24EGM BAA0894

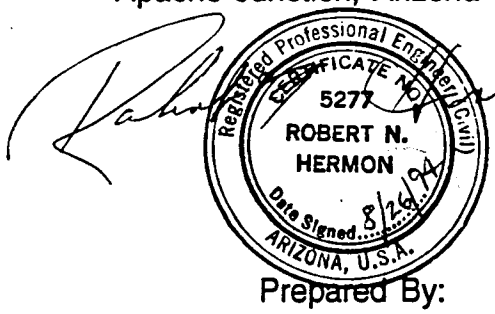
FINAL HYDROLOGY REPORT

FOR

EASTGATE MOBILE HOME PARK

Prepared For:

LAKE REALTY CORPORATION
288 North Ironwood Drive
Suite #115
Apache Junction, Arizona 85220



Prepared By:

ROBERT N. HERMON
BRADY•AULERICH & ASSOCIATES, INC.
1030 East Guadalupe Road
Tempe, Arizona 85283
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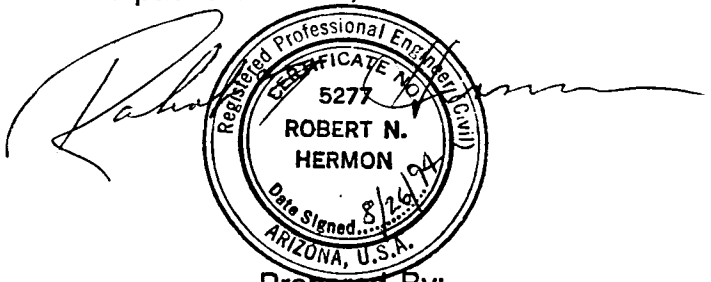

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SCOPE:

The intent of this report is to examine the impact of onsite and offsite storm water runoff flows generated by maximum 10 year and 100 year intensity storms upon the site and, further, to specifically analyze the capability of existing and proposed drainage facilities within and adjacent to the site with respect to their adequacy to receive, convey and/or detain those flows in accordance with prescribed County requirements and good engineering practice.

Accordingly this report will address and analyze specific drainage impacts and design feature accommodations as follows:

1) Maximum 100 year and 10 year offsite runoff flows affecting the offsite perimeter streets.

2) Maximum 100 year and 10 year drainage flows generated within the site.

3) Flood potential from maximum 100 year runoff flows detained downstream immediately West of the site.

INTRODUCTION:

The subject site located in the Southwest quarter of the Southeast quarter of Section 25, Township 1 North, Range 7 East of the Gila and Salt River Base and Meridian comprises a gross area of 28.5 acres, being bounded by Southern Avenue on the South, Sunland Avenue on the North, 114th Street on the East and the C.A.P. Canal on the West. Natural ground slope is downward to the Southwest at approximately 1.2%. The contributor drainage area for the site extends Northeasterly from the C.A.P. Canal 10,500 feet, intersecting Apache Boulevard just West of Ironwood Drive, and contains approximately 445 acres as determined from the U.S.G.S. Quadrangle map of "Apache

Junction" (See Drainage Map #1). Much of this upstream drainage area has already been developed and original wash locations and drainage patterns have been somewhat altered in the process. In addition, various detention/retention requirements instituted by the governments of both Pinal and Maricopa Counties over the years have certainly modified low flow wash conditions and in so doing have also attenuated the less frequent but high runoff flows as well.

1) OFFSITE RUNOFF IMPACT:

It is the intent of the design to intercept maximum contributory offsite storm water flows impacting the North and East boundaries of the site and to convey them (along with any flow locally generated by street runoff) to the Northwest or Southeast corners of the site where they, together with any other non-impacting flows, can be received into an existing detention basin along the Easterly side of the C.A.P. Canal.

Recent field inspection made along Meridian Road between Sunland and Pueblo Avenues indicates no major wash crossings in that road segment (although there is one minor crossing just North of Sunland Avenue on Meridian Road). Likewise there are no wash crossings on Pueblo Avenue West of Meridian Road to 112th Street. Since flows from the 380 acre area tributary to the Eastgate site (specifically the area upstream, East of Meridian Road or North of Pueblo Avenue) must cross one of those two streets somewhere within a quarter mile radius either West or South of their common intersection in order to have a direct impact on the subject site, it must be concluded (from the absence of any visible evidence) that most of that potential runoff has been attenuated and/or redirected by previous development in that area in such a way as to exclude it from flowing directly to and onto the site. Furthermore in considering other drainage

evidence it is obvious that much of the total runoff generated before reaching the Pueblo-Meridian intersection will flow:

1) West across Meridian Road through an existing mobile home park on the North side of Pueblo, or

2) South before reaching Meridian Road into a major wash which subsequently crosses Meridian Road between Sunland and Southern Avenues. In view of this situation, the more logical runoff condition to examine for direct site effect is that of runoff from maximum intensity - short duration storms of 100 year and 10 year frequency generated by the area immediately upstream of the study site, but West of Meridian Road and South of Pueblo Avenue which consists of 66.4 acres. This area can be divided into 5 smaller subdrainage sectors which separately and/or in combination impact the proposed offsite paving of Sunland Avenue and 114th Street along the North and East perimeter of the project site. These sectors, designated 1-5, are shown on the drainage map accompanying this report, and both the 100 year and 10 year runoff from each as determined by Rational formula are listed below:

Sector No.	Area AC	Runoff Coeff	100 Year Intensity	10 Year Intensity	Q(100 Yr) cfs	Q(10 Yr) cfs
1	13.8	0.80	6.42	3.88	71.9	43.4
2	16.2	0.80	8.11	4.90	100.9	61.0
3	10.0	0.80	6.42	3.88	52.1	31.5
4	15.2	0.40	6.42	3.88	39.6	23.9
5	11.2	0.40	6.42	3.88	29.2	17.6

Sectors 1 and 3 drain into sectors 5 and 4 respectively.

The combined flows of 1 and 5 then impact Sunland Avenue approximately 500 feet West of 114th Street, while the combined flows of 3 and 4 impact 114th Street about 500 feet South of Sunland Avenue. Drainage from Sector 2 flows directly into the intersection of

114th Street and Sunland Avenue.

Design features for acceptance and control of these flows include depression of the proposed roadway paving to match the flow line of existing washes where the flow crossing occurs and subsequent interception of the flows into concrete lined channels conveying them to outlet into the C.A.P. Canal detention area along the South and West sides of the subject site. Street crossing and channel capacities required are listed below:

Location of Crossing Flow	**Total Flow cfs**	
	10 year	100 year
Sunland-500 feet West of 114th Street	61.0	101.1
Sunland and 114th Street Intersection	61.0	100.9
114th Street-500 feet South of Sunland Avenue	55.4	91.7

The 10 year flows in their respective channels (4 foot wide bottom with 1:1 side slopes) are as follows:

Sunland Avenue Channel

114th Street to 500 feet West = $\frac{61.0}{2}$ = 30.5 cfs

500 feet West to 1300 feet West = 30.5 + 61.0 = 91.5 cfs

114th Street Channel

Sunland Avenue to 500 feet South = $\frac{61.0}{2}$ = 30.5 cfs

500 feet South to 1100 feet South = 30.5 + 55.4 = 89.9 cfs

Computer analysis of these flows are attached to this report and indicate the maximum depth of flow in the Sunland Avenue Channel at 2.15 feet except at the crossing point where confluence with additional inflow occurs. The depth at this location (500 feet West of 114th Street) rises to 3.17 feet. In the 114th Street Channel the maximum flow depth is less than 2.95 feet in all instances and not more than 2.15 feet except where additional incoming flow occurs.

Street runoff - which does not reach its peak at exactly the same time - will be diverted into the channels in accordance with County roadway drainage requirements. Both 114th Street and Sunland Avenue have varying longitudinal slopes. The maximum carrying capacity for a half street pavement section for each major slope condition (i.e. that which will maintain a 12 foot wide traffic lane free of storm water flow) is determined using Figure 3.2 and 3.4 of the Drainage Design Manual:

Street	Longitudinal Slope (%)	Max. cfs Capacity	Reduction Factor	Station
Sunland	0.643	1.0	0.8	1+90 to 8+40
114th	0.852	1.2	0.8	4+05 to 7+60
114th	1.454	1.5	0.8	9+40 to 12+80
Sunland	1.039	1.3	0.8	11+68 to 13+40

The maximum runoff generated by any length of street can be calculated using the 10 year - 15 minute storm intensity and a runoff coefficient of 0.95 and gives a runoff per 100 lf of 20 foot half street:

$$Q = (3.88)(0.95)(100)(20)\left(\frac{1}{43560}\right) = 0.169 \text{ cfs}$$

Using this figure the maximum allowable inlet spacing can be checked against the design spacing and the actual flow rate.

Street	Longitudinal Slope (%)	Design cfs Capacity	Maximum Allowable Spacing	Proposed Spacing	Design Flow
Sunland	0.643	0.80	473 feet	330 feet	0.56
Sunland	1.039	1.04	615 feet	430 feet	0.73
114th	0.852	0.96	568 feet	200 feet	0.34
114th	1.454	1.20	710 feet	445 feet	0.75

From the Drainage Design Manual for Maricopa County, the width of curb opening needed at each location for total interception can be calculated from Formula 3.6, page 25.

$$L_t = 0.6\ Q^{0.42} S^{0.3} \left(\frac{1}{nS_e}\right)^{0.6}$$

However, Figure 3.9 indicates that for a 3' - 6" wide curb opening inlet, the minimum hydraulic efficiency expected for the maximum slope (1.454%) and design flow (0.75 cfs) listed is 85%. Therefore, this opening width will be taken as adequate for all proposed curb openings on Sunland Avenue and on 114th Street except where wash crossing flows (mentioned previously) occur. At those wash locations the street profile is depressed by vertical curve to allow for a 2% hydraulic cross slope gradient, a minimum cross sectional area (12 sf) consistent with a flow velocity of 5 fps, and a nominal depth of 0.50 feet. In addition, erosion protection is provided on both sides of the roadway. Computer analysis indicates that the highest water surface elevation would not exceed 10 inches above the lowest centerline elevation at any crossing under the maximum 10 year storm condition. The major entrance way to the mobile home park has been located on 114th Street so as not to have any wash crossing between it and Southern Avenue, thereby providing a non-floodable access under 10 year storm conditions. Examining 100 year street runoff conditions and requirements as set forth in Table 3.1 of the Drainage Design Manual, the criteria include: a) maximum street flow (100 cfs), b) maximum flow velocity (10 fps) and c) maximum recommended depth of flow (8 inches above centerline).

The maximum 100 year street flow is that directly generated from the street itself by the 15 minute storm (6.42 in/hr) in addition to any other upstream contributory drainage flowing in the roadway cross section at the time. The runoff for a 445 foot length of 20 foot half roadway:

$$Q = (6.42)(0.95)(445)(20)\left(\frac{1}{43560}\right) = 1.25 \text{ cfs}$$

is relatively insignificant in comparison to that allowable (100 cfs) and since the adjacent channel will accept and contain both the upstream contributory flows and any runoff generated between the back of curb and right-of-way line, the design (versus allowable) conditions are obviously within compliance limits.

The only area of concern remaining is that of the wash crossings of the streets. Computer analysis at these locations indicate that the maximum water surface elevation for the Sunland Avenue wash crossing (78.86) is 1.63 feet above the lowest centerline elevation. This is about 12 inches higher than the maximum longitudinal conveyance depth recommended but it is not longitudinal conveyance and only occurs at that depressed section of roadway expressly designed for the crossing. The maximum water surface elevation (78.97) at the similar crossing of 114th Street is 10.4 feet above the lowest centerline.

The 100 year flows in their respective channels are listed below:

Sunland Avenue Channel
114th Street to 500 feet West = 50.5 cfs
500' West to 1300 feet West = 151.6 cfs

114th Street Channel
Sunland Avenue to 500 feet South = 50.5 cfs
500' South to 1100 feet South = 142.2 cfs

Computer analysis indicates a maximum depth of 3.55 feet at Station 9+58 on Sunland Avenue and a maximum depth of 4.64 feet on 114th Street at Station 8+71 (North end of culvert under the main entrance drive). On this basis the maximum street inundation above centerline at any place other than the wash crossings is 0.00 feet on Sunland Avenue and 0.12 feet on 114th Street.

2) ONSITE RUNOFF IMPACT:

The design intent is to adequately convey, detain and dispose of all storm water runoff generated within the subject site in accordance with County requirements.

In general, all runoff drains from the mobile home lots onto and along the roadways within the park and thereafter into one of seven detention/retention basins. The maximum volume of runoff necessary to be accepted by each basin, determined from its contributory drainage sector area, is listed hereinafter along with the calculated volume provided by each basin. Where there is less available retention volume than required, provision is made for overflow to another basin downstream.

