HYDROLOGY H18/D5 5 PLANS

H18/D5

5 PLANS

DALE BELLAMAH CORPORATION

POST OFFICE BOX 3325
6400 UPTOWN BOULEVARD, N.E.
EAST TOWER, SUITE 600

ALBUQUERQUE, NEW MEXICO 87110
TELEPHONE (505) 299-7631

Bob —
Jim

May 14, 1974

RECEIVED
MAY 1 5 1974
CITY ENGINEERS

Mr. V. Kimmick
City Engineer
City of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87103

Re: Final drainage report and calculations for Coronado Center, Albuquerque.

Dear Mr. Kimmick:

Attached please find one copy of the Drainage Calculations * prepared by Charles Kober and Associates for the Coronado Expansion. I would call to your attention one revision which is currently being made. South of Uptown Boulevard, the swale, shown on their report as a wide, non-defying swale, is to be constructed as a narrower, defined swale with 2 to 1 slopes, as an interim water control measure, pending the development between Uptown Boulevard and Indian School.

Your review and approval of these calculations would be appreciated.

Sincerely,

DALE BELLAMAH LAND CO., INC.

Larry D. Stroup, P.E. & L.S.
Chief Engineer

APPROVED FOR DRAINAGE
25 May 74
DATE
ACE
TITLE

lds:bev
Attachment

* 4 Layout drawings

BUILDERS—DEVELOPERS—REALTORS

Builders Owners and Managers of Residential Homes Apartment Properties Shopping Centers Motels
Mobile Home Parks, Free-Standing Commercial Properties

MEMBERS
National Association of Home Builders, International Council of Shopping Centers, National Association of Realtors

Boyle Engineering Corporation

1721 Girard Boulevard, N.E.
Albuquerque, New Mexico 87106

505 / 266-7789

RECEIVED
FEB 06 1978
CITY ENGINEERS

February 2, 1978

Bruno Conigliano
Drainage Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Bellamah Office Building

Plans are presently being prepared for the development of a portion of Jeannedale Addition - Unit No. 2 as shown on the attached sketch. Storm drainage from the southeast portion of Coronado Shopping Center is presently transported through the proposed development in an earthen channel and is deposited as surface flows in Indian School. Areas directly west of the site presently flow to San Pedro. We hereby request your approval for a new buried conduit drainage system which will handle flows from both referenced areas in accordance with both "Storm Drainage Study Relative to Development of Dale J. Bellamah's Jeannedale - Unit 4", January 1973 as prepared by MacCornack and Burns, Consulting Engineers, Inc. and "Drainage Calculations, Coronado Center, Albuquerque, New Mexico", May 1974, as prepared by Burke, Kober, Nicolais, Archuleta, Consulting Engineers.

The proposed system is shown on the attached sketch as well as sizes and required flow capacities. Please note that the required capacity will be provided to drain Area 2, but neither the required grading nor injection facilities will be provided until the area is developed. Flow will be injected in Manhole S-910. Table - 1 is a summary of the effect this additional flow will have on the existing storm drain system. As shown, the hydrostatic gradient will be located above the pipe soffitt, but well below the manhole rim elevations. Flows are based on upstream pipe capacities plus the additional injected flows from the referenced areas.

The proposed drainage system will eliminate the existing undesirable surface flows, provide drainage in accordance with previously approved studies, and will not increase the threat of flooding to the site or to adjacent areas.

If this proposal meets with your approval, please sign both copies and return one for our files. Your assistance in this matter is appreciated.

Very truly yours,

BOYLE ENGINEERING CORPORATION

Fred Burns

Fred Burns, PE

APPROVED:

_____ _____

City Drainage Engineer Date

mw

November 5, 1975

418.05

Mr. Robert Shawo
Charles Kober & Assoc.
2706 Wilshire Blvd.
Los Angeles, California 90057

RE: CORONADO CENTER

Dear Mr. Shawo:

I have reviewed your letter of October 28, 1975 and suggest the pipe proceed on a straight line. Perhaps to be aligned as shown in red. If this is not possible, i.e., the headwall must remain as shown, then I suggest consideration be given to an alignment shown in blue. If I missed something for that alternate, we can accept your proposal.

Very truly yours,

Kleston H. Laws
Assistant City Engineer-Hydrology

KHL/fs

Boyle Engineering Corporation

BY _____ DATE _____ SUBJECT BELLAMAH OFFICE BLDG SHEET NO. ____ OF ____

CHKD. BY _____ DATE _____ JOB NO. _____

100-YEAR WATER SURFACE ELEVATION

MANHOLE NO.	100 YEAR WS ELEV.	EXISTING GROUND ELEVATION	TOP OF PIPE ELEVATION
3-901	5225.85'	5231.5'	5225.85'
3-902	5226.62'	5229.8'	5226.27'
3-906	5230.71'	5235.0'	5228.86'
3-908	5233.88'	5243.0'	5231.11'
3-910	5235.59'	5242.0'	5234.21'
3-911	5236.94'	5245.0'	5236.92'

DRAINAGE CALCULATIONS

CORONADO CENTER

Albuquerque, New Mexico

RECEIVED

JUL 01 1974

CITY ENGINEERS

May 10, 1974 Revised

The attached Revised Drainage Calculations has been based on the same philosophy of the previous Revision (October 18, 1973) by adjusting the pipe diameter as possible to produce the same water surface and consequently the surface flows remain unchanged.

L. D. Stroup

June 24, 1974: Revised outfall channel south of Uptown Boulevard.

BASIC CRITERIA

Calculations are based upon the following:

Run-off:

Rational formula (Q - CIA)

c = 0.90
i = Per Peak Run-off Rates on Sheet No. 3 (25-Year Chart 1 City of Albuquerque Master Plan of Drainage, 1963)
T.C. = 10 min at first inlet

Pipe flow:

Mannings formula with n = 0.013
Pipes are sized for a 25-year storm

Inlets:

Grate Inlets sized to carry 25-year run-off with a maximum of 3-1/2" of ponding.

Curb Opening Inlets sized to carry 25-year run-off with water ponded to top of curb.

