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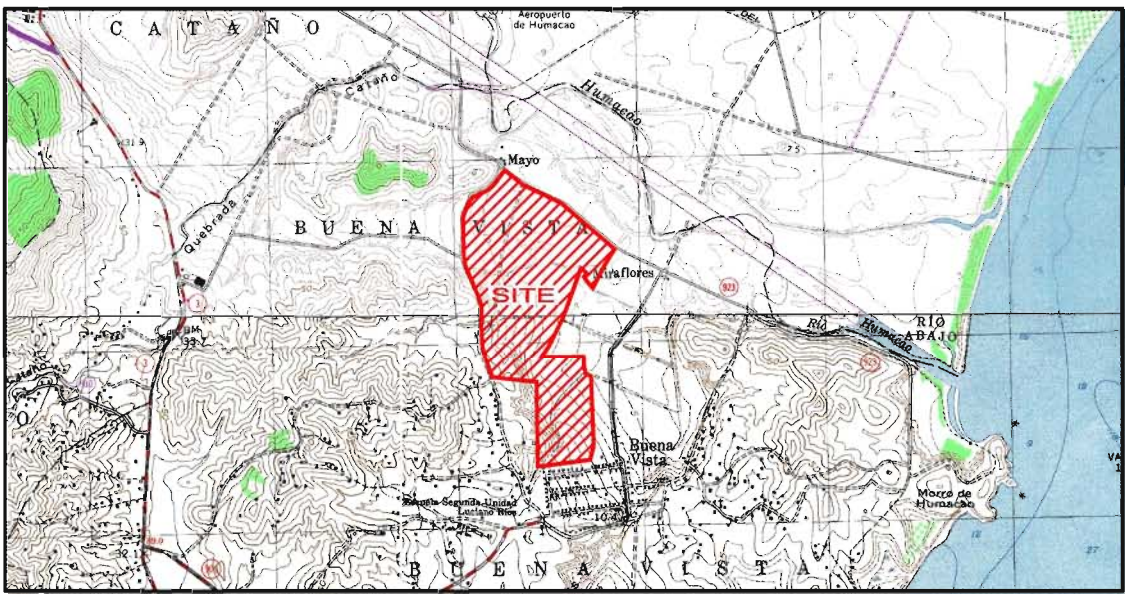
HYDROLOGIC–HYDRAULIC STUDY
PALACIOS DE HUMACAO
HUMACAO, PUERTO RICO



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HYDROLOGIC-HYDRAULIC STUDY
PALACIOS DE HUMACAO
HUMACAO, PUERTO RICO

Casiano Ancalle, P.E.

October, 2008 Revision

I. INTRODUCTION

A residential development project named Palacios de Humacao is planned to be constructed in a 176-acre property located east of PR-923 road, Buena Vista Ward, in the Municipality of Humacao.

The project site is subject to runoff discharge from the offsite areas located west of PR-923 through at least three storm watercourses crossing the site. The development of the site is going to increase runoff. This increase has to be mitigated according to the Puerto Rico Planning Board Regulation No. 3.

Purpose of Study

The purpose of the study is to determine the 100-year flood water levels and of the watercourses crossing the site; and to mitigate the increment in runoff due to the development in accordance to the Puerto Rico Planning Board Regulation No. 3.

Approach

The following steps have been undertaken throughout the study:

Hydrologic Analysis: The following parameters were determined for the hydrologic analysis: drainage areas, average soil curve number and runoff lag time. Based on these parameters,

discharges for 100, 50, 25, 10 and 2-yr frequencies storm were determined for existing and proposed conditions. HEC-1 model was used.

Runoff Discharge Mitigation Analysis: A mitigation analysis was made in order to counteract the impact of the proposed development. HEC-1 model was used for the mitigation analysis. Discharges for 2, 10, 25, 50 and 100-year frequencies were analyzed for mitigation.

Hydraulic Analysis: A hydraulic analysis was made in order to determine the water surface elevations for three watercourses at existing condition; and proposed condition. The COE's HECRAS model was used.

Conclusions and recommendations were elaborated.

Authorization

Eng. Jorge Cintrón authorized this study, under a contract signed with Eng. Casiano Ancalle, principal of CA Engineering.

II. PROJECT BACKGROUND

Location

The project site is located east of PR-923 Road, Buena Vista Ward, in the Municipality of Humacao. The project site bounds north with an undeveloped area, east with the properties of the Eastern Sugar Association, Mrs. Francisca Rivera Vázquez, Mr. Ruben Vázquez, Mr. Ramón Vázquez, Mr. Braulio Vázquez, Mr. Jorge Ortiz and Mrs. María Jacobett, south with the propoerties of Mrs. Medelicia Vellón, Mr. Emilio Narvaez, Mrs. Marta Morán, Mr. Juan Arez, Mrs. Isabel Vázquez, Mr. Guillermo Olmeda, Mrs. Carmen Pagán, Mrs. Margarita Camacho, Mr. Antonio Rivera, Mrs. Ivette Alvarez, Mrs. Rosa Hernández and Mr. David Hernández. The property bounds west with the properties of Mr. Basilio Pérez, Mr. Juan Reyes, Mr. Sigfrido Cruz and with Mr. Benjamin Otero. Perez. Figure 1 shows the approximate location of the site in the USGS quadrangle. Figure 2 shows a layout of the proposed project

Topography

The topography of the site is mostly flat with a mild slope from west to east. Ground elevations of the site vary between 13 and 7m. referred to mean sea level. Figure 3 shows the topography of the site.

Water Bodies

Three unnamed storm watercourses run across the site: the first located at the northern portion of the site was named Watercourse 1 for the purpose of the hydraulic analysis; the second at the middle of the site was named Watercourse 2, and the third located south of the site was named Watercourse 3. The drainage areas for these watercourses start at the hills located west of the project site.

Flooding

From the regulatory point of view, only two small areas of the project site are located in floodable zone. No structures are projected in these areas. Figure 7 shows a portion of the FEMA flood insurance rate map Panel 1270 and Panel 1810, revised on April 2005.

Field Work

Field data used in this study was taken by the drawings provided by Eng. José Melendez. This information was used in the hydraulic modeling. Results obtained in this study are based on this information. Fieldwork is attached in a pocket at the end of this study, as Appendix L.

Former Studies

No former hydrologic and hydraulic studies were identified for the project area. This study is based on the engineering criteria adopted for the analysis and the information provided by the engineer and gathered through site inspection and interviews of neighboring residents.

Study Level

This study is intended as an aid to the design engineer in the preparation of the construction drawings for the recommended structures. Figures, schematics and drawings must not be used as construction drawings. The design engineer must elaborate the construction drawings in agreement with the recommendations of this study.

III. HYDROLOGIC ANALYSIS

Methodology

The computer program entitled Flood Hydrograph Package (HEC-1) developed by the U.S. Army Corps of Engineers [1990] was used for the hydrologic analysis. Using this program, the Unit Hydrograph method and the Runoff Curve Number (CN) method, both developed by the Soil Conservation Service (SCS), were applied to determine the design hydrograph. This was computed by a process of translating the rainfall excess into a runoff hydrograph known as convolution.

Peak discharges ranging in frequencies from 2, 10, 25, 50 and 100-year were estimated for existing and proposed condition.

Drainage Areas

From the topography, the project site, which drains from west to east, was divided in three (3) drainage areas at the existing condition and six (6) small drainage areas at the proposed condition. At existing condition, drainage area P1 has 72.42 acres, P2 68.26 acres and P3 35.56 acres. At proposed condition: Drainage area P1 has been split in three: P1A with 24.28 acres, P1B1 with 14.07 acres and P1B2 with 52.46 acres. Area P2 was divided in two sub-areas, Area P2A has 16.17 acres and P2B has 31.37 acres. Area P3 has 37.90 acres at proposed condition. Six offsite areas are related to the project site: E1A with 49.14 acres, E1B with 65.27 acres, E1C with 7.25 acres, E2 with 151.31 acres, E3A with 198.87 acres and E3B with 29.58 acres. Figure 4 shows the drainage areas at existing condition and Figure 5 at proposed condition.

Curve Numbers

Curve numbers were computed using the NRCS methodology. Soil types and land uses were gotten from SCS [1978] soil maps. According to the Soil Survey of Humacao Area of Puerto Rico, most of the soil of the project site was classified as Maunabo Clay (Me) and Candelero Loam (CdB). Weighted curve numbers for these soils were estimated. Curve Number of 93 was adopted for the developed area in consideration of the type of proposed land use.

Appendix A shows the physiographic characteristics of the watersheds and the weighted Curve Number (CN) estimations. Figure 6 shows the portion of the soil map corresponding to the watersheds and project area.

Lag Time

The lag time was estimated as sixty percent of the time of concentration as estimated by the formula of Kirpitch.

$$Tc = 0.0078L^{0.77}/S^{0.385}$$

where:

L	=	channel length (ft)
S	=	channel slope
Tc	=	Time of concentration in min

Detailed Lag Time calculations are shown in Appendix A.

Rainfall Data

The variation of rainfall volume with time was required as part of the storm input for the SCS Curve Number method. Therefore, the development of a design storm with a rainfall frequency and duration was necessary to compute the design hydrograph for the watershed. Rainfall data used in this study was obtained from the NOAA's Atlas 14 website. The rainfall depths for 100, 50, 25, 10 and 2-years frequency for several durations was used and are shown in Table 1.

Table 1

Rainfall for 2, 10, 25, 50 y 100 years

HOURS RAINFALL						
		2	**10**	**25**	**50**	**100**
YEARS	**0.083**	0.47	0.74	0.88	0.99	1.11
	0.25	0.82	1.29	1.55	1.74	1.94
	1	1.94	3.07	3.68	4.14	4.62
	2	2.52	4.30	5.28	6.04	6.82
	3	2.82	4.99	6.23	7.21	8.24
	6	3.57	6.66	8.51	9.99	11.57
	12	4.40	8.38	10.79	12.76	14.84
	24	5.20	10.23	13.41	16.03	18.89

Time Distribution of Rainfall

The triangular type methodology was used to distribute the rainfall depth in time. This method is considered acceptable for small areas.

Rainfall Extraction

Rainfall extraction such as the vegetative interception, the depressional storage, and the infiltration were estimated using the SCS's Runoff Curve Number method. Though this method is used to predict runoff volume directly, the rainfall extraction is incorporated in the model as function of the curve number of the watershed.

Hydrologic Results

Following HEC-1 methodology, hydrographs were determined for existing and proposed condition. Input and output data for the HEC-1 model are included in Appendix B for existing condition and Appendix C for proposed condition. Table 2 shows the results of the hydrologic analysis.

Table 2
Peak Discharges for 2- 10- 25- 50 and 100-yr Frequencies

CONDITION	BASIN	**Peak Flow** (cfs)				
		2-yr	**10-yr**	**25-yr**	**50-yr**	**100-yr**
EXISTING	E1A	112	196	240	273	306
	E1B	144	251	307	348	391
	E1C	30	52	63	71	80
	COMB1 (E1B+E1C)	154	268	327	371	417
	COMB 2 (E1A+E1B+E1C)	266	464	568	644	723
	P1	168	291	355	402	451
	COMB 3 (COMB 2+P1)	434	755	923	1046	1175
	E2	329	580	711	807	907
	P2	147	263	323	367	413
	E3B	92	162	199	225	253
	P3	108	186	226	256	287
	COMB4 (E3B+P3)	195	338	412	467	524
	E3A	426	740	903	1024	1150

PROPOSED	E1A	112	196	240	273	306
	E1B	144	251	307	348	391
	E1C	30	52	63	71	80
	COMB 1(E1A+E1B+E1C)	266	464	568	644	723
	P1B1	47	77	93	105	117
	P1B2	130	215	260	293	328
	COMB 2 (P1B1+P1B2)	159	263	318	359	402
	P1A	61	101	122	138	154
	COMB 3 (COMB 2+P1A)	219	361	437	494	552
	COMB4 (COMB 1+COMB3)	485	825	1003	1136	1273
	E2	329	580	711	807	907
	P2A	54	89	107	120	135
	P2B	106	174	209	236	264
	COMB 5 (P2A+P2B)	160	262	316	356	398
	E3B	92	162	199	225	253
	P3	93	153	185	209	234
	COMB 6 (E3B+P3)	160	275	336	380	427
	E3A	426	740	903	1024	1150

From the inspection of Table 2, the peak discharge for proposed condition at project area P1 and P2 are higher than the existing condition. The increment in discharge has to be mitigated as required by Puerto Rico Planning Board Regulation No. 3.