100 Year-2 Hour Storm = 2.67 Inches Total Rainfall

DRAINAGE SECTOR ANALYSIS TOTAL RAINFALL

Sector Number	Total Rainfall ft	Runoff Coefficient	Drainage Area sf	Runoff Volume cf	Retention Provided cf
1	0.223	0.75	166,570	27,850	39,067
2	0.223	0.75	193,500	32,350	35,135
3	0.223	0.75	158,000	26,415	24,060
4	0.223	0.75	183,000	30,595	39,688
5	0.223	0.75	205,875	34,419	54,021
6	0.223	0.75	46,325	7,745	6,750
7	0.223	0.75	175,625	29,373	20,220
Total			1,082,895	188,747	218,941

Note: 1) Retention Basins 6 and 7 overflow to Retention Basin 1
2) Retention Basin 3 overflows to Retention basin 2

RETENTION BASIN ANALYSIS

Basin Number	Bottom Elevation	Highwater Elevation	Bottom Area	HW Area	Retention Volume
1	68.0	71.6	8,013	14,000	39,067
2	69.0	72.5	6,974	13,103	35,135
3	69.5	72.5	5,500	10,540	24,060
4	72.0	74.5	12,250	19,500	39,688
5	71.0	74.0	14,514	21,500	54,021
6	69.5	72.5	875	3,625	6,750
7	70.2	72.5	9,250	24,750	20,220

Ultimate disposal of the storm water will be either by percolation (basin numbers 3-6) or by percolation and metered outflow (basin numbers 1,2 and 7) into the existing flood retardance-detention facility along the Easterly side of the C.A.P. Canal.

Results of percolation tests made by Western Technologies indicate that the retention basin percolation can be projected at 1"/22, minutes which is equivalent to emptying a retention depth of 42 inches in 15.4 hours (considering only the bottom area of the basin). Since some retention extends beyond the bottom area it is also necessary to view the percolation from the stand point of volume per square foot of bottom area. On this basis the rate is 0.227 cf/sf per hour and the time necessary to percolate the maximum volume retention basin condition (i.e. greatest ratio of volume retained to area of bottom) occurs at basin number 6 where

$$T = \left(\frac{6750}{875}\right)\left(\frac{1}{0.227}\right) = 34.0 \text{ hours}$$

(< 36 hours therefore acceptable)

Metered outflow from basins 1, 2, and 7 will be through individual 12 inch diameter pipes at a nominal rate of 1 cubic foot per second each, thereby emptying those basins within less than 11 hours in all cases. Because of the potential for ponded offsite runoff

(between the C.A.P. Canal and the Westerly side of the site) to rise to a level higher than the outlet pipes from basins 1, 2, and 7, each of those pipes will have a flap gate valve installed on its outlet end to prevent flow from the ponded runoff back into the basins. The street flow capacities within the park are subject also to examination, although not being strictly held to the same criteria concerning non-inundated traffic lanes. Street capacities (based on longitudinal pavement slope) at top of curb and at 4 inches higher than top of curb are:

Street	At Top of Curb			4" Above Top of Curb		
Slope %	A	V	Q	A	V	Q
0.18	5.44	1.18	6.40	18.76	2.65	49.69
0.29	5.44	1.49	8.13	18.76	3.36	63.08
0.40	5.44	1.75	9.55	18.76	3.95	74.08
0.75	5.44	2.40	13.07	18.76	5.41	101.44
1.00	5.44	2.77	15.10	18.76	6.24	117.13
1.25	5.44	3.10	16.88	18.76	6.98	130.95

The maximum onsite runoff generated for each sector by the 10 year and the 100 year 15 minute storm is:

Sector	Area	Runoff Coeff	Maximum 10 Yr Q	Maximum 100 Yr Q
1	166,570	0.75	11.12	18.41
2	193,500	0.75	12.93	21.39
3	158,000	0.75	10.56	17.46
4	183,000	0.75	12.22	20.23
5	205,875	0.75	13.75	22.76
6	46,325	0.75	3.09	5.12
7	175,625	0.75	11.73	19.41

Comparing these values with the street flow capacities on the previous table, it can be readily seen that 1) in most cases the maximum 10 year runoff rate is larger than the curb-full capacity at or below 0.75% slope and 2) that in all cases the minimum street capacity at 4 inches above top of curb level is more than twice as great as any of the 100

year runoff flows. Therefore, it is concluded, that although a 10 year storm flow might reach a height greater than the top of curb level, it would in no case exceed 4 inches above that level. Since the pad grades for the park are set a minimum of 4 inches above top of curb, no lot flooding would occur. Finish floor grades for the mobile homes will be set a minimum of 12 inches above top of curb level.

POTENTIAL FLOOD IMPACT FROM DOWNSTREAM DETENTION FACILITIES:

An embankment constructed along the East side of the C.A.P. Canal (to protect it from flooding) functions as a flow diversion and detention facility for all runoff coming to it from many large drainage areas to the East. According to information obtained from both the U.S. Bureau of Reclamation and Maricopa County Flood Control District, the 100 year peak runoff flow into each "overchute" facility adjacent to the site is 733-799 cfs. Whereas the maximum outflow rate through the "overchute" pipes as given by the County Flood Control District is 565 cfs. Obviously, if these figures are correct, there is a need for some detention of part of the inflow and temporary storage for it. The area between the canal embankment and the Westerly property line of the project site together with the area between the Southern Avenue roadway embankment and the Southerly property line of the site constitute most of the potential for temporary detention storage - amounting to 4.0 acre feet below elevation 1571.5 (the maximum acceptable impoundment level as established from the proposed site design). Above this level storm water would be at a level higher than the highwater level of the lowest retention basin. The lowest ground elevation on the upstream side of the canal embankment is 1565.0. Two groups of five 72 inch diameter "overchute" culverts - one group 400 feet South of the Northwest corner of the site and the other 650 feet West of the Southeast corner - allow controlled outflow

of impounded storm water through floodway channel on the Westerly side of the canal. Thereafter it drains via a quadruple 10' x 6' box culvert under Southern Avenue into a second detention/retention area situated along the South side of the roadway. In addition, a group of three 73" x 55" cmp arch pipes, located about 350 feet West of the Southeast corner of the site allows storm water to flow under Southern Avenue into another drainage channel on the South side of the road and thereafter to continue South along the Easterly side of the canal.

The overchute pipes have an upstream invert elevation of 1565, maximum lengths of about 200 feet (for the North group) and 450 feet (for the South group). The cmp arch pipes have an invert elevation of 1566.3. The tops of all of these pipes, at their upstream ends, is basically the same elevation (1571). A conservative assumption for maximum highwater elevation downstream of the canal is 1569 (about 1 foot higher than average ground). Using the maximum design flow (760 cfs) given by the Bureau of Reclamation for the overchute at Southern Avenue and assuming a condition of full flow in the pipes and allowing for 20% clogging (i.e. only 4 out of 5 pipes operating) the flow in each pipe would be 190 cfs with a velocity of 6.72 fps and would require a minimum hydraulic grade differential of 1.55 feet for 200 feet of pipe or 2.04 feet for 400 feet. Since the nominal ground surface elevation difference is greater than this by about a foot, it is concluded that the original design must have assumed the flow depth at less than 100% full. Recalculating the flow using a 25% clogging factor and the actual pipe slope of 0.50%, the depth of flow is found to be 3.99 feet (only 67% of full depth condition) with a velocity of 10.16 fps, which is certainly within acceptable flow limits. Even if the flow requirement is increased to the highest design flow (840 cfs) indicated by the original designers for

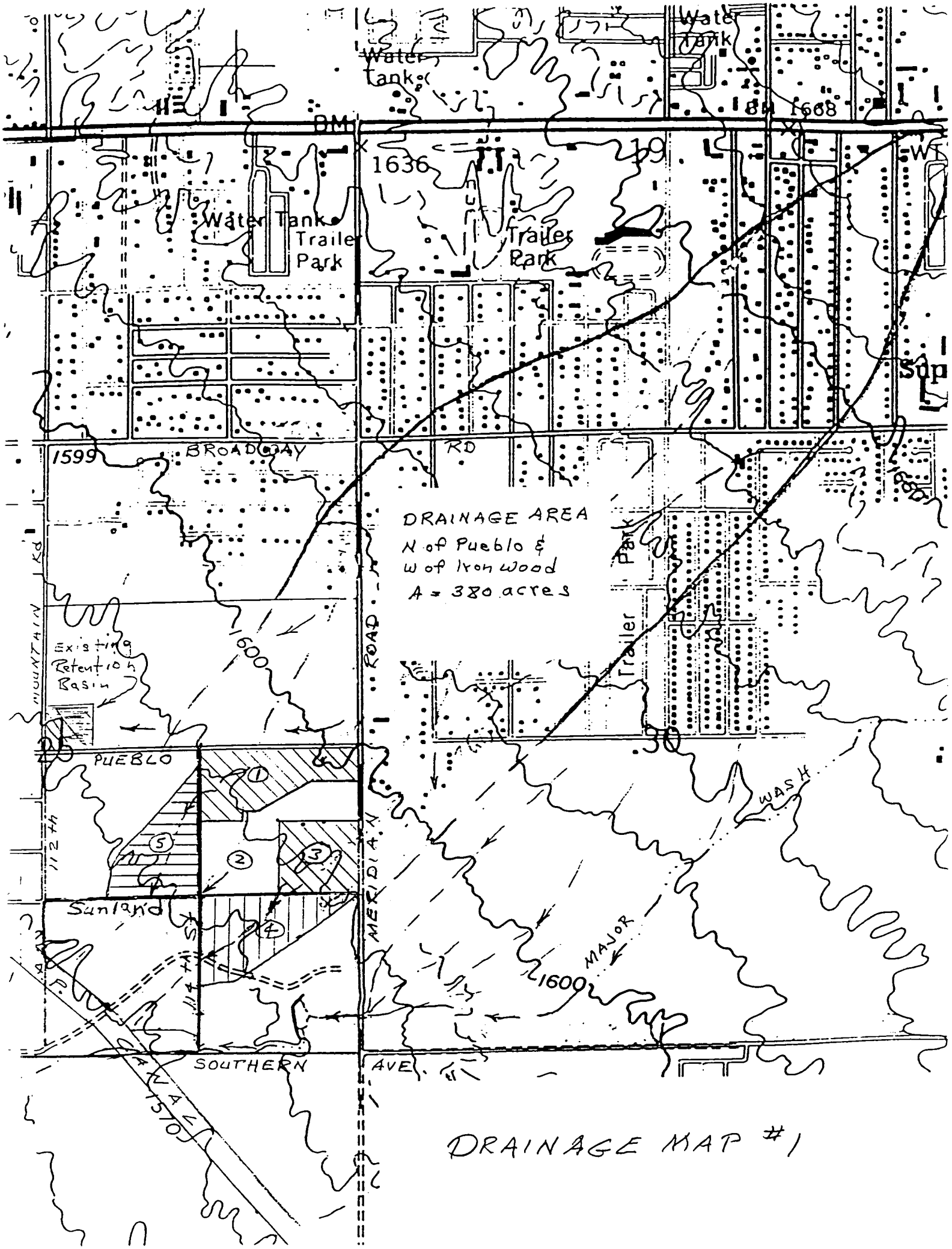
any of the three canal overchutes between Southern Avenue and Pueblo Drive (a half mile to the North), and even allowing for 25% clogging, the flow depth would still be only 4.15 feet (70% of total) and the velocity 10.38 fps (still acceptable).

Assuming that the upstream inlet of the overchute could somehow become submerged, it does not appear possible that the downstream outlet could, since the top of pipe there would be more than 2 feet higher than the nominal ground level at that location. Therefore, inlet control would be the condition. In that instance (still allowing for 25% clogging) the maximum flow to be accommodated would be 224 cfs, which requires a minimum velocity of 7.92 fps entrance velocity and a minimum submerged inlet of 1.46 feet (to provide for the energy head loss). However, the likelihood that this event would not occur is substantiated in two ways: 1) the maximum flow capacity of the overchute pipes flowing full and 25% clogged is (5)(259.5)(0.75) = 973 cfs, which is more than 100 cfs greater than any projected inflow, and 2) outflow through the 3 cmp arches (73 " x 55") under Southern Avenue has not been considered. Those arch pipes, each having a cross sectional area of 22 square feet, could convey a total of more than 300 cfs at a very slight hydraulic gradient (0.17%).