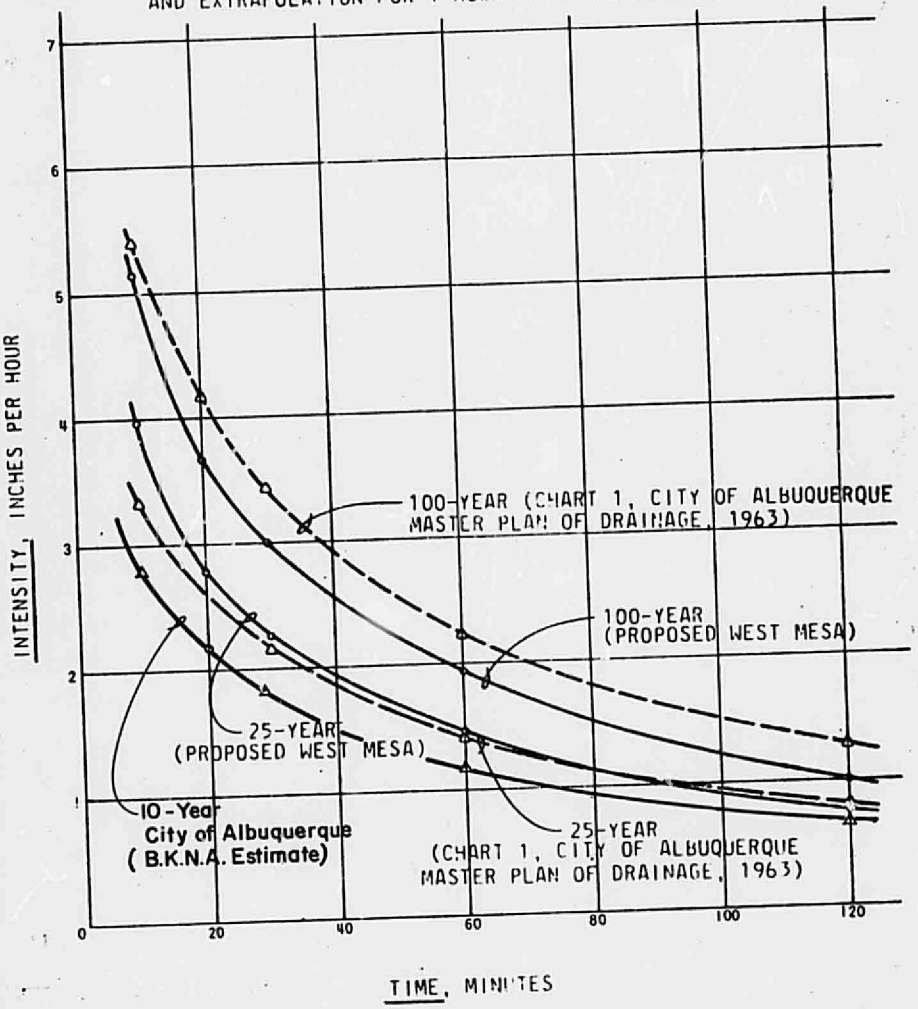
NOTE:

Loss Factor shown on the following calculation sheets represents a fractional proportion of $\frac{V^2}{2g}$ in accordance with the following:

- For 90° bend in alignment 1.00
- For 45° bend in alignment 0.50
- For No bend in alignment 0
  (If above bends are accomplished by a substantial radius, use 1/2 of the above Loss Factor)

TITLE:	BURKE KOBER NICOLAIS ARCHULETA		SHEET NO. 2
JOB:	JOB NO.	DATE	

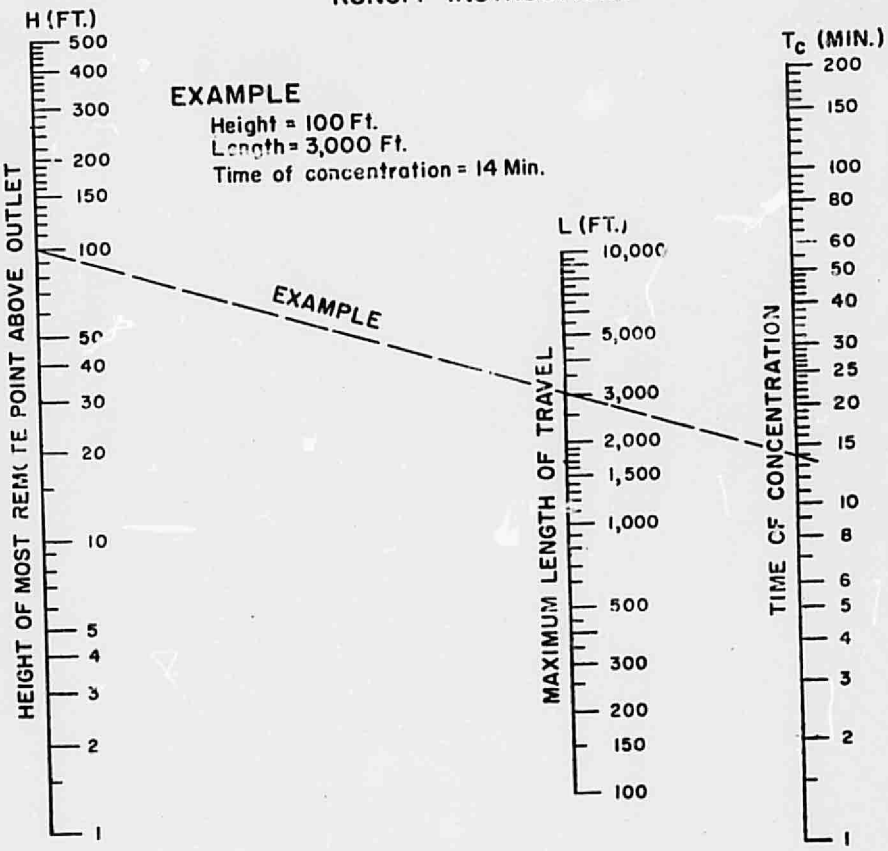
INTENSITY-DURATION-FREQUENCY CURVES
WEST MESA, ALBUQUERQUE
(SOURCE: WEATHER BUREAU ISOPLUVIALS, 1967
AND EXTRAPOLATION FOR 1 HOUR RAINFALL VALUES)



TITLE:	BURKE KOBER NICOLAIS ARCHULETA		SHEET NO. 3
JOB:	JOB NO.	DATE	

OFFICE STANDARD NO. 71-C
STORM DRAIN DESIGN DIV.

