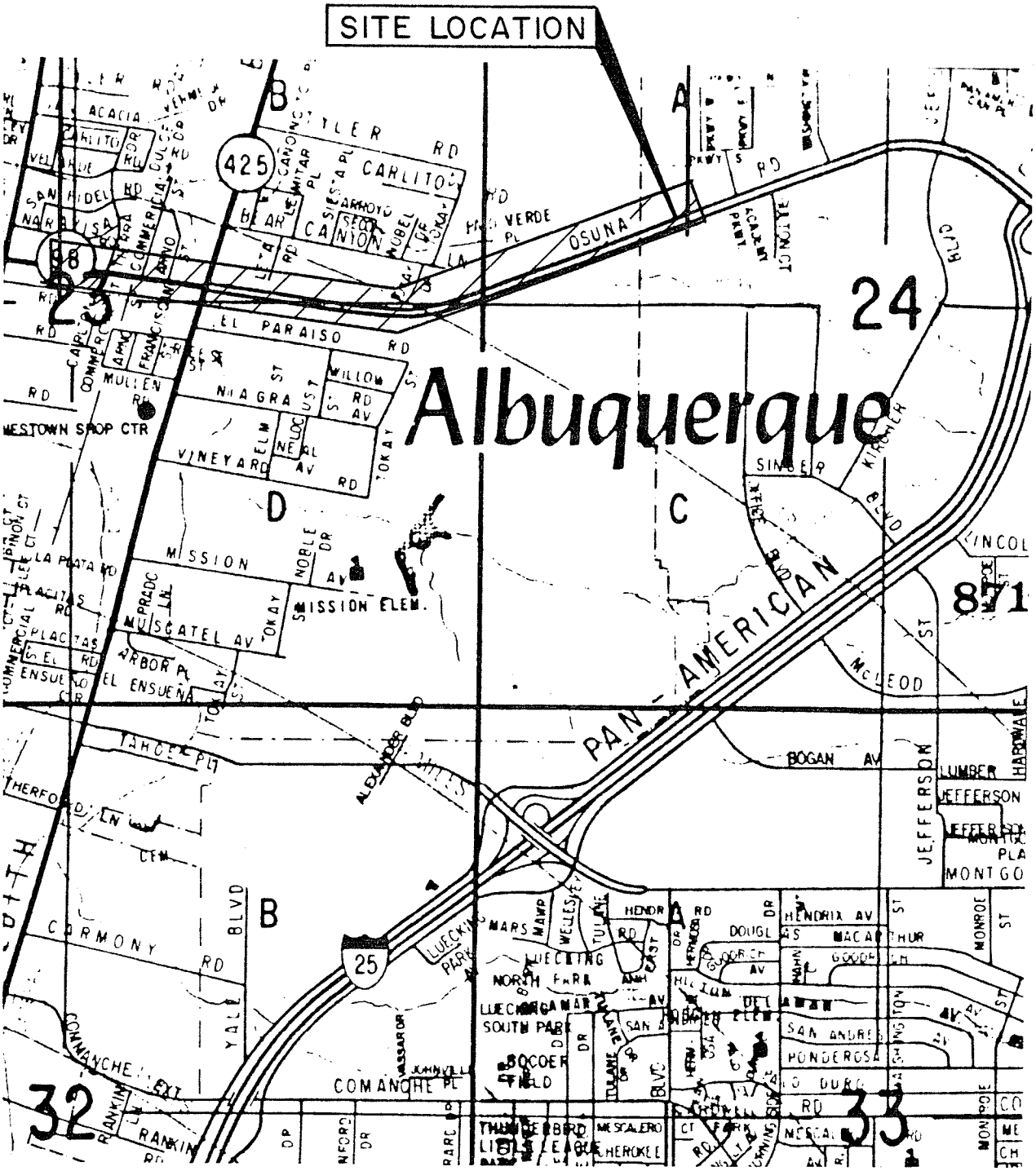
II. Purpose and Scope

The purpose of the project is to ensure that the development of the Osuna Road Improvements will not increase the flooding potential of adjacent and/or downstream properties. Existing flooding will be identified and recommendations proposed which will mitigate problem conditions related to the construction of Osuna Road. It is intended that construction of the Osuna Road will create safe traffic conditions generally free from stormwater hazards.

III. Existing Drainage Conditions

The project area is comprised of two (2) study areas: the area east of the North Diversion Channel (basin 12), and the area between the North Diversion Channel and Second Street NW (basins 1-11). The study area between the Channel and Second Street contains the major portion of the project. The drainage basins are comprised of Osuna Road and right-of-way, and adjacent developed residential and commercial properties north of the road. The watershed presently drains westward and ponds at existing depressions located at the AT&SF Railroad, and near Second Street just north of Osuna (see Figure 1). The existing roadway is an elevated county type section with roadside swales located on either side to convey flows westward.

The study area located east of the Channel is comprised of the Osuna Road and right-of-way, and some industrial development. The basin drains into Osuna Road, which is improved with curbs and gutters, to the east side of the Channel. At this



VICINITY MAP: E-15 & E-16

SCALE: 1"= 2000'

point the street flows are intercepted by a system of storm inlets which drain to the Channel via a 36" storm drain. Drainage rundowns are provided north and south of the existing bridge to drain any excess flows into the Channel upstream of the bridge.

From each of the depressions/detention basins in which flooding occurs, there is no apparent outfall which can be accessed. In addition, there is an existing drainage problem at the undercrossing of the Associated Gravel Products haul road. This road is located approximately 2000' west of the AMAFCA North Diversion Channel and the profile of the road shows a depression at a point just south of the crossing. A 24" storm drain has been provided as an outfall from the depression. However, from field observations, the storm drain has long since ceased to function properly.

SOILS TYPES

TABLE 1

Soil Map Symbol	Soil Series	Representative Soil Profile	Hydrologic Soil Group
EmB	Embudo	Gravelly Fine Sandy Loam	B
BKD	Bluepoint-Kokan	Loamy Fine Sand - Gravelly Sand	A
GF	Gila Complex	70% Sandy Loam, 15% Sandy Clay Loam & 15% Gravel	B
Gd	Gila Loam, moderately alkali	Sandy Loam - Very Fine Sandy Loam	B
Gb	Gila Loam	Sandy Loam - Very Fine Sandy Loam	B
Gm	Glendale Clay Loam	Clay Loam	B

The types of soil located within the drainage study areas are shown in Table 1. The quantities of stormwater runoff generated by the existing drainage basins are shown in the supplemental calculations provided in the appendix.

IV. Proposed Drainage Conditions

Due to the widening of Osuna Road east of the North Diversion Channel and the construction of a new bridge for westbound traffic, the existing asphalt rundown will require removal. This removal will be limited to that portion of the rundown which encroaches into the proposed abutment apron and will not effect that portion of the rundown that drains flows from the north. Due to the ineffectiveness of the existing battery of storm inlets located east of the rundown (see Calculations page 24), a new system of storm inlets will be installed. This new system will assist in draining the 100-year/6-hour storm from the roadway upstream of the new bridge.

Basins 1-4 make up the Osuna ROW between the North Diversion Channel and the AT&SF Railroad. Storm water within the roadway will be intercepted by a storm drain system with storm inlets located to adhere to the local drainage ordinance which requires that one free driving lane be available during a 10-year/6-hour storm event. The mainline will be designed to carry the 10-year/6-hour runoff based on existing conditions per suggestion by the NMSHTD. The calculations (see Appendix) demonstrate the effectiveness of the storm inlet location design. In addition to the street flows, offsite basins from the north will be allowed to discharge into the system. As shown by Figure 1, Basin 7A will sheet flow into the westbound lanes of the roadway. Additional storm inlets will be provided in the westbound lanes to drain this sheet flow. Basin 7B drains westward to Edith Boulevard. In anticipation of future Edith Road improvements a battery of storm inlets will be provided at the north curb returns of the intersection. The storm drainage system will drain to a detention pond located within the center median just east of the railroad crossing. Due to limited downstream capacity at the Alameda Drain, controlled discharge has been imposed on this project. Controlled discharge requires storage of stormwater within the center median on either side of the railroad crossing. The upstream pond (Pond No. #2) is the outfall for basins 1-4 and 7-9. The roadway and basin 7 drain as previously discussed. Basins 8 and 9 drain by 18-inch storm drains from double Type 'D' storm inlets. These inlets are located at sag points near the approaches to Osuna Road. Pond No. 2 drains at a controlled rate into Pond No. 1 by a 48-inch storm drain. Pond No. 1 accepts runoff from the remainder of the roadway and basin 10. Basin 10 is drained by a 18-inch storm drain from an existing double Type 'D' inlet which presently drains as a sump. Pond No. 1 drains at a controlled rate of approximately 15 cfs into the existing 48-inch storm drain provided by the Second Street improvement project.

It must be noted that the storm inlets provided to basins 8,9 and 10 are intended to drain nuisance flows that are presently causing ponding at the approaches to Osuna Road. The relative elevation of the existing ponding area at Broadway Place is below the anticipated 10-year/6-hour water surface of Pond No. 2 located within the center median of Osuna Road. Since Pond No. 2 is the outfall for the existing drop inlet located at Broadway Place, temporary ponding of stormwater will occur over the drop inlet until the peak passes. An automatic drainage gate will be placed over the end of the 18-inch lateral to prohibit backwater from Pond No. 2 up through the drop inlet.

The storm drainage system, which has been alluded to in the previous discussion, will flow to the Alameda Drain under controlled discharge conditions. The discharge conditions for the Osuna Road improvements project was determined by the Middle Rio Grande Conservancy District and in a study of the Alameda Drain by Boyle Engineering. The rate of discharge will be 15 cfs, with a storage requirement of approximately 93,500 cubic feet. The outfall will be metered into the Alameda Drain by the 2nd Street project with an appropriate outlet structure.

Some portions of the properties located south, but adjacent to the roadway, could potentially drain into the roadway. This analysis and design assume no discharge into the roadway or associated storm drainage facilities by these properties. Generally, the topography falls to the south and west making this restriction compatible with existing and future drainage patterns. Should a development require release of stormwater into the Osuna Road improvements, it is recommended that controlled discharge rate of 0.20 cfs per acre be imposed. This rate will allow detention ponds to drain within 24 hours per local ordinances. Due to the very limited downstream capacity of this project, any discharge into Osuna Road by these properties should be discouraged.

V. Recommendations

1. Controlled discharge to the Alameda Drain at a rate of approximately 15 cfs is recommended for the Osuna Road improvements. The discharge rate was specified by the Boyle Engineering study of the Alameda Drain. This is also the maximum inflow rate that the Middle Rio Grande Conservancy District will allow.

2. Provide detention ponds in the center median of the roadway. The ponds (2) will be sized to hold approximately 93,500 CF of stormwater. Low flow trickle channels will be provided to drain nuisance flows. Maximum water surfaces (10-year/6-hour) will be below the bottom of subbase.

3. Construct a storm drain system to drain the 10-year/6-hour storm event from the project area. Storm inlets shall be spaced to keep one lane dry in each direction, per local ordinances.

4. Construct a battery of storm inlets at the north curb returns of the Edith/Osuna intersection.

5. Provide storm inlets and laterals at Tierra, Broadway Place, and Arno to drain depression areas.

6. Provide automatic drainage gate at the end of the Broadway Place lateral to prohibit backwater from Pond No. 2.

7. Future expansion of the Osuna roadway driving lanes will not be permitted in the center median area between Second Street NW and the AT&SF Railroad. This action would severely deplete critical detention pond volumes. In the event that the capacity of the Alameda Drain is increased to handle a larger discharge of runoff from the Osuna Road improvements, the roadway widening may be possible.

8. Prohibit free discharge of storm water from properties located south of Osuna Road.

VI. ADDENDUM NO. 1

The Osuna Road improvement project provides storm drainage facilities designed to convey the 10-year/6-hour design storm from the project basin to the Alameda Drain. The 10-year design storm was established as the project storm for two reasons:

1. The NMSHTD agreed to provide funding for a 10-year system.
2. Limited capacity at the Alameda Drain required implementation of detention ponding within the roadway center medians. Sufficient area was not available to pond higher level storms.

The 10-year storm drainage system was tested to determine the effects of a 100-year/6-hour storm on the system and identify potential flooding. It was determined that excess runoff in the form of street flow would become a problem at Edith Boulevard. It is anticipated that approximately 49.2 cfs would sheet flow across the intersection and potentially cause flood damage to downstream property. Concern arose about this potential flooding problem which led to a study to determine the most economical means to mitigate the problem. Various sites were studied as possible detention ponding areas, with associated piping and outfall systems. In each case, the land was unavailable or the system was cost prohibitive. It was decided by Bernalillo County Public Works Department that an independent system would be built to intercept the excess runoff. The system would drain to a future storm drainage facility to be constructed in Edith Boulevard. Due to the timing of the projects, the collection system would be built with the Osuna Road project. Since no outfall is available, the collection system would be stubbed both north and south from Osuna Road. This provides flexibility to the future Edith system for alignment and connection. The drop inlets to be located in Osuna also wil not be built at this time as keeping debris and water out of them is a problem. Laterals will be constructed to the curbline and be available for connection to the future drop inlets.

APPENDIX

I. HYDROLOGY

A. THE CRITERIA FOR HYDROLOGIC CALCULATIONS IS PER THE SCS METHOD AS OUTLINED IN THE CITY OF ALBUQUERQUE DEVELOPMENT PROCESS MANUAL, VOLUME II, CHAPTER 22:

1. RAINFALL $P_{100} = 2.20"$ $P_{10} = 1.45"$

2. TIME OF CONCENTRATION

$$T_c = 0.0078\, L^{0.77} / S^{0.385} \quad (\text{MIN})$$

WHERE L = LENGTH (FT)
S = SLOPE (FT/FT)

3. RUNOFF

$$Q = \frac{45.4AR}{T_c} \quad (\text{CFS})$$

WHERE: A = AREA (AC)
R = DIRECT RUNOFF (IN.)

4. VOLUME

$$V = 3630\,AR \quad (\text{CF})$$

5. SCS CURVE NUMBER (CN) PER PLATES 22.2 C-2 AND 22.2 C3.

HYDROLOGIC CALCULATIONS

AP	BASINS	AREA AC.	L_{FT}	H_{FT}	$T_{c\ min}$	%IMPER	SOIL	CN	R_{10} in.	R_{100} in.	Q_{10} CFS	Q_{100} CFS	V_{10} CF	V_{100} CF
1	1	9.6	5700	91	30	95	GF, EMB BKD	95	1.0	1.7	14.5	24.7	34,848	59,242
1	2	9.6	5700	91	30	95	"	"	"	"	14.5	24.7	"	"
2	3	2.0	700	11	10	"	GD	"	"	"	9.1	15.4	7,260	12,342
2	4	2.0	700	11	10	"	GD	"	"	"	9.1	15.4	"	"
3	5	1.6	950	10	10	"	GD GM	"	"	"	7.3	12.3	5808	9873
3	6	1.6	950	10	10	"	GD GM	"	"	"	7.3	12.3	"	"
1	7	54.0	3600	62	20	40	GF BKD	84	0.4	0.9	49.0	110.3	78,408	176,418
4	8	3.6	750	6	10	40	GD	75	0.2	0.5	3.3	8.2	2614	6534
5	9	10.2	1150	9	10	"	GD	"	"	"	9.3	23.2	7405	18,513
6	10	2.6	400	2	10	"	GD Gb	"	"	"	2.4	5.9	1888	4719
7	11	28.9	2000	14	18	"	Gb GD, GM	"	"	"	14.6	36.4	20,981	52,454
1	1,2,7	73.2	5700	91	30		GF, EMB BKD	87	0.55	1.1	60.1	121.9	146,144	292,288
2	1-4,7	77.2	6400	102	33		GF, GD EMB BKD	87	"	"	58.4	116.8	154,130	308,260
3	1-7	80.4	7750	112	.36		GF, GD, GM, EMB BKD	88	"	"	55.8	111.5	160,520	321,040
1	7A	35.0	3600	62	20	40	GF BKD	84	0.4	0.9	31.8	71.5	50,820	114,345
1	7B	19.0	3600	62	20	40	"	84	0.4	0.9	17.2	38.8	27,588	62,073
8	1A	4.2	2470	33	17	95	GF EMB BKD	95	1.0	1.7	11.2	19.1	15,246	25,918

ESPEY, HUSTON & ASSOCIATES INC.
Engineering & Environmental Consultants

SUBJECT HYDROLOGY

OSUNA ROAD

SHEET 2 OF
DATE 1-4-88 BY DL
CK BY

ESPEY, HUSTON & ASSOCIATES INC.
Engineering & Environmental Consultants

SUBJECT HYDROLOGY

OSUNA ROAD

SHEET 2 OF _____ BY DL
DATE 1-4-88 CK BY _____

HYDROLOGIC CALCULATIONS

AP	BASINS	AREA AC	L_{FT}	H_{FT}	T_c min	%IMP	SOIL	CN	R_{10} in	R_{100} in	Q_{10} CFS	Q_{100} CFS	V_{10} CF	V_{100} CF
8	2A	4.2	2470	33	17	95	GE MID DIRD	95	1.0	1.7	11.2	19.1	15,246	25,918
1	1,2,7A	54.2	5700	91	30		"	90	0.7	1.3	57.4	106.6	137,722	255,770
9	12	22.0	4360	71	24	95		95	1.0	1.7	34.3	58.3	79,600	135,762