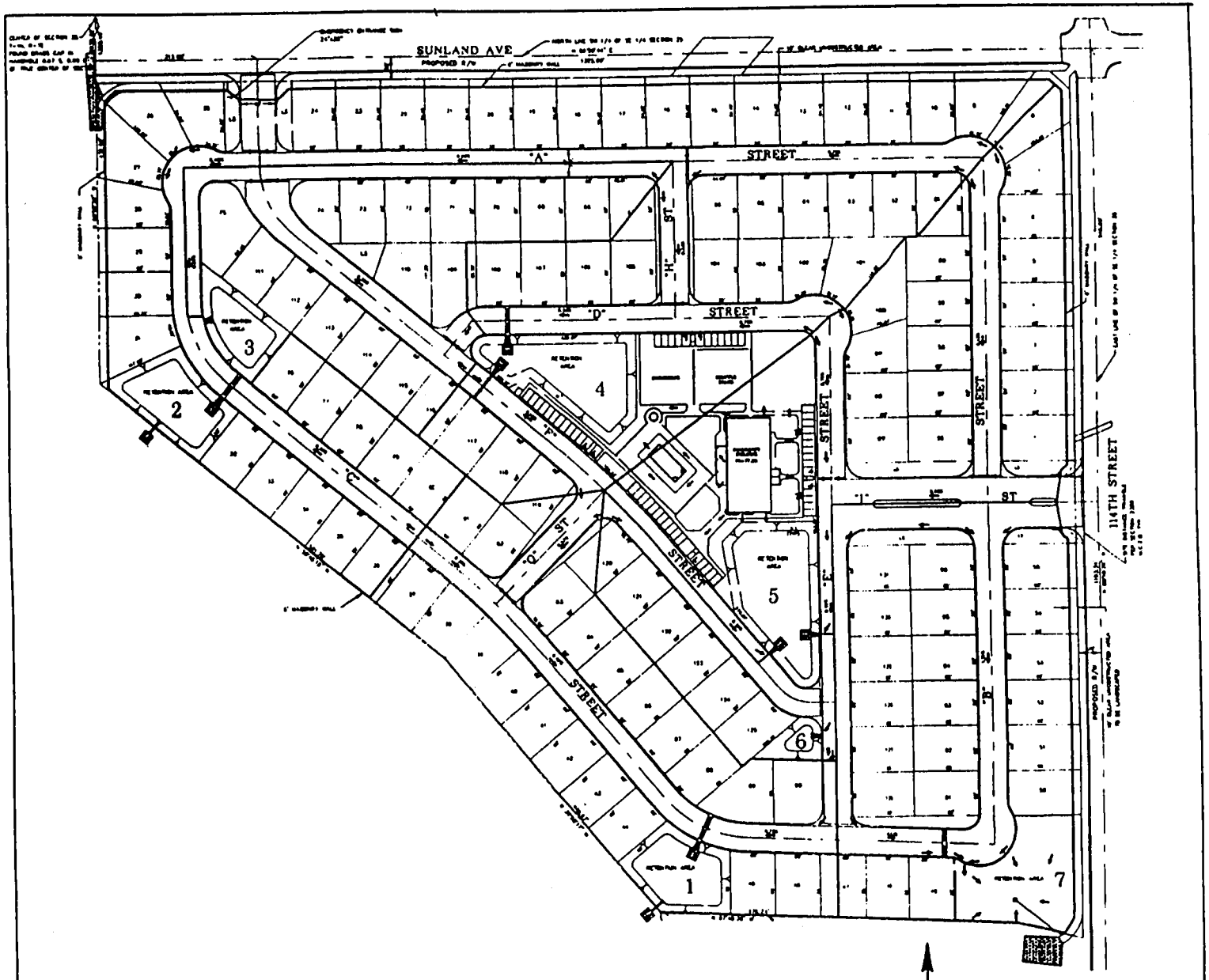
CONCLUSION:

In view of the foregoing analysis it is concluded that the maximum flood level that could occur due to the impact of all offsite runoff intercepted by and transmitted through the C.A.P. Canal embankment between Southern Avenue and Pueblo Drive would not exceed elevation 1571 - the level of the tops of the inlets of the three groups of overchute pipes. These, plus the group of arch culverts, having a combined flow-through capability at that level of over 4,800 cfs in comparison to the peak total runoff of 2059 cfs projected by

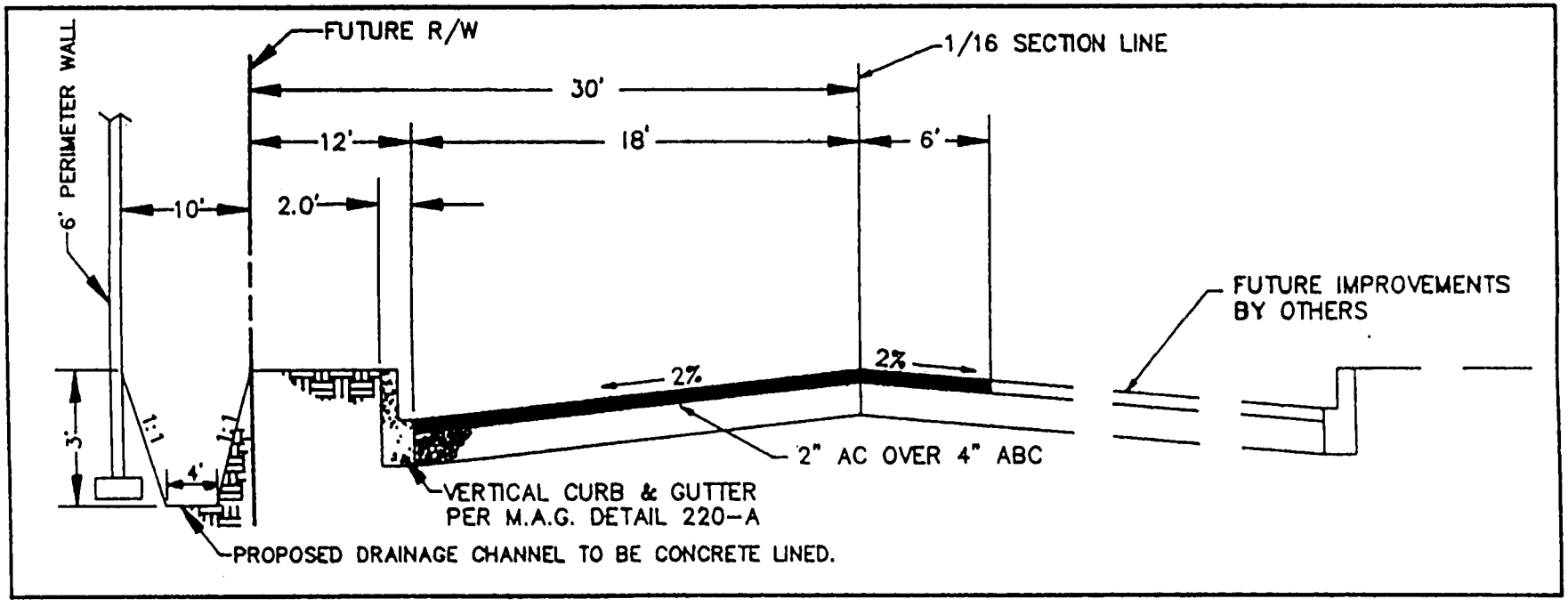
County Flood Control studies, evidence adequate capacity (even with clogging factors of 25-50%) to transmit the peak flows without imposing ponding above that level.



DRAINAGE MAP #1

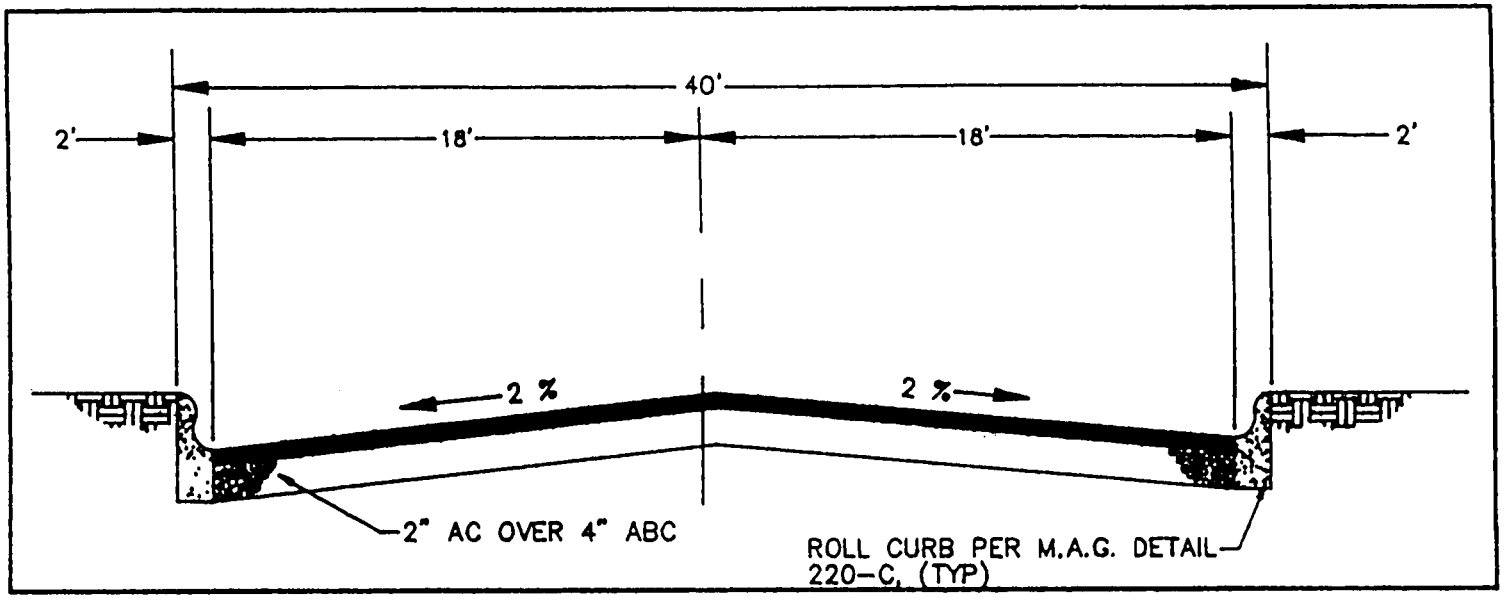


RETENTION AREA EXHIBIT

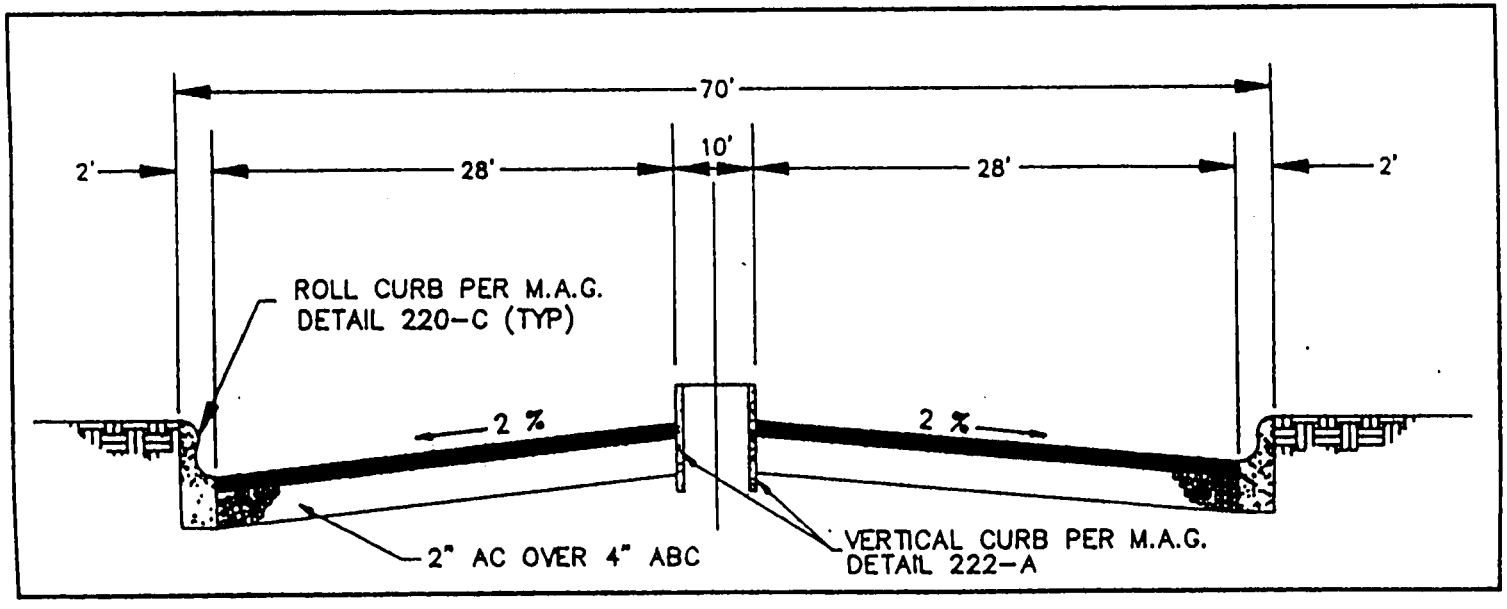


TYPICAL PERIMETER STREET SECTION C-C

N.T.S.



TYPICAL PRIVATE STREET SECTION A-A
N.T.S.



TYPICAL STREET SECTION AT MAIN ENTRANCE B-B
N.T.S.