RUNOFF INSTRUCTIONS



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

FIG. 1A TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

Reprinted from "Design of Roadside Drainage Channels - Hydraulic Engineering Circular No 6", April 1962, U. S. Dept. of Commerce, Bureau of Public Roads

100 YEAR FREQUENCY (Combined Surface & Pipe flow-Lines 3thru 8)

Line	WS	Loss Factor	TC	Q	C	i	Ind. Area	Σ of Area	Conduit	HG Slope	L	ΣL	V	H
	78.100		10.00											
	76.970	.00												
1				15	.90	5.40		135000	18" Pipe	.02057	165.00	165.00	8.52	1.129
	73.575'		10.32				60000							
	73.27	.50					55900							
2				27	.90	5.33		250900	18" Pipe	*D=1.20	74.00	239.00		
	61.780		10.40											
	61.020		10.31											
3				34	.90	5.33		312200	24" Pipe	.02316	89.84	328.84	10.96	1.865
	58.939	.00					177900**							
	60.465		10.56											
4				14	.90	5.29		134300	24" Pipe	.00421	293.00	621.84	4.67	.339
	59.231	.00					78200**							
	58.767		11.35											
5				22	.90	5.14		212500	24" Pipe	.00997	229.48	851.32	7.19	.803
	56.479	.00					166400**							
	56.271		11.87											
6				39	.90	5.06		378900	30" Pipe	.00932	135.94	987.26	8.07	1.011
	55.003	.50					120900**							
	53.780		12.15											
7				51	.90	5.01		499800	30" Pipe	.01594	265.30	1252.56	10.55	1.728
	49.552	.00					120600**							
	50.031		12.59											
8				63	.90	4.94		620400	36" Pipe	.00904	233.98	1486.54	8.97	1.250
	47.916		13.00											
	47.757	.50					567100							
9				119	.90	4.88		1187500	54" Pipe	.00372	302.58	1789.12	7.05	.773
	46.774		13.66											
	46.426	.00					265700							
10				144	.90	4.79		1453200	54" Pipe	.00536	177.07	1966.19	8.05	1.121
	45.590		13.99											
	44.833	.00					126000							
11				155	.90	4.75		1579200	54" Pipe	.00622	1142.53	3108.72	10.99	1.878
12														
13	35.796		15.93											
14														

*Pipe flows only partially full at depth shown.

** Represents only that portion of the individual area which will enter the pipe-remainder flows in surface swale (See Plate A)

100 YEAR SURFACE WATER DRAINAGE CALCS.

SEE PLATE -A-

LINE NO.	LENGTH		Ind. Area Ft^2	Inlet Area Ft^2	Summation Area Ft^2	Time of Concentration Min.	Intensity "I" in/hr.
		Initial Overland Flow					
3	89.24 FT.	25:1 83:1 b = .00 s = .00380					
		d = .295 Q = 8 V = 1.70 n = .0150	0	54 700	54 700	5.00	7.03
		d = .395 Q = 17 V = 2.07 n = .0150			132 600		
4	293.00 FT	27:1 29:1 b = .00 s = .01000					
		d = .460 Q = 22 V = 3.71 n = .0150	132 600	34000	166 600	6.80	6.25
		d = .444 Q = 20 V = 3.63 n = .0150			151 100		
5	229.48 FT.	33:1 43:1 b = .00 s = .01000					
		d = .514 Q = 40 V = 4.00 n = .0150	151 100	168 600	319 700	7.83	5.92
		d = .449 Q = 23 V = 3.65 n = .0150			221 600		

100 YEAR SURFACE WATER DRAINAGE CALCS.

SEE PLATE -A-

LINE NO.	LENGTH FT.								Ind. Area Ft 2	Inlet Area Ft 2	Summation Area Ft 2	Time of Concentration Min.	Intensity "I" in/hr.
6	135.94	67:1	190:1	b =	.00	s =	.01000						
		d =	.348	Q =	48	V =	3.08	n = .0150	221600	175700	397900	8.45	5.75
		d =	.313	Q =	36	V =	2.87	n = .0150			296300		
7	276.00 FT.	28:1	50:1	b =	.00	s =	.01200						
		d =	.500	Q =	41	V =	4.30	n = .0150	296300	69000	365300	10.05	5.39
		d =	.436	Q =	29	V =	3.92	n = .0150			257550		
8	218.00 FT.	28:1	50:1	b =	.00	s =	.01200						
		d =	.500	Q =	41	V =	4.30	n = .0150	257550	121100	378650	10.98	5.21
9													

25 YEAR FREQUENCY--LINES 3 thru 8

Line	WS	Loss Factor	TC	Q	C	i	Ind Area	Σ of Area	Conduit	HG Slope	L	ΣL	V	H
	58.670		10.40											
	59.397	.00												
3				21	.90	3.28		312200	24" PIPE	.00877	89.84	89.84	6.74	.706
	58.607		10.83											
	58.462	.00					54700							
4				24	.90	3.23		366900	24" PIPE	.01178	293.00	382.84	7.81	.949
	54.859		11.31											
	54.721	.00					91700							
5				26	.90	3.18		458600	24" PIPE	.01361	229.48	612.32	8.40	1.096
	51.590		11.75				91600							
	51.807	.00												
6				36	.90	3.14		550200	30" PIPE	* D=2.14	135.94	748.26		
	50.703		12.05											
	49.663	.50					195000							
7				47	.90	3.11		745200	30" PIPE	*D=2.02	265.30	1013.56		
	46.042		12.52				69000							
	46.487	.00					96000							
8				57	.90	3.06		910200	36" PIPE	*D=2.40	233.98	1247.54		
	44.735		12.96											

*Pipe flows only partially full @ depth shown.