H Y D R O G R A P H S

HYDROGRAPH COMPUTATION WORKSHEET

DATE 12-18-87
COMPUTED BY DL
CHECK BY

PROJECT OSUNA ROAD

LOCATION POND # 1 ⟨ W OF RR ⟩

ANALYSIS POINT # 3

(DR. AREA) A = 80.4 ACRES

T_c 36 MIN

POINT RAINFALL 1.45 IN. FROM PLATE 22.2 D-1

CN = 87 FROM PLATES 22.2 C-2, 22.2 C-3

RUNOFF VOLUME R = 0.55 IN. FROM PLATE 22.2 C-4

COMPUTED T_p = 36 MIN. $T_p = T_c$
(Rounded to even minute)

$q_p = \frac{45.4A}{T_p}$ = 101.4 CFS./INCH OF RUNOFF

$(R \times q_p) = Q_{peak}$ = 55.8 CFS (10 YR)

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

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

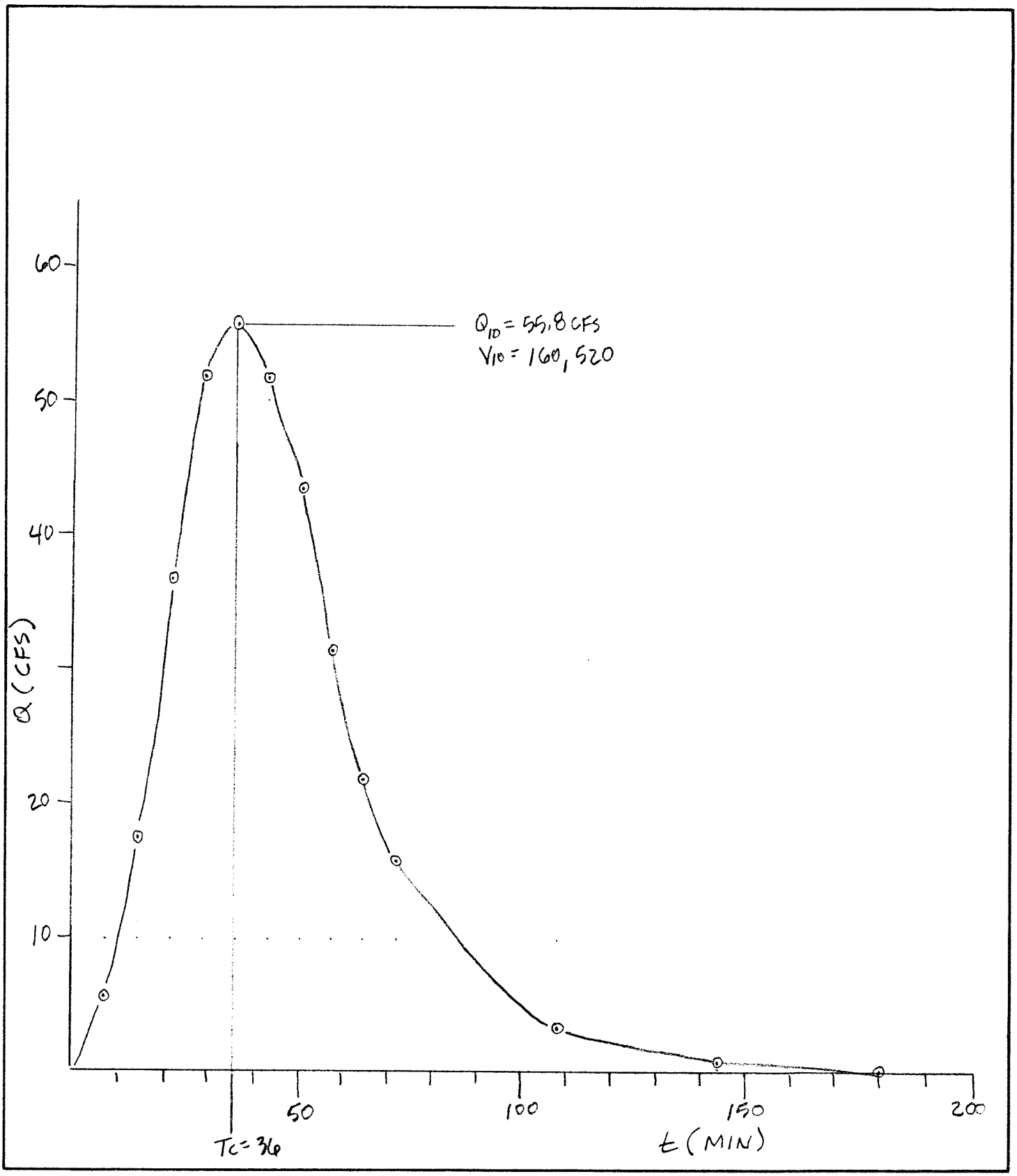
	(t/T_p)	t (min.)	y	Q (cfs)
1	0	0	0	0
2	.1		.03	
3	.2	7.2	.10	5.6
4	.3		.190	
5	.4	14.4	.310	17.3
6	.5		.470	
7	.6	21.6	.660	36.8
8	.7		.820	
9	.8	28.8	.930	51.9
10	.9		.990	
11	1.0	36	1.00	55.8
12	1.1		.990	
13	1.2	43.2	.930	51.9
14	1.3		.860	
15	1.4	50.4	.780	43.5
16	1.5		.680	
17	1.6	57.6	.560	31.2
18	1.7		.460	
19	1.8	64.8	.390	21.8
20	1.9		.330	
21	2.0	72	.280	15.6
22	2.2		.207	
23	2.4		.147	
24	2.6		.107	
25	2.8		.077	
26	3.0	108	.055	3.1
27	3.2		.040	
28	3.4		.029	
29	3.6		.021	
30	3.8		.015	
31	4.0	144	.011	0.6
32	4.5		.005	
33	5.0	180	.000	0

PLATE 22.2 F-1

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT HYDROGRAPH AT POINT NO 1 @ AP # 3

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-86 PAGE 5 OF _____



NOTES:

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Engineering & Environmental Consultants

HYDROGRAPH COMPUTATION WORKSHEET

DATE 12-18-87
COMPUTED BY [illegible]
CHECK BY _____

PROJECT OSUNA ROAD

LOCATION POND #2 (E OF R.R.)

ANALYSIS POINT # 2

(DR. AREA) A = 77.2 ACRES

T_c 33 MIN

POINT RAINFALL 1.45 IN. FROM PLATE 22.2 D-1

CN = 0.55 FROM PLATES 22.2 C-2, 22.2 C-3

RUNOFF VOLUME R = 0.55 IN. FROM PLATE 22.2 C-4

COMPUTED T_p = 33 MIN. $T_p = T_c$
(Rounded to even minute)

$q_p = \frac{45.4A}{T_p}$ = 106.2 CFS./INCH OF RUNOFF

$(R \times q_p) = Q_{peak}$ = 58.4 CFS (10yR)

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

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

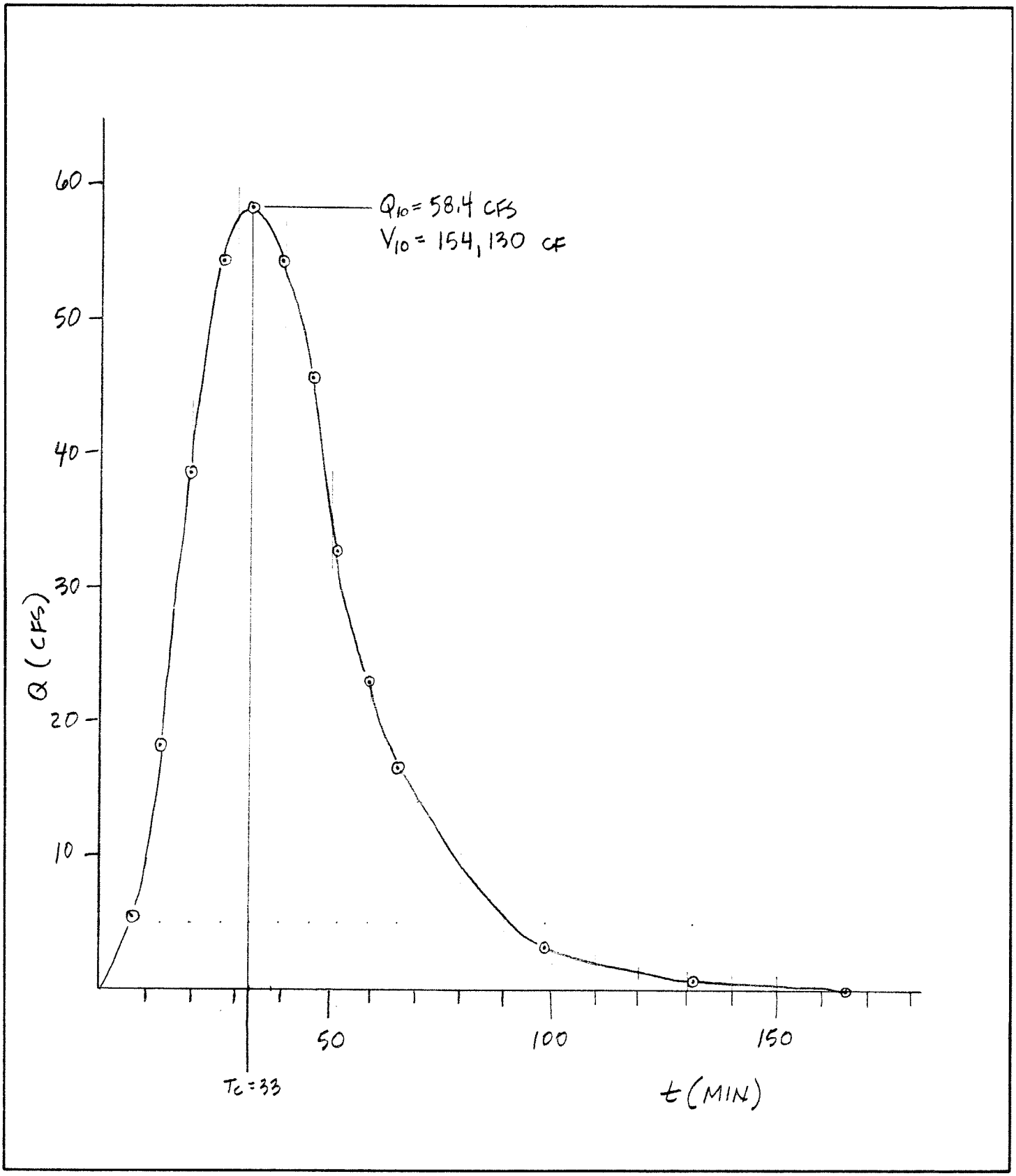
	(t/T_p)	t (min.)	y	Q (cfs)
1	0	0	0	0
2	.1		.03	
3	.2	6.6	.10	5.8
4	.3		.190	
5	.4	13.2	.310	18.1
6	.5		.470	
7	.6	19.8	.660	38.5
8	.7		.820	
9	.8	26.4	.930	54.3
10	.9		.990	
11	1.0	33	1.00	58.4
12	1.1		.990	
13	1.2	39.6	.930	54.3
14	1.3		.860	
15	1.4	46.2	.780	45.6
16	1.5		.680	
17	1.6	52.8	.560	32.7
18	1.7		.460	
19	1.8	59.4	.390	22.8
20	1.9		.330	
21	2.0	66.0	.280	16.4
22	2.2		.207	
23	2.4		.147	
24	2.6		.107	
25	2.8		.077	
26	3.0	99	.055	3.2
27	3.2		.040	
28	3.4		.029	
29	3.6		.021	
30	3.8		.015	
31	4.0	132	.011	0.6
32	4.5		.005	
33	5.0	165.0	.000	

PLATE 22.2 F-1

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT HYDROGRAPH AT POINT NO 2 - AP # 2

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 7 OF _____



NOTES:

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Engineering & Environmental Consultants

P O N D R O U T I N G

PROJECT NAME Ogunz Pond JOB NO. 625.3

SUBJECT POND ROUTING

BY DL CK. BY _____ APPROVED BY _____ DATE 2-22-88 PAGE 8 OF _____

- POND ROUTING CRITERIA

POND ROUTING METHOD SHOWN ON THE FOLLOWING PAGES WAS DEVELOPED UTILIZING THE STORAGE INDICATION METHOD AS OUTLINED IN "INTRODUCTION TO HYDROLOGY", VIESSMAN, KNAPP, LEWIS AND HARBAUGH, 2ND EDITION, HARPER & ROW, 1977, PGS 240 - 244.

- ORIFACE LOSS COEFFICIENT

THE ORIFACE LOSS COEFFICIENT USED IN DETERMINING FLOWRATES THROUGH HEADWALLS WITH DISCHARGE RESTRICTOR PLATES WAS DETERMINED BY UTILIZING "HANDBOOK OF HYDRAULICS", BRATER AND KING, 6TH EDITION, McGRAW-HILL, 1976, TABLE 4-8, PG 4-33.

NOTES:

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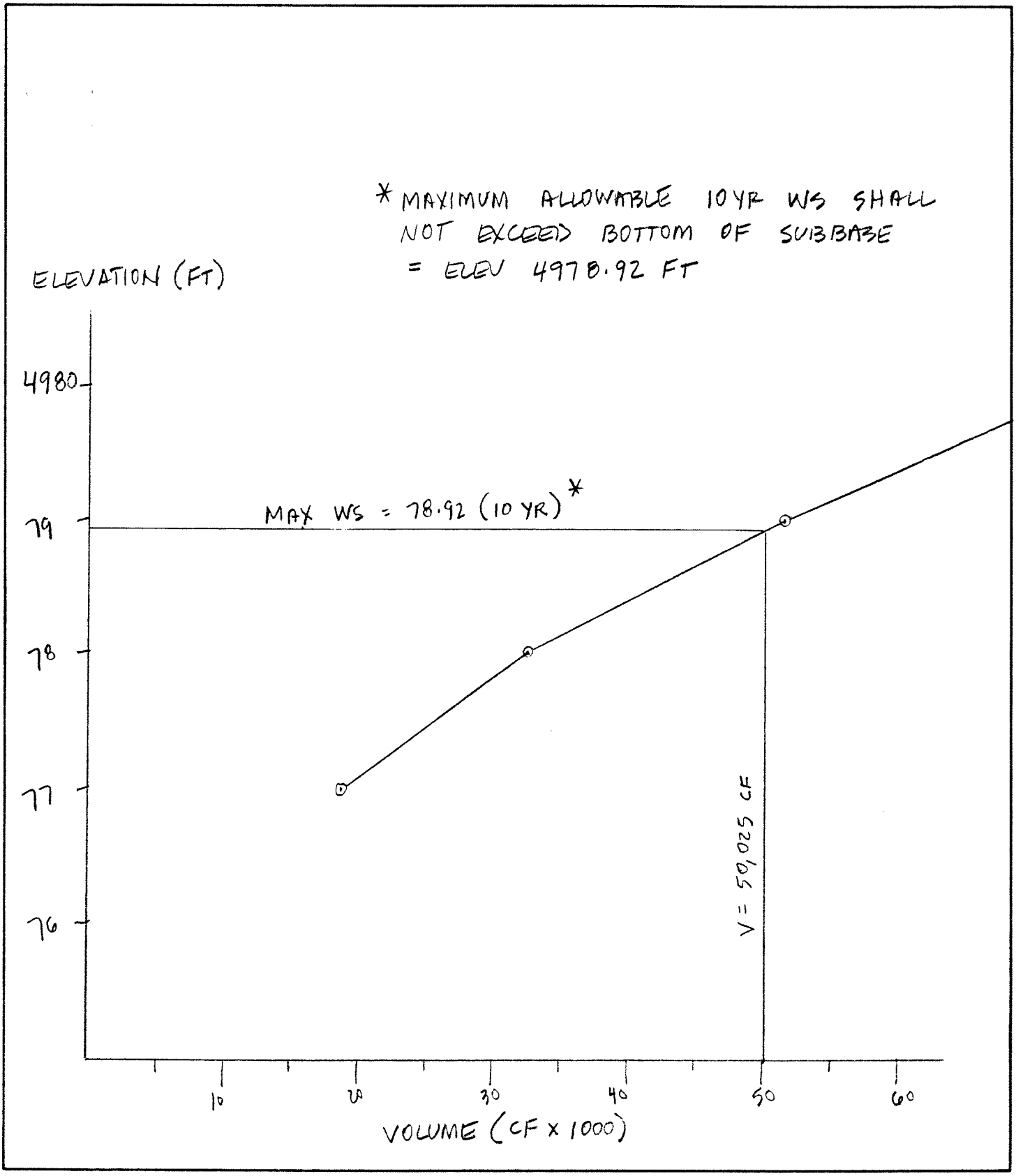
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT POND NO 1 ELEVATION -VS- VOLUME PLOT

BY _____ CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 9 OF _____



NOTES:

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PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT POND ROUTING

BY DL CK. BY _____ APPROVED BY _____ DATE 2-22-88 PAGE 10 OF _____

FROM ELEVATION - VS - VOLUME PLOT FOR POND NO 1, THE MAXIMUM ALLOWABLE 10 YR STORAGE = 50,025 CF. THE STORAGE REQUIREMENT FOR THE PROJECT = 93,500 CF ESTABLISHED BY BOYLE ENGINEERS. THEREFORE, POND NO 2 STORAGE REQUIREMENT = 43,475 CF.