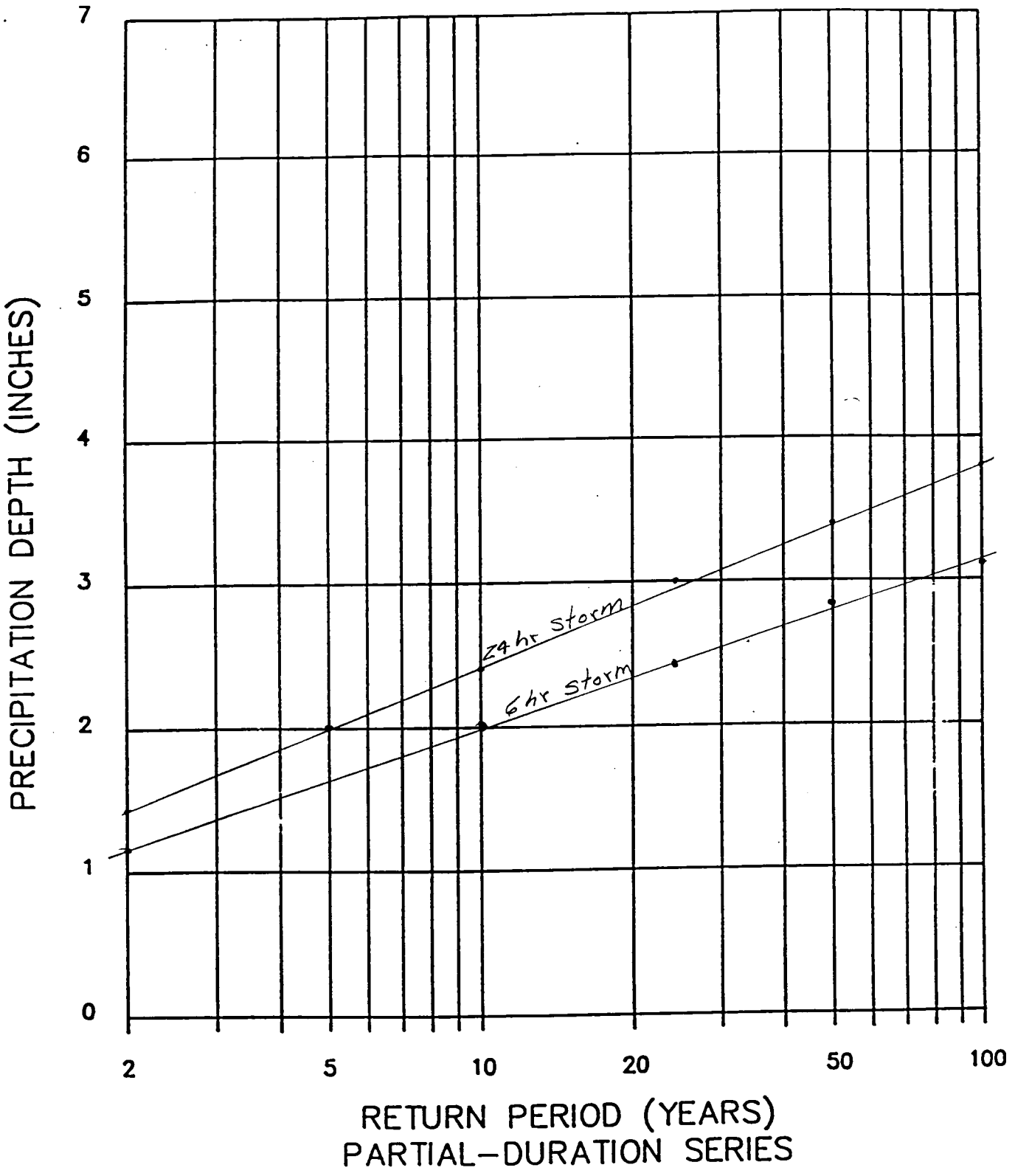
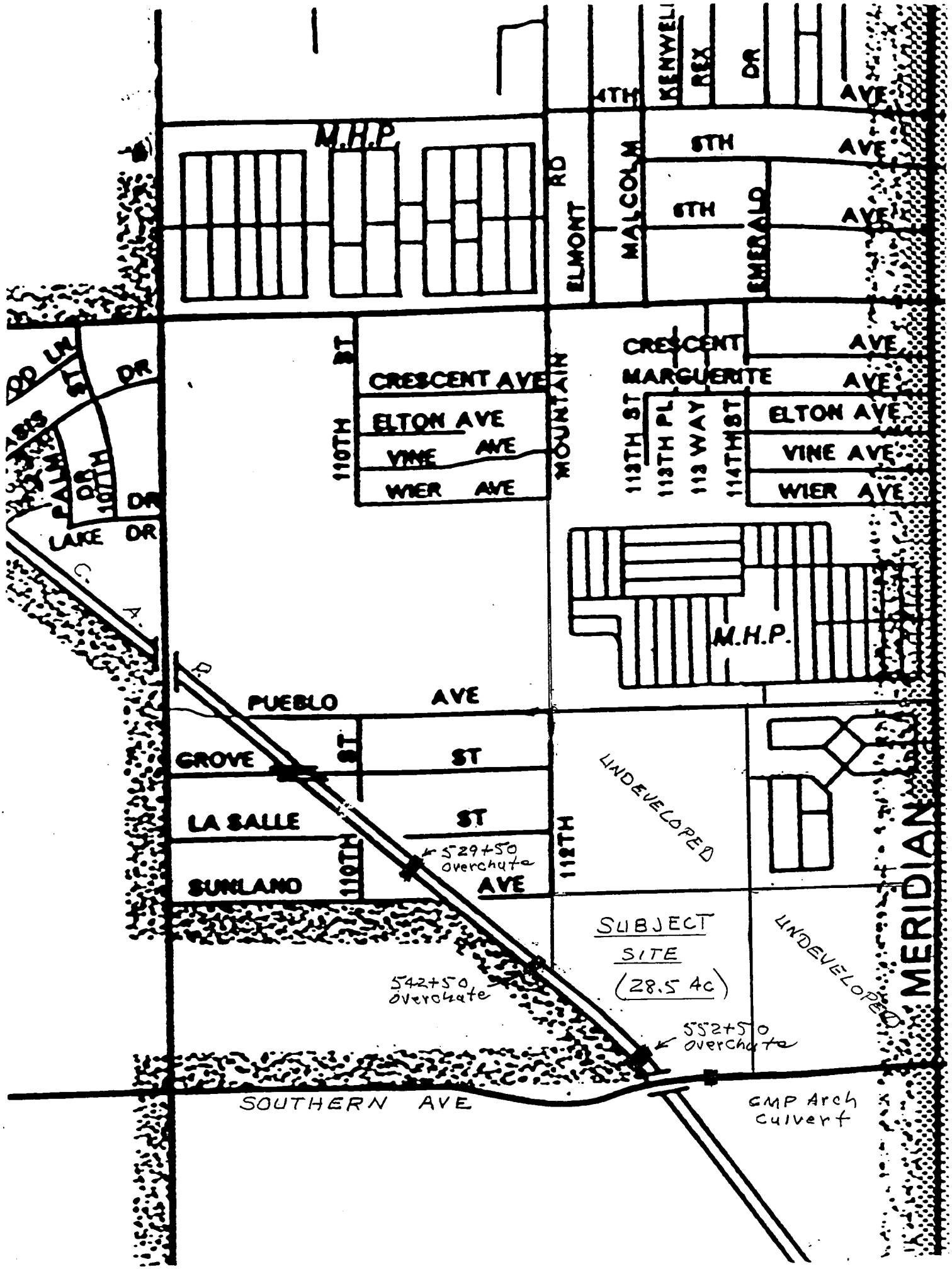


Figure 2.14
Precipitation Depth versus Return Period for Partial-Duration Series


M.H.P.
4TH
KENWELL
REX
DR
AVE
5TH
AVE
6TH
AVE
ELMONT
RD
MALCOLM
EMERALD
CRESCENT AVE
MARGUERITE AVE
110TH ST
CRESCENT AVE
ELTON AVE
VINE AVE
WIER AVE
MOUNTAIN
113TH ST
113TH PL
113 WAY
114TH ST
ELTON AVE
VINE AVE
WIER AVE
PALM
DR
LAKE
DR
C.A.P.
M.H.P.
PUEBLO AVE
GROVE ST
LA SALLE ST
SUNLAND AVE
110TH ST
113TH
529+50 overchute
542+50 overchute
552+50 overchute
UNDEVELOPED
SUBJECT SITE
(28.5 Ac)
UNDEVELOPED
MERIDIAN
SOUTHERN AVE
CMP Arch Culvert

HYDROLOGIC REPORT

C.A.P. REACH 1.....
OVERCHUTE ANALYSIS....
529+50 542+50 552+50..

Hyd. No. 1

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 846.86 cfs
Storm frequency	= 100 yr	Time interval	= 5 min
Basin area	= 2553.6 ac	Basin curve No.	= 85
Ave basin slope	= 1.21 %	Hydraulic len	= 27984 ft
Basin lag	= 211.2 min	Time of concen	=352.70 min
Total precip.	= 3.80 in	Distribution	= S.C.S. II

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (min cfs)		TIME--OUTFLOW (min cfs)		TIME--OUTFLOW (min cfs)		TIME--OUTFLOW (min cfs)	
605.00	9.07	610.00	9.88	615.00	10.75	620.00	11.67
625.00	12.67	630.00	13.73	635.00	14.87	640.00	16.10
645.00	17.40	650.00	18.81	655.00	20.32	660.00	21.93
665.00	23.65	670.00	25.51	675.00	27.53	680.00	29.73
685.00	32.12	690.00	34.73	695.00	37.82	700.00	41.83
705.00	47.35	710.00	55.56	715.00	68.33	720.00	83.76
725.00	99.81	730.00	116.41	735.00	133.49	740.00	151.00
745.00	168.86	750.00	187.01	755.00	205.41	760.00	224.04
765.00	242.89	770.00	261.94	775.00	281.17	780.00	300.57
785.00	320.12	790.00	339.82	795.00	359.64	800.00	379.58
805.00	399.63	810.00	419.78	815.00	440.00	820.00	460.29
825.00	480.64	830.00	501.03	835.00	521.45	840.00	541.89
845.00	562.33	850.00	582.76	855.00	603.16	860.00	623.53
865.00	643.84	870.00	664.08	875.00	684.26	880.00	704.31
885.00	724.21	890.00	743.91	895.00	763.39	900.00	782.59
905.00	801.12	910.00	818.24	915.00	833.02	920.00	843.55
925.00	846.86	930.00	845.95	935.00	844.11	940.00	841.43
945.00	838.01	950.00	833.95	955.00	829.35	960.00	824.30
965.00	818.87	970.00	813.07	975.00	806.94	980.00	800.49
985.00	793.74	990.00	786.73	995.00	779.46	1000.00	771.96
1005.00	764.22	1010.00	756.27	1015.00	748.11	1020.00	739.77
1025.00	731.24	1030.00	722.54	1035.00	713.67	1040.00	704.65
1045.00	695.49	1050.00	686.19	1055.00	676.76	1060.00	667.20
1065.00	657.51	1070.00	647.71	1075.00	637.79	1080.00	627.75
1085.00	617.60	1090.00	607.34	1095.00	596.98	1100.00	586.52
1105.00	575.96	1110.00	565.30	1115.00	554.56	1120.00	543.72
1125.00	532.80	1130.00	521.80	1135.00	510.72	1140.00	499.56
1145.00	488.33	1150.00	477.04	1155.00	465.69	1160.00	454.27
1165.00	442.81	1170.00	431.29	1175.00	419.73	1180.00	408.13

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME--OUTFLOW (min cfs)		TIME--OUTFLOW (min cfs)		TIME--OUTFLOW (min cfs)		TIME--OUTFLOW (min cfs)	
1185.00	396.49	1190.00	384.82	1195.00	373.11	1200.00	361.38
1205.00	349.63	1210.00	337.86	1215.00	326.08	1220.00	314.30
1225.00	302.52	1230.00	290.75	1235.00	279.02	1240.00	267.32
1245.00	255.69	1250.00	244.13	1255.00	232.79	1260.00	221.96
1265.00	211.98	1270.00	203.56	1275.00	197.82	1280.00	193.64
1285.00	189.79	1290.00	186.22	1295.00	182.91	1300.00	179.81
1305.00	176.89	1310.00	174.11	1315.00	171.45	1320.00	168.91
1325.00	166.46	1330.00	164.12	1335.00	161.87	1340.00	159.70
1345.00	157.60	1350.00	155.58	1355.00	153.62	1360.00	151.73
1365.00	149.91	1370.00	148.14	1375.00	146.42	1380.00	144.76
1385.00	143.15	1390.00	141.58	1395.00	140.06	1400.00	138.59
1405.00	137.15	1410.00	135.76	1415.00	134.41	1420.00	133.10
1425.00	131.82	1430.00	130.59	1435.00	129.39	1440.00	128.23
1445.00	127.06	1450.00	125.88	1455.00	124.69	1460.00	123.50
1465.00	122.30	1470.00	121.08	1475.00	119.85	1480.00	118.62
1485.00	117.36	1490.00	116.09	1495.00	114.81	1500.00	113.51
1505.00	112.19	1510.00	110.85	1515.00	109.49	1520.00	108.11
1525.00	106.71	1530.00	105.29	1535.00	103.85	1540.00	102.38
1545.00	100.90	1550.00	99.39	1555.00	97.85	1560.00	96.30
1565.00	94.72	1570.00	93.12	1575.00	91.49	1580.00	89.84
1585.00	88.17	1590.00	86.47	1595.00	84.75	1600.00	83.01
1605.00	81.24	1610.00	79.44	1615.00	77.62	1620.00	75.78
1625.00	73.91	1630.00	72.01	1635.00	70.09	1640.00	68.14
1645.00	66.16	1650.00	64.16	1655.00	62.20	1660.00	60.27
1665.00	58.39	1670.00	56.53	1675.00	54.72	1680.00	52.94
1685.00	51.20	1690.00	49.49	1695.00	47.81	1700.00	46.17
1705.00	44.56	1710.00	42.99	1715.00	41.45	1720.00	39.94
1725.00	38.46	1730.00	37.02	1735.00	35.60	1740.00	34.22
1745.00	32.86	1750.00	31.54	1755.00	30.24	1760.00	28.98
1765.00	27.74	1770.00	26.53	1775.00	25.35	1780.00	24.19
1785.00	23.07	1790.00	21.97	1795.00	20.90	1800.00	19.86
1805.00	18.84	1810.00	17.86	1815.00	16.90	1820.00	15.97
1825.00	15.06	1830.00	14.18	1835.00	13.33	1840.00	12.51
1845.00	11.72	1850.00	10.95	1855.00	10.21	1860.00	9.49