25-YEAR FREQUENCY

Line	WS	Loss Factor	TC	Q	C	i	Ind. Area	Σ of Area	Conduit	*D	L	ΣL	V	H
	77.920		10.00											
	76.73	.00		2	.90	3.33		42900	18" Pipe	*0.43	230.00			
16														
	75.73		12.28				13000							
	75.72	.50		3	.90	3.08		55900	18" Pipe	*0.42	50.00	280.00		
17														
	75.22		12.70				0							
	75.16	.50		3	.90	3.04		55900	18" Pipe	*0.36	88.64	368.64		
18														
	73.44		13.44											

* Pipe flows only partially full @ depth shown.

25-YEAR FREQUENCY

Line	WS	Loss Factor	TC	Q	C	i	Ind. Area	Σ of Area	Conduit	HG Slope	L	Σ L	V	H
	77.370		10.00											
	76.16	.00												
19				3	.90	3.33		56550	18" Pipe	*D=0.66	300.00	300.00		
	74.96		12.26											
	74.9	.50					0							
20				3	.90	3.09		56550	18" Pipe	*D=0.66	50.00	350.00		
	74.76		12.67											
	75.20	.50					24250							
21				5	.90	3.05		80800	18" Pipe	*D=1.10	131.09	481.09		
	74.83		13.78											
	73.63	1.00					8000							
22				5	.90	2.95		88800	18" Pipe	*D=0.30	60.00	541.09		
	57.40		14.10				0							
	57.61	.00												
23				5	.90	2.93		88800	18" Pipe	*D=0.51	239.00	780.09		
	56.81		15.27											
	56.91	.50					23100							
24				6	.90	2.84		111900	18" Pipe	*D=0.61	82.76	862.85		
	56.46		15.77											
	57.312	.50					80100							
25 & 26				7	.90	2.80		192000	24" Pipe	.00570	492.67	1355.52	4.48	.312
	54.504		16.61											
	54.350	.50					33600							
27				9	.90	2.75		265700	24" Pipe	.00419	373.53	1729.05	4.66	.337
	52.785		16.68											

*Pipe flows only partially full @ depth shown

25-YEAR FREQUENCY

Line	WS	Loss Factor	TC	Q	C	i	Ind. Area	Σ of Area	Conduit	*D	L	ΣL	V	H
	55.869		10.00											
		.00												
28				2	.90	3.33		39400	18" Pipe	0.44	130.00			
	55.782		11.40											
	55.702	.00					34300							
29				4	.90	3.17		73700	18" Pipe	0.89	211.33	341.33		
	55.254		12.69											
	55.147	1.00												
30				4	.90	3.05		73700	18" Pipe	0.89	328.91	670.24		
	54.504		14.78											

*Pipe flows only partially full @ depth shown

100 YEAR SURFACE WATER DRAINAGE

Section AA

:1 32:1 b = 67.50 s = .01000

d = .258 Q = 71 V = 3.85 n = .0150

Drainage Area = Area A + Area B
= 45220* + 593,300
= 1045500 sq. ft.
length of overland flow = 3500 ft.
Height diff from origin to point of concentration = 10.6

T.C. = 33
I = 3.27
Q = C.I.A.
= $0.9 \times 3.27 \times \frac{1045500}{43560}$
= 70.63 (call 71 cfs)

Drainage Area = Area A & B + Area C
= 1045500 + 36300
= 1081800 sq. ft.

Section BB

100:1 70:1 b = .00 s = .02000

d = .430 Q = 79 V = 5.02 n = .0150

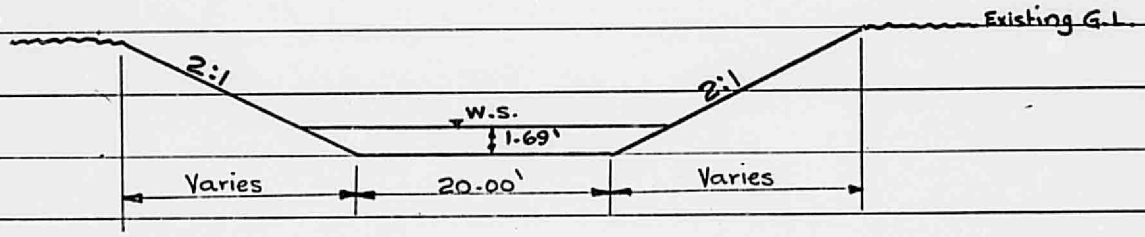
V = 5.02 fps
length of flow from A to B = 250.00 ft.
T.C. = 0.78 min.
Total T. C. = 33 + 0.78 = 33.83 min.
I = 3.55
Q = C.I.A.
= $0.9 \times 3.55 \times \frac{1404600}{43560}$
= 79 cfs

*Represents 46% of actual area which further represents the 100 yr. surface overflow not carried in the existing 10-yr. underground system.

OUTFALL CHANNEL SOUTH OF UPTOWN BOULEVARD

2:1 2:1 b = 20.00 s = .00140

d = 1.690 Q = 79 V = 2.01 n = .0350



GRATED INLET CAPACITIES

General:

Proposed inlets are 24" x 36" for single grate.
Open area = 6.00 sq. ft. - 1.92 sq. ft. (area of bars)
= 4.08 sq. ft. (call 4.00 sq. ft.)
Assuming grate at 50% clogged.
Resultant open area is 2.00 sq. ft.

Sump Condition:

With maximum allowable ponding = 0.30 ft.
Capacity of single inlet = 2.00 x 2.55 = 5.10 cfs ft.
Allowable drainage area = $Q/_{ci}$

$$= \frac{5.10}{0.9 \times 3.33}$$

= 1.70 Ac. = 74052 sq. ft.
(call 74,000 sq. ft.)

Continuous grade condition:

Based upon an average condition of a "v" swale with 2% side slopes on a gradiant of s=0.0040, one grate is required for each 60,000 sq. ft. of drainage area as follows:

$$Q = 0.90 \times 3.33 \times \frac{60.000}{43\ 560} = 4.13 \text{ cfs}$$

(Using method developed by John Hopkins University)

Gutter flow depth = 0.235 ft.
$+ \frac{0.035}{0.270}$ $(v^2/2g)$ V=1.50 fps

1" Depression flow depth = 0.192' (v = 2.24 fps
y' = 0.192 - 0.08 = 0.112 ft.

$$L' = 1.20\ v \tan\theta \left\{\frac{Y'}{g}\right\}^{\frac{1}{2}}$$

(L' - theoretical length for 100% interception)

$$L' = 1.2 \times 2.24 \times 50 \times \left\{\frac{0.112}{32.20}\right\}^{\frac{1}{2}}$$

L' = 7.92 ft. (actual L=3.00 ft.)