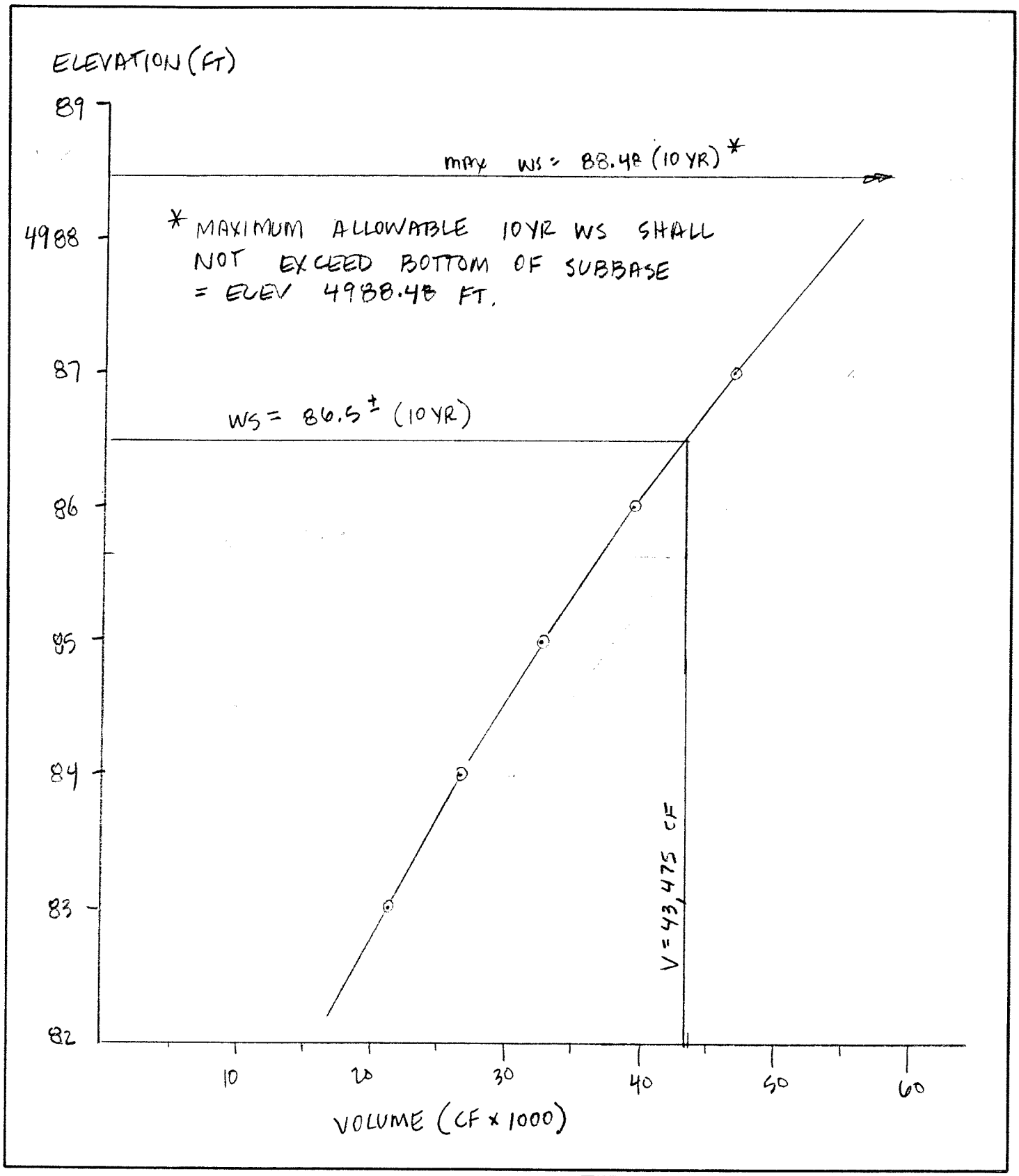
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT POND NO 2 ELEVATION - VS - VOLUME PLOT

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 11 OF _____



NOTES:

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Engineering & Environmental Consultants

PROJECT NAME OSWIN ROAD JOB NO. 6259

SUBJECT POND VOLUME -VS- DISCHARGE DATA

BY PL CK. BY _____ APPROVED BY _____ DATE 2-22-88 PAGE 12 OF _____

DETERMINE POND VOLUME -VS- DISCHARGE DATA FOR POND ROUTING:

POND No 1:

ELEVATION	h	Q$_{OUT}$*	VOLUME
4977	1.87'	10.5 cfs	18,383 cf
78	2.87	13.1	32,613
79	3.87	15.2	51,538
80	4.87	17.0	73,978
78.92	3.79	15.0	50,025

* USING ORIFACE EQN W/ A = 1.60 SF
C = 0.60

POND No 2:

ELEVATION	h	Q$_{OUT}$ †	VOLUME
4983	2.59'	17.9 cfs	21,065 cf
84	3.59	21.1	26,690
85	4.59	23.8	32,765
86	5.59	26.3	39,290
87	6.59	28.6	46,940
86.50	6.09	27.5	43,475

† USING ORIFACE EQN W/ A = 2.31 SF
C = 0.60

NOTES:

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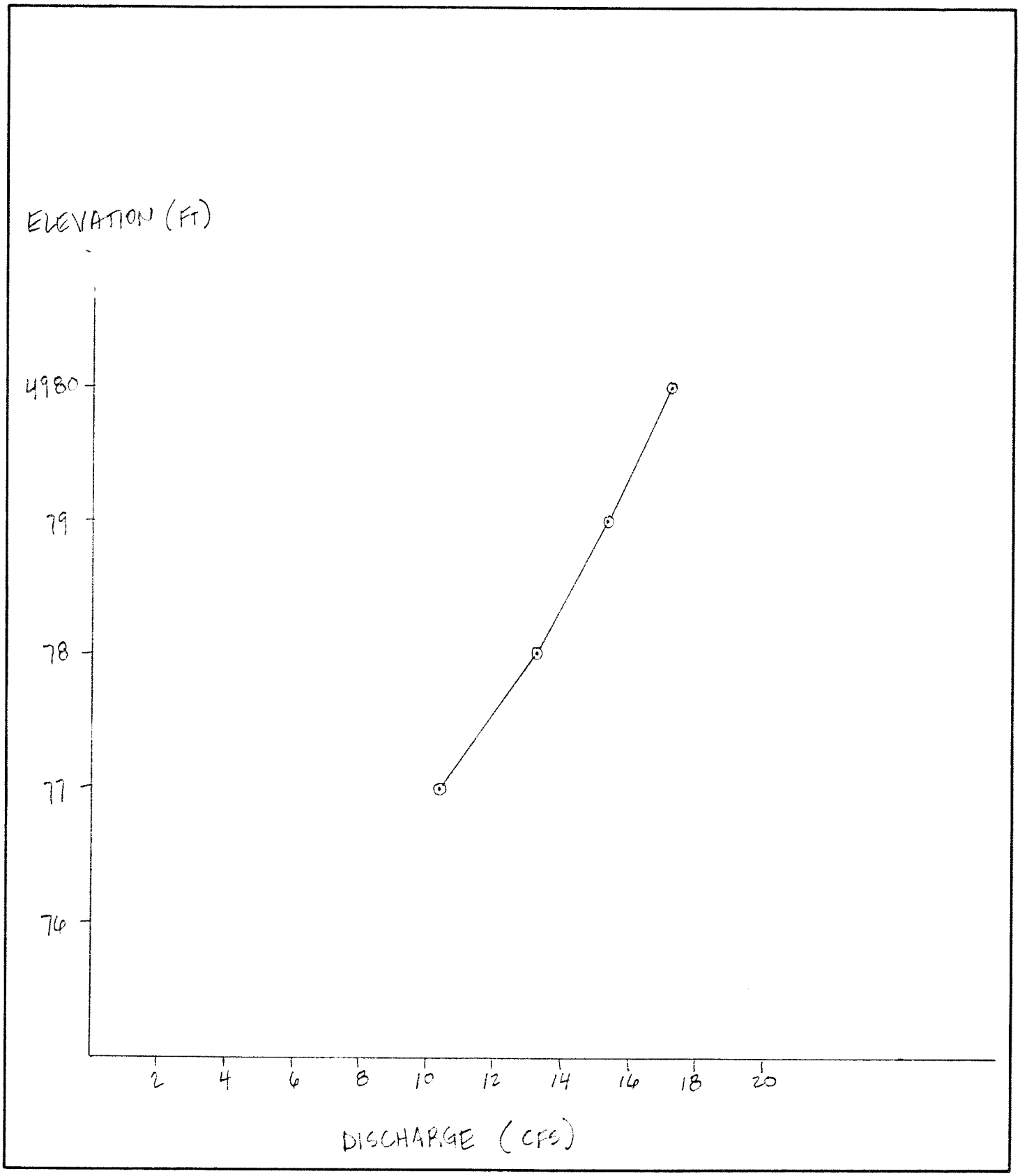
Engineering & Environmental Consultants

PROJECT NAME OSWIN ROAD JOB NO. 6259

SUBJECT POND No 1 ELEVATION -VS- DISCHARGE PLOT

BY DL CK. BY _____ APPROVED BY _____ DATE 2-17-88 PAGE 13 OF _____



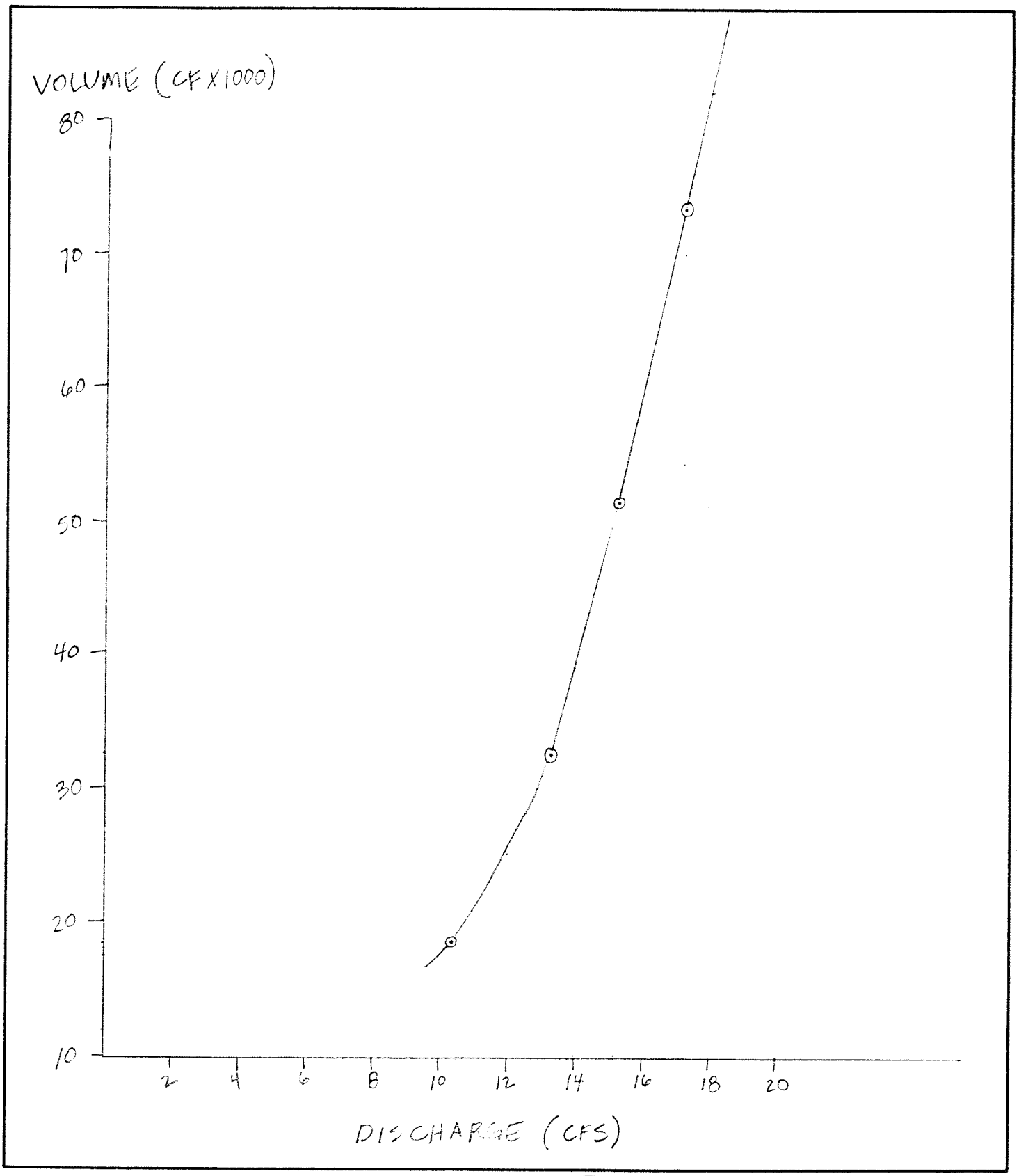
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUVA POND JOB NO. (6257)

SUBJECT POND NO. 1 - VOLUME -VS- DISCHARGE PLOT

BY DL CK. BY _____ APPROVED BY _____ DATE 2-17-88 PAGE 14 OF _____



NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA POND JOB NO. 6257

SUBJECT STORAGE INDICATION DATA FOR POND ROUTING

BY DL CK. BY _____ APPROVED BY _____ DATE 2-22-88 PAGE 15 OF _____

POND No 1 :

STORAGE	Q	2S/Δt + Q
17,500 cf	10 cfs	68.3 cfs
25,000	12	95.3
39,000	14	144.0
50,025	15	181.2
60,000	16	216.0

POND No 2 :

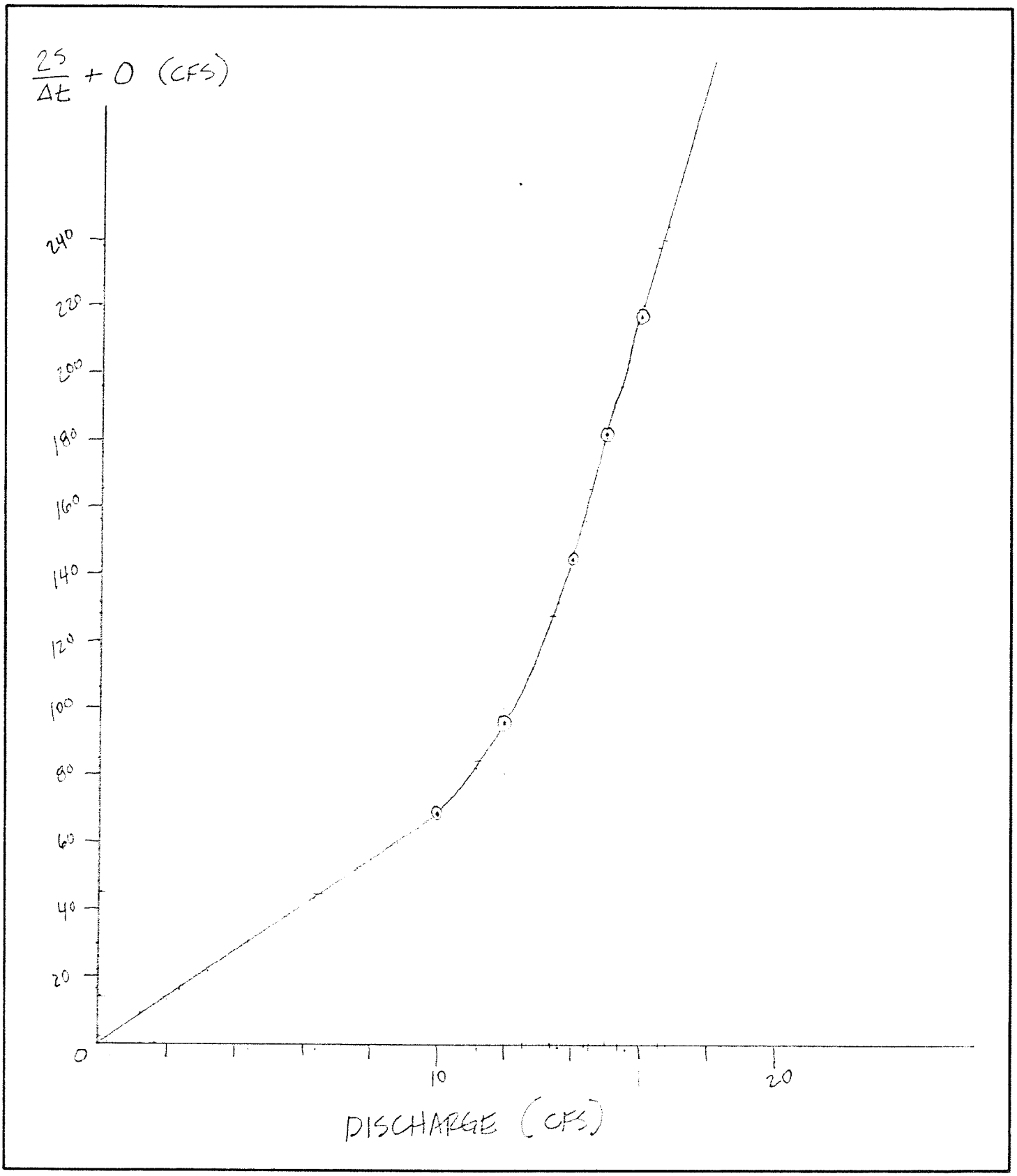
STORAGE	Q	2S/Δt + Q
21,000 cf	18 cfs	88.0 cf
24,500	20	101.7
28,500	22	117.0
33,000	24	134.0
38,000	26	152.7
45,000	28	178.0