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	85.00	7	121.00	84.00
2	100.00	84.00	8	140.00	84.00
3	103.00	81.00	9	159.00	84.00
4	107.00	81.00	10	160.00	84.50
5	110.00	84.00	11	170.00	84.50
6	120.00	84.50			

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

Run date: 08-20-1994

Water Surface Profile Analysis File: a:114TH-10.OPC

Flow factor = 1 / Tolerance (ft/100) = 0.0500 / Max iterations = 27

SECTION 1 CHANNEL STA 0 + 0 BASE Q = 90

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	50	0
CHANNEL	90.0	13.2	6.8	1570	0.015	51	10
RIGHT OB	0.0	0.0	0.0	0	0.020	55	0

WSEL =	69.65	VEL HD =	0.719	JUMP ELEV =	N/A
CRWSEL =	69.65	EN LOSS =	0.000	STA JUMP =	N/A
TOP WID =	8	EN GD LN =	70.37	JMP LOSS =	N/A
CHNL SLP =	9.8039 %	DEPTH =	2.15	Critical flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	90.00	71.00	4	107.00	67.50
2	100.00	70.50	5	110.00	70.50
3	103.00	67.50	6	115.00	71.00

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 2 CHANNEL STA 0 + 51 BASE Q = 90

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	50	0
CHANNEL	90.0	13.2	6.8	1570	0.015	51	10
RIGHT OB	0.0	0.0	0.0	0	0.020	55	0

WSEL =	74.65	VEL HD =	0.719	JUMP ELEV =	N/A
CRWSEL =	74.65	EN LOSS =	5.000	STA JUMP =	N/A
TOP WID =	8	EN GD LN =	75.37	JMP LOSS =	N/A
CHNL SLP =	9.8039 %	DEPTH =	2.15	Critical flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	79.50	6	120.00	79.30
2	100.00	75.50	7	121.00	78.80
3	103.00	72.50	8	140.00	79.19
4	107.00	72.50	9	150.00	79.00
5	110.00	75.50	10	160.00	75.00

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 3 CHANNEL STA 1 + 84 BASE Q = 90

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	133	0
CHANNEL	90.0	10.5	8.6	1147	0.015	133	9
RIGHT OB	0.0	0.0	0.0	0	0.000	133	0

WSEL = 74.71	VEL HD = 1.136	JUMP ELEV = 74.96
CRWSEL = 74.96	EN LOSS = 0.477	STA JUMP = 182.50
TOP WID = 8	EN GD LN = 75.85	JMP LOSS = 0.080
CHNL SLP = 0.3008 %	DEPTH = 1.81	Supercritical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	76.00	6	120.00	75.36
2	100.00	75.90	7	121.00	75.36
3	103.00	72.90	8	140.00	75.75
4	107.00	72.90	9	150.00	75.55
5	110.00	75.90	10	160.00	74.50

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 4 CHANNEL STA 5 + 39 BASE Q = 90

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	355	0
CHANNEL	90.0	13.2	6.8	1570	0.015	355	10
RIGHT OB	0.0	0.0	0.0	0	0.020	355	0

WSEL =	76.15	VEL HD =	0.719	JUMP ELEV =	N/A
CRWSEL =	76.15	EN LOSS =	1.023	STA JUMP =	N/A
TOP WID =	8	EN GD LN =	76.87	JMP LOSS =	N/A
CHNL SLP =	0.3099 %	DEPTH =	2.15	Critical flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	80.00	7	121.00	78.31
2	100.00	77.00	8	140.00	78.70
3	103.00	74.00	9	146.00	78.58
4	107.00	74.00	10	150.00	78.50
5	110.00	77.00	11	170.00	80.00
6	120.00	78.80			

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 5 CULVERT STA 6 + 50 BASE Q = 90

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
STRUCT	90.0	15.6	5.8	1928	0.015	111	11
CHANNEL	90.0	20.5	4.4	2849	0.015	111	12

WSEL = 76.95	VEL HD = 0.299	No. STRUC = 1
CRWSEL = N/A	EN LOSS = 0.380	CULV HEIGHT = 3.00
TOP WID = 10	EN GD LN = 77.25	CULV WIDTH = 6.00
CHNL SLP = 0.0000 %	DEPTH = 2.95	INV EL UP = 74.35
INV EL DN = 74.00	ENT COEFF = 0.50	WEIR COEFF = 2.63
CULV SLP = 0.315 %	TOP CHORD = 78.50	ORF COEFF = 0.62
Outlet control	FLOW TYPE = Normal flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	80.00	7	121.00	78.31
2	100.00	77.00	8	140.00	78.70
3	103.00	74.00	9	146.00	78.58
4	107.00	74.00	10	150.00	78.50
5	110.00	77.00	11	170.00	80.00
6	120.00	78.80			

SECTION 6 CHANNEL STA 6 + 51 BASE Q = 90

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	0	0
CHANNEL	90.0	17.8	5.0	2359	0.015	1	12
RIGHT OB	0.0	0.0	0.0	0	0.000	0	0

WSEL = 77.02	VEL HD = 0.395	JUMP ELEV = N/A
CRWSEL = N/A	EN LOSS = 0.169	STA JUMP = N/A
TOP WID = 9	EN GD LN = 77.42	JMP LOSS = N/A
CHNL SLP = 34.9998 %	DEPTH = 2.67	Subcritical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	79.00	6	120.00	78.58
2	100.00	77.35	7	121.00	78.08
3	103.00	74.35	8	140.00	78.47
4	107.00	74.35	9	146.00	78.35
5	110.00	77.35	10	170.00	79.30

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 7 CHANNEL STA 7 + 15.59998 BASE Q = 90

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	0	0
CHANNEL	90.0	17.1	5.3	2222	0.015	65	11
RIGHT OB	0.0	0.0	0.0	0	0.020	0	0

WSEL =	77.09	VEL HD =	0.432	JUMP ELEV =	N/A
CRWSEL =	N/A	EN LOSS =	0.103	STA JUMP =	N/A
TOP WID =	9	EN GD LN =	77.52	JMP LOSS =	N/A
CHNL SLP =	0.2322 %	DEPTH =	2.59	Subcritical flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	79.00	5	110.00	77.50
2	100.00	77.50	6	120.00	77.54
3	103.00	74.50	7	140.00	77.93
4	107.00	74.50	8	146.00	78.00

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 8 CHANNEL STA 8 + 39 BASE Q = 30.5

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	123	0
CHANNEL	30.5	5.9	5.1	513	0.015	123	7
RIGHT OB	0.0	0.0	0.0	0	0.020	123	0

WSEL = 77.44 VEL HD = 0.412 JUMP ELEV = N/A

CRWSEL = 77.44 EN LOSS = 0.330 STA JUMP = N/A

TOP WID = 6 EN GD LN = 77.85 JMP LOSS = N/A

CHNL SLP = 1.4506 % DEPTH = 1.15 Critical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	80.00	5	110.00	79.29
2	100.00	79.29	6	120.00	79.43
3	103.00	76.29	7	121.00	78.94
4	107.00	76.29	8	140.00	79.33

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 9 CHANNEL STA 9 + 39 BASE Q = 30.5

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	100	0
CHANNEL	30.5	5.9	5.1	513	0.015	100	7
RIGHT OB	0.0	0.0	0.0	0	0.020	100	0

WSEL = 79.04 VEL HD = 0.412 JUMP ELEV = N/A

CRWSEL = 79.04 EN LOSS = 1.600 STA JUMP = N/A

TOP WID = 6 EN GD LN = 79.45 JMP LOSS = N/A

CHNL SLP = 1.6000 % DEPTH = 1.15 Critical flow

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	82.00	5	110.00	80.89
2	100.00	80.89	6	120.00	80.90
3	103.00	77.89	7	121.00	80.40
4	107.00	77.89	8	140.00	80.79

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 10 CHANNEL STA 10 + 59.59998 BASE Q = 30.5

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	121	0
CHANNEL	30.5	5.9	5.1	513	0.015	121	7
RIGHT OB	0.0	0.0	0.0	0	0.000	121	0

WSEL =	80.81	VEL HD =	0.412	JUMP ELEV =	N/A
CRWSEL =	80.81	EN LOSS =	1.770	STA JUMP =	N/A
TOP WID =	6	EN GD LN =	81.22	JMP LOSS =	N/A
CHNL SLP =	1.4677 %	DEPTH =	1.15	Critical flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	84.00	5	110.00	82.66
2	100.00	82.66	6	120.00	82.65
3	103.00	79.66	7	121.00	82.15
4	107.00	79.66	8	140.00	82.54

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 11 CHANNEL STA 11 + 13.59998 BASE Q = 30.5

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	54	0
CHANNEL	30.5	5.9	5.1	513	0.015	54	7
RIGHT OB	0.0	0.0	0.0	0	0.000	54	0

WSEL =	81.80	VEL HD =	0.412	JUMP ELEV =	N/A
CRWSEL =	81.80	EN LOSS =	0.990	STA JUMP =	N/A
TOP WID =	6	EN GD LN =	82.21	JMP LOSS =	N/A
CHNL SLP =	1.8333 %	DEPTH =	1.15	Critical flow	

SECTION DATA

POINT	STATION	ELEVATION	POINT	STATION	ELEVATION
1	99.00	84.00	6	120.00	83.65
2	100.00	83.65	7	121.00	83.15
3	103.00	80.65	8	140.00	83.54
4	107.00	80.65	9	146.00	83.42
5	110.00	83.65	10	170.00	83.30

STA OF LEFT OVERBANK = 100 STA OF RIGHT OVERBANK = 110

SECTION 12 CHANNEL STA 11 + 63.59998 BASE Q = 30.5

	FLOW RATE	AREA	VEL	CONVEY	n-VAL	RCH	WET PR
LEFT OB	0.0	0.0	0.0	0	0.020	50	0
CHANNEL	30.5	5.9	5.1	513	0.015	50	7
RIGHT OB	0.0	0.0	0.0	0	0.000	50	0

WSEL =	82.15	VEL HD =	0.412	JUMP ELEV =	N/A
CRWSEL =	82.15	EN LOSS =	0.350	STA JUMP =	N/A
TOP WID =	6	EN GD LN =	82.56	JMP LOSS =	N/A
CHNL SLP =	0.7000 %	DEPTH =	1.15	Critical flow	

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HYDROLOGIC REPORT

N SIDE SOUTHERN.....
E SIDE C.A.P. CANAL...
E. of f. Meridian & N of f. Pueblo

Hyd. No. 17

Hydrograph type	= S.C.S. RUNOFF	Peak discharge	= 457.85 cfs
Storm frequency	= 100 yr	Time interval	= 1 min
Basin area	= 380 ac	Basin curve No.	= 90
Ave basin slope	= 1.2 %	Hydraulic len	= 10500 ft
Basin lag	= 80.2 min	Time of concen	=133.85 min
Total precip.	= 3.75 in	Distribution	= Synthetic