IV. RUNOFF MITIGATION ANALYSIS

The development of the site will increase the runoff discharge. The Puerto Rico Planning Board Regulation No. 3 requires a flow mitigation structure wherever an increase in discharge is produced. Therefore, flow detention structures will be included in the project.

Methodology

The computer program HEC-1 provides means for modeling detention structures. The purpose of detention is that the proposed condition peak discharge does not exceed the existing condition peak discharge.

Two detention ponds have been considered for the project to mitigate the runoff increase. One pond located at project area P1B2 and another at project area P2B. The discharge from the pond will merge to discharge into the existing watercourses. The design engineer must provide the means to assure that the entire runoff of the area P1B2 and P2B discharge into these detention ponds.

Depth-Volume Relations

The base area of Pond P1B2 will be 10,748 square meters and the side slopes 1V:2H, detention pond P2B will have 1,500 square meters and the side slopes 1V:2H. The Depth-Volume calculations were made under the assumption of a square base. Appendix D includes a spreadsheet with the depth-volume relation computations and the curve for the ponds.

Flow – Depth Relations

The control structure for the pond P1B2 will consist on a 5.50-meter bottom width rectangular channel at the bottom of the pond. Pond P2B will have four (4) 30” orifices at the pond bottom, and 22-feet wide rectangular weir located 1.60 meter above the pond bottom. Flow–Depth relations for these structures were estimated taking into consideration discharges through

orifices. Flow through the orifices was computed using Torrecelli's formula. Appendix D includes a spreadsheet with the depth-flow relation computations and its respective curve.

Results

Input and output data for the HEC-1 mitigation model are included in Appendix E. Table 3 shows the comparison of the discharges for existing, and proposed condition.

Table 3
Mitigation Analysis Results Comparison

CONDITION	BASIN	Peak Flow (cfs)				
		2-yr	10-yr	25-yr	50-yr	100-yr
EXISTING	E1A	112	196	240	273	306
	E1B	144	251	307	348	391
	E1C	30	52	63	71	80
	COMB1 (E1B+E1C)	154	268	327	371	417
	COMB 2 (E1A+E1B+E1C)	266	464	568	644	723
	P1	168	291	355	402	451
	COMB 3 (COMB 2+P1)	434	755	923	1046	1175
	E2	329	580	711	807	907
	P2	147	263	323	367	413
	E3B	92	162	199	225	253
	P3	108	186	226	256	287
	COMB4 (E3+P3)	195	338	412	467	524
	E3A	426	740	903	1024	1150

PROPOSED	E1A	112	196	240	273	306
	E1B	144	251	307	348	391
	E1C	30	52	63	71	80
	COMB 1(E1A+E1B+E1C)	266	464	568	644	723
	P1B1	47	77	93	105	117
	P1B2	130	215	260	293	328
	COMB 2 (P1B1+P1B2)	159	263	318	359	402
	P1A	61	101	122	138	154
	COMB 3 (COMB 2+P1A)	219	361	437	494	552
	COMB4 (COMB 1+COMB3)	485	825	1003	1136	1273
	E2	329	580	711	807	907
	P2A	54	89	107	120	135
	P2B	106	174	209	236	264
	COMB 5 (P2A+P2B)	160	262	316	356	398
	E3B	92	162	199	225	253
	P3	93	153	185	209	234
	COMB 6 (E3B+P3)	160	275	336	380	427
	E3A	426	740	903	1024	1150
PROPOSED W/MITIGATION	E1A	112	196	240	273	306
	E1B	144	251	307	348	391
	E1C	30	52	63	71	80
	COMB 1(E1A+E1B+E1C)	266	464	568	644	723
	P1B1	47	77	93	105	117
	P1B2	130	215	260	293	328
	POND	91	165	203	233	264
	COMB 2 (P1B1+POND)	121	183	216	242	267
	P1A	61	101	122	138	154
	COMB 3 (COMB 2+P1A)	159	282	348	398	450
	COMB4 (COMB 1+COMB3)	424	746	916	1042	1173
	E2	329	580	711	807	907
	P2A	54	89	107	120	135
	P2B	106	174	209	236	264
	POND	92	143	167	183	210
	COMB 5 (P2A+POND)	146	226	265	293	322
	E3B	92	162	199	225	253
	P3	93	153	185	209	234
	COMB 6 (E3B+P3)	160	275	336	380	427
	E3A	426	740	903	1024	1150

The results of the detention analysis show that the proposed detention ponds provide appropriate runoff mitigation for the 100-year frequency discharge for areas P1 and P2. Mitigation for 2-, 10-, 25- and 50-yr frequency peak discharges was also verified.

Mitigation Structure Dimensions and Accessories

The maximum water stage at the pond for the 100-yr peak at pond P1B2 will be 0.92m. (3.02 ft); and the water stage at the pond P2B will be 1.67m. (5.49 ft.) Final dimensions for the ponds will include a minimum free board of 0.60 meters. Then, the detention ponds will have the characteristics shown in Table 4.

Table 4
Detention Tank Characteristics

		POND P1B2	POND P2B
Pond Dimensions	Base Area	10,748 m2	1,500 m2
	Height	1.52m	2.27 m
Outlet Accessories	Orifices @ bottom		Four (4)-30”ø
Outlet Chamber Discharge	Weir Width		6.70m@ 1.60m above bottom
	Open Rectangular Channel	5.50m wide	6.70m wide

For the mitigation analysis, the bottom geometry of the pond has been considered square but another shape can be used as well if the magnitude of the area is maintained. Figure 10 shows the schematics of the detention pond and the outlet accessories for the pond P1B2 and Figure 11 shows the schematics of the detention pond and the outlet accessories for the pond P2B.

The bottom of the Pond P1B2 and Pond P2B have been located discharging above the 2-years water surface elevation at Watercourse one and Watercourse two.

V. HYDRAULIC ANALYSIS

The three watercourses crossing road PR-923 are actually undefined when they cross the project site. A very small amount of runoff discharge run through the existing man made channels; while the majority spreads all over the plain. Then, the hydraulic analysis at existing condition was made assuming effective flow area. At proposed condition, channel structures were incorporated in order to find the water levels and to size the channels and the crossing structures for the project.

The hydraulic analysis was made by using the mathematical model HEC-RAS developed by the US Corps of Engineers. This model includes a subroutine for culverts that is necessary to simulate inlet control at over loaded piping systems. The friction coefficient used in the modeling was obtained from visual inspection of the existing structures; and cross-checked with the typical values provided by Barnes (1967) and Chow (1959). Manning's coefficient used for modeling the drainage system was 0.035 for existing condition and for the concrete pipes 0.013.

Field work was performed by Eng. José Melendez. Copy of this work is included in Appendix L.

Contraction and Expansion Coefficients

Coefficients of contraction and expansion used are those recommended by the HEC-RAS user's manual. Thus, coefficients of 0.1 and 0.3 respectively were used for gradual transitions.

Hydraulics for Existing Conditions-Watercourse One

The existing condition includes the main watercourse draining offsite areas E1b and E1c and offsite area E1a. Discharges for the watercourses were gotten from the hydrologic analysis. These discharges were arithmetically accumulated along the course at their points of incorporation.

The hydraulic analysis was made for a 100-years discharge. More recurrent rainfall events were also modeled. Location of the cross sections used in the hydraulic run is shown in Figure 15. Appendix F includes the analysis computer output. Tables No. 5 show the summary of the results for existing condition hydraulics.

Table 5

Results for Existing Conditions - Watercourse One

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
#1	10	100yrs	11.82	12.80	14.54	13.63	14.58	0.000016	1.01	21.58	111.00	0.24
#1	9.5		Culvert									
#1	9.1	100yrs	11.82	12.46	14.39		14.41	0.000009	0.79	28.37	111.00	0.18
#1	9	100yrs	11.82	12.46	14.34	14.34	14.40	0.005543	1.59	15.94	100.00	0.46
#1	8	100yrs	11.82	11.72	12.42	12.61	13.81	0.165662	6.40	3.10	24.40	2.98
#1	7	100yrs	11.82	11.34	12.38	12.22	12.43	0.003852	1.35	11.59	24.40	0.48
#1	6	100yrs	11.82	10.86	11.84		11.92	0.005513	1.55	10.30	24.40	0.57
#1	5	100yrs	11.82	10.38	11.53		11.57	0.001779	1.05	14.30	24.40	0.35
#2	4	100yrs	20.49	9.87	11.05		11.15	0.004467	1.72	14.96	24.40	0.56
#2	3	100yrs	20.49	9.31	10.71		10.76	0.001777	1.22	20.21	24.40	0.36
#2	2	100yrs	33.30	8.92	10.31		10.46	0.004482	2.00	20.02	24.40	0.59
#2	1	100yrs	33.30	8.39	9.83	9.55	9.96	0.004400	1.87	21.21	24.40	0.54

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
#3	5	100yrs	8.67	13.57	16.01	14.24	16.01	0.000001	0.24	62.36	111.00	0.05
#3	4.5		Culvert									
#3	4.1	100yrs	8.67	13.14	15.34		15.35	0.000003	0.45	35.79	111.00	0.10
#3	4	100yrs	8.67	13.14	15.26	15.26	15.34	0.006654	1.62	9.19	44.00	0.46
#3	3	100yrs	8.67	12.05	12.76	12.82	13.03	0.051662	3.39	4.97	44.00	1.63
#3	2	100yrs	8.67	11.15	11.91	11.91	11.99	0.013333	1.88	7.88	44.00	0.85
#3	1	100yrs	8.67	9.87	11.19	10.63	11.19	0.000014	0.32	32.23	44.00	0.10

Hydraulics for Proposed Condition - Watercourse One

Proposed condition includes channeling of the main watercourse to optimize land utilization for development. The channel used is of trapezoidal section with bank slopes of 1V:1.5H. The channel will have a bottom width of 2.44 meter between cross sections 3 and 9; and 5.44-meters bottom width between cross sections 1 and 2. A 12’x8’ box culvert will be used as road crossing at cross section 5.1 (See Figure 13). Appendix G includes the computer output. Table 6 shows the summary of the results for the Watercourse one.

Table 6

Results for Proposed Conditions - Watercourse One

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
#1	10	100yrs	20.49	12.80	14.70	13.99	14.77	0.00028	1.41	22.50	51.00	0.33
#1	9.5		Culvert									
#1	9.1	100yrs	20.49	12.46	13.65	13.65	14.25	0.00266	3.44	5.96	5.00	1.00
#1	9	100yrs	20.49	11.90	12.91	13.32	14.18	0.05362	4.99	4.10	5.68	1.87
#1	8	100yrs	20.49	11.71	13.44	13.13	13.70	0.00633	2.28	9.00	7.98	0.68
#1	7	100yrs	20.49	11.11	12.86		13.11	0.00598	2.23	9.19	8.06	0.67
#1	6	100yrs	20.49	10.40	12.29		12.49	0.00433	1.98	10.35	8.51	0.57
#1	5.1	100yrs	20.49	9.64	12.13	11.05	12.21	0.00117	1.24	17.42	15.00	0.31
#1	5.05		Culvert									
#1	5	100yrs	20.49	9.60	11.55		11.73	0.00377	1.88	10.90	8.72	0.54
#1	4	100yrs	23.81	9.00	11.00		11.23	0.00459	2.10	11.34	8.87	0.59
#1	3	100yrs	23.81	8.33	10.16		10.46	0.00667	2.41	9.86	8.32	0.71
#1	2	100yrs	33.25	7.96	9.63		9.89	0.00517	2.25	14.76	12.03	0.65
#1	1	100yrs	33.25	7.43	9.21	8.73	9.43	0.00400	2.05	16.18	12.48	0.58

At proposed condition, the results indicate that the water elevation at Cross Section 10 is slightly higher than the existing condition. But the increment is within the allowed by the PR Planning Board Regulation No. 13. At Cross Sections 6, 7 and 8, the water elevations raise more than 0.30 meters; but this rise is given inside the project property; and the grading of the site will take care of this increase. In no other cross section the increase in water elevations is higher than those of the existing condition. The resulting water surface elevations are shown in Figure 16.

Hydraulics for Existing Conditions-Watercourse Two

The existing condition includes the watercourse draining offsite area E2. Discharges for the watercourse were gotten from the hydrologic analysis.

The hydraulic analysis was made for a 100-years discharge. Location of the cross sections used in the hydraulic run is shown in Figure 15. Appendix H includes the analysis computer output. Tables No. 7 show the summary of the results for existing condition hydraulics.