TITLE: Grated Inlet Capacities	BURKE KOBER NICOLAIS ARCHULETA		SHEET NO.
JOB: Coronado Center	JOB NO. 7275	DATE Sept. 1973	1 of 2

Bypass $Q = 0.50\ (L'-L)\ (g)^{\frac{1}{2}}\ (y')^{3/2}$
Bypass $Q = 0.50\ (4.92)\ (5.67)\ (0.037)$
Bypass $Q = 0.52$ cfs

$$\frac{4.13 - 0.52}{4.13} = \underline{\underline{87\%\ \text{interception per grate}}}$$

After 2 bypasses flow in surface swale will be approximately 4.75 cfs (d=0.25') and interception per grate = 4.13 cfs.

TITLE: Grated Inlet Capacities	BURKE KOBER NICOLAIS ARCHULETA		SHEET NO. 2 of 2
JOB: Coronado Center	JOB NO. 7275	DATE Sept. 1973	

Line	Inlet Area	No. of Grates
1	* 135,000	2
2	* 60,000	1
4	54,700	1
5	91,700	2
6	91,600	2
7	195,000	3
8	69,000	1
9	*207,000	3
11	*421,000	4
15	96,100	2

2 No. double grate

*Sump Condition

CURB OPENING FOR THE

CUL-DE-SAC ON PROSPECT

(100-Year Surface Water Drainage)

Drainage area (A) (San Pedro Dr.)

Width of pavement = 49.32 ft.
Length of pavement = 1025 ft.
Length of 6' sidewalk = 380 ft.

$A = 49.32 \times 1025 + 6 \times 380 = 52,833$ sq. ft. (1.21 Ac.)

$Q = C\,I\,A$
$= 0.90 \times 5.40 \times 1.21$
$= 5.88$ cfs

Using a local depression 2 inches deep and 2 feet wide.
Depth of water at curb face, yo = 0.50 ft.
Height of opening h = 0.50 ft.

From Fig. 3-1

Capacity per foot = 1.10

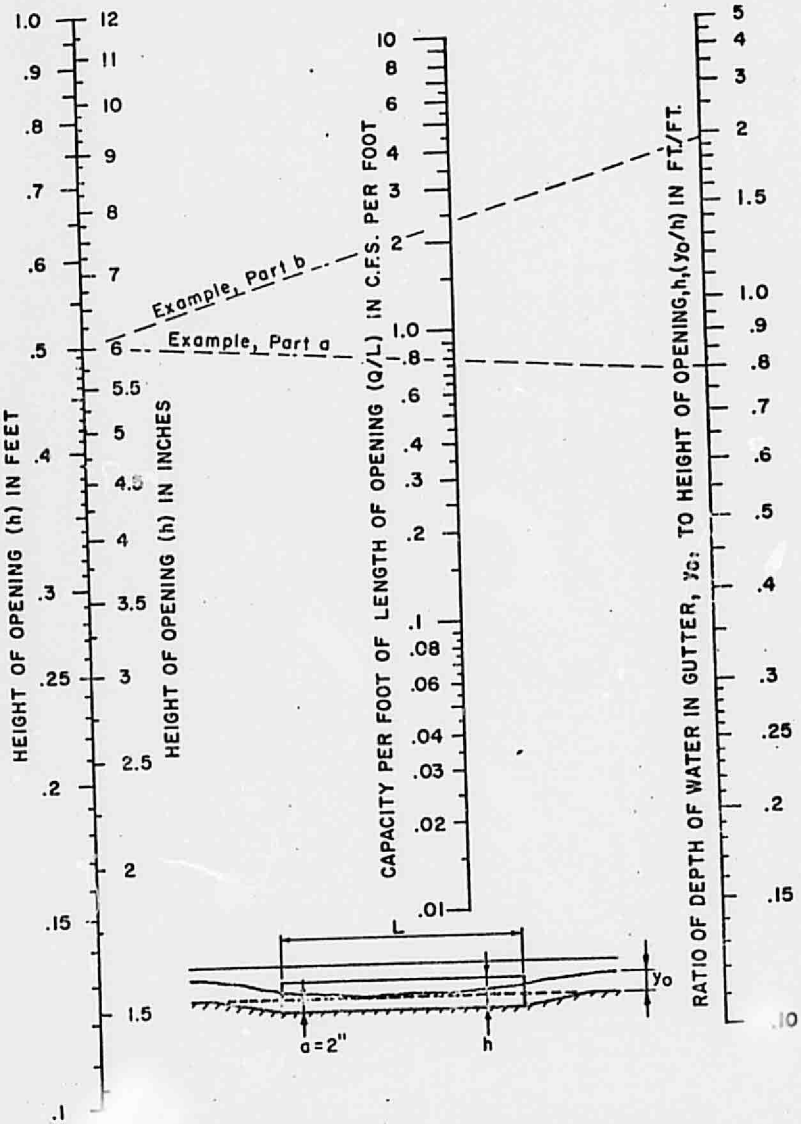
From Table 2-1

Reduction factor (sump condition) = 0.80
$0.80 \times 1.10 = 0.88$ cfs/ft. Allowable capacity per foot
Required opening = $\frac{5.88}{0.88} = 6.68$ (call 7 ft.)