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
1.55	1.02	1.57	1.13	1.58	1.25	1.60	1.37
1.62	1.50	1.63	1.65	1.65	1.80	1.67	1.96
1.68	2.14	1.70	2.33	1.72	2.53	1.73	2.75
1.75	2.98	1.77	3.22	1.78	3.48	1.80	3.76
1.82	4.06	1.83	4.38	1.85	4.72	1.87	5.09
1.88	5.47	1.90	5.89	1.92	6.33	1.93	6.80
1.95	7.31	1.97	7.85	1.98	8.43	2.00	9.06
2.02	9.73	2.03	10.45	2.05	11.23	2.07	12.07
2.08	12.98	2.10	13.97	2.12	15.05	2.13	16.24
2.15	17.54	2.17	18.99	2.18	20.60	2.20	22.42
2.22	24.50	2.23	26.90	2.25	29.75	2.27	32.99
2.28	36.55	2.30	40.36	2.32	44.39	2.33	48.60
2.35	52.98	2.37	57.49	2.38	62.13	2.40	66.88
2.42	71.74	2.43	76.68	2.45	81.71	2.47	86.82
2.48	92.00	2.50	97.25	2.52	102.56	2.53	107.92
2.55	113.34	2.57	118.81	2.58	124.33	2.60	129.89
2.62	135.49	2.63	141.13	2.65	146.81	2.67	152.53
2.68	158.27	2.70	164.05	2.72	169.86	2.73	175.69
2.75	181.55	2.77	187.43	2.78	193.34	2.80	199.26
2.82	205.21	2.83	211.17	2.85	217.15	2.87	223.14
2.88	229.15	2.90	235.17	2.92	241.20	2.93	247.24
2.95	253.29	2.97	259.34	2.98	265.40	3.00	271.46
3.02	277.53	3.03	283.59	3.05	289.65	3.07	295.71
3.08	301.76	3.10	307.81	3.12	313.84	3.13	319.87
3.15	325.88	3.17	331.87	3.18	337.84	3.20	343.79
3.22	349.72	3.23	355.62	3.25	361.48	3.27	367.31
3.28	373.10	3.30	378.84	3.32	384.52	3.33	390.15
3.35	395.71	3.37	401.19	3.38	406.59	3.40	411.89
3.42	417.07	3.43	422.13	3.45	427.03	3.47	431.75

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
3.48	436.27	3.50	440.52	3.52	444.47	3.53	448.01
3.55	451.04	3.57	453.38	3.58	455.09	3.60	456.32
3.62	457.15	3.63	457.64	3.65	457.85	3.67	457.81
3.68	457.56	3.70	457.12	3.72	456.52	3.73	455.75
3.75	454.85	3.77	453.82	3.78	452.68	3.80	451.43
3.82	450.07	3.83	448.63	3.85	447.10	3.87	445.49
3.88	443.80	3.90	442.04	3.92	440.21	3.93	438.31
3.95	436.36	3.97	434.35	3.98	432.28	4.00	430.16
4.02	427.99	4.03	425.78	4.05	423.51	4.07	421.20
4.08	418.85	4.10	416.46	4.12	414.03	4.13	411.56
4.15	409.05	4.17	406.51	4.18	403.94	4.20	401.33
4.22	398.69	4.23	396.01	4.25	393.31	4.27	390.58
4.28	387.82	4.30	385.03	4.32	382.22	4.33	379.38
4.35	376.51	4.37	373.62	4.38	370.70	4.40	367.77
4.42	364.80	4.43	361.82	4.45	358.82	4.47	355.79
4.48	352.74	4.50	349.67	4.52	346.57	4.53	343.45
4.55	340.30	4.57	337.13	4.58	333.93	4.60	330.70
4.62	327.45	4.63	324.18	4.65	320.89	4.67	317.57
4.68	314.23	4.70	310.86	4.72	307.48	4.73	304.07
4.75	300.65	4.77	297.20	4.78	293.73	4.80	290.25
4.82	286.74	4.83	283.22	4.85	279.68	4.87	276.12
4.88	272.54	4.90	268.95	4.92	265.34	4.93	261.71
4.95	258.07	4.97	254.41	4.98	250.74	5.00	247.05
5.02	243.35	5.03	239.63	5.05	235.91	5.07	232.16
5.08	228.41	5.10	224.64	5.12	220.87	5.13	217.08
5.15	213.28	5.17	209.47	5.18	205.65	5.20	201.82
5.22	197.99	5.23	194.14	5.25	190.29	5.27	186.44
5.28	182.57	5.30	178.70	5.32	174.83	5.33	170.96
5.35	167.08	5.37	163.20	5.38	159.32	5.40	155.43
5.42	151.56	5.43	147.68	5.45	143.81	5.47	139.94
5.48	136.09	5.50	132.24	5.52	128.40	5.53	124.58
5.55	120.78	5.57	116.99	5.58	113.24	5.60	109.51
5.62	105.81	5.63	102.16	5.65	98.56	5.67	95.01
5.68	91.54	5.70	88.15	5.72	84.88	5.73	81.75
5.75	78.80	5.77	76.11	5.78	73.64	5.80	71.34
5.82	69.19	5.83	67.17	5.85	65.26	5.87	63.44
5.88	61.71	5.90	60.05	5.92	58.46	5.93	56.94
5.95	55.47	5.97	54.05	5.98	52.67	6.00	51.35
6.02	50.06	6.03	48.81	6.05	47.60	6.07	46.42
6.08	45.28	6.10	44.16	6.12	43.08	6.13	42.02
6.15	40.99	6.17	39.98	6.18	39.00	6.20	38.04
6.22	37.11	6.23	36.19	6.25	35.30	6.27	34.42
6.28	33.57	6.30	32.73	6.32	31.91	6.33	31.11
6.35	30.33	6.37	29.56	6.38	28.81	6.40	28.07
6.42	27.35	6.43	26.64	6.45	25.95	6.47	25.27
6.48	24.61	6.50	23.96	6.52	23.32	6.53	22.70

HYDROGRAPH DISCHARGE TABLE Cont'd

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
6.55	22.08	6.57	21.48	6.58	20.90	6.60	20.32
6.62	19.75	6.63	19.20	6.65	18.66	6.67	18.12
6.68	17.60	6.70	17.09	6.72	16.59	6.73	16.10
6.75	15.62	6.77	15.15	6.78	14.69	6.80	14.23
6.82	13.79	6.83	13.36	6.85	12.93	6.87	12.51
6.88	12.11	6.90	11.71	6.92	11.32	6.93	10.94
6.95	10.56	6.97	10.19	6.98	9.84	7.00	9.49
7.02	9.14	7.03	8.81	7.05	8.48	7.07	8.16
7.08	7.85	7.10	7.54	7.12	7.25	7.13	6.95
7.15	6.67	7.17	6.39	7.18	6.12	7.20	5.86
7.22	5.60	7.23	5.35	7.25	5.11	7.27	4.87
7.28	4.64	7.30	4.42	7.32	4.20	7.33	3.99
7.35	3.78	7.37	3.58	7.38	3.39	7.40	3.20
7.42	3.02	7.43	2.84	7.45	2.67	7.47	2.51
7.48	2.35	7.50	2.20	7.52	2.05	7.53	1.91
7.55	1.77	7.57	1.64	7.58	1.52	7.60	1.40
7.62	1.28	7.63	1.17	7.65	1.07	7.67	0.97

DESIGN STORM PRECIPITATION TABLE

Hyd. No. 17
100 year return period
4.5 hour storm duration
Total precip. (in) = 3.748753
Rainfall location = WESTERN

TIME (min)	INC P (in)	TIME (min)	INC P (in)	TIME (min)	INC P (in)	TIME (min)	INC P (in)
1.000	0.003	2.000	0.003	3.000	0.003	4.000	0.003
5.000	0.003	6.000	0.003	7.000	0.003	8.000	0.003
9.000	0.003	10.000	0.003	11.000	0.003	12.000	0.003
13.000	0.003	14.000	0.003	15.000	0.003	16.000	0.003
17.000	0.003	18.000	0.003	19.000	0.003	20.000	0.003
21.000	0.003	22.000	0.003	23.000	0.003	24.000	0.003
25.000	0.003	26.000	0.003	27.000	0.003	28.000	0.004
29.000	0.004	30.000	0.004	31.000	0.004	32.000	0.004
33.000	0.004	34.000	0.004	35.000	0.004	36.000	0.004
37.000	0.004	38.000	0.004	39.000	0.004	40.000	0.004
41.000	0.004	42.000	0.004	43.000	0.004	44.000	0.004
45.000	0.004	46.000	0.004	47.000	0.004	48.000	0.004
49.000	0.004	50.000	0.004	51.000	0.004	52.000	0.004
53.000	0.005	54.000	0.005	55.000	0.005	56.000	0.005
57.000	0.005	58.000	0.005	59.000	0.005	60.000	0.005
61.000	0.005	62.000	0.005	63.000	0.005	64.000	0.005
65.000	0.005	66.000	0.005	67.000	0.005	68.000	0.006
69.000	0.006	70.000	0.006	71.000	0.006	72.000	0.006
73.000	0.006	74.000	0.006	75.000	0.006	76.000	0.006
77.000	0.006	78.000	0.007	79.000	0.007	80.000	0.007
81.000	0.007	82.000	0.007	83.000	0.007	84.000	0.007
85.000	0.008	86.000	0.008	87.000	0.008	88.000	0.008
89.000	0.008	90.000	0.008	91.000	0.009	92.000	0.009
93.000	0.009	94.000	0.009	95.000	0.009	96.000	0.010
97.000	0.010	98.000	0.010	99.000	0.011	100.000	0.011
101.000	0.011	102.000	0.012	103.000	0.012	104.000	0.012
105.000	0.013	106.000	0.013	107.000	0.014	108.000	0.014
109.000	0.015	110.000	0.016	111.000	0.016	112.000	0.017
113.000	0.018	114.000	0.019	115.000	0.020	116.000	0.021
117.000	0.022	118.000	0.023	119.000	0.025	120.000	0.026
121.000	0.028	122.000	0.030	123.000	0.033	124.000	0.036
125.000	0.039	126.000	0.043	127.000	0.048	128.000	0.054
129.000	0.061	130.000	0.070	131.000	0.081	132.000	0.097
133.000	0.117	134.000	0.147	135.000	0.193	136.000	0.168
137.000	0.131	138.000	0.106	139.000	0.088	140.000	0.075
141.000	0.065	142.000	0.057	143.000	0.051	144.000	0.045

HYDROLOGIC REPORT

E SIDE 114TH.....
800' N OF SUNLAND.....
.....

Hyd. No. 1

Hydrograph type =
Storm frequency = 10 yr

Peak discharge = 43.44 cfs
Time interval = 1 min

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
0.02	2.90	0.03	5.79	0.05	8.69	0.07	11.58
0.08	14.48	0.10	17.38	0.12	20.27	0.13	23.17
0.15	26.07	0.17	28.96	0.18	31.86	0.20	34.75
0.22	37.65	0.23	40.55	0.25	43.44	0.27	40.55
0.28	37.65	0.30	34.75	0.32	31.86	0.33	28.96
0.35	26.07	0.37	23.17	0.38	20.27	0.40	17.38
0.42	14.48	0.43	11.58	0.45	8.69	0.47	5.79
0.48	2.90	0.50	0.00	0.52	0.00	0.53	0.00

HYDROLOGIC REPORT

E SIDE 114TH.....
800' N OF SUNLAND.....
.....

Hyd. No. 2

Hydrograph type	= RATIONAL	Peak discharge	= 71.89 cfs
Storm frequency	= 100 yr	Time interval	= 1 min
Time of conc.	= 15 min	Intensity	= 6.51 in/hr
Runoff coeff.	= .8	Basin area	= 13.8 ac

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
0.02	4.79	0.03	9.59	0.05	14.38	0.07	19.17
0.08	23.96	0.10	28.76	0.12	33.55	0.13	38.34
0.15	43.13	0.17	47.93	0.18	52.72	0.20	57.51
0.22	62.30	0.23	67.10	0.25	71.89	0.27	67.10
0.28	62.30	0.30	57.51	0.32	52.72	0.33	47.93
0.35	43.13	0.37	38.34	0.38	33.55	0.40	28.76
0.42	23.96	0.43	19.17	0.45	14.38	0.47	9.59
0.48	4.79	0.50	0.00	0.52	0.00	0.53	0.00

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HYDROLOGIC REPORT

E SIDE 114TH.....
N SIDE SUNLAND.....
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Hyd. No. 3

Hydrograph type	= RATIONAL	Peak discharge	= 60.99 cfs
Storm frequency	= 10 yr	Time interval	= 1 min
Time of conc.	= 10 min	Intensity	= 4.71 in/hr
Runoff coeff.	= .8	Basin area	= 16.2 ac

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
0.02	6.10	0.03	12.20	0.05	18.30	0.07	24.40
0.08	30.50	0.10	36.60	0.12	42.70	0.13	48.80
0.15	54.89	0.17	60.99	0.18	54.89	0.20	48.80
0.22	42.70	0.23	36.60	0.25	30.50	0.27	24.40
0.28	18.30	0.30	12.20	0.32	6.10	0.33	0.00

HYDROLOGIC REPORT

E SIDE 114TH.....
N SIDE SUNLAND.....
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Hyd. No. 4

Hydrograph type	= RATIONAL	Peak discharge	= 100.93 cfs
Storm frequency	= 100 yr	Time interval	= 1 min
Time of conc.	= 10 min	Intensity	= 7.79 in/hr
Runoff coeff.	= .8	Basin area	= 16.2 ac

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
0.02	10.09	0.03	20.19	0.05	30.28	0.07	40.37
0.08	50.47	0.10	60.56	0.12	70.65	0.13	80.75
0.15	90.84	0.17	100.93	0.18	90.84	0.20	80.75
0.22	70.65	0.23	60.56	0.25	50.47	0.27	40.37
0.28	30.28	0.30	20.19	0.32	10.09	0.33	0.00