Table 7

Results for Existing Conditions - Watercourse Two

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
one	6	100yrs	25.71	15.87	19.33	17.82	19.64	0.00098	2.48	10.37	3.00	0.43
one	5.5		Culvert									
one	5	100yrs	25.71	15.62	17.57	17.57	18.55	0.00406	4.39	5.85	3.00	1.00
one	4	100yrs	25.71	13.43	14.17	14.50	16.81	0.316675	9.47	4.42	24.43	4.20
one	3	100yrs	25.71	11.90	13.04	12.97	13.22	0.00882	2.31	14.14	24.43	0.77
one	2	100yrs	25.71	10.80	12.02		12.15	0.00594	2.00	15.99	24.43	0.64
one	1	100yrs	25.71	10.63	11.89		12.01	0.00484	1.86	17.03	24.43	0.58
one	0	100yrs	25.71	10.50	11.81	11.57	11.92	0.00401	1.73	18.06	24.43	0.53

Hydraulics for Proposed Condition-Watercourse Two

Watercourse two will be channelized by a 2.44-meters bottom width trapezoidal channel with 1V:1.5H bank slopes. A 12’x 8’ box culvert is also included in section 3.1 as a street crossing structure (See Figure 14).

Appendix I includes the computer output. Table 8 shows the summary of the results for Watercourse two.

Table 8

Results for Proposed Conditions - Watercourse Two

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
one	6	100yrs	25.71	15.87	19.32	17.82	19.64	0.00098	2.48	10.36	3.00	0.43
one	5.5		Culvert									
one	5.1	100yrs	25.71	15.62	17.58	17.58	18.55	0.00404	4.38	5.87	3.00	1.00
one	5	100yrs	25.71	15.62	16.52	17.22	19.28	0.01815	7.36	3.50	5.33	2.90
one	4	100yrs	25.71	13.24	14.38	14.84	15.80	0.03886	5.28	4.87	6.10	1.89
one	3.2	100yrs	25.71	10.16	13.10	11.76	13.16	0.00054	1.16	24.09	15.00	0.26
one	3.15		Culvert									
one	3.1	100yrs	25.71	10.00	11.97		12.25	0.00422	2.33	11.04	8.77	0.66
one	3	100yrs	25.71	9.90	11.79		12.10	0.00503	2.49	10.34	8.51	0.72
one	2	100yrs	25.71	9.14	11.46		11.62	0.00199	1.78	14.95	13.58	0.47
one	1	100yrs	34.84	9.00	11.02	10.86	11.49	0.00696	3.03	11.49	8.93	0.85
one	0	100yrs	34.84	8.92	10.75	10.75	11.41	0.00158	3.68	10.17	8.00	0.97

The results indicate that the water surface elevation at Cross Section 4 raises 0.21 meters; but this rise is within the allowed by the PR Planning Board Regulation No. 13. The resulting water surface elevations are shown in Figure 16.

Hydraulics for Existing Conditions-Watercourse Three

The existing condition includes a watercourse draining offsite area E3a. Discharges for this watercourse were gotten from the hydrologic analysis.

The hydraulic analysis was made for a 100-years discharge. Location of the cross sections used in the hydraulic run is shown in Figure 15. Appendix J includes the analysis computer output. Table No. 9 shows the summary of the results for existing condition hydraulics.

Table 9

Results for Existing Conditions – Watercourse Three

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
one	6	100yrs	32.60	16.40	17.54	17.54	17.82	0.01399	2.91	14.20	24.43	0.97
one	5.5	100yrs	32.60	15.40	16.42	16.54	16.89	0.03056	3.90	11.13	24.43	1.40
one	5	100yrs	32.60	14.90	15.99	16.04	16.33	0.01877	3.25	12.96	24.43	1.11
one	4	100yrs	32.60	13.40	14.46	14.54	14.85	0.02376	3.55	12.04	24.43	1.24
one	3	100yrs	32.60	11.40	12.53	12.54	12.82	0.01480	2.97	13.95	24.43	1.00
one	2	100yrs	32.60	10.40	11.73	11.54	11.89	0.00573	2.11	18.73	24.43	0.64
one	1	100yrs	32.60	9.40	10.63	10.54	10.84	0.00900	2.48	16.28	24.43	0.79

Hydraulics for Proposed Condition - Watercourse Three

This watercourse was routed along the south and east limit of the property by a trapezoidal channel with 2.44-meters bottom width and bank slopes of 1V:1.5H.

Appendix K includes the computer output. Table 10 shows the summary of the results for this watercourse 3.

Table 10

Results for Proposed Conditions - Watercourse Three

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
one	6	100yrs	32.60	16.40	17.54	17.54	17.82	0.01399	2.91	14.20	24.43	0.97
one	5.5	100yrs	32.60	13.52	15.80		16.10	0.00541	2.44	13.35	9.28	0.65
one	4.5	100yrs	32.60	12.94	14.96		15.40	0.00893	2.94	11.08	8.51	0.82
one	4.1	100yrs	32.60	12.37	14.45		14.86	0.00790	2.81	11.59	8.69	0.78
one	3.1	100yrs	32.60	11.47	13.58		13.97	0.00753	2.76	11.81	8.76	0.76
one	2.1	100yrs	32.60	10.59	12.64		13.06	0.00841	2.88	11.33	8.60	0.80
one	1.1	100yrs	32.60	9.90	12.03		12.40	0.00725	2.72	11.97	8.82	0.75
one	0	100yrs	32.60	9.70	11.67	11.53	12.15	0.01001	3.07	10.62	8.35	0.87

The results indicate that the water elevations at proposed condition, at the comparable cross sections, 5.5 and 6 are lower and equal, respectively, to those of the existing condition. The resulting water surface elevations are shown in Figure 16.

VI. CONCLUSIONS AND RECOMMENDATIONS

The following are the conclusions of this study:

1. From the regulatory point of view, one area of the north and a small area at the southeast of the project site are classified as floodable for a 100-year rainfall event.

2. Proposed condition discharge for project area is higher than that of the existing condition at areas P1 and P2. Runoff discharge mitigation is needed at these areas.

3. Mitigation reduces the local peak discharge for the project area P1 from 552 cfs to 450 cfs, which is less than that of the existing condition (451cfs); and for the project area P2 from 398 cfs to 322 cfs.

The following are the recommendations of this study:

1. The runoff discharge mitigation structures will have the dimensions and accessories indicated in Table 4 of this report. The bottom area of the ponds can either be rectangular or of any other shape.

2. The channels must be installed to the elevations given in this study; any change found necessary must be subject to hydraulic verification.

3. The channels bank must be protected by appropriate revetment from the dynamic action of the water according to the velocities estimated in the hydraulic computations.

4. The minimum roadway elevation will be 0.60 meters above the 100-year water surface elevation at the detention ponds or above 100-year water elevation at the watercourses; which ever is higher.

5. Structural stability of the ponds must be assured during the design.

6. It is very important to prepare a long-term maintenance plan, which should include the proposed pipes, the pond outlet structure and the receiving storm system inspection after each significant discharge events. Damages, if any, must be repaired promptly and properly.

Study Limits

All the recommendations specified in this study must be considered to assure the optimum performance of the proposed discharge mitigation tank and receiving stream. The design engineer will be responsible for elaborating the drawings in conformance with the recommendations of this study.

The results of this study are based on free flow conditions through the hydraulic structures. Proper maintenance must be developed to assure this condition. On the event of the occurrence of any severe obstruction to the flow, the results and recommendations may be impaired. Finally, results and recommendations included in this report must be used only and exclusively by the design engineer for the intended purposes as indicated in this study.

VII. BIBLIOGRAPHY

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FIGURES

CERTIFICATION
HYDROLOGIC-HYDRAULIC STUDY

I hereby certify that the document "***Hydrologic and Hydraulic Study for Palacios de Humacao in Humacao, Puerto Rico***" has been prepared in accordance with the best hydrologic and hydraulic practices as described in this document and that, based on the studies and field measurements provided by other parties, results are true and correct.

Certified today, October 24, 2008

Casiano Ancalle, P.E.
Lic. 11294

CASIANO ANCALLE
INGENIERO
LICENCIADO
LIC.#11294
PUERTO RICO

Estado Libre Asociado de Puerto Rico

Departamento de Estado

Secretaria Auxiliar de Juntas Examinadoras

certificamos que:

Casiano Ancalle Choque

esta autorizado a ejercer como

Ingeniero Licenciado

en Puerto Rico

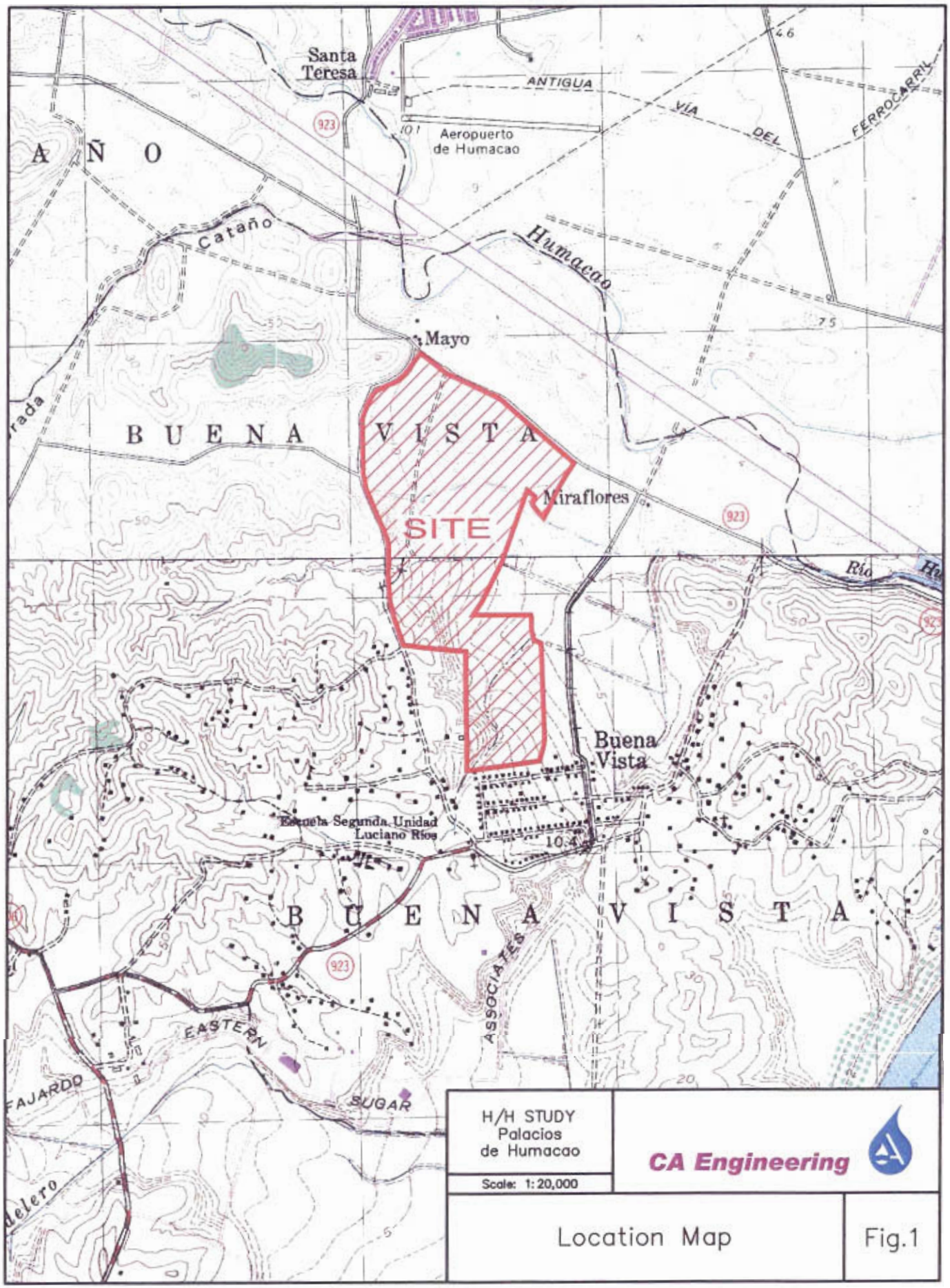
Licencia Núm: **11294**

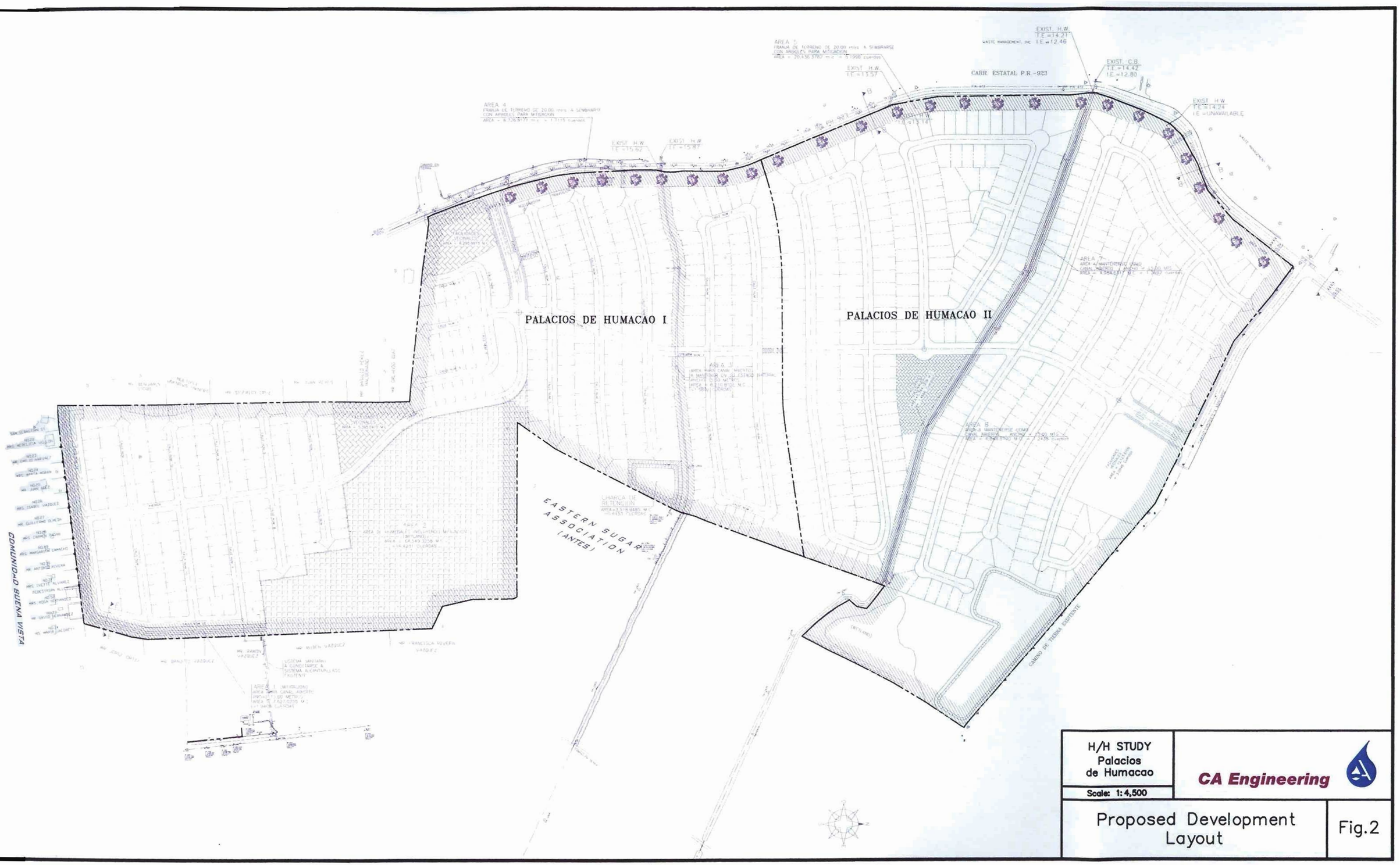
Expedición: **23 de abril de 2005**

Expiración: **22 de abril de 2010**

Secretario Auxiliar

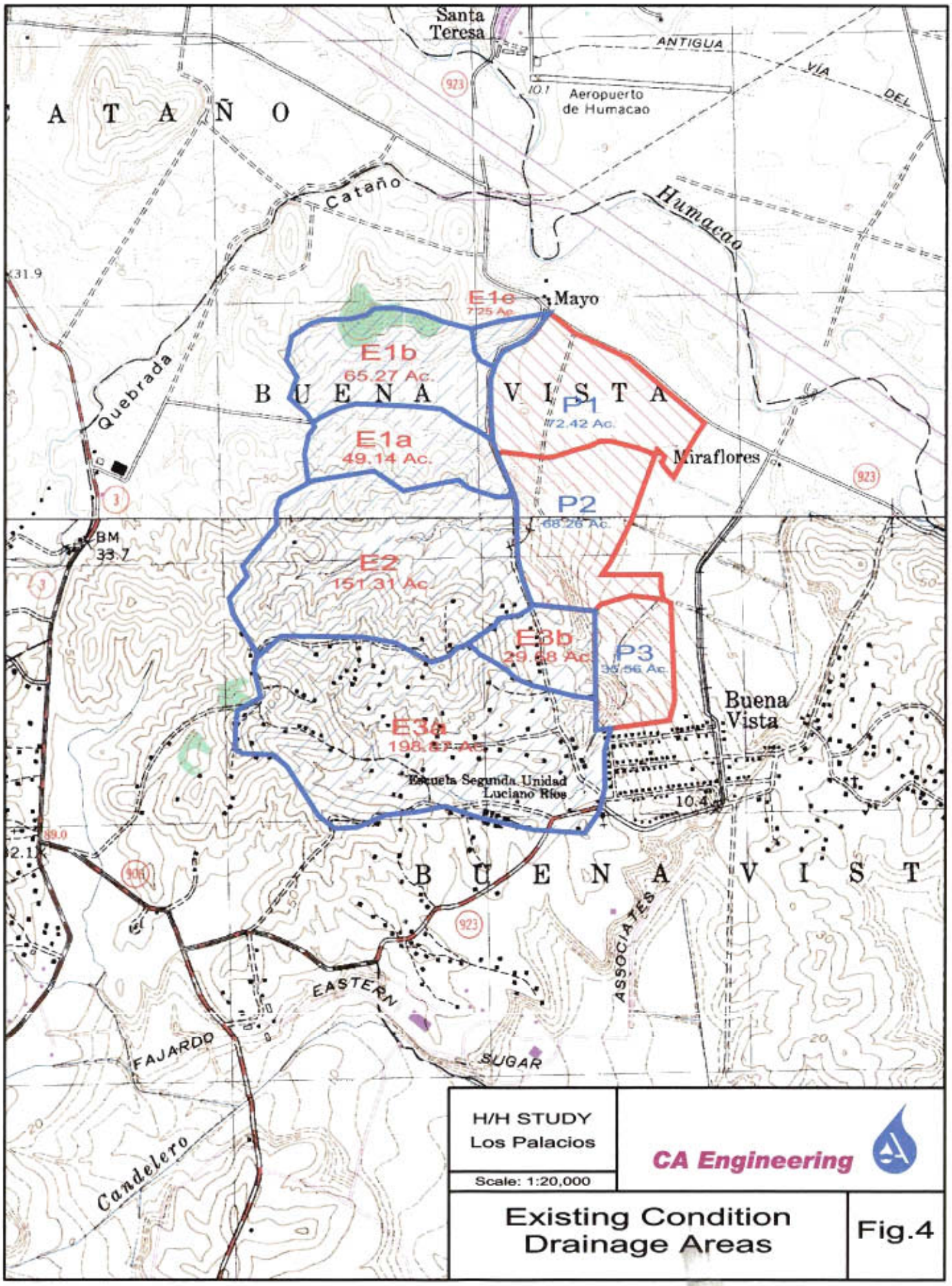
Presidente de la Junta


Santa Teresa
ANTIGUA
VÍA DEL FERROCARRIL
Aeropuerto de Humacao
A Ñ O
Cataño
Humacao
Mayo
B U E N A V I S T A
Miraflores
SITE
Río
Buena Vista
Escuela Segunda Unidad Luciano Ríos
B U E N A V I S T A
ASSOCIATES
EASTERN
SUGAR
FAJARDO
H/H STUDY
Palacios de Humacao
Scale: 1:20,000
CA Engineering
Location Map
Fig.1



H/H STUDY Palacios de Humacao	CA Engineering
Scale: 1:4,500	
Proposed Development Layout	Fig.2

H/H STUDY Palacios de Humacao	CA Engineering
Scale: 1: 4,500	
Existing Topography of the Site	Fig.3