NOTES:

PROJECT NAME OCHA POINT JOB NO. 6[illegible]

SUBJECT POINT NO 1 STORAGE INDICATION CURVE

BY DL CK. BY _____ APPROVED BY _____ DATE 2-22-89 PAGE 16 OF _____



NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSCEOLA POND JOB NO. 6299

SUBJECT POND 110 1 ROUTING TABLE

BY DL CK. BY _____ APPROVED BY _____ DATE 2-22-88 PAGE 17 OF _____

t	n	In	In + In+1	2Sn/Δt - On	2Sn+1/Δt + On+1	On+1
0	1	0	2.0	0	0	0
10	2	2.0	13.0	1.4	2.0	0.3
20	3	11.0	34.5	10.4	14.4	2.0
30	4	23.5	52.5	32.1	44.9	6.4
40	5	29.0	61.5	66.2	84.6	9.2
50	6	32.5	64.0	100.9	127.7	13.4
60	7	31.5	60.5	135.9	164.9	14.5
70	8	29.0	55.2	165.8	196.4	15.3
80	9	26.2	48.7	189.0	221.0	16.0
90	10	22.5	39.5	204.7	237.7	16.5
100	11	17.0	28.0	210.6	244.2	16.8
110	12	11.0	18.2	205.6	238.6	16.5
120	13	7.2	12.2	191.8	223.8	16.0
130	14	5.0	8.5	172.8	204.0	15.6
140	15	3.5	5.5	151.3	181.3	15.0
150	16	2.0	3.2	128.0	156.8	14.4
160	17	1.2	2.0	104.0	131.2	13.6
170	18	0.8	1.3	80.8	106.0	12.6
180	19	0.5	0.7	59.7	82.1	11.2
190	20	0.2	0.3	42.8	60.4	8.8
200	21	0.1	0.2	30.3	43.1	6.4
210	22	0.1	0.2	21.7	30.5	4.4
220	23	0.1	0.2	15.5	21.9	3.2
230	24	0.1	0.1	10.9	15.7	2.4
240	25	0	0	7.8	11.0	1.6
250	26	0	0	5.4	7.8	1.2
260	27	0	0	3.4	5.4	1.0
270	28	0	0	2.4	3.4	0.5

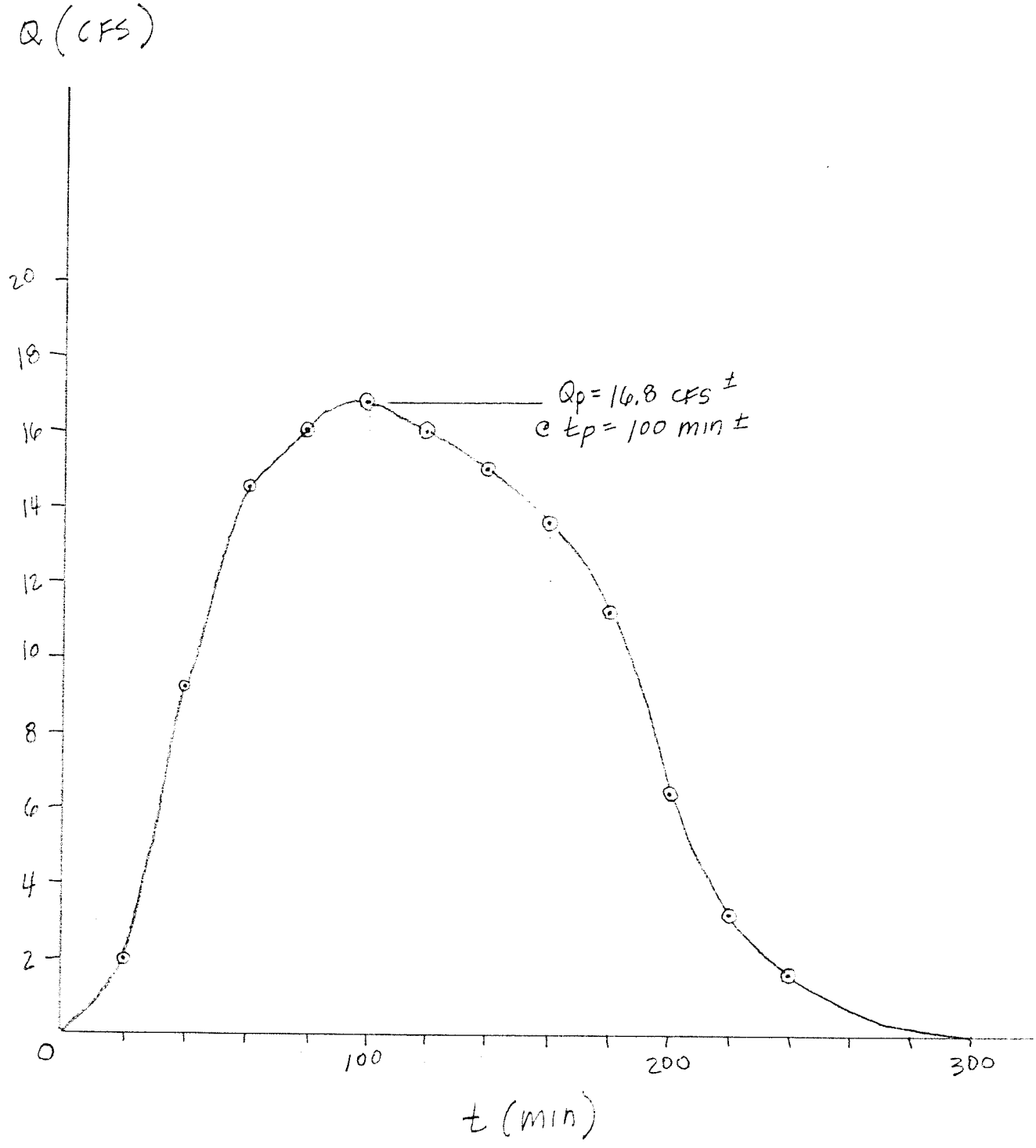
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA POND JOB NO. 6057

SUBJECT POND NO. 1 OUTFLOW HYDROGRAPH

BY DL CK. BY _____ APPROVED BY _____ DATE 2-22-88 PAGE 18 OF _____



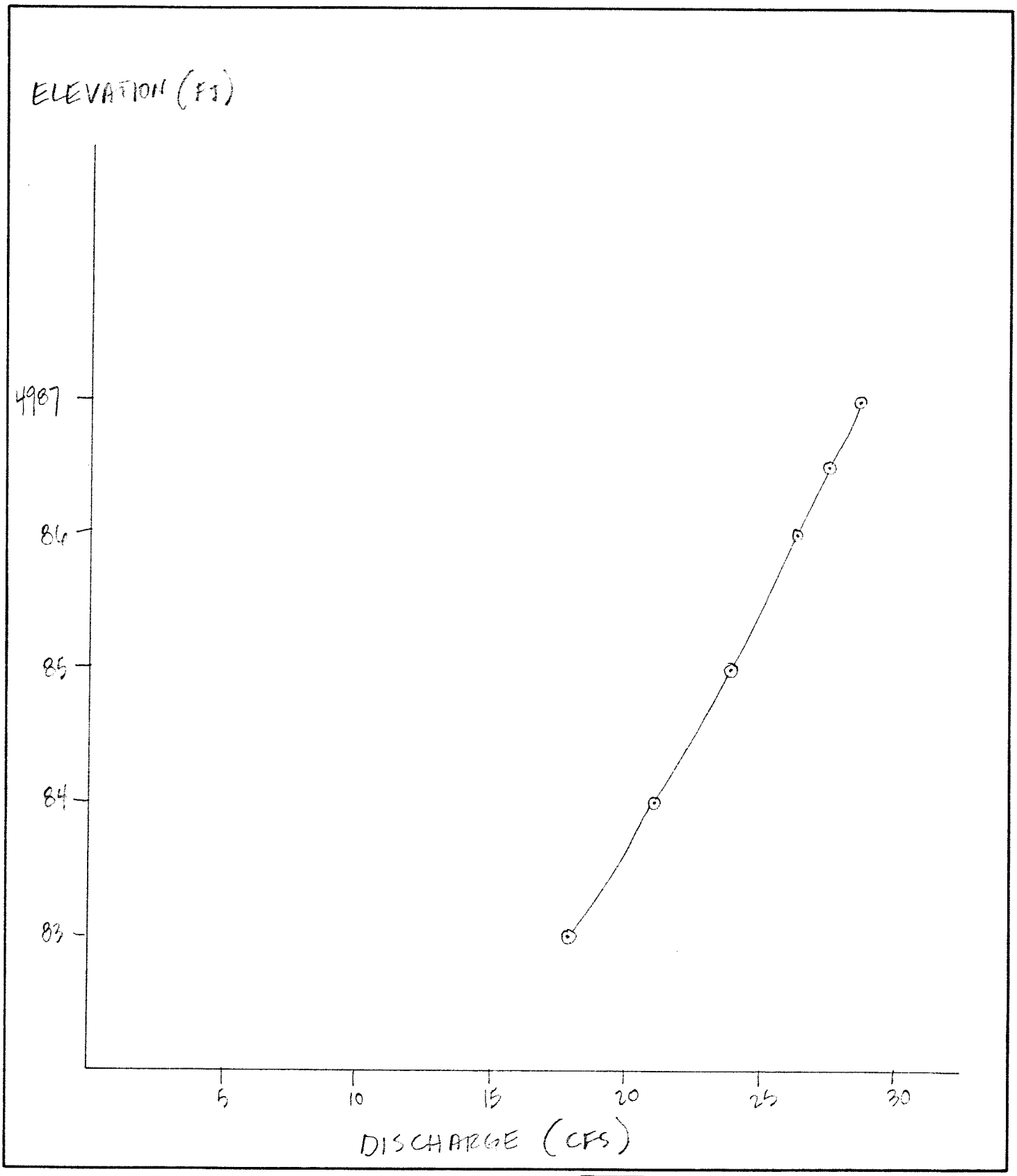
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME DSUIA ROAD JOB NO. 6259

SUBJECT POND NO 2 ELEVATION -VS- DISCHARGE PLOT

BY DL CK. BY _____ APPROVED BY _____ DATE 2-17-88 PAGE 19 OF _____



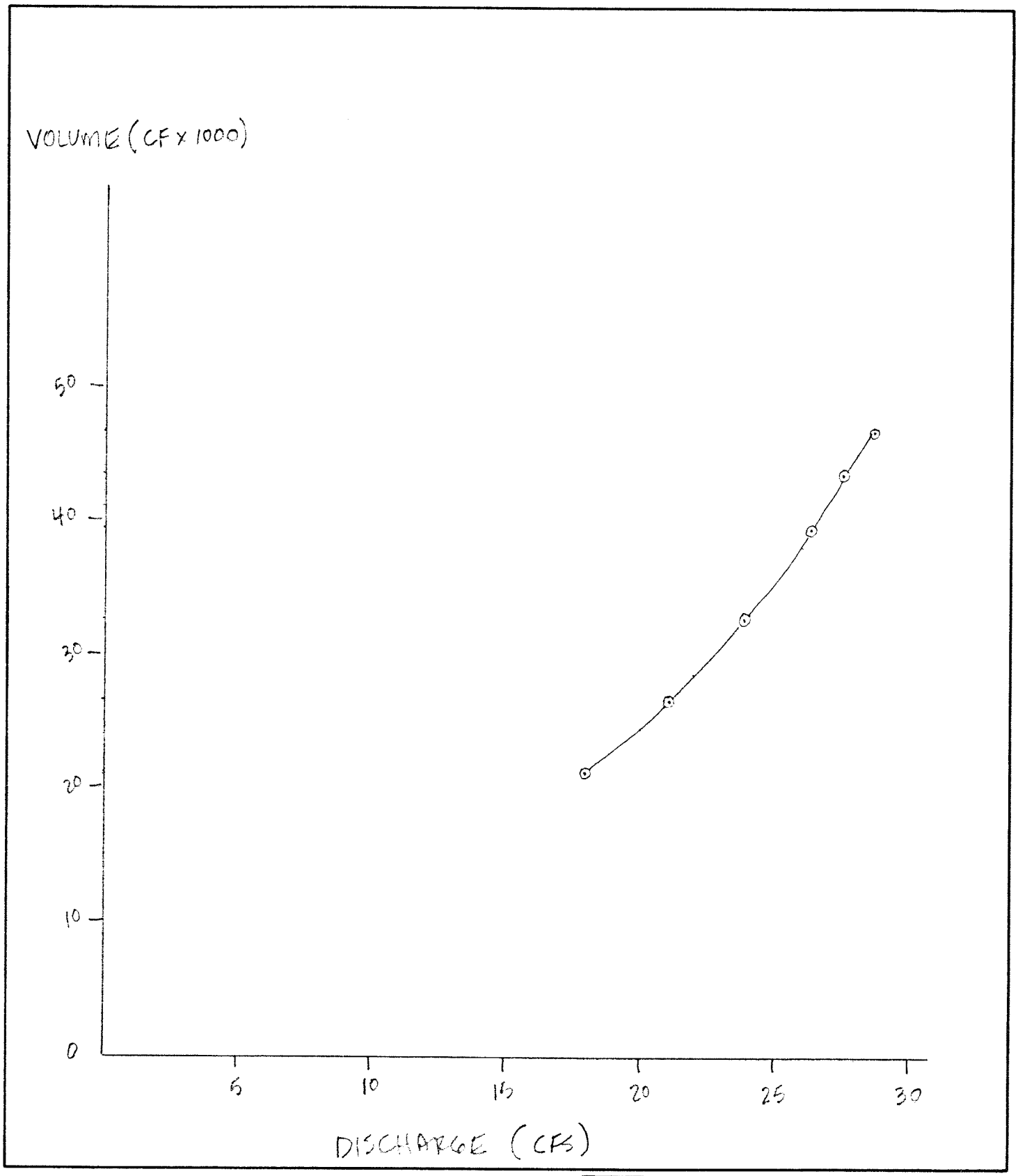
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6759

SUBJECT POND NO 2 VOLUME -VS- DISCHARGE PLOT

BY DL CK. BY _____ APPROVED BY _____ DATE 2-17-88 PAGE 20 OF _____



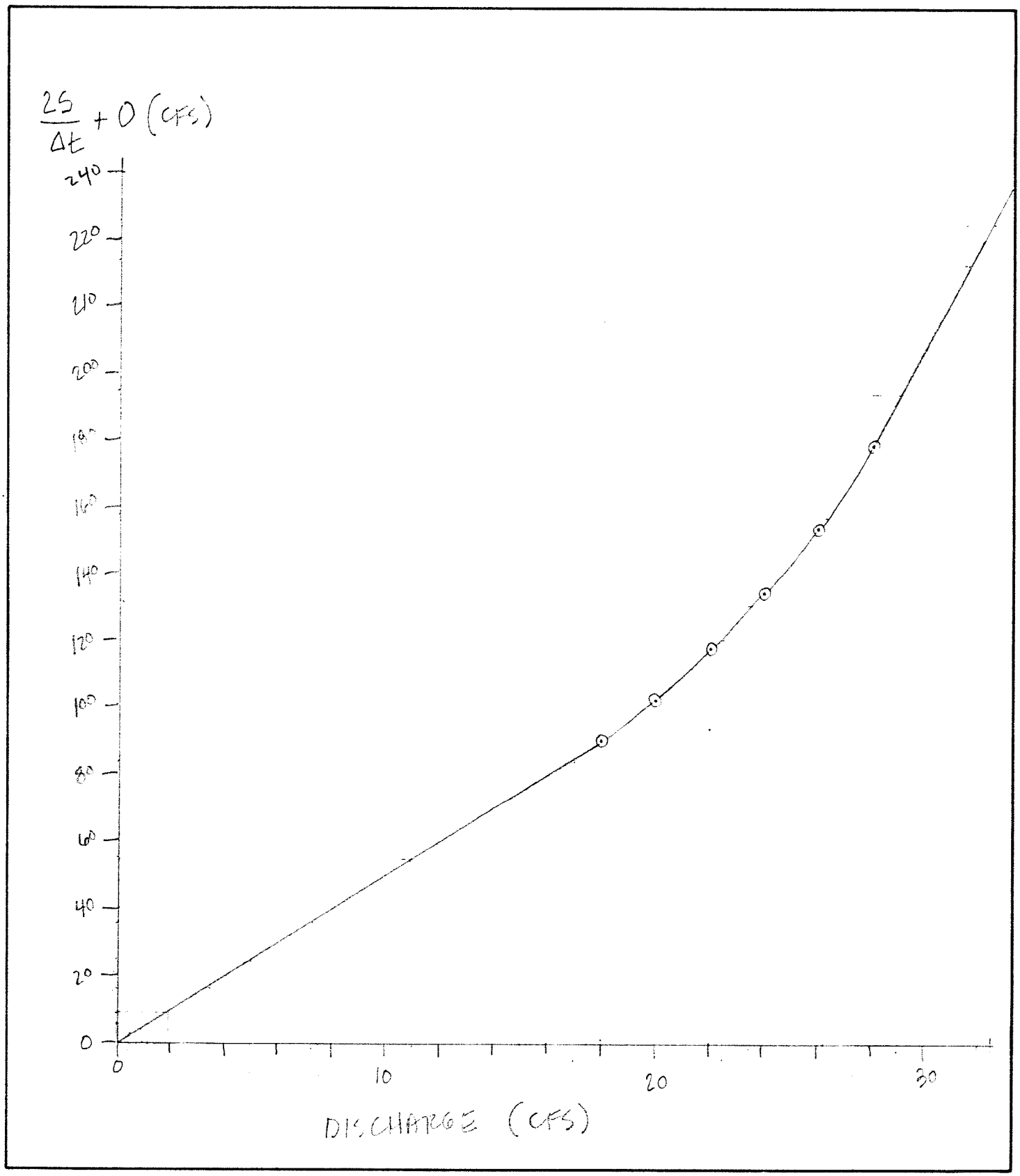
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSWIN POND JOB NO. 6259