TABLE 2-1

REDUCTION FACTORS TO APPLY TO INLETS

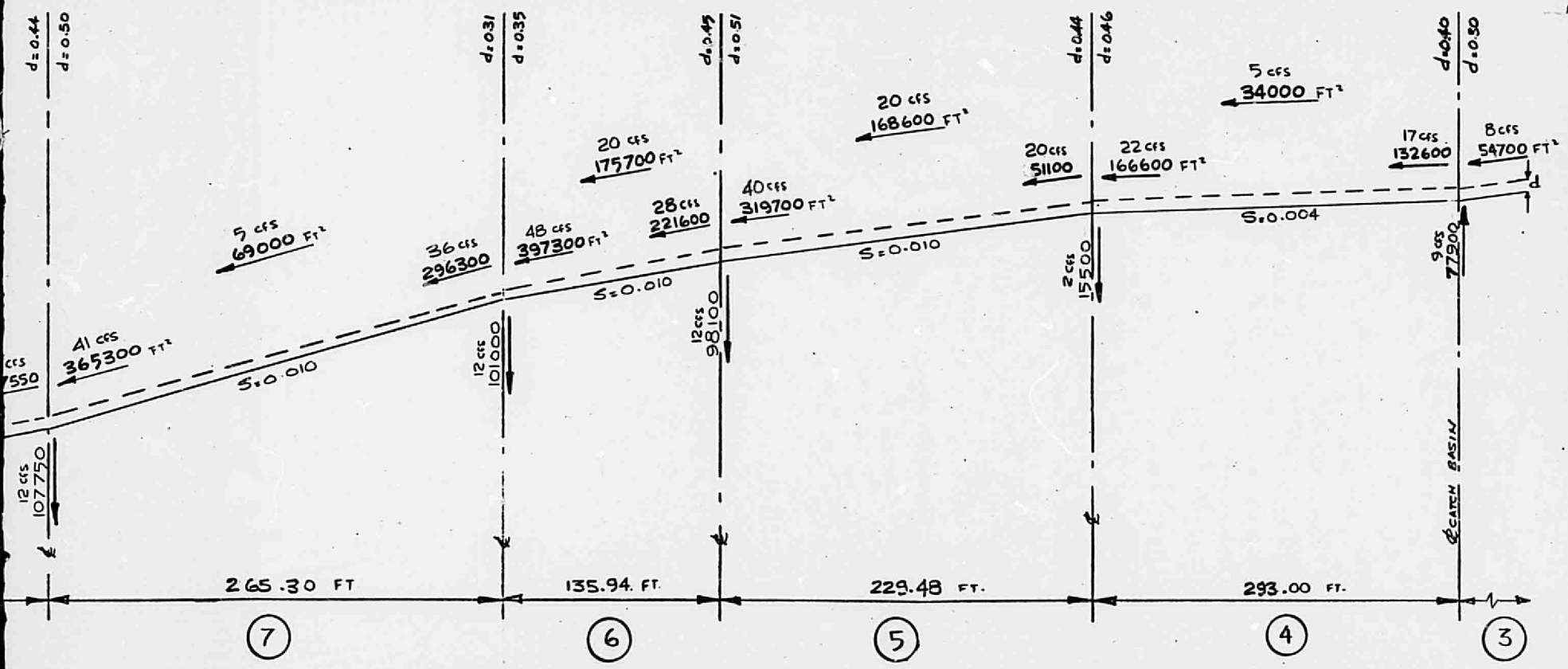
Condition (1)	Inlet Type (2)	Percentage of Theoretical Capacity Allowed (3)
Sump	Curb Opening	80%
Sump	Grated	50%
Sump	Combination	65%
Continuous Grade	Curb Opening	80%
Continuous Grade	Deflector	75%
Continuous Grade	Longitudinal Bar Grated	60%
Continuous Grade	Transverse Bar Grate or Longitudinal Bar Grate Incorporating transverse bars	50%
Continuous Grade	Combination	110% of that listed for type of grate utilized



NOMOGRAPH FOR CAPACITY OF CURB OPENING INLETS IN SUMPS, DEPRESSION DEPTH 2"

From Bureau of Public Roads Nomograph.