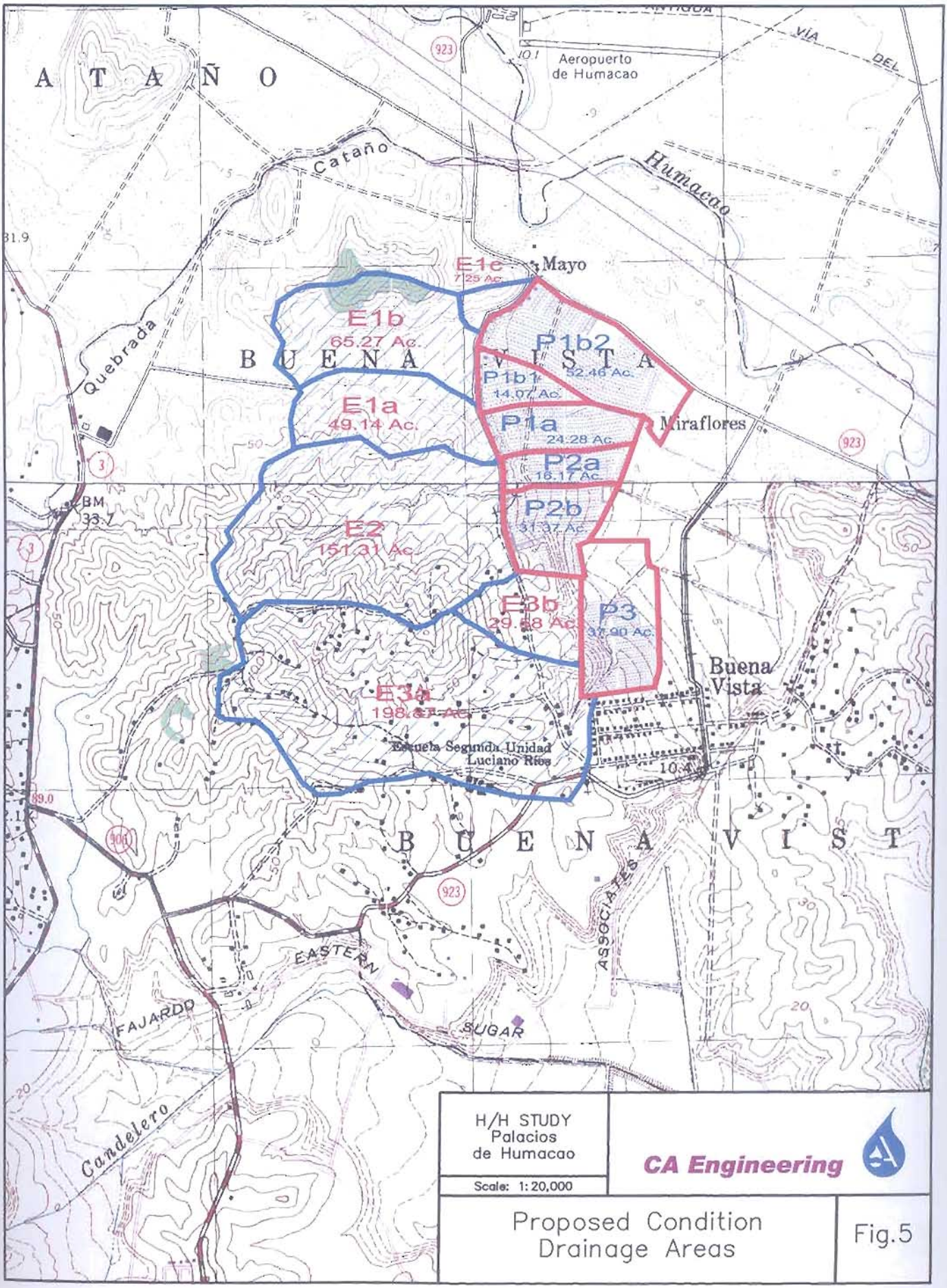
H/H STUDY
Los Palacios

Scale: 1:20,000

CA Engineering

Existing Condition Drainage Areas

Fig.4



H/H STUDY
Palacios de Humacao

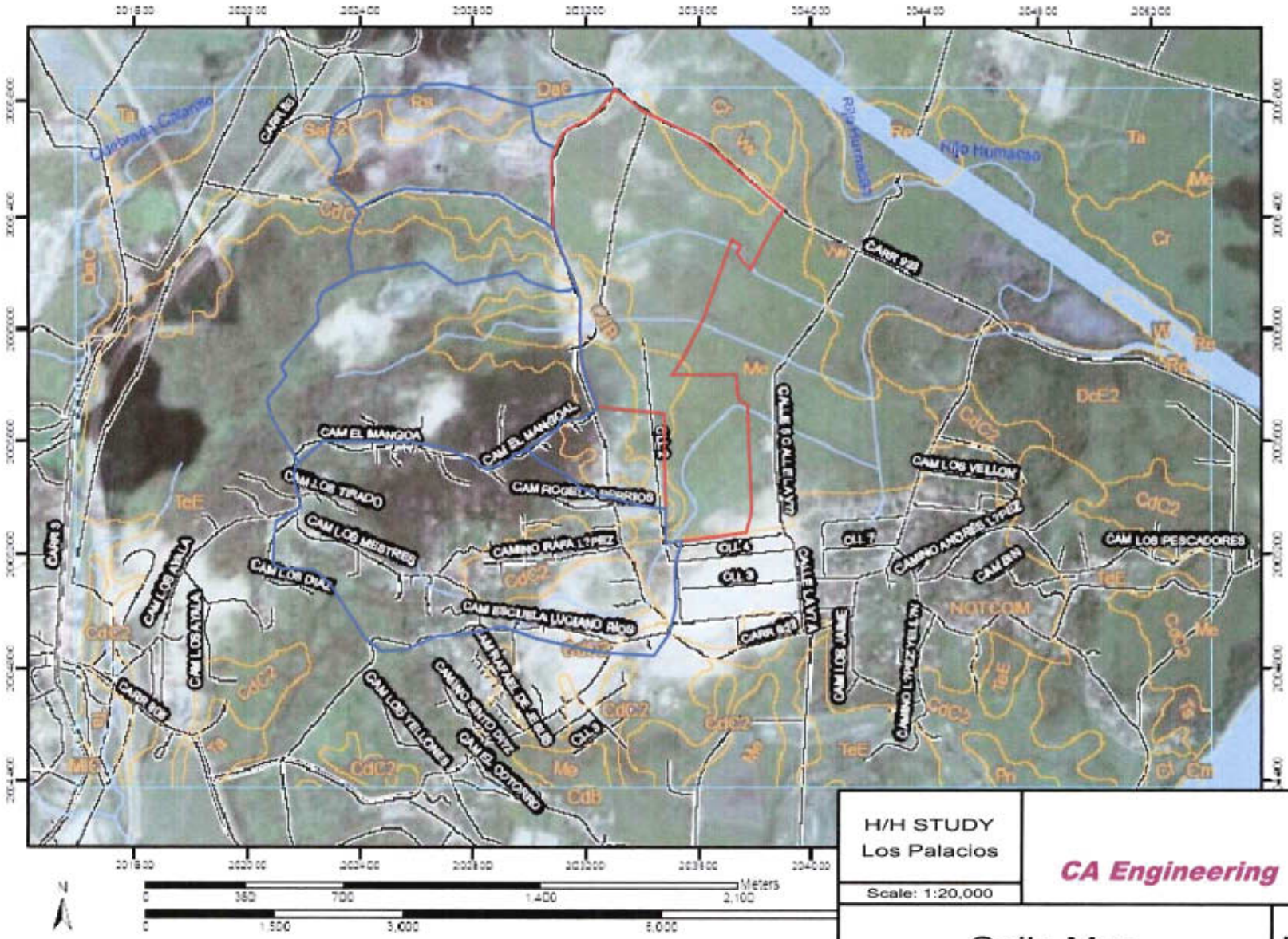
Scale: 1:20,000

CA Engineering

Proposed Condition Drainage Areas

Fig.5

Soil Map–Humacao Area, Puerto Rico Eastern Part
(Los Palacios, Humacao, PR.)