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HYDROLOGIC REPORT

N SIDE SUNLAND.....
660' E OF 114TH.....
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Hyd. No. 5

Hydrograph type	= RATIONAL	Peak discharge	= 31.48 cfs
Storm frequency	= 10 yr	Time interval	= 1 min
Time of conc.	= 15 min	Intensity	= 3.94 in/hr
Runoff coeff.	= .8	Basin area	= 10 ac

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
0.02	2.10	0.03	4.20	0.05	6.30	0.07	8.39
0.08	10.49	0.10	12.59	0.12	14.69	0.13	16.79
0.15	18.89	0.17	20.99	0.18	23.09	0.20	25.18
0.22	27.28	0.23	29.38	0.25	31.48	0.27	29.38
0.28	27.28	0.30	25.18	0.32	23.09	0.33	20.99
0.35	18.89	0.37	16.79	0.38	14.69	0.40	12.59
0.42	10.49	0.43	8.39	0.45	6.30	0.47	4.20
0.48	2.10	0.50	0.00	0.52	0.00	0.53	0.00

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HYDROLOGIC REPORT

N SIDE SUNLAND.....
660' E OF 114TH.....
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Hyd. No. 6

Hydrograph type	= RATIONAL	Peak discharge	= 52.09 cfs
Storm frequency	= 100 yr	Time interval	= 1 min
Time of conc.	= 15 min	Intensity	= 6.51 in/hr
Runoff coeff.	= .8	Basin area	= 10 ac

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
0.02	3.47	0.03	6.95	0.05	10.42	0.07	13.89
0.08	17.36	0.10	20.84	0.12	24.31	0.13	27.78
0.15	31.26	0.17	34.73	0.18	38.20	0.20	41.67
0.22	45.15	0.23	48.62	0.25	52.09	0.27	48.62
0.28	45.15	0.30	41.67	0.32	38.20	0.33	34.73
0.35	31.26	0.37	27.78	0.38	24.31	0.40	20.84
0.42	17.36	0.43	13.89	0.45	10.42	0.47	6.95
0.48	3.47	0.50	0.00	0.52	0.00	0.53	0.00

HYDROLOGIC REPORT

E SIDE 114TH.....
500' S OF SUNLAND.....
.....

Hyd. No. 7

Hydrograph type	= RATIONAL	Peak discharge	= 23.92 cfs
Storm frequency	= 10 yr	Time interval	= 1 min
Time of conc.	= 15 min	Intensity	= 3.94 in/hr
Runoff coeff.	= .4	Basin area	= 15.2 ac

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
0.02	1.59	0.03	3.19	0.05	4.78	0.07	6.38
0.08	7.97	0.10	9.57	0.12	11.16	0.13	12.76
0.15	14.35	0.17	15.95	0.18	17.54	0.20	19.14
0.22	20.73	0.23	22.33	0.25	23.92	0.27	22.33
0.28	20.73	0.30	19.14	0.32	17.54	0.33	15.95
0.35	14.35	0.37	12.76	0.38	11.16	0.40	9.57
0.42	7.97	0.43	6.38	0.45	4.78	0.47	3.19
0.48	1.59	0.50	0.00	0.52	0.00	0.53	0.00

HYDROLOGIC REPORT

E SIDE 114TH.....
500' S OF SUNLAND.....
.....

Hyd. No. 8

Hydrograph type	= RATIONAL	Peak discharge	= 39.59 cfs
Storm frequency	= 100 yr	Time interval	= 1 min
Time of conc.	= 15 min	Intensity	= 6.51 in/hr
Runoff coeff.	= .4	Basin area	= 15.2 ac

HYDROGRAPH DISCHARGE TABLE

TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfs)		TIME--OUTFLOW (hrs cfS)	
0.02	2.64	0.03	5.28	0.05	7.92	0.07	10.56
0.08	13.20	0.10	15.84	0.12	18.48	0.13	21.12
0.15	23.75	0.17	26.39	0.18	29.03	0.20	31.67
0.22	34.31	0.23	36.95	0.25	39.59	0.27	36.95
0.28	34.31	0.30	31.67	0.32	29.03	0.33	26.39
0.35	23.75	0.37	21.12	0.38	18.48	0.40	15.84
0.42	13.20	0.43	10.56	0.45	7.92	0.47	5.28
0.48	2.64	0.50	0.00	0.52	0.00	0.53	0.00

GINEERING DATA SYSTEMS CORPORATION
ter Surface Profiling Detailed Report

te 08/20/94 Time 16:56:00
File SNLND-10.WPS Report Page 1
PROJECT:

Section 1 Channel Station 0 + 00 Discharge 91.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
ft Ob	0.00	0.00	0.00	0.00	0.0200	150.00	0.00
annel	91.50	12.88	7.10	1514.93	0.0150	150.00	9.97
Rgt Ob	0.00	0.00	0.00	0.00	0.0200	150.00	0.00

ter Elevation	zas	72.21 ft	Critical Water	zc	72.21 ft	
pth	Dep	2.11 ft	Normal Water	zn	72.26 ft	
Energy Grade Line-EGL	as	72.99 ft	Flow CRITICAL FLOW			
ergy Loss	ht	0.00 ft	METHOD Average Conveyance			
n of Elev Shot	zmin	70.10 ft	Velocity Head	Hv	0.78 ft/s	
Channel Slope	Sch	0.33 %	Velocity Coeff	alpha	1.00	
Energy Loss Fr	hf	0.55 ft	Offs Lft Water Line	xlw	100.89 ft	
ergy Loss Eddy	ho	0.00 ft	Offs Rgt Water Line	xrw	109.11 ft	
tted Width	Wwet	8.22 ft	Jump Loss	hjump	N / A	
Ave Reach Lgth	Lave	8.22 ft	Jump Elevation	zjump	N / A	
			Station of Jump	Ljump	N / A	

Cross Section Groundshots <ft>

	60.0	74.00	2	64.0	72.90	3	70.0	73.00	4	89.0	72.60
5	90.0	73.10	6	100.0	73.10	7	103.0	70.10	8	107.0	70.10
9	110.0	73.10	10	111.0	74.00						

ction 2 Channel Station 1 + 50 Discharge 91.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	0.00	0.00	0.00	0.00	0.0200	150.00	0.00
Channel	91.50	13.69	6.68	1646.67	0.0150	150.00	10.24
t Ob	0.00	0.00	0.00	0.00	0.0200	150.00	0.00

Water Elevation	zas	72.81 ft	Critical Water	zc	72.71 ft	
Depth	Dep	2.21 ft	Normal water	zn	72.77 ft	
ergy Grade Line-EGL	as	73.50 ft	Flow SUBCRITICAL FLOW			
..ergy Loss	ht	0.51 ft	METHOD Average Conveyance			
Min of Elev Shot	zmin	70.60 ft	Velocity Head	Hv	0.69 ft/s	
annel Slope	Sch	0.33 %	Velocity Coeff	alpha	1.00	
ergy Loss Fr	hf	0.50 ft	Offs Lft Water Line	xlw	100.79 ft	
Energy Loss Eddy	ho	0.01 ft	Offs Rgt Water Line	xrw	109.21 ft	
''etted Width	Wwet	8.41 ft	Jump Loss	hjump	N / A	
e Reach Lgth	Lave	8.41 ft	Jump Elevation	zjump	N / A	
			Station of Jump	Ljump	N / A	

oss Section Groundshots <ft>

1	60.0	76.10	2	64.0	74.90	3	70.0	75.00	4	89.0	74.60
-	90.0	75.10	6	100.0	73.60	7	103.0	70.60	8	107.0	70.60
	110.0	73.60	10	111.0	76.10						

ction 3 Culvert Station 2 + 40 Discharge 91.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	0.00	0.00	0.00	0.00	0.0000	0.00	0.00
Channel	91.50	19.80	4.62	2674.22	0.0150	90.00	12.44
t Ob	0.00	0.00	0.00	0.00	0.0000	0.00	0.00
lvert	91.50	17.65	5.18	N/A	0.0150	90.00	12.41
Overflw	0.00	0.00	0.00	N/A	N/A	90.00	N/A

ter Elevation	zas	73.61 ft	Critical Water	zc	72.87 ft
pth	Dep	2.41 ft	Normal water	zn	72.61 ft
Energy Grade Line	EGLas	73.94 ft	Flow SUBCRITICAL FLOW		
ergy Loss	ht	0.44 ft	METHOD Average Conveyance		
n of Elev Shot	zmin	71.20 ft	Velocity Head	Hv	0.33 ft/s
Channel Slope	Sch	0.67 %	Velocity Coeff	alpha	1.00
Energy Loss Fr	hf	0.11 ft	Offs Lft Water Line	xlw	100.20 ft
ergy Loss Eddy	ho	0.00 ft	Offs Rgt Water Line	xrw	109.61 ft
wetted Width	Wwet	9.41 ft	Jump Loss	hjump	N / A
Ave Reach Lgth	Lave	9.41 ft	Jump Elevation	zjump	N / A
			Station of Jump	Ljump	N / A

ow Type OUTLET CONTROL S1 (t/2+c/2)

LVERT REPORT

il Water	TW	2.21 ft	D/s EGL	EGLds	73.50 ft
Critical depth	yc	1.60 ft	Normal depth	yn	1.39 ft
Inlet ctrl EGL	EGLic	73.76 ft	Inlet Crtl dischg	Qic	91.50 cfs
tlet Ctrl EGL	EGLoc	73.94 ft	Outlet Ctrl dischg	Qoc	91.50 cfs
it loss	Lx	-0.28 ft	Culvert length	Lcv	90.00 ft
Friction loss	Lf	0.44 ft	Culvert slope	Scv	0.67 %
trance loss	Le	0.28 ft	Length full	Lfull	0.00 ft
lvert Depth	D	3.00 ft	Length Corrected	Lcorr	90.00 ft
U/s Inv Elev	ziu	71.20 ft	Culvert Area	Acv	24.00 ft^2

let, Equation type, and Coefficients
ype R.BOX 30->75deg Wingwall Flares
Eq 1
efs (K=0.0260; M=1.0000; c=0.0347; Y=0.8600)

OVERFLOW REPORT

rfl dischrg	Qovf	0.00 cfs	Crest elevation	zcrest	75.10 ft
s Wa Surf	zus	73.61 ft	D/s Wa Surf	zds	72.81 ft
U/s Vel Head	Hvus	0.33 ft	Overflow Vel	Vovf	0.00 ft/s
Eff Weir Lgth	Leff	0.00 ft	Submergence Coef	Ct	0.0000
ir Coefficient	Cw	0.0000			

Cross Section Groundshots <ft>

	60.0	76.10	2	64.0	74.90	3	70.0	75.00	4	89.0	74.60
5	90.0	75.10	6	100.0	74.20	7	101.0	71.20	8	108.0	71.20
9	110.0	74.20	10	111.0	76.10						

ction 4 Channel Station 2 + 41 Discharge 91.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	0.00	0.00	0.00	0.00	0.0200	1.00	0.00
Channel	91.50	12.86	7.11	1511.55	0.0150	1.00	9.96
t Ob	0.00	0.00	0.00	0.00	0.0200	1.00	0.00

Water Elevation	zas	73.31 ft	Critical Water	zc	73.31 ft
Depth	Dep	2.11 ft	Normal water	zn	0.00 ft
ergy Grade Line-EGL	as	74.09 ft	Flow CRITICAL FLOW		
..ergy Loss	ht	0.15 ft	METHOD Average Conveyance		
Min of Elev Shot	zmin	71.20 ft	Velocity Head	Hv	0.79 ft/s
annel Slope	Sch	0.00 %	Velocity Coeff	alpha	1.00
ergy Loss Fr	hf	0.00 ft	Offs Lft Water Line	xlw	100.89 ft
Energy Loss Eddy	ho	0.14 ft	Offs Rgt Water Line	xrw	109.11 ft
tted Width	Wwet	8.21 ft	Jump Loss	hjump	N / A
e Reach Lgth	Lave	8.21 ft	Jump Elevation	zjump	N / A
			Station of Jump	Ljump	N / A

oss Section Groundshots <ft>

1	60.0	76.70	2	64.0	75.50	3	70.0	75.60	4	89.0	75.20
	90.0	75.70	6	100.0	74.20	7	103.0	71.20	8	107.0	71.20
	110.0	74.20	10	111.0	77.00						

ction 5 Channel Station 2 + 66 Discharge 91.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	0.00	0.00	0.00	0.00	0.0200	25.00	0.00
Channel	91.50	12.87	7.11	1512.48	0.0150	25.00	9.96
^-t Ob	0.00	0.00	0.00	0.00	0.0200	25.00	0.00