SUBJECT POND NO 2 STORAGE INDICATION CURVE

BY DL CK. BY _____ APPROVED BY _____ DATE 2-17-88 PAGE 21 OF _____



NOTES:

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Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT POND NO 2 ROUTING TABLE

BY DL CK. BY _____ APPROVED BY _____ DATE 2-22-88 PAGE 20 OF _____

t	n	In	In + In+1	2Sn/Δt - On	2Sn+1/Δt + On+1	On+1
0	1	0	9.7	0	0	0
10	2	9.7	49.7	5.7	9.7	2.0
20	3	40.0	97.5	33.4	55.4	11.0
30	4	57.5	111.5	83.9	130.9	23.5
40	5	54.0	89.0	137.4	195.4	29.0
50	6	35.0	58.0	161.4	226.4	32.5
60	7	23.0	37.0	156.4	219.4	31.5
70	8	14.0	23.0	135.4	193.4	29.0
80	9	9.0	14.5	106.0	158.4	26.2
90	10	5.5	8.5	75.5	120.5	22.5
100	11	3.0	5.0	50.0	84.0	17.0
110	12	2.0	3.5	33.0	55.0	11.0
120	13	1.5	2.3	22.3	36.5	7.2
130	14	0.8	1.3	14.6	24.6	5.0
140	15	0.5	0.8	8.9	15.9	3.5
150	16	0.3	0.4	5.7	9.7	2.0
160	17	0.1	0.1	3.7	6.1	1.2
170	18	0	0	2.2	3.8	0.8
180	19	0	0	1.2	2.2	0.5
190	20	0	0	0.8	1.2	0.2
200	21	0	0	0.6	0.8	0.1
210	22	0	0	0.4	0.6	0.1
220	23	0	0	0.2	0.4	0.1
230	24	0	0	0	0.2	0
240	25					
250	26					
260	27					
270	28					

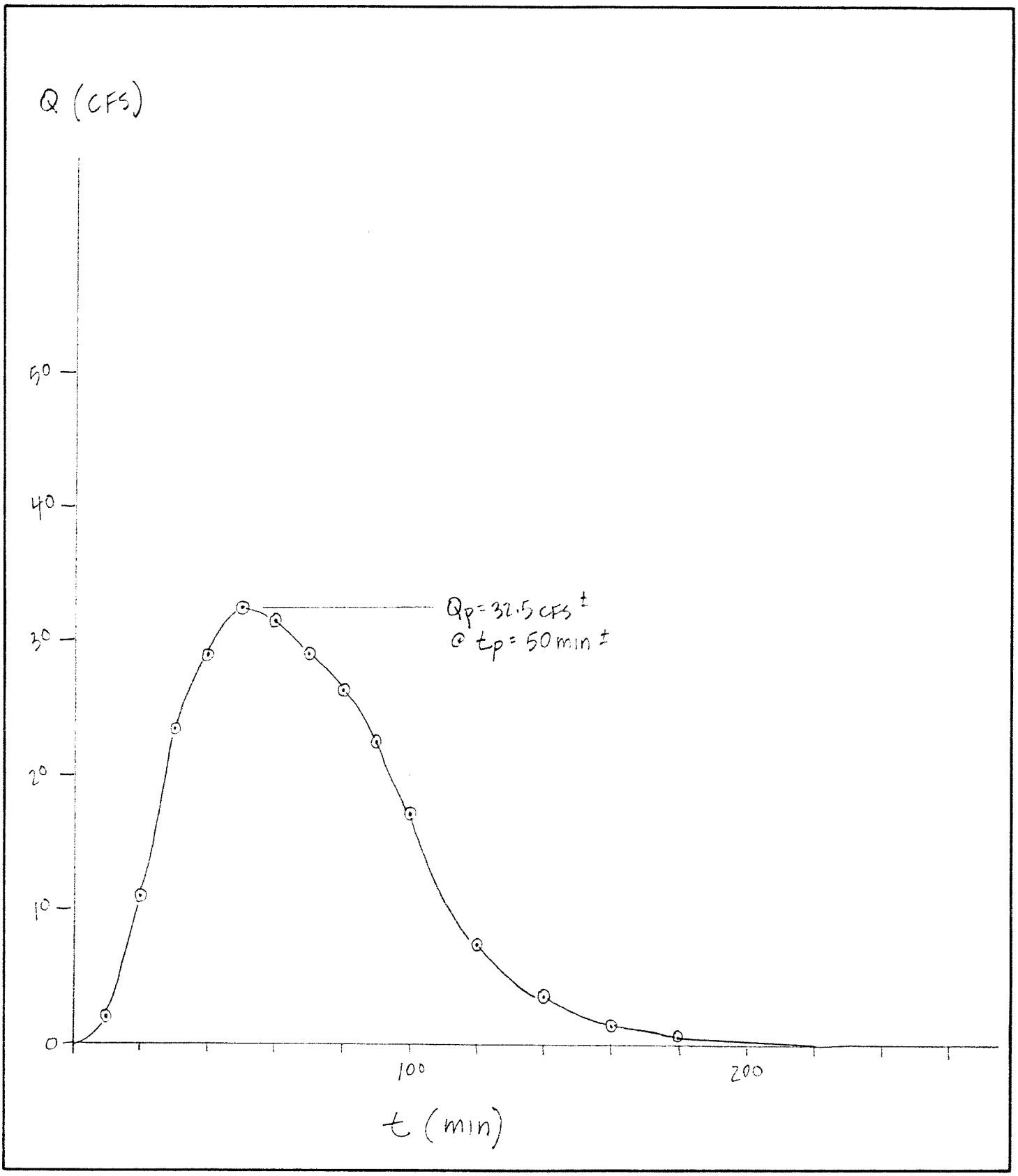
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME SCUMA POND JOB NO. 6257

SUBJECT POND NO 2 OUTFLOW HYDROGRAPH

BY PL CK. BY _____ APPROVED BY _____ DATE 2-17-88 PAGE 23 OF _____



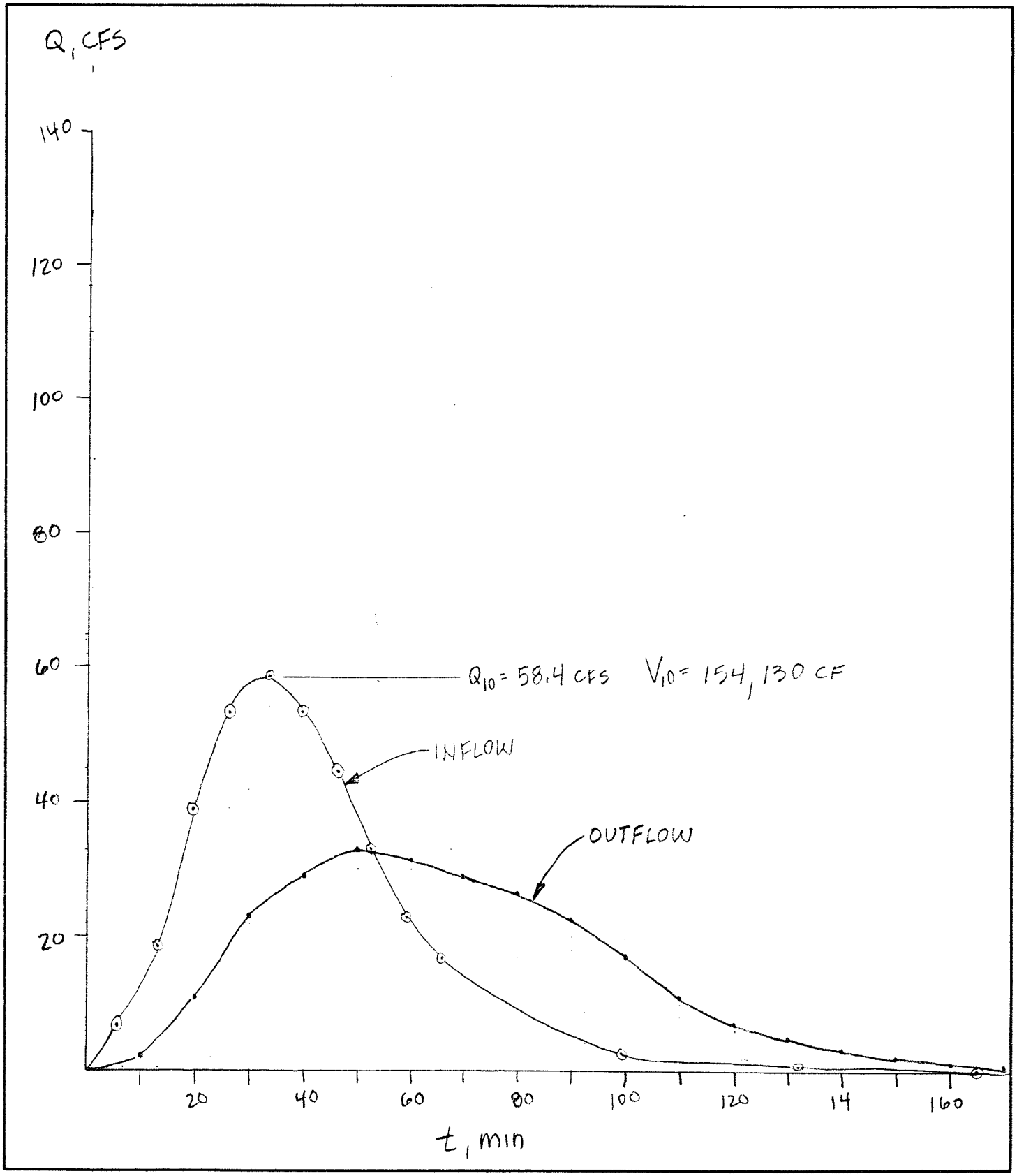
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT 10 YR HYDROGRAPH @ POND NO 2 - AP # 2

BY DL CK. BY _____ APPROVED BY _____ DATE 2-29-88 PAGE 24 OF _____



NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

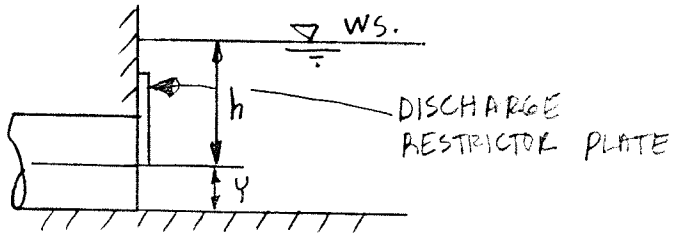
PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT POND OUTLET DESIGN

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 25 OF _____

POND OUTLETS TO BE CONTROLLED TO LIMIT DISCHARGE TO ALAMEDA DRAIN. WILL UTILIZE STEEL PLATE BOLTED OVER HEADWALL & 48" PIPE TO CONTROL DISCHARGE.

USE ORIFACE EQN TO SOLVE FOR AREA:



$$Q = CA\sqrt{2gh}$$

$$\Rightarrow A = Q/C\sqrt{2gh}$$

WHERE: Q = DISCHARGE, CFS
* C = LOSS COEF* = 0.6
g = 32.2 F/S²
* h = HEAD, FT

POND NO 1:

Q_A = 15.0 CFS (MAX ALLOWED TO ALAMEDA DRAIN)

MAX WS = 78.92
INV @ HEADWALL = 74.47
PIPE ϕ = 48"

$$\Rightarrow h = 3.79' \text{ FT} \qquad A = 15/0.6\sqrt{2g(2.45} = \underline{1.60 \text{ SF}}$$

* PER "HANDBOOK OF HYDRAULICS", TABLE 4-8

REV 6-88

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT POND OUTLET DESIGN

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 26 OF _____

POND No 2

Q_R = 27.5 CFS

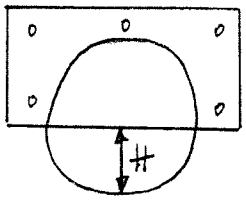
10 YR WS = 86.5

INV @ HEADWALL = 79.75

PIPE ϕ = 48"

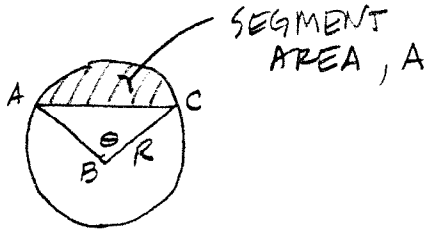
$\Rightarrow$ h = 6.09 FT $\quad A = 27.5 / 0.6\sqrt{2g(4.75)} = 2.31$ SF

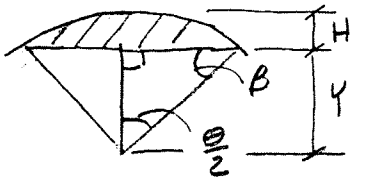
DETERMINE VERTICAL DISTANCE FROM INVERT OF PIPE TO BOTTOM EDGE OF STEEL PLATE:



SOLVE FOR SEGMENT AREA TO DETERMINE H:

$$A = \frac{R^2}{2}\left(\frac{\pi\theta}{180} - \sin\theta\right)$$





H + Y = 2 FT

REV. 6-88

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
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PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT POND OUTLET DESIGN

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 27 OF _____

POND No 1:

$A = 1.60$ SF $\quad 1.60 = \frac{2^2}{2}\left(\frac{\pi\theta}{180} - \sin\theta\right)$

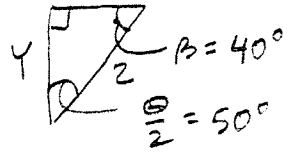
$0.80 = \left(\frac{\pi\theta}{180} - \sin\theta\right) = f(\theta)$

BY T:E

θ	$f\theta$
95°	0.66
100°	0.76

LET $\theta = 100°$

SOLVE FOR H:



$\frac{Y}{\sin 40°} = \frac{2}{\sin 90°}$ $\quad Y = 1.29'$

$H = 2.0 - Y = 0.71$ FT

POND No 2:

$A = 2.31$ SF $\quad 2.31 = \frac{2^2}{2}\left(\frac{\pi\theta}{180} - \sin\theta\right)$

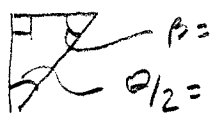
$1.15 = \left(\frac{\pi\theta}{180} - \sin\theta\right) = f(\theta)$

BY T:E

θ	$f(\theta)$
115	1.10
110	0.98

LET $\theta = 115°$

SOLVE FOR H:



$\frac{Y}{\sin 35} = 2$ $\quad Y = 1.07'$ $\quad H = 2 - Y = 0.93'$

REV 6-88

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

S T O R M D R A I N D E S I G N

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET LOCATIONS

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 28 OF _____

- DETERMINE SPACING & LOCATIONS OF STORM INLETS. BEGIN STORM DRAIN SYSTEM JUST WEST OF AGP MULTIPLATE STRUCTURE.

- MAXIMUM ALLOWABLE DEPTH = 0.28 FT (14' x 0.02) PER DRAINAGE ORDINANCE TO KEEP ONE LANE DRY DURING 10-YEAR STORM EVENT.

- DETERMINE Q/LF TYPICAL ROADWAY

  OSUNA ROW = 150' 1/2 ROW = 75'

  USE T_c = 10 min

  CN = 95

  P_{10} = 1.44 in. R_{10} = 1.0 in.

  BY SCS METHOD:

$$Q/LF = \left(75' \times 1' / 43560\right) 45.4\,(1.0'')/10\ \text{min} = 0.00782\ \text{CFS/LF}$$

- BY USING DPM CHART 22.3 D-4 DETERMINE Q AT D = 0.28 FT FOR VARIOUS STREET SLOPES. LENGTH REQUIRED TO DEVELOP 0.28 FT DEPTH VARIES WITH SLOPE:

$$L = Q / 0.00782$$

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET LOCATIONS

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 29 OF _____

SLOPE	Q	L
0.2	0.9	115'
0.3	1.1	141
0.4	1.3	166
0.5	1.4	179
0.6	1.5	192
0.7	1.7	217
0.8	1.8	230
0.9	1.9	243
1.0	2.0	256
1.1	2.1	269
1.2	2.2	281
1.3	2.3	294
1.4	2.4	307
1.5	2.45	313

SLOPE	Q	L
1.6	2.5	320
1.7	2.6	332
1.8	2.7	345
1.9	2.75	352
2.0	2.8	358
2.1	2.9	370
2.2	3.0	384
2.3	3.05	390
2.4	3.1	396
2.5	3.15	402
2.6	3.2	409
2.7	3.25	416
2.8	3.3	422
2.9	3.4	435
3.0	3.45	442

THESE VALUES ARE UTILIZED TO LOCATE STORM INLETS AS TABULATED ON SHEETS.