H/H STUDY
Los Palacios

Scale: 1:20,000

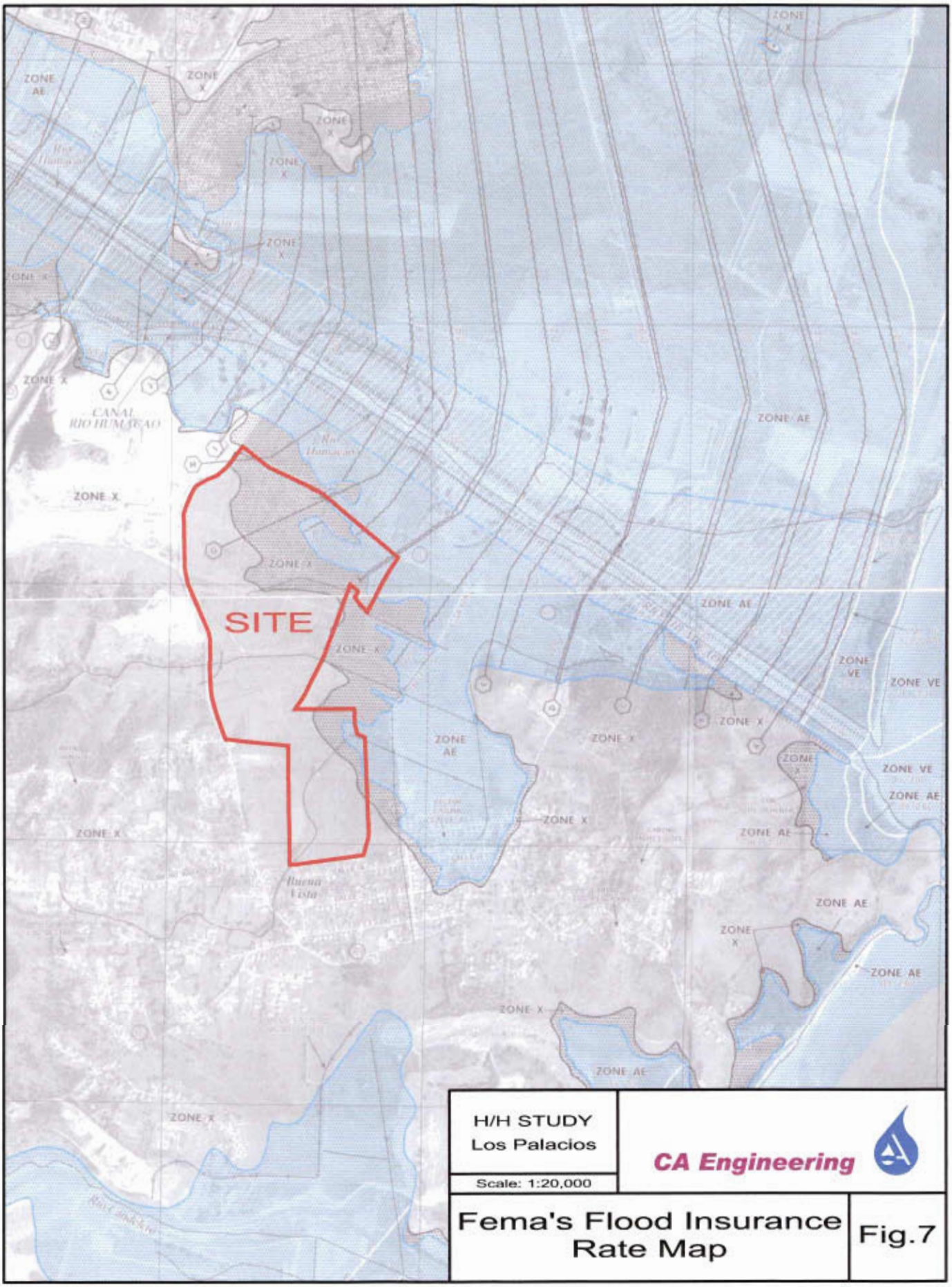
CA Engineering

Soils Map

Fig.6

Natural Resources Conservation Service

Web Soil Survey 2.0
National Cooperative Soil Survey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Vista
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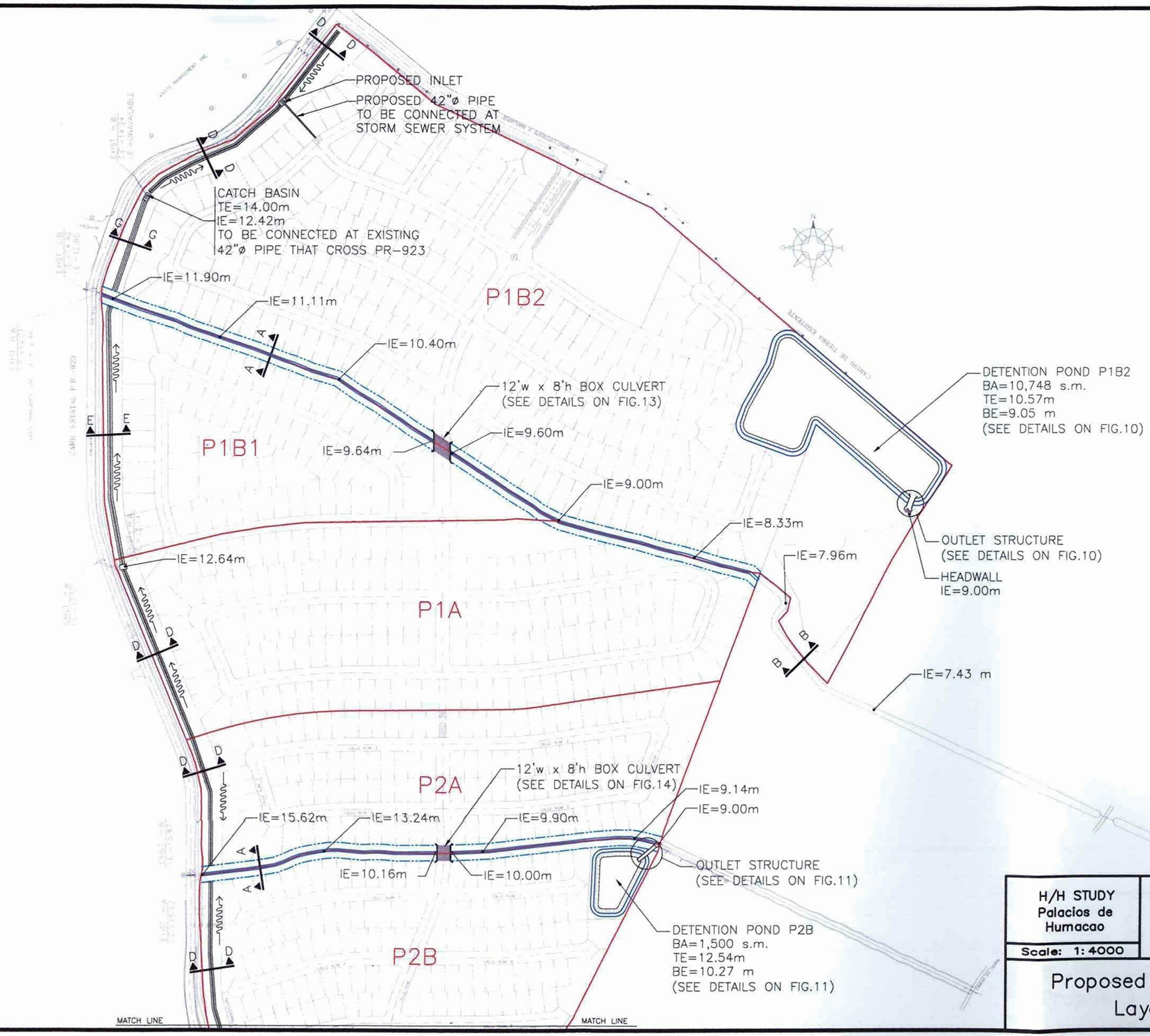
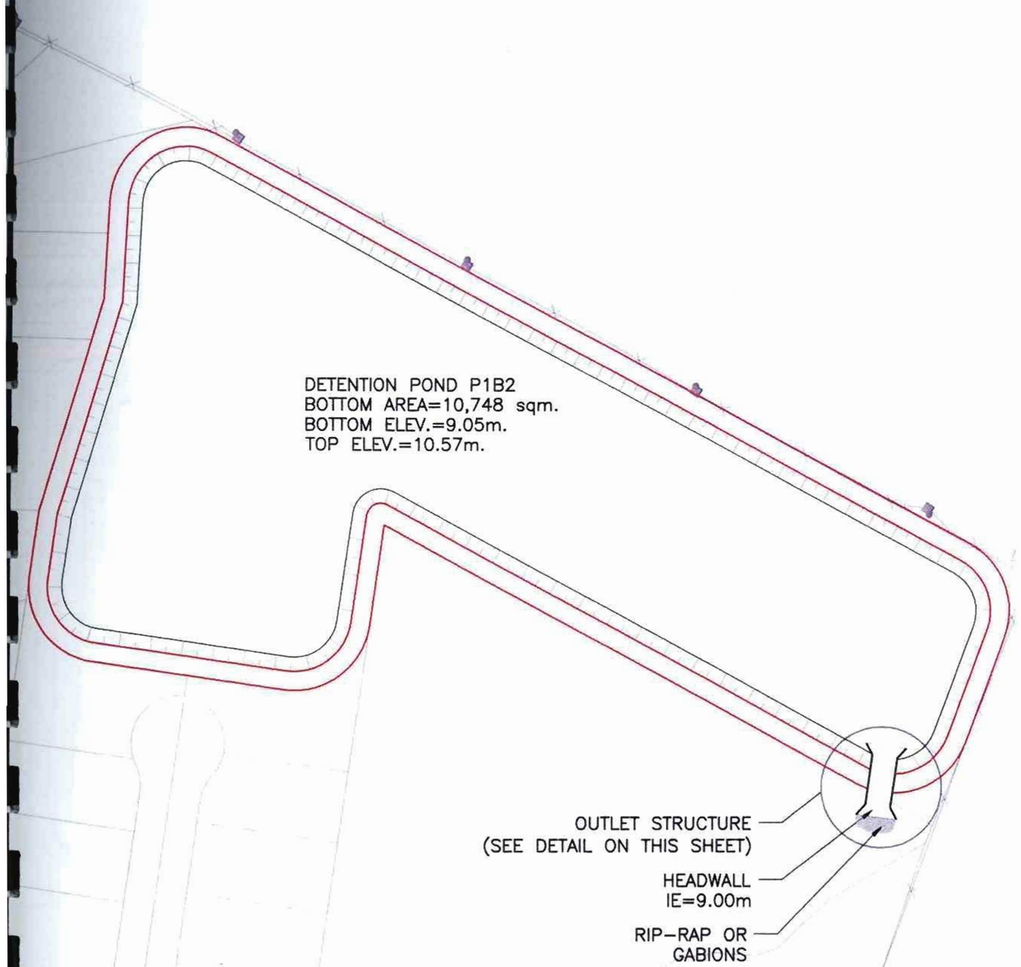
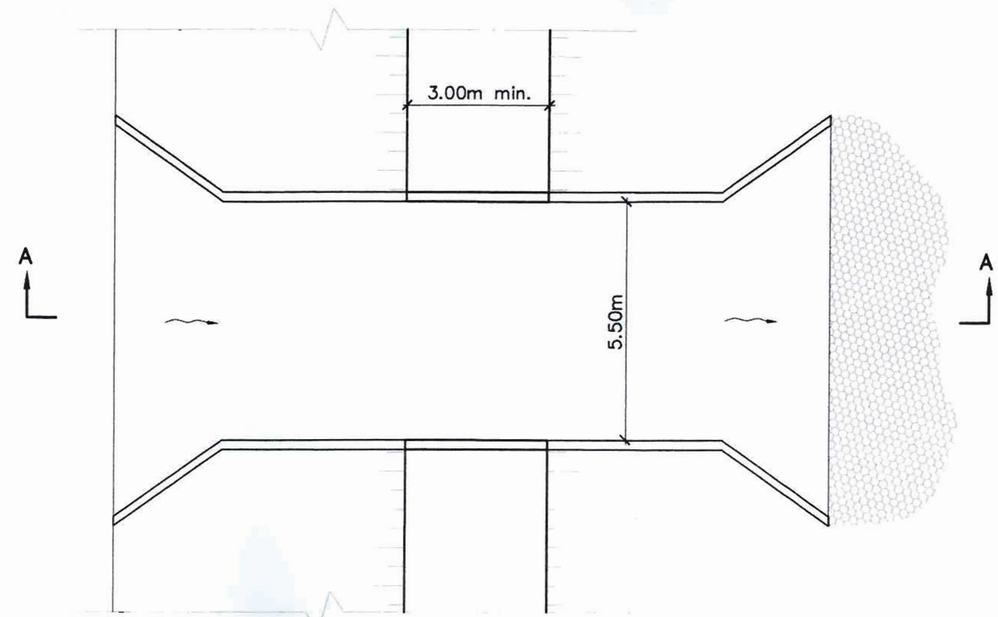
H/H STUDY
Los Palacios
Scale: 1:20,000
CA Engineering
Fema's Flood Insurance
Rate Map
Fig.7



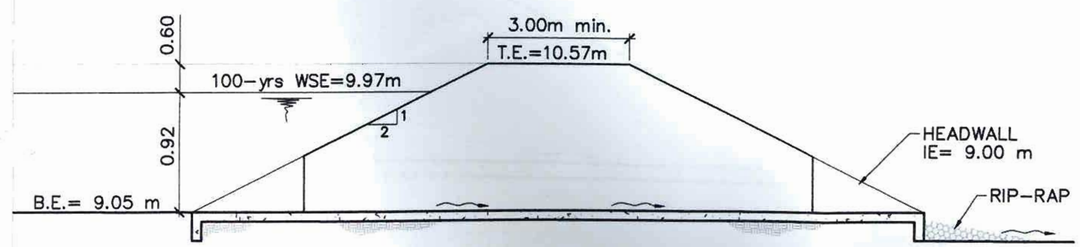
H/H STUDY Palacios de Humacao	CA Engineering
Scale: 1:4000	
Proposed Structures Layout #1	Fig.8

H/H STUDY Palacios de Humacao Scale: 1:4000	CA Engineering
Proposed Structures Layout #2	Fig.9





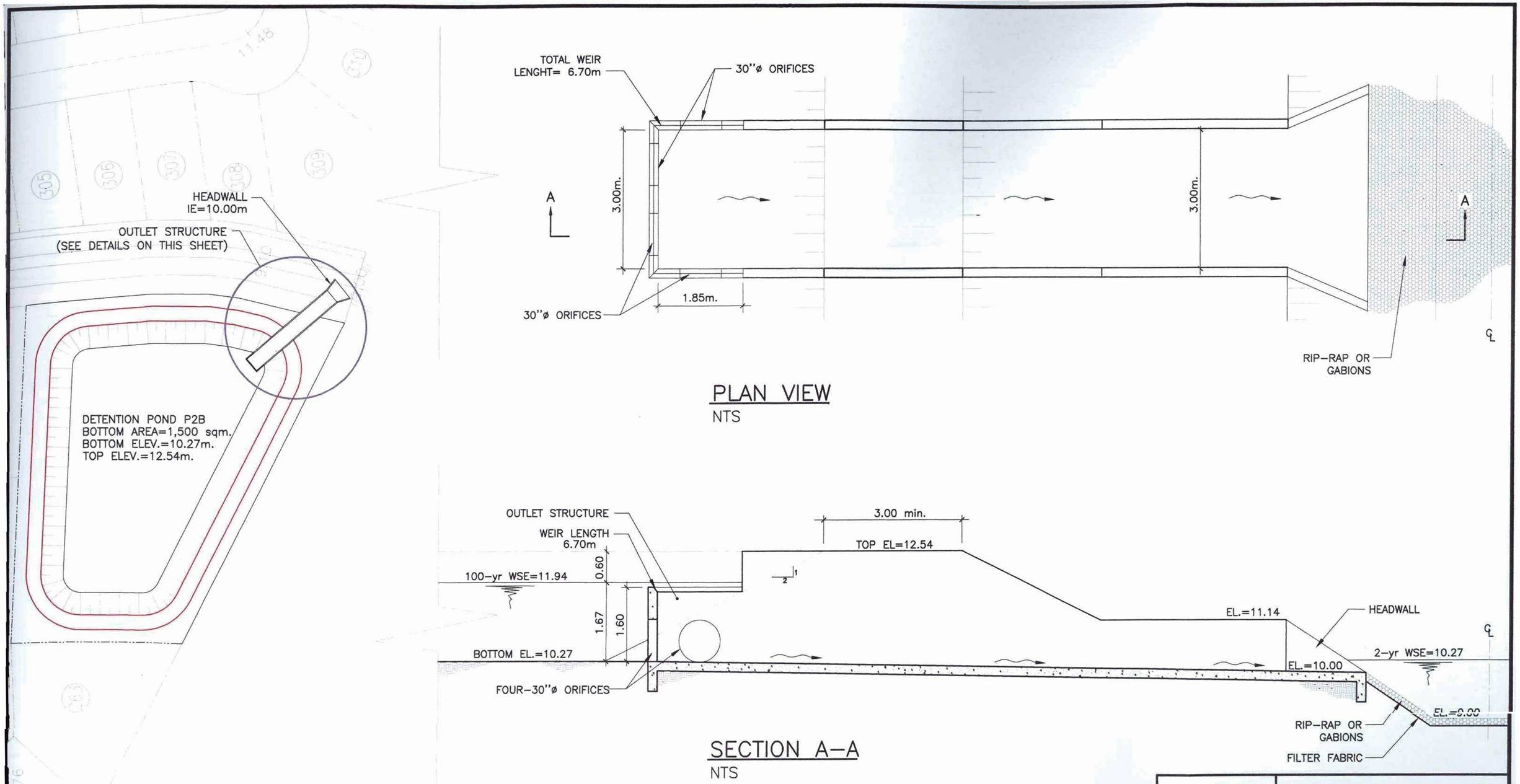
PLAN VIEW
NTS



SECTION A-A
NTS

OUTLET STRUCTURE

H/H STUDY Palacios de Humacao	CA Engineering
Scale: NTS	
Detention Pond Schematics Pond P1B2	Fig.10



OUTLET STRUCTURE

H/H STUDY Palacios de Humacao	CA Engineering
Scale: NTS	
Detention Pond Schematics Pond P2B	Fig.11

APPENDIXES

APPENDIX A

HYDROLOGIC PARAMETERS ESTIMATION

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

HUMACAO 2 SSE, PUERTO RICO (66-4613) 18.1333 N 65.8333 W 209 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 3, Version 3
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2006
Extracted: Thu Mar 7 2008

Precipitation Frequency Estimates (inches)

AEP* (1-in-Y)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	0.47	0.64	0.82	1.31	1.94	2.52	2.82	3.57	4.40	5.20	6.38	7.05	8.45	9.68	13.17	16.16	20.42	24.85
5	0.63	0.85	1.10	1.76	2.60	3.57	4.07	5.32	6.64	8.01	9.87	10.84	12.74	14.18	18.37	21.98	27.29	32.55
10	0.74	1.01	1.29	2.07	3.07	4.30	4.99	6.66	8.38	10.23	12.59	13.78	16.06	17.55	22.13	26.05	31.99	37.65
25	0.88	1.21	1.55	2.48	3.68	5.28	6.23	8.51	10.79	13.41	16.48	18.00	20.74	22.22	27.18	31.42	38.08	44.12
50	0.99	1.36	1.74	2.79	4.14	6.04	7.21	9.99	12.76	16.03	19.70	21.49	24.61	26.02	31.15	35.56	42.72	48.95
100	1.11	1.51	1.94	3.11	4.62	6.82	8.24	11.57	14.84	18.89	23.18	25.26	28.77	30.05	35.29	39.82	47.45	53.78
200	1.23	1.68	2.15	3.44	5.11	7.63	9.32	13.25	17.07	21.98	26.94	29.34	33.26	34.33	39.65	44.22	52.27	58.66
500	1.39	1.90	2.43	3.90	5.78	8.76	10.83	15.65	20.25	26.45	32.37	35.23	39.70	40.43	45.73	50.32	58.88	65.23
1000	1.51	2.07	2.66	4.25	6.31	9.65	12.05	17.61	22.85	30.16	36.86	40.11	45.00	45.40	50.60	55.14	64.10	70.29

* These precipitation frequency estimates are based on an annual maxima series. **AEP** is the Annual Exceedance Probability.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