Water Elevation	zas	74.97 ft	Critical Water	zc	74.97 ft
Depth	Dep	2.11 ft	Normal water	zn	73.79 ft
ergy Grade Line-EGL	as	75.75 ft	Flow CRITICAL FLOW		
ergy Loss	ht	1.66 ft	METHOD Average Conveyance		
Min of Elev Shot	zmin	72.86 ft	Velocity Head	Hv	0.78 ft/s
annel Slope	Sch	6.64 %	Velocity Coeff	alpha	1.00
ergy Loss Fr	hf	0.09 ft	Offs Lft Water Line	xlw	100.89 ft
Energy Loss Eddy	ho	0.08 ft	Offs Rgt Water Line	xrw	109.11 ft
Wetted Width	Wwet	8.21 ft	Jump Loss	hjump	N / A
e Reach Lgth	Lave	8.21 ft	Jump Elevation	zjump	N / A
			Station of Jump	Ljump	N / A

oss Section Groundshots <ft>

1	60.0	76.90	2	64.0	75.63	3	70.0	75.75	4	89.0	75.36
5	90.0	75.86	6	100.0	75.86	7	103.0	72.86	8	107.0	72.86
9	110.0	75.86	10	111.0	76.90						

ction 6 Channel Station 3 + 81 Discharge 91.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	0.00	0.00	0.00	0.00	0.0200	115.00	0.00
Channel	91.50	12.88	7.10	1514.51	0.0150	115.00	9.96
t Ob	0.00	0.00	0.00	0.00	0.0200	115.00	0.00

Water Elevation	zas	75.71 ft	Critical Water	zc	75.71 ft	
Depth	Dep	2.11 ft	Normal water	zn	75.41 ft	
ergy Grade Line-EGL	as	76.49 ft	Flow CRITICAL FLOW			
ergy Loss	ht	0.74 ft	METHOD Average Conveyance			
Min of Elev Shot	zmin	73.60 ft	Velocity Head	Hv	0.78 ft/s	
annel Slope	Sch	0.64 %	Velocity Coeff	alpha	1.00	
ergy Loss Fr	hf	0.42 ft	Offs Lft Water Line	xlw	100.89 ft	
Energy Loss Eddy	ho	0.08 ft	Offs Rgt Water Line	xrw	109.11 ft	
Wetted Width	Wwet	8.22 ft	Jump Loss	hjump	N / A	
e Reach Lgth	Lave	8.22 ft	Jump Elevation	zjump	N / A	
			Station of Jump	Ljump	N / A	

oss Section Groundshots <ft>

1	60.0	77.60	2	64.0	76.37	3	70.0	76.49	4	89.0	76.10
5	90.0	76.60	6	100.0	76.60	7	103.0	73.60	8	107.0	73.60
9	110.0	76.60	10	111.0	77.60						

ction 7 Channel Station 7 + 21 Discharge 91.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	0.00	0.00	0.00	0.00	0.0200	340.00	0.00
Channel	91.50	15.43	5.93	1937.03	0.0150	340.00	10.81
t Ob	0.00	0.00	0.00	0.00	0.0200	340.00	0.00

Water Elevation	zas	76.93 ft	Critical Water	zc	76.63 ft	
Depth	Dep	2.41 ft	Normal water	zn	76.79 ft	
ergy Grade Line-EG	Las	77.47 ft	Flow SUBCRITICAL FLOW			
ergy Loss	ht	0.98 ft	METHOD Average Conveyance			
Min of Elev Shot	zmin	74.52 ft	Velocity Head	Hv	0.55 ft/s	
annel Slope	Sch	0.27 %	Velocity Coeff	alpha	1.00	
ergy Loss Fr	hf	0.96 ft	Offs Lft Water Line	xlw	100.59 ft	
Energy Loss Eddy	ho	0.02 ft	Offs Rgt Water Line	xrw	109.41 ft	
tted Width	Wwet	8.81 ft	Jump Loss	hjump	N / A	
e Reach Lgth	Lave	8.81 ft	Jump Elevation	zjump	N / A	
			Station of Jump	Ljump	N / A	

oss Section Groundshots <ft>

1	60.0	79.00	2	64.0	78.32	3	70.0	78.44	4	89.0	78.05
	90.0	78.55	6	100.0	77.52	7	103.0	74.52	8	107.0	74.52
	110.0	77.52	10	111.0	79.00						

ction 8 Channel Station 8 + 39 Discharge 91.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	23.95	18.07	1.33	841.96	0.0200	118.00	38.70
Channel	67.55	17.26	3.91	2374.35	0.0150	118.00	10.55
^t Ob	0.00	0.00	0.00	0.00	0.0200	118.00	0.00

Water Elevation	zas	77.47 ft	Critical Water	zc	77.28 ft
Depth	Dep	2.63 ft	Normal water	zn	77.05 ft
ergy Grade Line-EGL	as	77.66 ft	Flow SUBCRITICAL FLOW		
ergy Loss	ht	0.18 ft	METHOD Average Conveyance		
Min of Elev Shot	zmin	74.84 ft	Velocity Head	Hv	0.18 ft/s
annel Slope	Sch	0.27 %	Velocity Coeff	alpha	1.75
ergy Loss Fr	hf	0.15 ft	Offs Lft Water Line	xlw	62.34 ft
Energy Loss Eddy	ho	0.04 ft	Offs Rgt Water Line	xrw	109.63 ft
Wetted Width	Wwet	47.29 ft	Jump Loss	hjump	N / A
e Reach Lgth	Lave	47.29 ft	Jump Elevation	zjump	N / A
			Station of Jump	Ljump	N / A

oss Section Groundshots <ft>

1	30.0	79.00	2	60.0	78.00	3	64.0	77.10	4	70.0	77.23
5	89.0	76.84	6	101.0	76.84	7	103.0	74.84	8	107.0	74.84
	110.0	77.84	10	111.0	79.00						

ction 9 Channel Station 11 + 01 Discharge · 30.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	0.00	0.00	0.00	0.00	0.0200	262.00	0.00
Channel	30.50	5.64	5.40	478.55	0.0150	262.00	7.13
^-t Ob	0.00	0.00	0.00	0.00	0.0200	262.00	0.00

water Elevation	zas	80.51 ft	Critical Water	zc	80.51 ft	
Depth	Dep	1.11 ft	Normal water	zn	80.12 ft	
ergy Grade Line-EGL	as	80.96 ft	Flow CRITICAL FLOW			
ergy Loss	ht	3.30 ft	METHOD Average Conveyance			
Min of Elev Shot	zmin	79.40 ft	Velocity Head	Hv	0.45	ft/s
annel Slope	Sch	1.74 %	Velocity Coeff	alpha	1.00	
ergy Loss Fr	hf	1.06 ft	Offs Lft Water Line	xlw	101.89 ft	
Energy Loss Eddy	ho	0.02 ft	Offs Rgt Water Line	xrw	108.11 ft	
Wetted Width	Wwet	6.21 ft	Jump Loss	hjump	N / A	
e Reach Lgth	Lave	6.21 ft	Jump Elevation	zjump	N / A	
			Station of Jump	Ljump	N / A	

oss Section Groundshots <ft>

1	60.0	83.50	2	64.0	82.16	3	70.0	82.28	4	89.0	81.89	
5	90.0	82.39	6	100.0	82.40	7	103.0	79.40	8	107.0	79.40	
	110.0	82.40	10	111.0	83.50							

ction 10 Channel Station 12 + 21 Discharge 30.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	0.00	0.00	0.00	0.00	0.0200	120.00	0.00
Channel	30.50	5.65	5.40	478.82	0.0150	120.00	7.13
^t Ob	0.00	0.00	0.00	0.00	0.0200	120.00	0.00

Water Elevation	zas	81.76 ft	Critical Water	zc	81.76 ft	
Depth	Dep	1.11 ft	Normal water	zn	81.49 ft	
ergy Grade Line-EGL	as	82.21 ft	Flow CRITICAL FLOW			
ergy Loss	ht	1.25 ft	METHOD Average Conveyance			
Min of Elev Shot	zmin	80.65 ft	Velocity Head	Hv	0.45 ft/s	
annel Slope	Sch	1.04 %	Velocity Coeff	alpha	1.00	
ergy Loss Fr	hf	0.49 ft	Offs Lft Water Line	xlw	101.89 ft	
Energy Loss Eddy	ho	0.04 ft	Offs Rgt Water Line	xrw	108.11 ft	
Watted Width	Wwet	6.21 ft	Jump Loss	hjump	N / A	
e Reach Lgth	Lave	6.21 ft	Jump Elevation	zjump	N / A	
			Station of Jump	Ljump	N / A	

oss Section Groundshots <ft>

1	60.0	84.50	2	64.0	83.41	3	70.0	83.53	4	89.0	83.14
	90.0	83.64	6	100.0	83.65	7	103.0	80.65	8	107.0	80.65
	110.0	83.65	10	111.0	84.50						

ction 11 Channel Station 12 + 72 Discharge 30.50 cfs

	Q	AREA	VEL	CONVEYANCE	n	RCH LGTH	WET PERM
	cfs	ft^2	ft/s			ft	ft
t Ob	0.00	0.00	0.00	0.00	0.0200	51.00	0.00
Channel	30.50	5.63	5.41	477.51	0.0150	51.00	7.12
t Ob	0.00	0.00	0.00	0.00	0.0000	51.00	0.00

water Elevation	zas	82.10 ft	Critical Water	zc	82.10 ft	
Depth	Dep	1.10 ft	Normal water	zn	81.95 ft	
ergy Grade Line-EGL	as	82.56 ft	Flow CRITICAL FLOW			
ergy Loss	ht	0.35 ft	METHOD Average Conveyance			
Min of Elev Shot	zmin	81.00 ft	Velocity Head	Hv	0.45 ft/s	
annel Slope	Sch	0.69 %	Velocity Coeff	alpha	1.00	
ergy Loss Fr	hf	0.21 ft	Offs Lft Water Line	xlw	101.90 ft	
Energy Loss Eddy	ho	0.05 ft	Offs Rgt Water Line	xrw	108.10 ft	
Wetted Width	Wwet	6.21 ft	Jump Loss	hjump	N / A	
e Reach Lgth	Lave	6.21 ft	Jump Elevation	zjump	N / A	
			Station of Jump	Ljump	N / A	

oss Section Groundshots <ft>

1	50.0	84.50	2	51.0	84.00	3	70.0	84.00	4	89.0	84.00	
	90.0	84.50	6	101.0	83.00	7	103.0	81.00	8	107.0	81.00	
	110.0	84.00	10	111.0	86.00							

:NEERING DATA SYSTEMS CORPORATION
:r Surface Profiling Summary Report

: : 08/22/94 Time 17:37:04
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'ROJECT:

	/atSurf. ft	Flow ft	Crit. ft	Energy ft	Left cfs	Channel cfs	Right cfs	Channel ft/s	Wetted ft	Elev.	Depth	Elev.	Elev.	FlowRate
	73.28	3.18	73.28	73.72	20.96	130.03	0.01	5.71	47.56					
2	73.39	2.79	73.39	74.38	0.00	151.00	0.00	7.97	9.58					
3	74.68	3.48	73.50	75.03	0.00	151.00	0.00	4.76	19.29					
	74.49	3.29	73.99	75.11	0.24	150.75	0.01	6.30	12.06					
	76.03	3.17	76.03	76.47	21.10	129.89	0.01	5.72	47.43					
6	76.77	3.17	76.77	77.21	21.15	129.85	0.01	5.72	47.48					
	77.31	2.79	77.31	78.30	0.00	151.00	0.00	7.98	9.58					
	78.39	3.55	77.58	78.46	81.02	69.93	0.05	2.75	62.12					
9	80.89	1.49	80.89	81.47	0.00	50.00	0.00	6.13	6.97					
10	82.13	1.48	82.13	82.72	0.00	50.00	0.00	6.14	6.97					
	82.48	1.48	82.48	83.07	0.00	50.00	0.00	6.14	6.97					

NEERING DATA SYSTEMS CORPORATION
r Surface Profiling Summary Report

: 08/22/94 Time 17:39:13
EG-114TH.OPC Report Page 1
ROJECT:

	latSurf. ft	Flow ft	Crit. ft	Energy ft	Left cfs	Channel cfs	Right cfs	Channel ft/s	Wetted ft	Elev.	Depth	Elev.	Elev.	FlowRate
	70.20	2.70	70.20	71.16	0.00	142.00	0.00	7.86	9.39					
c	75.20	2.70	75.20	76.16	0.00	141.95	0.05	7.83	0.51					
3	76.25	4.75	74.40	76.28	0.10	38.49	103.41	1.57	71.00					
	76.69	2.69	76.69	77.66	0.00	142.00	0.00	7.88	9.39					
	78.64	4.64	76.69	78.77	0.00	142.00	0.00	2.92	45.09					
6	78.59	4.24	77.05	78.79	0.32	125.93	15.74	3.77	52.91					
	78.73	4.23	77.20	78.81	0.27	93.31	48.42	2.80	70.82					
	78.71	2.42	77.77	78.87	0.00	50.00	0.00	3.21	8.85					
9	79.38	1.49	79.38	79.96	0.00	50.00	0.00	6.13	6.97					
10	81.15	1.49	81.15	81.73	0.00	50.00	0.00	6.13	6.97					
	82.13	1.48	82.13	82.72	0.00	50.00	0.00	6.14	6.97					
	82.48	1.48	82.48	83.07	0.00	50.00	0.00	6.14	6.97					