- FOR WESTBOUND LANES MUST CONSIDER SHEET FLOW FROM BASIN 7A INTO STREET.

$Q_{10} = 31.8$ CFS

FRONTAGE = 2600 LF ± $\Rightarrow \frac{31.8 \text{ CFS}}{2600 \text{ FT}} = 0.0122$ CFS/LF

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET LOCATIONS

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 30 OF _____

UTILIZE INLET LOCATIONS DETERMINED BY ABOVE CRITERIA. WILL REQUIRE MULTIPLE INLET INSTALLATIONS (TYPE 'A' WITH TYPE 'C')

DETERMINE Q/LF :

$$Q/LF = 0.00782 + 0.0122 = 0.02 \text{ CFS/LF}$$

INSTALL MULTIPLE INLETS FROM EDITH EAST TO STA 63+00.

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET LOCATIONS

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 31 OF _____

A. EASTBOUND

INLET NO.	STREET SLOPE	STA	Q_{10}	d_{10}	Q_{INLET}	RESIDUAL
1 (A)	0.028	68+60	11.2	0.40'	6.5	4.7
2 (C)	0.028	68+40	4.7	0.33	4.7	0
3 (A)	0.028	64+80	3.4	0.28	3.2	0.2
4 (A)	0.020	60+68	3.0	0.29	2.8	0.2
5 (A)	0.011	57+57	2.4	0.29	2.4	0
6 (A)	0.011	54+88	2.1	0.28	2.1	0
7 (A)	0.016	51+86	2.5	0.28	2.5	0
8 (A)	0.0125	48+79	2.4	0.28	2.4	0
9 (A)	0.0125	45+82	2.2	0.28	2.2	0
10 (A)	0.0125	42+88	2.3	0.28	2.3	0
11 (A)	0.010	40+21	2.0	0.28	2.0	0
12 (A)	0.020	37+10	2.8	0.28	2.8	0
13 (A)	0.0154	33+52	2.8	0.28	2.8	0
RUNDOWN	SAG	29+00	6.3	—	—	0

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET LOCATIONS

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 32 OF _____

B. WESTBOUND

INLET NO.	STREET SLOPE	STA	Q_{10}	d_{10}	Q_{INLET}	RESIDUAL
14 (A)	0.028	68+60	11.2	0.40	6.5	4.7
15 (C)	0.028	68+40	4.7	0.33	4.7	0
16 (A)	0.028	64+80	3.4	0.28	3.2	0.2
17 (A)	0.021	60+68	6.0	0.35	4.0	2.0
18 (C)	0.021	60+48	2.0	0.26	2.0	0
19 (A)	0.010	57+57	5.8	0.38	3.9	1.9
20 (C)	0.010	57+37	1.9	0.28	1.9	0
21 (A)	0.010	54+88	5.0	0.37	3.9	1.1
22 (C)	0.010	54+68	1.1	0.24	1.1	0
23 (A)	0.016	51+86	5.6	0.36	4.0	1.6
24 (C)	0.016	51+66	1.6	0.25	1.6	0
25 (A)	0.016	48+79	5.7	0.37	4.0	1.7
26 (C)	0.016	48+59	1.7	0.26	1.7	0
27 (A)	0.0125	45+82	5.9	0.37	4.1	1.8
28 (C)	0.0125	45+62	1.8	0.26	1.8	0
29 (A)	0.0125	43+70	4.2	0.34	3.9	0.3
30 (A)	0.010	40+21	7.0	0.40	4.5	2.5
31 (C)	0.010	40+01	2.5	0.29	2.5	0
32 (A)	0.020	37+10	6.2	0.35	4.0	2.2
33 (C)	0.020	36+90	2.2	0.27	2.2	0
34 (A)	0.0154	33+52	2.6	0.28	2.6	0
RUNDOWN	SAG	29+00	6.3	—	—	0

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET LOCATIONS

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 37 OF _____

C. EDITH BLVD @ OSUNA

INLET NO.	STREET SLOPE	STA	Q_{10}	d_{10}	Q_{INLET}	RESIDUAL	
35(A)	0.015		8.6	0.40	5.0	3.6	NORTHBOUND
36(CC)	0.015		3.6	0.32	3.6	0	
37(A)	0.015		8.6	0.40	5.0	3.6	
38(CC)	0.015		3.6	0.32	3.6	0	SOUTHBOUND

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET LOCATIONS

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 34 OF _____

PROVIDE STORM INLETS AT EXISTING SIDE STREETS (TIERRA, BROADWAY PL & ARNO) TO DRAIN PONDING AREAS.

DOUBLE 'D' INLETS W/ FRENCH DRAINS EXIST AT BROADWAY PL AND TIERRA. TIE TO NEW SYSTEM IN OSUNA WITH NEW 18" RCP.

PROVIDE NEW DOUBLE 'D' INLET AT ARNO WITH 18" CONNECTION TO OSUNA SYSTEM.

- CHECK CAPACITY OF DOUBLE 'D' INLET/GRATE:

① CHECK BY WEIR EQN: $Q = 3.33LH^{3/2}$

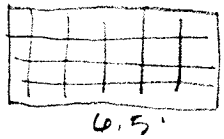
WHERE: $H = 0.87$

$L = P = 17.25'$

$Q_{MAX} = 46.6$

APPLY CLOGGING FACTOR

$46.6/2 = 23.3$ CFS



TYPICAL COA DBL GRATING

② CHECK BY B.P.R FIGURE 309.4F

EFFECTIVE OPENING = 12.38 SF

BY CURVE (B) $h = 0.87'$ $Q/SF = 3.5$

$3.5(12.38') = 43.3$

APPLY CLOGGING FACTOR $43.3/2 = 21.7$

BOTH METHODS YIELD SIMILAR VALUES; USE 21.7 CFS

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET LOCATIONS

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 35 OF _____

CAPACITY OF TYPE DOUBLE 'D' INLETS EXCEEDS DISCHARGES ANTICIPATED AT INLET LOCATIONS. CHECK 18" CONNECTOR PIPE FOR Q_{10} CAPACITY:

BASIN	STREET	PIPE SLOPE	* Q_{MAX}	Q_{10}	Q_{100}
10	TIERRA	0.0097	10.4 CFS	2.4	5.9
9	B-WAY PL	0.001	3.3	9.3	23.2
8	ARNO	0.0087	9.8	3.3	8.2

* $Q_{MAX} = \frac{1.49}{0.013} A R^{2/3} S^{1/2}$ $A = 1.77 SF$ $R = 0.38 FT$

WITH THE EXCEPTION OF BROADWAY PLACE, ALL INLETS SHOULD DRAIN ADEQUATELY. BROADWAY WILL DRAIN WITH SOME TEMPORARY PONDING AT THE INLET LOCATION.

THE NEW INLET AT ARNO, AND THE CONNECTION TO THE EXISTING INLETS AT TIERRA AND BROADWAY PLACE ARE PROVIDED TO HELP MITIGATE PONDING OF NUISANCE WATER AT THE APPROACHES TO OSUNA ROAD. AS SHOWN BY THE TOPOGRAPHY IN EACH BASIN, IT IS NOT ANTICIPATED THAT THE Q_{PEAK} WILL BE DEVELOPED AT THE INLETS. HOWEVER, SOME RELIEF FROM PONDED WATER WILL BE REALIZED.
FOR PURPOSES OF CALCULATING HGL FOR THE SYSTEM, THE PEAK Q_{10} WILL BE USED FOR EACH BASIN.

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA R.M.P. JOB NO. 6259

SUBJECT MAINLINE STORM DRAIN SIZING

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 36 OF _____

MAINLINE SIZING

STA	AREA	L	H	T_c	CN	R_{10}	Q_{10}	PIPE SLOPE	PIPE DIA
68+60	4.2	2470	33	17	95	1.0	11.2	0.044	18"
67+90	8.4	2490	34	17	95	1.0	22.2	0.0288	24
64+88	9.8	2850	44	18	95	1.0	24.7	0.0279	24
60+38	14.3	3262	55	19	93	0.9	30.8	0.016	30
57+57	19.6	3573	60	20	92	0.8	35.6	0.016	30
54+36	24.2	3842	64	22	91	0.75	37.5	0.016	30
51+63	29.7	4167	68	23	91	"	44.0	0.010	30
47+13	34.5	4451	75	24	91	"	48.9	0.010	36
45+30	39.5	4748	76	26	91	"	51.7	0.010	36
42+63	44.5	5042	80	27	90	0.7	52.4	0.0202	30
39+85	49.6	5345	82	29	90	"	54.4	0.0202	30
36+82	54.2	5620	88	30	90	"	57.4	0.0202	30
35+95	73.2	5700	91	30	87	0.55	60.1	0.013	36
33+10	74.5	6020	94	32	87	"	58.1	0.005	42
26+30	77.2	6725	110	34	87	"	56.7	0.005	48
23+50	77.2	6980	111	35	87	"	55.7	0.005	48
16+00	80.4	7280	114	36	87	"	55.8	0.005	48

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET ANALYSIS EAST OF BRIDGE

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 37 OF _____

DUE TO CONSTRUCTION OF A NEW BRIDGE FOR WESTBOUND TRAFFIC OVER THE NORTH DIVERSION CHANNEL, THE EXISTING ASPHALT RUNDOWN WILL BE REPLACED WITH A SERIES OF STORM INLETS. CRITERIA IS TO DRAIN 100YR 6HR STORM IN ORDER TO DRY ALL FLOWS EAST OF THE BRIDGE.

FIRST, ANALYZE EXISTING SD SYSTEM @ AP No 9:

BASIN AREA = 22 AC
L = 4350
I_t = 71
T_c = 24
P_{100} = 2.2 in.

CN = 95
R_{100} = 1.40
Q_{100} = 58.3 CFS

INLET	Q_{100}	SLOPE	d_{100}	Q_{INLET}	Q_{PIPE}	RESIDUAL
DC	58.3	0.01	0.82	18	18	40.3
DC	40.3	0.01	0.73	16.5	34.5	23.8
DC	23.8	0.01	0.60	13.5	48.0	10.3

CHECK 36" MAINLINE:

BY MANNING'S A = 7.06 SF S = 0.0027
P = 9.42 n = 0.013
R = 0.75

Q_{MAX} = 34.7 CFS ⇒ PIPE DIA & SLOPE LIMIT SYSTEM AT SECOND INLET

⇒ LET $Q_{RESIDUAL}$ = 23.8 CFS TO BE DRAINED BY NEW PARALLEL SYSTEM.

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT STORM INLET ANALYSIS EAST OF BRIDGE

BY DL CK. BY _____ APPROVED BY _____ DATE 1-4-88 PAGE 38 OF _____

SIZE NEW PARALLEL SD SYSTEM:

INLET	Q_{100}	SLOPE	d_{100}	Q_{INLET}	Q_{PIPE}	RESIDUAL
A	23.8	0.01	0.60'	9.6	9.6	14.2
DC	14.2	0.01	0.52	9.2	18.8	5.0
DC	5.0	0.01	0.37	5.0	23.8	0

USE: 18" CONNECTOR PIPES @ S = 0.02

24" MAIN @ S = 0.01

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

S T O R M D R A I N S Y S T E M #2

C H A N G E O R D E R N U M B E R #2

PROJECT NAME Ogilvie Ranch JOB NO. 6239

SUBJECT SD System #2 CD #2

BY DL CK. BY _____ APPROVED BY _____ DATE 6-22-88 PAGE 39 OF _____

- DESIGN STORM DRAIN SYSTEM TO INTERCEPT THE DIFFERENCE BETWEEN $Q_{100} - Q_{10}$ AT EDITH BLVD.

- PROVIDE STUBOUTS BOTH NORTH AND SOUTH FOR CONNECTION TO FUTURE STORM DRAIN IN EDITH BLVD. STUBS TO BE PROVIDED NORTH AND SOUTH AS POINT OF CONNECTION IS UNKNOWN AT THIS TIME.

- SINCE NO OUTFALL EXISTS, THE DRIP INLETS WILL BE DESIGNED BUT NOT BUILT AT THIS TIME.

- THE DESIGN Q WILL BE THE DIFFERENCE BETWEEN THE Q_{10} PIPE FLOW AT EDITH AND Q_{100}. PER THE FOLLOWING HYDROGRAPHS, THE DESIGN $Q = 49.2$ CFS.

NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

HYDROGRAPH COMPUTATION WORKSHEET

DATE _____
COMPUTED BY _____
CHECK BY _____

BASINS 7A, 1, 2

PROJECT OSUNA ROAD

LOCATION EDITH @ OSUNA

ANALYSIS POINT # 1

(DR. AREA) A = 54.2 ACRES

T_c 30 MIN

POINT RAINFALL 2.2 IN. FROM PLATE 22.2 D-1

CN = 90 FROM PLATES 22.2 C-2, 22.2 C-3

RUNOFF VOLUME R = 1.3 IN. FROM PLATE 22.2 C-4

COMPUTED T_p = 30 MIN. $T_p = T_c$
(Rounded to even minute)

$q_p = \frac{45.4A}{T_p}$ = 82.0 CFS./INCH OF RUNOFF

$(R \times q_p) = Q_{peak}$ = 106.6 CFS (100YR)

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

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

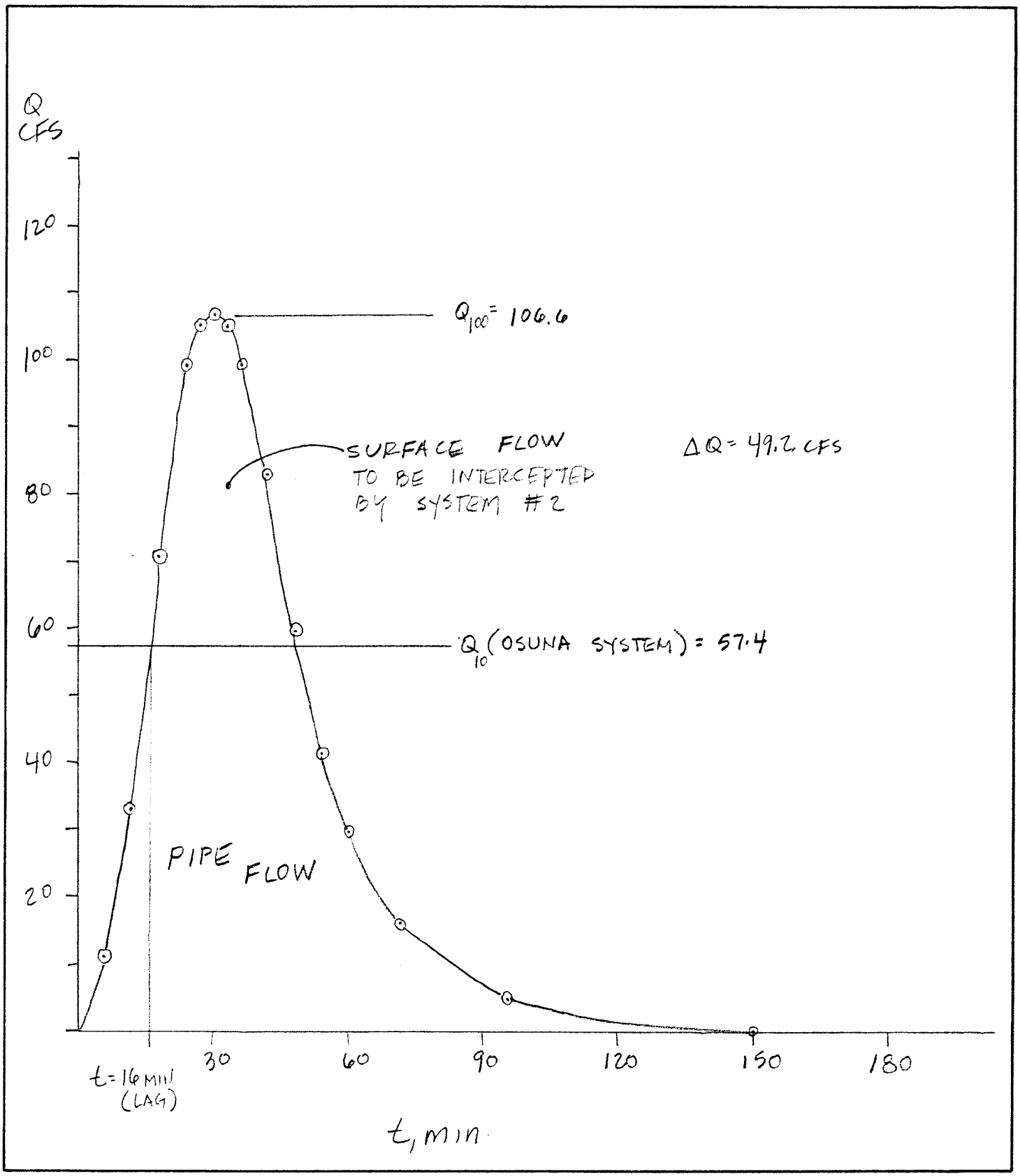
	(t/T_p)	t (min.)	y	Q (cfs)
1	0	0	0	0
2	.1		.03	
3	.2	6	.10	10.7
4	.3		.190	
5	.4	12	.310	33.0
6	.5		.470	
7	.6	18	.660	70.4
8	.7		.820	
9	.8	24	.930	99.1
10	.9	27	.990	105.5
11	1.0	30	1.00	106.6
12	1.1	33	.990	105.5
13	1.2	36	.930	99.1
14	1.3		.860	
15	1.4	42	.780	83.1
16	1.5		.680	
17	1.6	48	.560	59.7
18	1.7		.460	
19	1.8	54	.390	41.6
20	1.9		.330	
21	2.0	60	.280	29.8
22	2.2		.207	
23	2.4	72	.147	16.0
24	2.6		.107	
25	2.8	84	.077	8.5
26	3.0		.055	
27	3.2	96	.040	4.3
28	3.4		.029	
29	3.6	108	.021	2.2
30	3.8		.015	
31	4.0	120	.011	1.1
32	4.5		.005	
33	5.0	150	.000	0