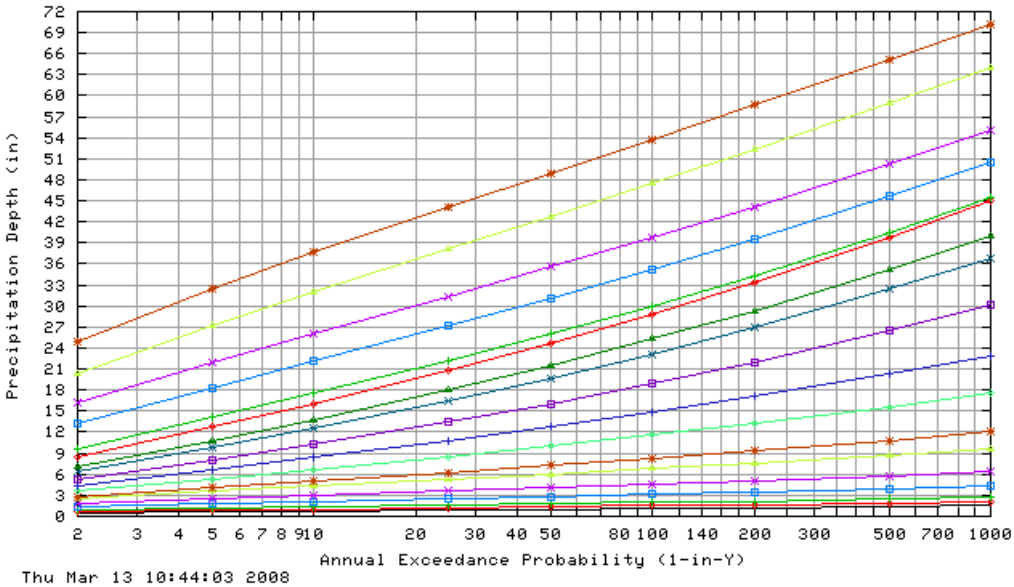
* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
AEP (1-in-Y)**	**5 min**	**10 min**	**15 min**	**30 min**	**60 min**	**120 min**	**3 hr**	**6 hr**	**12 hr**	**24 hr**	**48 hr**	**4 day**	**7 day**	**10 day**	**20 day**	**30 day**	**45 day**	**60 day**
2	0.50	0.68	0.88	1.41	2.09	2.71	3.10	3.98	4.96	5.80	7.28	7.96	9.58	10.80	14.54	17.46	21.82	26.48
5	0.71	0.97	1.24	1.99	2.95	3.86	4.48	5.93	7.46	8.90	11.19	12.15	14.41	15.80	20.30	23.81	29.24	34.72
10	0.80	1.09	1.40	2.24	3.32	4.65	5.46	7.37	9.36	11.29	14.24	15.41	18.12	19.54	24.43	28.21	34.30	40.17
25	0.94	1.29	1.66	2.65	3.93	5.68	6.81	9.40	10.90	14.75	18.62	20.10	23.36	24.66	30.00	34.18	40.80	47.12
50	1.06	1.45	1.87	2.99	4.43	6.50	7.87	11.06	12.89	17.58	22.32	24.05	27.74	28.95	34.43	38.77	45.98	52.47
100	1.19	1.63	2.09	3.34	4.96	7.36	9.02	12.86	14.99	20.71	26.34	28.41	32.61	33.61	39.21	43.53	51.21	57.93
200	1.32	1.81	2.32	3.71	5.51	8.27	10.26	14.79	17.24	24.13	30.86	33.21	37.88	38.61	44.29	48.47	56.63	63.52
500	1.51	2.06	2.64	4.23	6.27	9.54	11.98	17.53	20.45	29.10	37.32	40.16	45.58	45.86	51.54	55.44	64.20	71.03
1000	1.65	2.26	2.90	4.64	6.88	10.57	13.40	19.85	23.08	33.25	42.70	45.95	52.05	52.57	57.28	61.07	70.36	76.95

* The **upper** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **greater** than.
** These precipitation frequency estimates are based on an annual maxima series. **AEP** is the Annual Exceedance Probability.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)																		
AEP (1-in-Y)**	**5 min**	**10 min**	**15 min**	**30 min**	**60 min**	**120 min**	**3 hr**	**6 hr**	**12 hr**	**24 hr**	**48 hr**	**4 day**	**7 day**	**10 day**	**20 day**	**30 day**	**45 day**	**60 day**
2	0.43	0.59	0.75	1.21	1.79	2.29	2.55	3.19	3.91	4.71	5.73	6.35	7.60	8.80	12.14	15.03	19.17	23.43
5	0.62	0.85	1.09	1.74	2.58	3.25	3.68	4.76	5.91	7.22	8.80	9.70	11.39	12.83	16.87	20.34	25.50	30.64
10	0.73	1.00	1.28	2.05	3.04	3.90	4.48	5.91	7.39	9.17	11.16	12.24	14.24	15.77	20.19	23.99	29.75	35.36
25	0.81	1.11	1.42	2.27	3.37	4.75	5.54	7.46	9.42	11.91	14.46	15.82	18.24	19.80	24.67	28.71	35.17	41.22
50	0.91	1.24	1.59	2.55	3.78	5.40	6.36	8.69	11.02	14.12	17.10	18.70	21.39	22.95	28.03	32.29	39.19	45.46
100	1.00	1.37	1.76	2.82	4.18	6.05	7.20	9.96	12.70	16.54	19.98	21.72	24.74	26.31	31.52	35.88	43.23	49.58
200	1.10	1.51	1.94	3.10	4.60	6.73	8.08	11.28	14.44	19.10	22.92	24.96	28.29	29.71	35.02	39.62	47.30	53.71
500	1.24	1.70	2.18	3.48	5.17	7.65	9.28	13.16	16.90	22.77	27.07	29.48	33.16	34.48	39.97	44.60	52.77	59.13
1000	1.34	1.84	2.36	3.77	5.60	8.37	10.23	14.67	18.90	25.77	30.40	33.16	37.17	38.34	43.80	48.43	57.05	63.24

* The **lower** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **less** than.
** These precipitation frequency estimates are based on an annual maxima series. **AEP** is the Annual Exceedance Probability.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

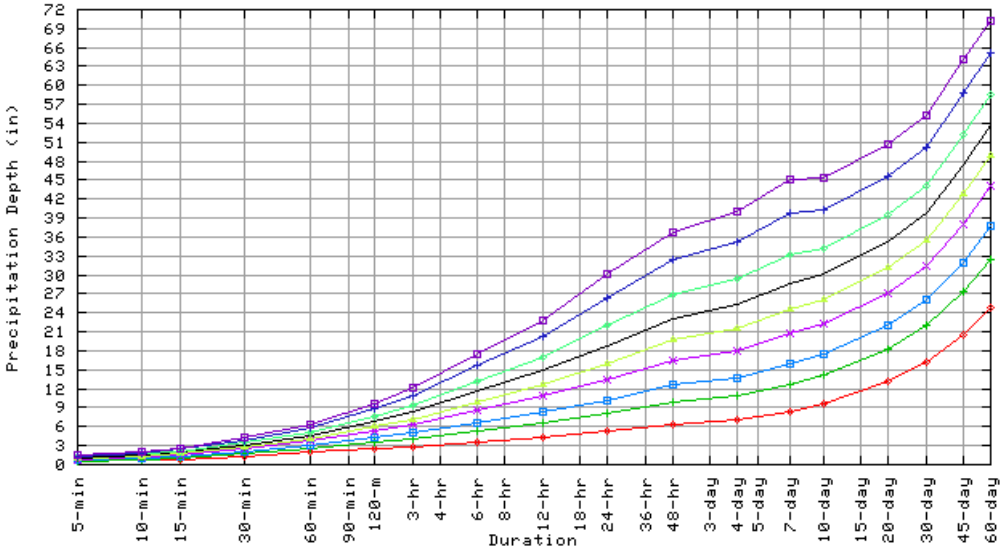
Annual Maxima based Point Precipitation Frequency Estimates - Version: 3
18.1333 N 65.8333 W 209 ft



Thu Mar 13 10:44:03 2008

Duration			
5-min	120-m	48-hr	30-day
10-min	3-hr	4-day	45-day
15-min	6-hr	7-day	60-day
30-min	12-hr	10-day	
60-min	24-hr	20-day	

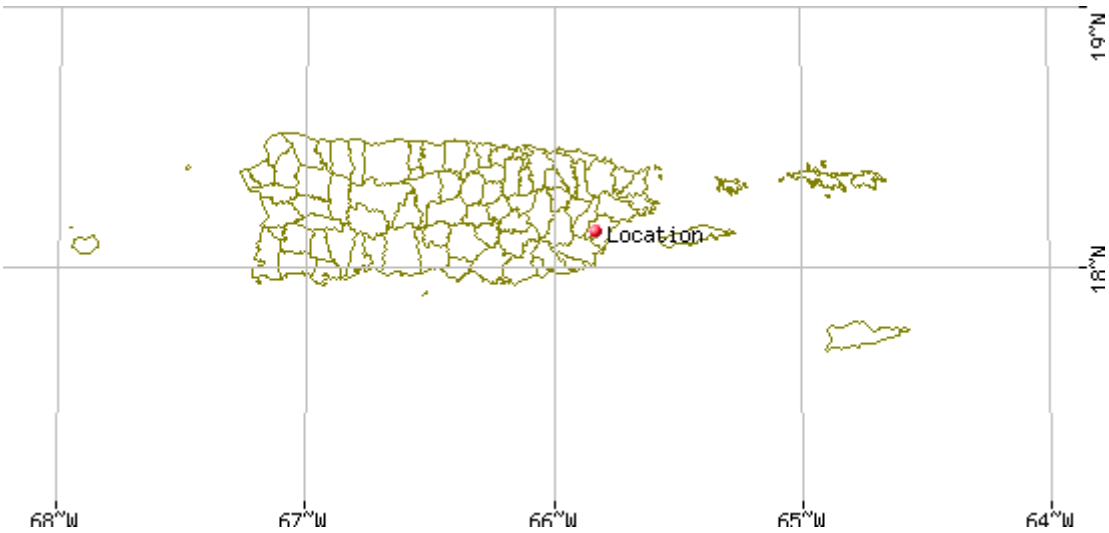
Annual Maxima based Point Precipitation Frequency Estimates - Version: 3
18.1333 N 65.8333 W 209 ft

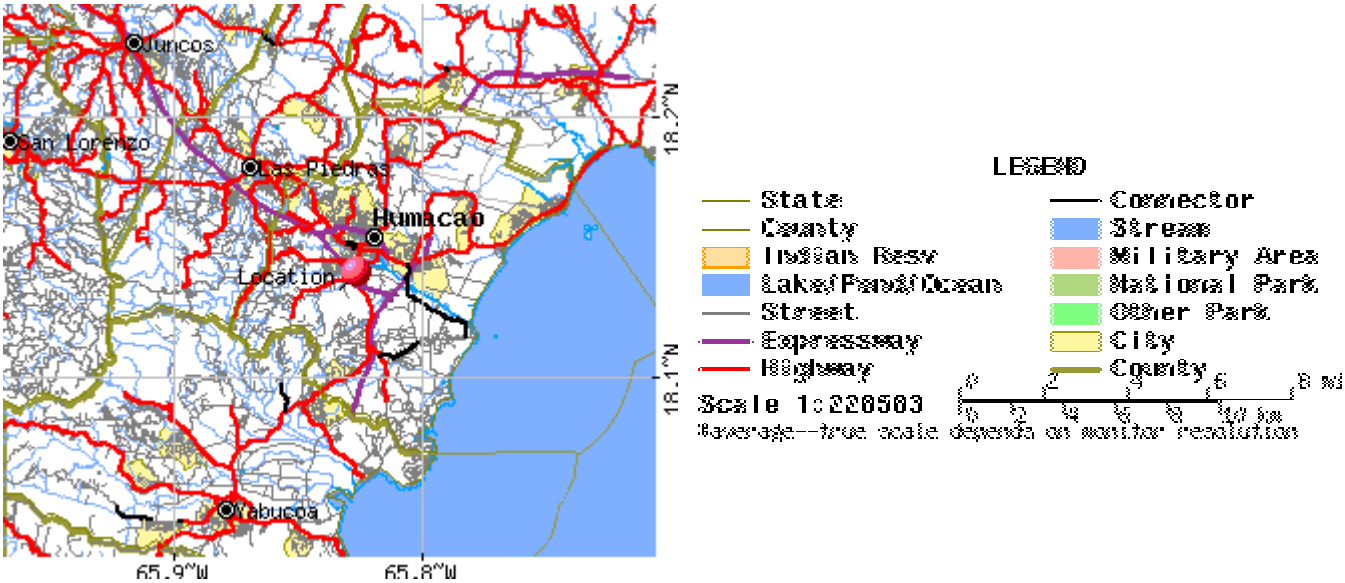


Thu Mar 13 10:44:03 2008

Annual Exceedance Probability (1-in-Y)	
1 in 2	1 in 100
1 in 5	1 in 200
1 in 10	1 in 500
1 to 25	1 in 1000
1 in 50	