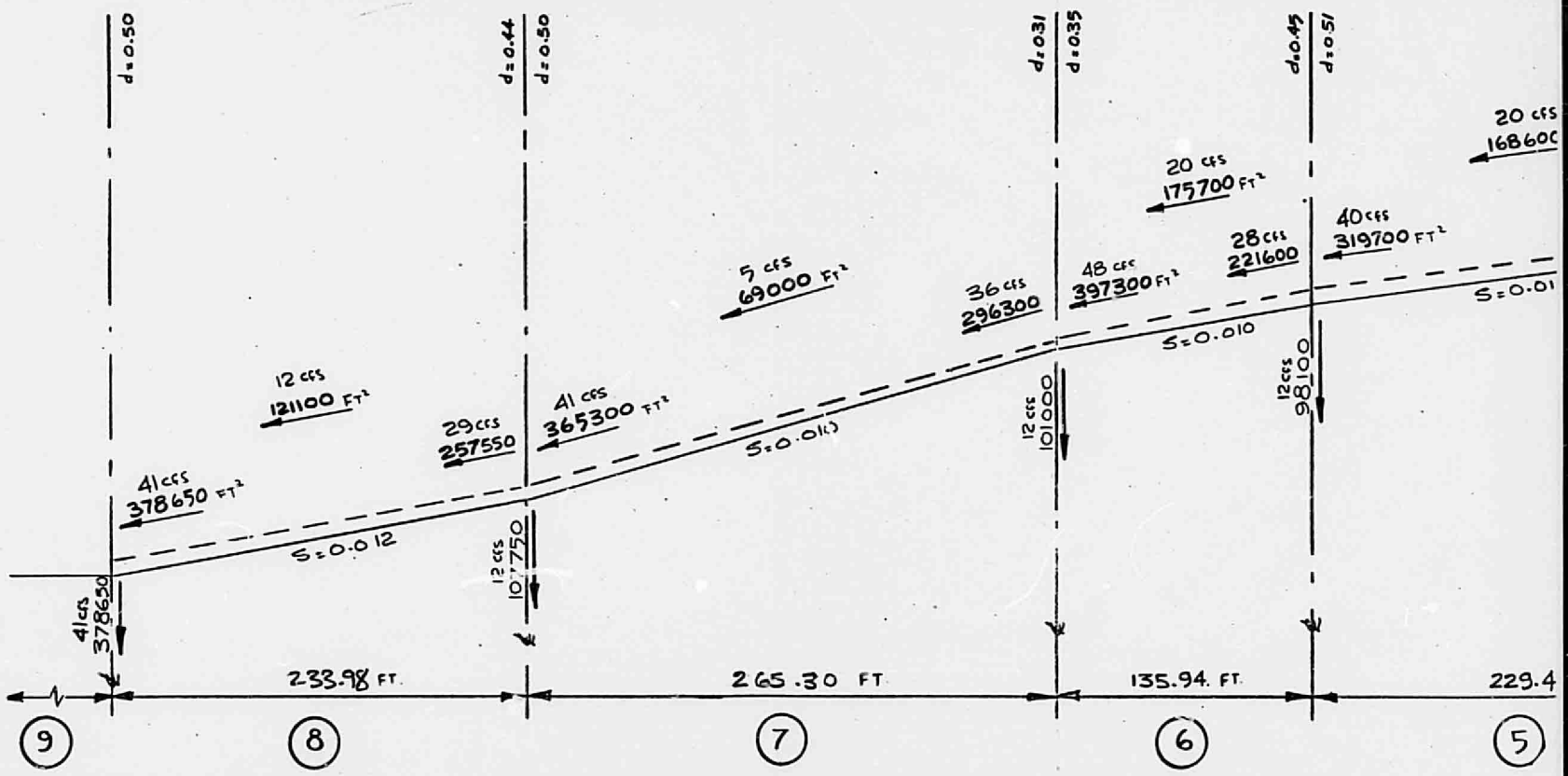
WATER DRAINAGE **PLATE A.**

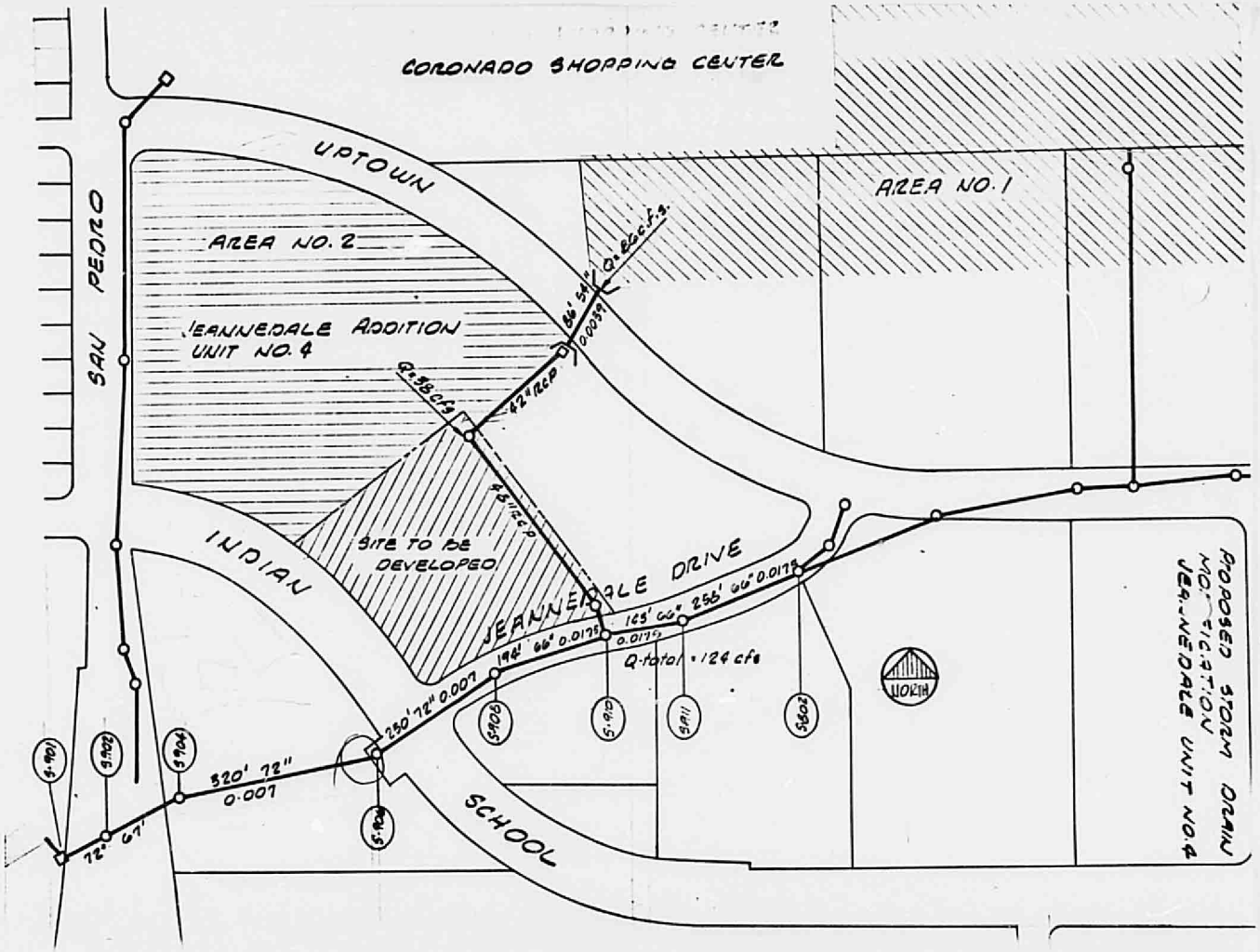


This Plan shot
In two Sections

100 YEAR SURFACE WATER DRAINAGE

PLATE A.