PLATE 22.2 F-1

PROJECT NAME OSUNA ROAD JOB NO. 6259

SUBJECT HYDROGRAPH BASINS 1, 2, 7A @ AP 1

BY DL CK. BY _____ APPROVED BY _____ DATE _____ PAGE 41 OF _____



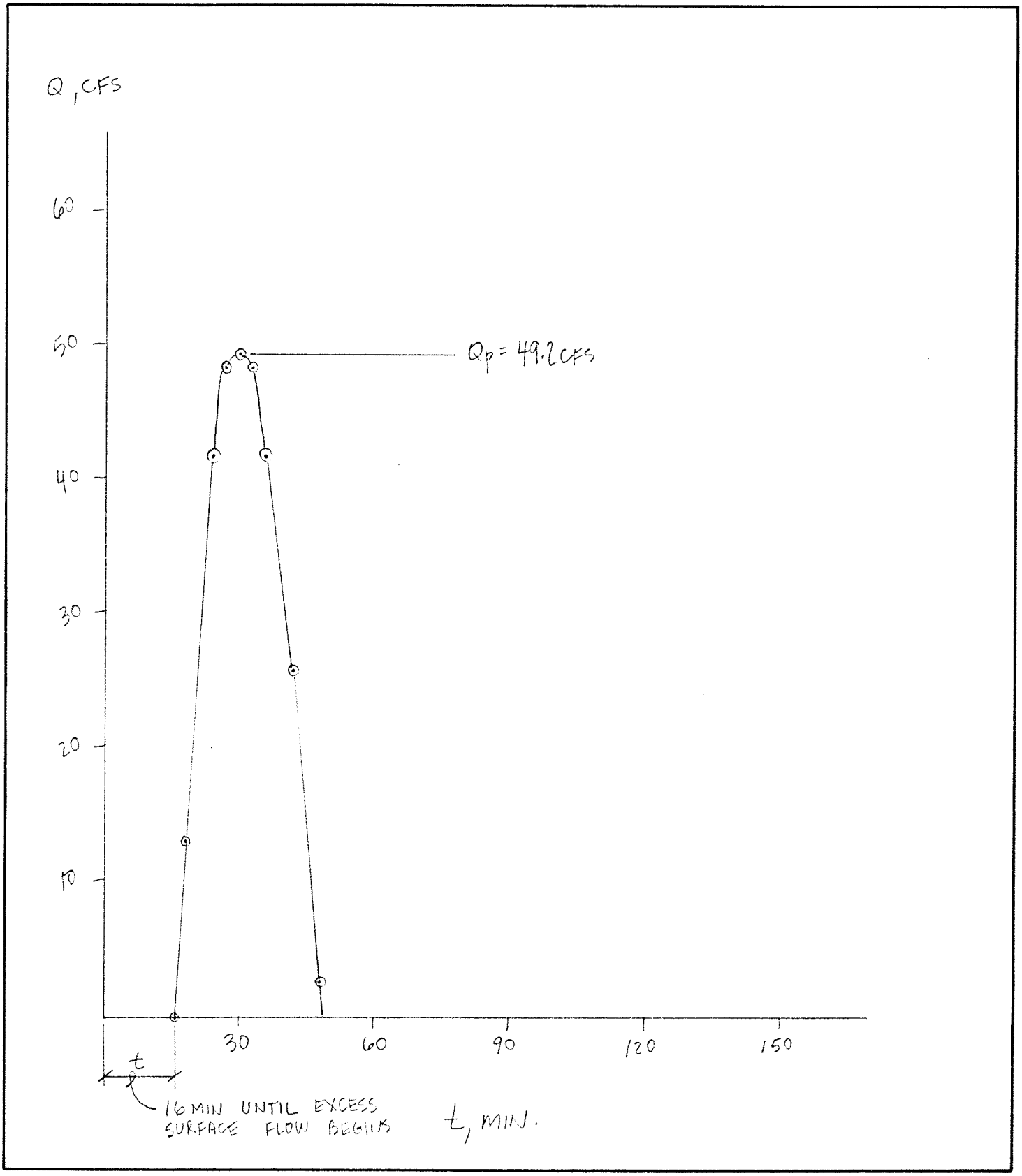
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA ROAD JOB NO. 6857

SUBJECT EXCESS STREET FLOW HYDROGRAPH @ AP # 1

BY DL CK. BY _____ APPROVED BY _____ DATE 6-21-88 PAGE 42 OF _____



NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSUNA PHASE JOB NO. 6729

SUBJECT STORM INLET LOCATION & DESIGN

BY DL CK. BY _____ APPROVED BY _____ DATE 6-21-88 PAGE 43 OF _____

- DETERMINE SPACING, LOCATION AND NUMBER OF STORM INLETS REQUIRED TO DRAIN EXCESS STREET FLOW PRIOR TO REACHING EDITH BLVD.
- DESIGN SERIES OF INLETS LOCATED EAST OF EDITH TO DRAIN EXCESS FLOW.
- USE DPM CHARTS 22.3 D-4 - D-6 TO DETERMINE NO. OF INLETS REQUIRED.

	INLET NO.	STREET SLOPE	STA	Q CFS	d FT	Q_{INLET} CFS	RESIDUAL CFS
EASTBOUND	39 (A)	0.02	38+40	10.0	0.40	5.2	4.8
	40 (C)	0.02	38+20	4.8	0.33	3.5	1.3
	41 (C)	0.02	38+00	1.3	0.22	1.3	0
WESTBOUND	42 (A)	0.02	38+80	39.2	0.63	11.5	27.5
	43 (CC)	0.02	38+60	27.5	0.57	12.0	15.5
	44 (CC)	0.02	38+40	15.5	0.47	8.6	6.9
	45 (CC)	0.02	38+20	6.9	0.38	5.5	1.4
	46 (CC)	0.02	38+00	1.4	0.23	1.4	0

NOTES:

PROJECT NAME OSWEGO ROAD JOB NO. 6057

SUBJECT STORM DRAIN MAINLINE SIZING

BY DL CK. BY _____ APPROVED BY _____ DATE 6-22-88 PAGE 44 OF _____

• STORM DRAIN SIZING

USE MANNINGS EQN: $Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$

STATION	Q	PIPE SLOPE	PIPE DIA
EASTBOUND			
38+40 D.I.	5.2	0.02	18"
38+20 D.I.	8.7	0.02	18"
38+00 MH	10.0	0.01	18"
WESTBOUND			
38+80 D.I.	11.5	0.02	18"
38+60 D.I.	23.5	0.02	24"
38+40 D.I.	32.1	0.02	24"
38+20 D.I.	37.6	0.02	30"
38+00 MH	39.2	0.02	30"
MAINLINE	49.2	0.02	30"
	49.2		
	49.2		
	49.2		

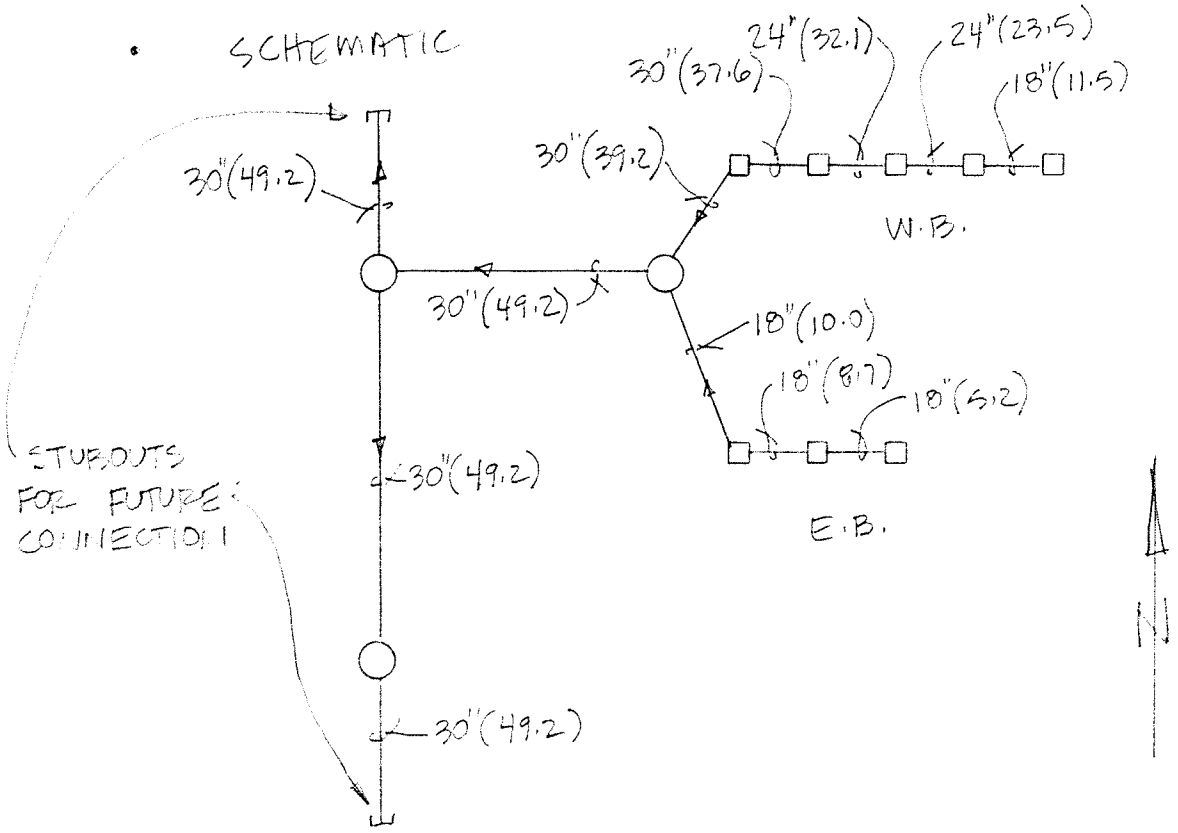
NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

PROJECT NAME OSWEGO 1976 JOB NO. 89-39

SUBJECT STORM DRAIN MAINLINE SIZING

BY DL CK. BY _____ APPROVED BY _____ DATE 6-22-89 PAGE 45 OF _____

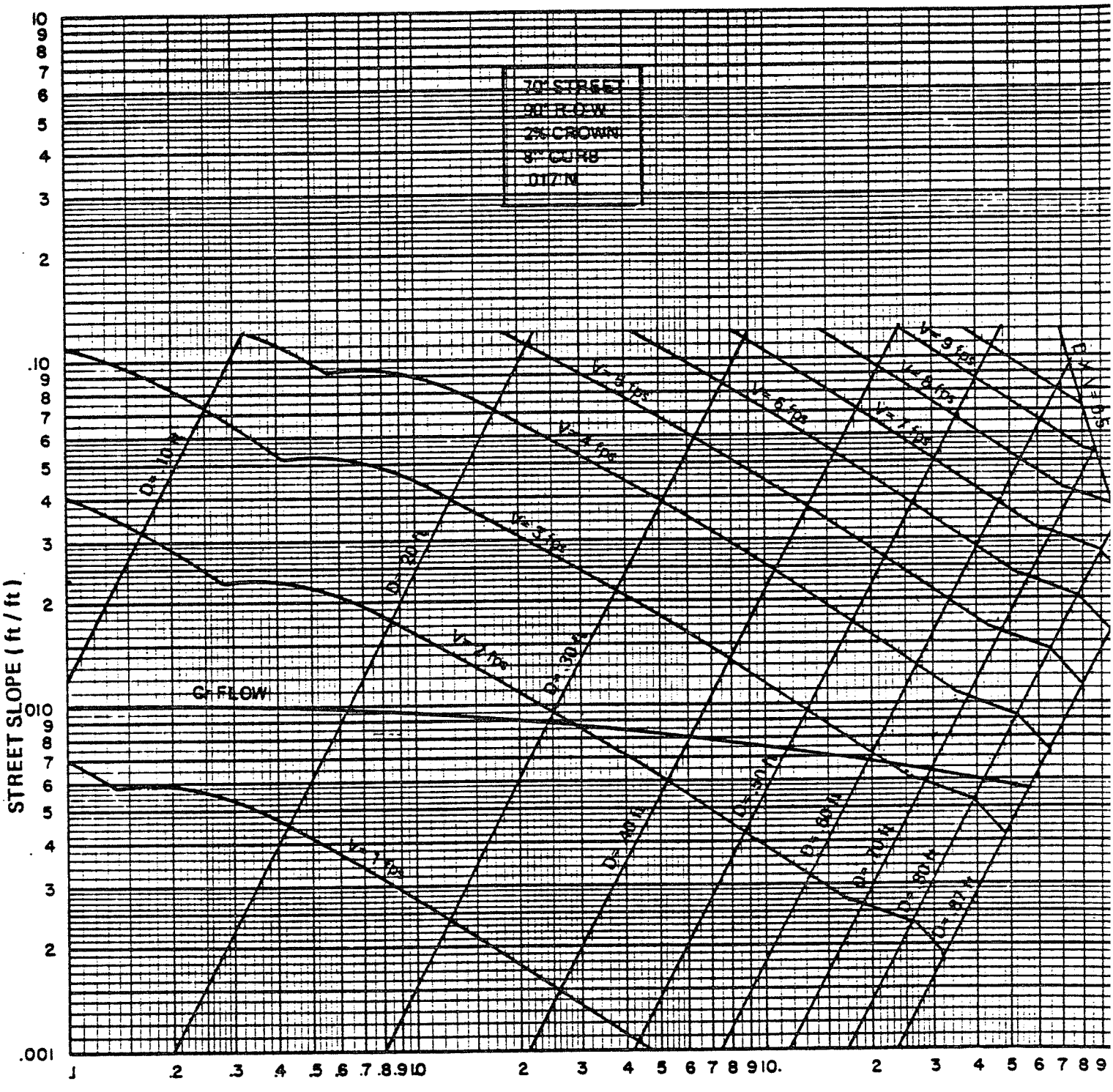


NOTES:

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants

STREET DEPTH CHARTS
&
GRATING CAPACITY CHARTS

STREET CAPACITY

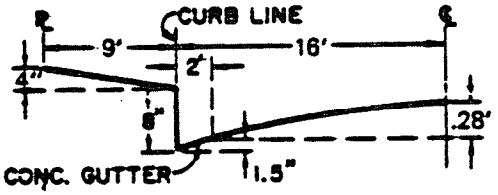


REV. 3-83

PLATE 22.3 D-4

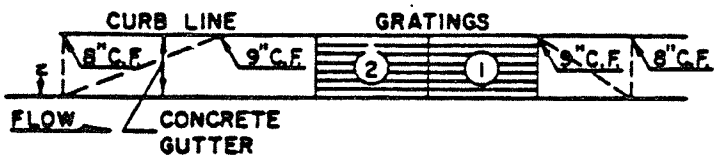
GRATING CAPACITIES FOR TYPE "A" , "C" and "D"

GRATING & GUTTER PLAN

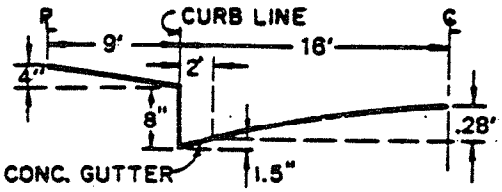


TYPICAL HALF STREET SECTION
(ABOVE BASIN)

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"