CORONADO SHOPPING CENTER
UPTOWN
AREA NO. 1
AREA NO. 2
JEANNEDALE ADDITION
UNIT NO. 4
SAN PEDRO
Q=26 c.f.s.
86' 54"
0.0039
Q=58 cfs
42" RCP
48" RCP
SITE TO BE
DEVELOPED
INDIAN
JEANNEDALE DRIVE
165' 66" 256' 66" 0.0175
194' 66' 0.0175
0.0175
Q-total = 124 cfs
250' 72" 0.007
320' 72"
0.007
72" 67'
S-901
S-902
S-904
S-903
S-905
S-906
S-907
S-908
S-909
SCHOOL
NORTH
PROPOSED STORM DRAIN
MODIFICATION
JEANNEDALE UNIT NO. 4

Charles Kober Associates

2706
Wilshire Boulevard

Los Angeles
California
90057

cable
Kobasoc

telephone
213
386 7534

RECEIVED
OCT 3 1975
CITY ENGINEERS

October 28, 1975

City of Albuquerque
Public Works Department
Post Office Box 1293
Albuquerque, New Mexico 87103

Attention: Mr. Q. R. Kielich
Assistant City Engineer - Design

Reference: CORONADO CENTER
Albuquerque, New Mexico

Gentlemen:

We are enclosing herewith a copy of drainage calcs showing the head and tail water elevations in regard to Uptown Blvd. storm drain, also a sketch showing the proposed storm drain alignment from the inlet head walls as per original design (Sheet CA/C-2) to the existing storm drain pipe in Uptown Blvd.

We are submitting this to you for your review and approval and/or comment.

Very truly yours,

CHARLES KOBER ASSOCIATES

Robert Y. Shawo

Robert Y. Shawo

RYS:vgt

cc: J. Tusant, R. Smallwood

File

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Los Angeles
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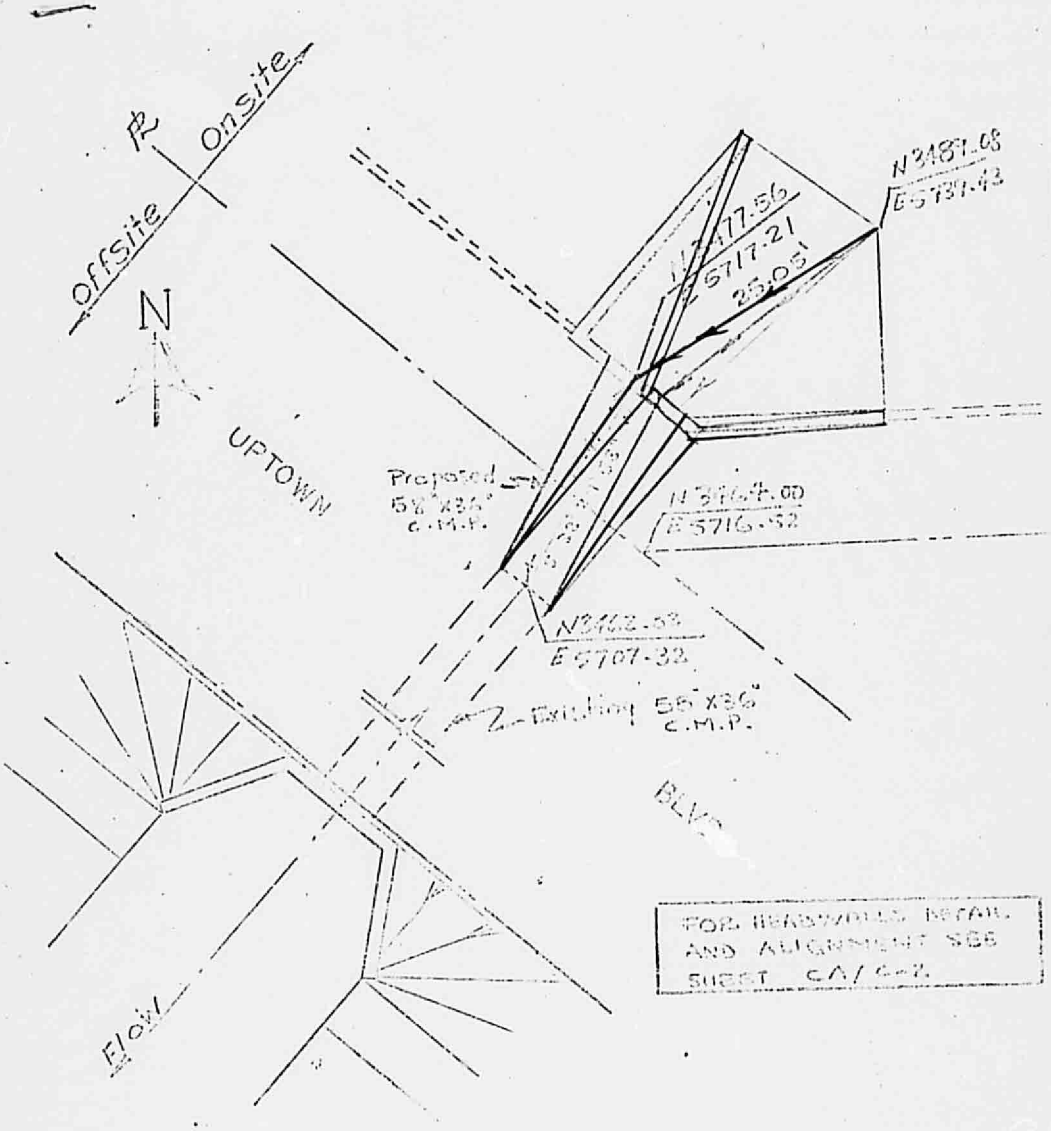
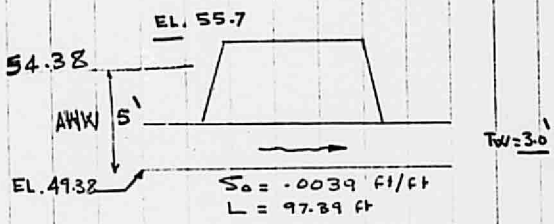


REV. S.D. ALIGNMENT
AT UPTOWN BLVD.
OCT. 25, 1979

CORONADO CENTER
73125 (UPTOWN BLVD S.D.)

R.Y.S.
10-16-75

Q = 79 cfs = $Q_{100\ yr.}$
TW = 3.0'



CULVERT DESCRIPTION (ENT. TYPE)	Q	SIZE	HEAD WATER COMPUTATION: INLET CONT		OUTLET CONTROL $HW = H + h_o - LS_o$								CONTROLLING HW	OUTLET VELOCITY
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	Tw	h_o	LS_o	HW		
C.M.P. Ovel (Head Wall)	79	58" x 36"	1.27	3.81	.5	2.6	2.1	2.6	3.0	2.8	.38	5	5.0'	6.3 fps