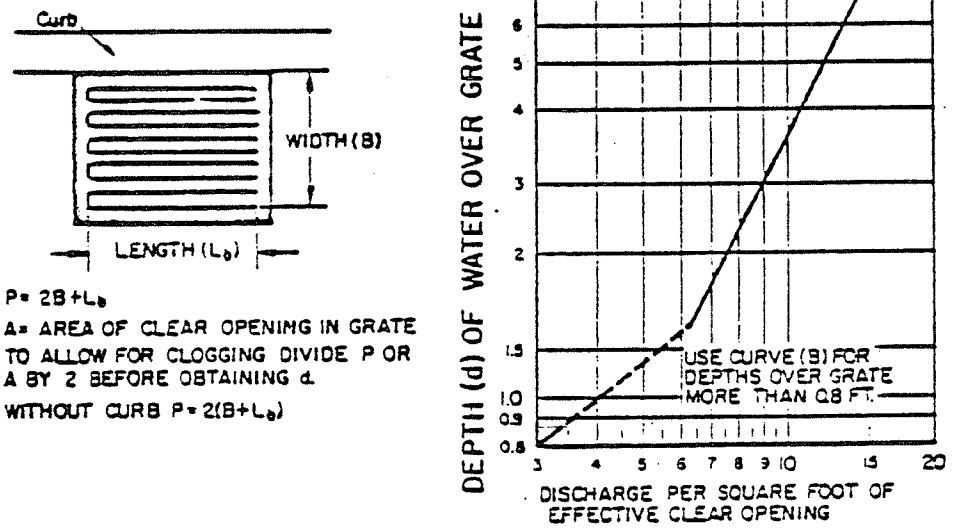


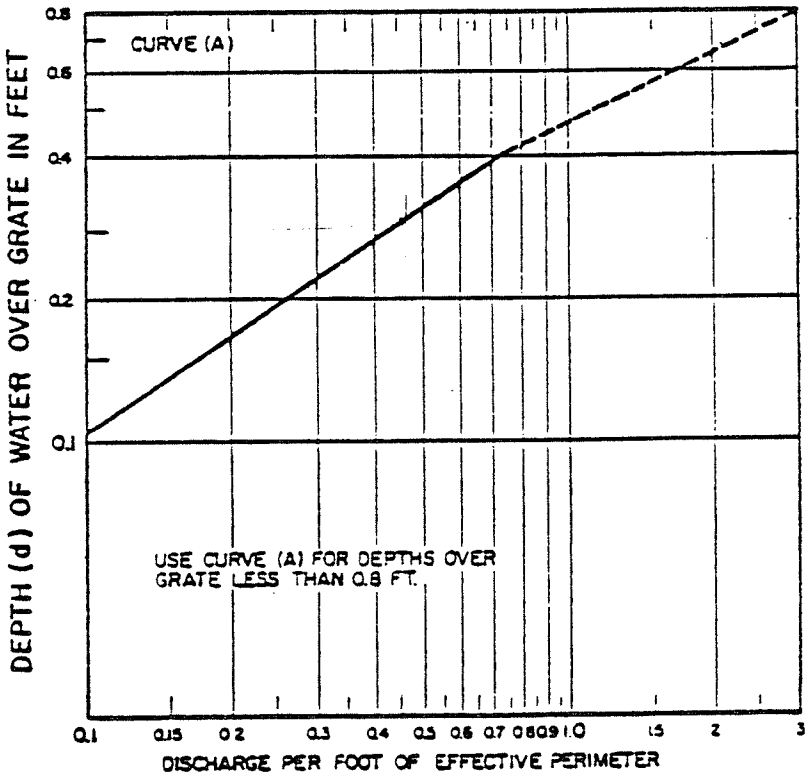
GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

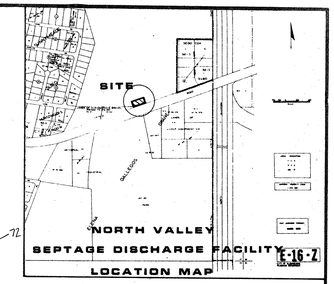




BUREAU OF PUBLIC ROADS
REV. AUG. 1968

HYDRAULIC CAPACITY OF GRATE INLET IN SUMP

ESPEY, HUSTON & ASSOCIATES, INC.
ENGINEERING & ENVIRONMENTAL CONSULTANTS



UNPLATTED

NOTE: SEE SHTS C-7, C-8 FOR CONSTRUCTION ⚠ OF A BERM ALONG NORTH PROPERTY LINE

N 70° 46' 32" E

100.00'

200.00'

3' TRANSITION TO FULL CURB

F.F. = 74.85

WHEELCHAIR RAMP

PROVIDE COBBLES ON POND BOTTOM $D_{50} = 3''$±

⚠ FOR SLAB DETAILS, SEE SHEET C-2

60' ACCESS EASEMENT

8' 44' F-F 8'

CONSTRUCT RUNDOWN SEE SECTIONS A-A & B-B SHEET C-10

WS @ 72.0

F.L. 72.00

INV 70.31

TRACT Z-2A

LANDS OF AGP CO.

S 70° 46' 32" W

S 19° 13' 23" E

N 19° 13' 23" W

TBM - EXISTING CURB RETURN TC = 5073.42

CONSTRUCT HEADWALL & POND DRAINLINE. SEE DETAILS SHEET C-10

MH

FH

$Q_{100} = 2.1$ cfs

$Q_R = 0.1$ cfs

25'

CONSTRUCT STANDARD DRAINLINE THROUGH CURB PER CITY OF ALBUQUERQUE STD. DWG. 2235 INV. = 69.68± SEE NOTICE TO CONTRACTOR SHEET C-10

150' R.O.W.

107' F-F

21.5'

SCALE: 1" = 10'

UNPLATTED

OSUNA ROAD NE

NOTE

The site topography shown hereon is taken from the aerial topography provided by Tom R. Mann & Assoc., dated 4-30-85 and supplemental field surveys performed by Espey, Huston & Assoc., Inc. (EH&A) on 1-10-89. Since the last date of survey ongoing grading and other site altering operations have taken place on-site in conjunction with the Osuna Road project. EH&A therefore makes no representation as to the present condition of the site. The Contractor is hereby notified to make his own site inspection to determine the present condition of the site and identify the exact scope of earthwork required prior to submitting his bid.

LEGAL DESCRIPTION

Tract 'Z-2-B', Lands of Albuquerque Gravel Products Company, Inc.

PROPERTY ADDRESS

Osuna Road N.E.

PROJECT BENCHMARK

Station is an AMAFCA brass tablet marked "NDC-12-ID2" set on a concrete post projecting 0.4 feet above ground. The station is located 700 feet south of the Osuna bridge adjacent to the west edge of the AMAFCA North Diversion Channel.

ELEVATION = 5095.8 feet MSLD

LEGEND

- 74 — PROPOSED CONTOUR
- 74 — EXISTING CONTOUR
- PROPOSED SPOT ELEVATION
- EXISTING SPOT ELEVATION
- TC 72.02 PROPOSED TOP OF CURB ELEVATION
- PROPOSED CONCRETE
- DIRECTION OF FLOW
- SWALE
- PROPERTY LINE
- $Q_{100} = 2.1$ cfs DEVELOPED 100 YEAR FLOWRATE

⚠ REVISED SLAB GEOMETRY & GRADES, ADDED BERM	6/28/89	D.L.

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants
317 COMMERCIAL ST. N.E.
ALBUQUERQUE, NEW MEXICO 87102
PHONE: (505) 242-1909

RODNEY A. LORENZ 5985 REGISTERED PROFESSIONAL ENGINEER
3-15-89 6-28-89

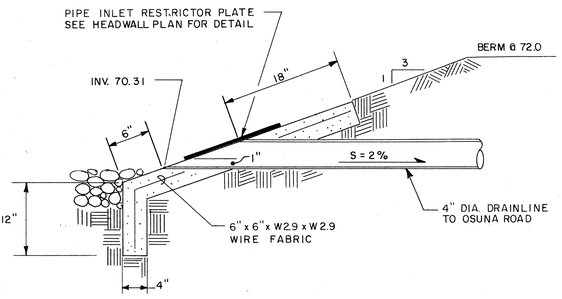
COUNTY OF BERNALILLO
NEW MEXICO

SEPTAGE DISCHARGE FACILITY

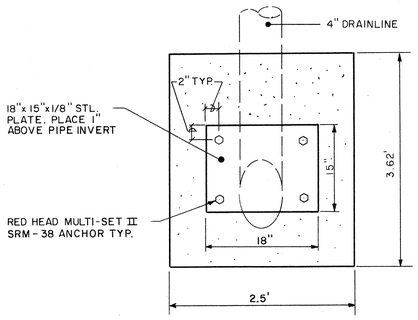
RECEIVED AUG 09 1989 HYDROLOGY SECTION

GRADING AND DRAINAGE PLAN

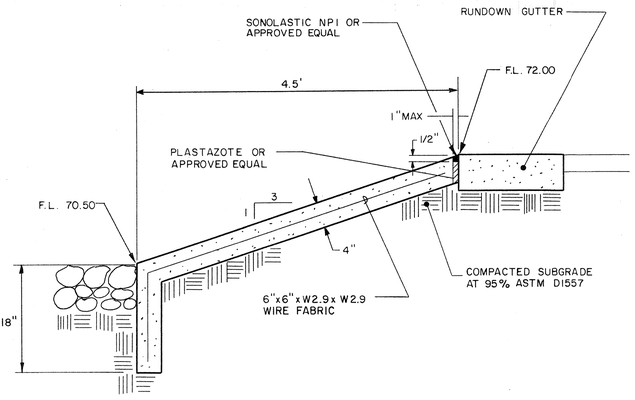
DESIGN: DL	DATE: MARCH 1989	SHEET OF C-9
DRAFT: TED		



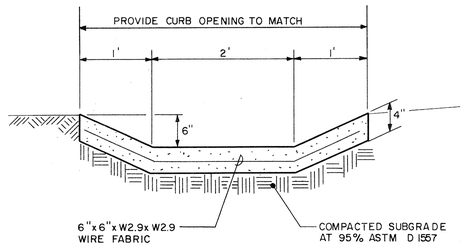
HEADWALL SECTION



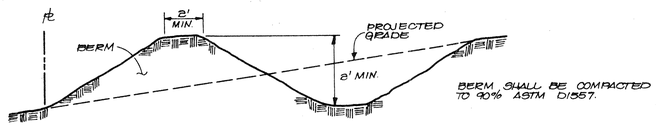
HEADWALL PLAN



RUNDOWN SECTION B-B



RUNDOWN SECTION A-A



TEMPORARY EROSION CONTROL BERM

GRADING AND DRAINAGE PLAN

The Grading and Drainage Plan shown hereon identifies the improvements required to manage developed stormwater runoff from the project site, and details a grading scheme that complements the site improvements and interfaces well with adjacent properties. The purpose of this plan is to detail drainage management improvements and provide grading information to facilitate construction of site paving and drainage improvements for the North Valley Septage Discharge Facility.

As shown by the vicinity map, the site is located on Osuna Road N.E. approximately 1400 feet west of the AMAFCA North Diversion Channel. The site contains approximately 0.46 acres and is presently undeveloped. The existing topography slopes generally to the north with an earthen berm located longitudinally through the site. Existing onsite flows drain to the northwest into the area being mined by Albuquerque Gravel Products Co. No offsite flows impact the site.

As shown by plate 16 of 50 of the FIRM for Albuquerque, New Mexico, this site does not lie within a designated flood hazard zone.

The proposed improvements include paving, drainage, landscaping, and utilities for a Septage Discharge Facility for the County of Bernalillo, New Mexico. As established by the "Drainage Report for Osuna Road, Second Street Through North Diversion Channel", prepared by Espey, Huston & Associates, Inc., dated July 1988, this site is not allowed free discharge of stormwater into Osuna Road. As established by the Report, the site is allowed a discharge rate of 0.2 cubic feet per second per acre. Therefore, it is necessary to implement detention ponding as a means of managing stormwater generated by this site. As shown by the plan, all stormwater will be routed overland to a detention pond located at the southwest corner of the site. The pond will discharge through a drainline into Osuna Road where the flows will be intercepted by an existing storm drain which outfalls at the Alameda Drain. This method of managing runoff is in accordance with the approved "Conceptual Grading and Drainage Plan for the Septage Discharge Facility", prepared by Espey, Huston & Assoc., Inc., dated November 30, 1988.

The contractor will be required to implement temporary erosion control improvements during the construction phase of the project. The plan shall consist of a ditch-dike system placed at the project boundaries in order to limit the release of sediment from the site. The contractor will be required to maintain the temporary erosion control facilities until all paving and drainage improvements are in place.

The calculations which appear hereon analyze the 10 year and 100 year, 6 hour design storms falling within the project site for both existing and developed conditions. The SCS method of estimating runoff is used as outlined in the City of Albuquerque "Development Process Manual", Volume II, Chapter 22.

CALCULATIONS

I. CRITERIA

Rainfall: P100 = 2.20 in.
P10 = 1.45 in.

Time of Concentration: Tc = 0.0078(L^0.77)/S^0.385 (min.)

where L = length (ft.)
S = slope (ft./ft.)

Soil: Embudo (EmB)
Hydrologic soil group "B"

SCS curve number: CN per DPM, Vol. II, plates 22.2 C2 & C3

Runoff: Q = 45.4AR/Tc (c.f.s.)

where A = basin area (ac.)
R = direct runoff (in.)
Tc = time of conc.(min)

Volume: 3630AR (c.f.)

where A = basin area (ac.)
R = direct runoff (in.)

II. RUNOFF

BASIN	AREA	Tc	%IMP	CN	R10	R100	Q10	Q100	V10	V100
EXIST. SITE	0.46	10	0	70	0.1	0.4	0.2	0.8	167	668
DEV. SITE	0.46	10	60	87	0.4	1.0	0.8	2.1	668	1670

III. POND HYDRAULICS

A. Outlet Pipe Sizing

Allowable Discharge = 0.2 cfs/ac.

= 0.2*0.46 ac = 0.1 cfs

Determine area of outlet by orifice equation:

Q = CA(2gh)^0.5 Where: C = 0.6
Q = 0.1 cfs
g = 32.2 ft/sec^2
h = 1.42 ft

Solving for area: A = 0.017 sf

Use a 4-inch drainline with a cover plate to control discharge rate to 0.1 cfs(see Headwall Plan). Use of an oversized pipe allows for removal of the cover plate and easier maintenance of the drainline. Setting the cover plate 1-inch above the pipe invert results in a 0.017 sf outlet area.

B. Pond Inlet Sizing

1. Determine curb opening width by Weir equation:

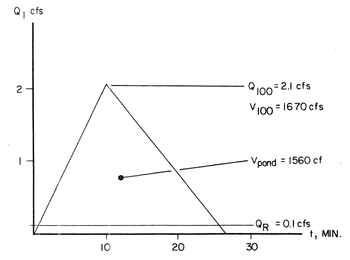
Q = 3.33LH^1.5 Where: Q = 2.1 cfs
H = 0.5 ft

L = 1.8 ft use 2.0 ft curb opening
(see Section A-A)

Use same geometry for rundown section

C. Pond Volume Determination

By utilizing a simplified hydrograph:



POND VOLUME PROVIDED = 1650 cf ±

GENERAL NOTES

1. Two (2) working days prior to any excavation the Contractor shall contact Line Locating Service, 765-1234, for location of existing utilities.
2. Prior to construction, the Contractor shall excavate and verify the horizontal and vertical location of all potential obstructions. Should a conflict exist, the Contractor shall notify the Engineer so that the conflict can be resolved with a minimum delay.
3. All work on this project shall be performed in accordance with applicable Federal, State, and Local laws, rules and regulations regarding construction safety and health.
4. All construction within Public Right-of-Way shall be performed in accordance with applicable City of Albuquerque standards and procedures.
5. The Contractor shall maintain access to adjacent properties during construction.
6. It is the Contractor's responsibility to protect and maintain in service all existing utilities.
7. All gas, electric, telephone lines, cables and appurtenances encountered during construction that require relocation or extension shall be done by the responsible utility company. It will be the Contractor's responsibility to coordinate all necessary utility relocations.
8. The Contractor shall be required to confine his work within the construction limits and/or public right-of-way to preserve existing vegetation and private property. Overnight parking of construction vehicles and equipment shall not obstruct driveways or designated traffic lanes.
9. A disposal site for all excess excavation material, asphaltic paving, concrete curbs and sidewalks, etc., shall be obtained by the Contractor in compliance with applicable environmental regulations and approved by the Field Engineer. All costs incurred in obtaining a disposal site and haul thereto shall be considered incidental to the project and no separate payment shall be made.
10. For Site horizontal geometry see sheet C-1.
11. For Site Paving Details see sheet C-2.
12. For site Earthwork, Pavement, Foundation, and Drainage recommendations see Project Specifications SECTION 11. The Contractor shall be required to strictly adhere to the recommendations made by that report.
13. The Contractor shall be required to obtain a topsoil disturbance permit from Environmental Health prior to any earthwork operations.
14. The Contractor shall construct and maintain temporary erosion control facilities during the construction phase of the project. All facilities shall remain in place until all paving and drainage improvements are completed.

DRAINAGE FACILITIES WITHIN CITY R.O.W.

NOTICE TO CONTRACTOR

1. An excavation/construction permit will be required before beginning any work within City right-of-way. An approved copy of these plans must be submitted at the time of application for this permit.
2. All work detailed on these plans to be performed, except as otherwise stated or provided hereon, shall be constructed in accordance with City of Albuquerque Standard Specifications for Public Works Construction, 1986.
3. Two working days prior to any excavation, contractor must contact Line Locating Service, 765-1234, for location of existing utilities.
4. Prior to construction, the contractor shall excavate and verify the horizontal and vertical locations of all constructions. Should a conflict exist, the contractor shall notify the engineer so that the conflict can be resolved with a minimum amount of delay.
5. Backfill compaction shall be according to arterial street use.
6. Maintenance of these facilities shall be the responsibility of the Owner being served.

ESPEY HUSTON & ASSOCIATES, INC.
317 COMMERCIAL ST. N.E.
ALBUQUERQUE, NEW MEXICO 87102
PHONE (505) 842-9366

COUNTY OF BERNALILLO
NEW MEXICO

SEPTAGE DISCHARGE FACILITY

RECEIVED
AUG 09 1989
HYDROLOGY SECTION

NORMIE A. LOBERG
NEW MEXICO
8021
REGISTERED PROFESSIONAL ENGINEER

3-15-89 6-28-89

DRAINAGE DETAILS

DES.	DATE	SHEET OF
PL	MARCH 1989	C-10
TED		