Maps -


Location
19°N
18°N
68°W
67°W
66°W
65°W
64°W


Juncos
San Lorenzo
Las Piedras
Humacao
Location
Yabucoa
18.2°N
18.1°N
65.9°W
65.8°W
LEGEND
State
County
Indian Resv
Lake/Pond/Ocean
Street
Expressway
Highway
Connector
Stream
Military Area
National Park
Other Park
City
County
Scale 1:220503
Average--true scale depends on monitor resolution

PHYSIOGRAFIC INFORMATION:

Soil	Description	HSG	CN
CdB	Candelero Loam 2 to 5% slopes, eroded	C	86
CdC2	Candelero Loam 5 to 12% slopes, eroded	C	86
Cr	Coloso Silty Clay	D	89
Me	Maunabo Clay	D	89
Rs	Rock Land	D	89
SaE2	Sabana Silty Clay,Loam 20 to 40% slopes,eroded	D	89
TeE	Tejas Gravelly Sandy Loam,20 to 40% slopes,eroded	D	89

PHYSIOGRAFIC INFORMATION: PROJECT AREA (E1A)

Existing Conditions

Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Me	D	89	45,673.58	11.286
CdC2	C	86	65,965.54	16.300
TeE	D	89	87,224.47	21.553

Total (acres)	49.14
Total (km2)	0.199
Total (mi2)	0.077
Weighted CN	88

PHYSIOGRAFIC INFORMATION: PROJECT AREA (E1B)

Existing Conditions

Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Me	D	89	162,214.17	40.083
CdC2	C	86	1,943.25	0.480
SaE2	D	89	61,107.67	15.099
Rs	D	89	38,894.92	9.611

Total (acres)	65.27
Total (km2)	0.264
Total (mi2)	0.102
Weighted CN	89

PHYSIOGRAFIC INFORMATION: PROJECT AREA (E1C)

Existing Conditions

Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Me	D	89	9,724.37	2.403
Rs	D	89	19,600.56	4.843

Total (acres)	7.25
Total (km2)	0.029
Total (mi2)	0.011
Weighted CN	89

PHYSIOGRAFIC INFORMATION: PROJECT AREA (E2)

Existing Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
TeE	D	89	492,849.89	121.782
CdC2	C	86	80,611.12	19.919
CdB	C	86	38,892.00	9.610
Total (acres)				151.31
Total (km2)				0.612
Total (mi2)				0.236
Weighted CN				88

PHYSIOGRAFIC INFORMATION: PROJECT AREA (E3A)

Existing Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
TeE	D	89	642,186.97	158.682
CdC2	C	86	123,463.33	30.507
CdB	C	86	8,638.02	2.134
Me	D	89	30,530.00	7.544
Total (acres)				198.87
Total (km2)				0.805
Total (mi2)				0.311
Weighted CN				89

PHYSIOGRAFIC INFORMATION: PROJECT AREA (E3B)

Existing Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
TeE	D	89	36,295.03	8.968
CdC2	C	86	56,655.67	13.999
CdB	C	86	26,776.98	6.617
Total (acres)				29.58
Total (km2)				0.120
Total (mi2)				0.046
Weighted CN				87

PHYSIOGRAFIC INFORMATION: PROJECT AREA (P1)

Existing Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Me	D	89	252,800.00	62.466
Cr	D	89	40,265.00	9.949
Total (acres)				72.42
Total (km2)				0.293
Total (mi2)				0.113
Weighted CN				89

PHYSIOGRAFIC INFORMATION: PROJECT AREA (P2)

Existing Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Me	D	89	128,130.00	31.660
CdC2	C	86	58,020.00	14.337
CdB	C	86	90,113.00	22.267
Total (acres)				68.26
Total (km2)				0.276
Total (mi2)				0.107
Weighted CN				87

PHYSIOGRAFIC INFORMATION: PROJECT AREA (P3)

Existing Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Me	D	89	131,249.00	32.431
CdB	C	86	10,526.00	2.601
TeE	D	89	2,150.00	0.531
Total (acres)				35.56
Total (km2)				0.144
Total (mi2)				0.056
Weighted CN				89

PHYSIOGRAFIC INFORMATION: PROJECT AREA (P1A)

Proposed Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Developed	D	93	98,265.99	24.281
Total (acres)				24.28
Total (km2)				0.098
Total (mi2)				0.038
Weighted CN				93

PHYSIOGRAFIC INFORMATION: PROJECT AREA (P1B1)

Proposed Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Developed	D	93	56,943.71	14.071
Total (acres)				14.07
Total (km2)				0.057
Total (mi2)				0.022
Weighted CN				93

PHYSIOGRAFIC INFORMATION: PROJECT AREA (P1B2)

Proposed Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Developed	D	93	212,289.95	52.456
Total (acres)				52.46
Total (km2)				0.212
Total (mi2)				0.082
Weighted CN				93

PHYSIOGRAFIC INFORMATION: PROJECT AREA (P2A)

Proposed Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Developed	D	93	65,432.56	16.168
Total (acres)				16.17
Total (km2)				0.065
Total (mi2)				0.025
Weighted CN				93

PHYSIOGRAFIC INFORMATION: PROJECT AREA (P2B)

Proposed Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Developed	D	93	126,954.39	31.370
Total (acres)				31.37
Total (km2)				0.127
Total (mi2)				0.049
Weighted CN				93

PHYSIOGRAFIC INFORMATION: PROJECT AREA (P3)

Proposed Conditions				
Soil	HSG	Curve Number	Area (metros^2)	Area (acre)
Developed	D	93	153,366.40	37.896
Total (acres)				37.90
Total (km2)				0.153
Total (mi2)				0.059
Weighted CN				93

COMPUTATIONS FOR TIME OF CONCENTRATION - Kirpich Equation

$Tc = 0.0078L^{0.77}/S^{0.385}$

Where: L in ft, S in ft/ft, Tc in min

Higher Elevation		Lower Elevation		Distance		Time of Concentration		Lag Time
m	ft	m	ft	m	ft	min	hours	hours

Existing
Offsite Area E1A

20.00	65.60	19.00	62.32	113.20	371.296	4.5868	0.07645	0.046
19.00	62.32	18.00	59.04	26.43	86.690	0.8548	0.01425	0.009
18.00	59.04	17.00	55.76	53.33	174.922	1.9230	0.03205	0.019
17.00	55.76	16.00	52.48	47.99	157.407	1.7023	0.02837	0.017
16.00	52.48	15.00	49.20	58.62	192.274	2.1449	0.03575	0.021
15.00	49.20	14.00	45.92	90.83	297.922	3.5569	0.05928	0.036
14.00	45.92	13.00	42.64	122.53	401.898	5.0262	0.08377	0.050
13.00	42.64	12.00	39.36	107.12	351.354	4.3035	0.07172	0.043
12.00	39.36	11.00	36.08	101.56	333.117	4.0465	0.06744	0.040
				721.61	2366.88080	28.14483	0.46908	**0.281**

Existing
Offsite Area E1B

20.00	65.60	19.00	62.32	62.41	204.705	2.3059	0.03843	0.023
19.00	62.32	18.00	59.04	125.98	413.214	5.1900	0.08650	0.052
18.00	59.04	17.00	55.76	111.02	364.146	4.4849	0.07475	0.045
17.00	55.76	16.00	52.48	88.58	290.542	3.4553	0.05759	0.035
16.00	52.48	15.00	49.20	94.44	309.763	3.7207	0.06201	0.037
15.00	49.20	14.00	45.92	80.96	265.549	3.1144	0.05191	0.031
14.00	45.92	13.00	42.64	75.80	248.624	2.8863	0.04810	0.029
13.00	42.64	12.00	39.36	70.82	232.290	2.6684	0.04447	0.027
12.00	39.36	11.00	36.08	95.62	313.634	3.7744	0.06291	0.038
				805.63	2642.46640	31.60024	0.52667	**0.316**

Existing
Offsite Area E1C

50.00	164.00	40.00	131.20	22.79	74.751	0.2968	0.00495	0.003
40.00	131.20	30.00	98.40	23.31	76.457	0.3047	0.00508	0.003
30.00	98.40	20.00	65.60	25.47	83.542	0.3375	0.00563	0.003
20.00	65.60	15.00	49.20	13.28	43.558	0.2077	0.00346	0.002
15.00	49.20	11.00	36.08	28.41	93.185	0.5449	0.00908	0.005
				113.26	371.49280	1.69160	0.02819	**0.017**

Existing
Offsite Area E2

90.00	295.20	80.00	262.40	35.34	115.915	0.4927	0.00821	0.005
80.00	262.40	70.00	229.60	44.39	145.599	0.6411	0.01069	0.006
70.00	229.60	60.00	196.80	37.39	122.639	0.5258	0.00876	0.005
60.00	196.80	50.00	164.00	46.87	153.734	0.6827	0.01138	0.007
50.00	164.00	40.00	131.20	184.65	605.652	3.3262	0.05544	0.033
40.00	131.20	30.00	98.40	93.26	305.893	1.5112	0.02519	0.015
30.00	98.40	20.00	65.60	323.44	1060.883	6.3552	0.10592	0.064
20.00	65.60	15.00	49.20	331.47	1087.222	8.5374	0.14229	0.085
15.00	49.20	14.00	45.92	202.14	663.019	8.9608	0.14935	0.090
				1298.95	4260.55600	31.03309	0.51722	**0.310**

Existing
Offsite Area E3A

90.00	295.20	80.00	262.40	32.08	105.222	0.4406	0.00734	0.004
80.00	262.40	70.00	229.60	60.58	198.702	0.9181	0.01530	0.009
70.00	229.60	60.00	196.80	103.29	338.791	1.7004	0.02834	0.017
60.00	196.80	50.00	164.00	98.58	323.342	1.6112	0.02685	0.016
50.00	164.00	40.00	131.20	129.07	423.350	2.1995	0.03666	0.022
40.00	131.20	30.00	98.40	291.00	954.480	5.6249	0.09375	0.056
30.00	98.40	20.00	65.60	460.75	1511.260	9.5636	0.15939	0.096
20.00	65.60	15.00	49.20	264.75	868.380	6.5855	0.10976	0.066
15.00	49.20	14.00	45.92	82.16	269.485	3.1677	0.05280	0.032
14.00	45.92	13.00	42.64	74.23	243.474	2.8173	0.04696	0.028
				1596.49	5236.48720	34.62882	0.57715	**0.346**

Existing
Offsite Area E3B

80.00	262.40	70.00	229.60	66.74	218.907	1.0268	0.01711	0.010
70.00	229.60	60.00	196.80	26.96	88.429	0.3604	0.00601	0.004
60.00	196.80	50.00	164.00	27.90	91.512	0.3750	0.00625	0.004
50.00	164.00	40.00	131.20	23.73	77.834	0.3110	0.00518	0.003
40.00	131.20	30.00	98.40	36.31	119.097	0.5083	0.00847	0.005
30.00	98.40	20.00	65.60	96.70	317.176	1.5757	0.02626	0.016
20.00	65.60	10.00	32.80	210.38	690.046	3.8671	0.06445	0.039
				488.72	1603.00160	8.02438	0.13374	**0.080**

Existing
Project Area P1

12.00	39.36	11.00	36.08	78.59	257.775	3.0093	0.05016	0.030
11.00	36.08	10.00	32.80	61.79	202.671	2.2794	0.03799	0.023
10.00	32.80	9.00	29.52	108.00	354.240	4.3443	0.07241	0.043
9.00	29.52	8.00	26.24	50.16	164.525	1.7916	0.02986	0.018
8.00	26.24	7.00	22.96	230.00	754.400	10.4019	0.17337	0.104
7.00	22.96	6.00	19.68	146.05	479.044	6.1563	0.10260	0.062
				674.59	2212.65520	27.98279	0.46638	**0.280**

Existing
Project Area P2

15.00	49.20	14.00	45.92	87.38	286.606	3.4013	0.05669	0.034
14.00	45.92	13.00	42.64	62.29	204.311	2.3008	0.03835	0.023
13.00	42.64	12.00	39.36	96.39	316.159	3.8096	0.06349	0.038
12.00	39.36	11.00	36.08	109.50	359.160	4.4141	0.07357	0.044
11.00	36.08	10.00	32.80	141.95	465.596	5.9571	0.09928	0.060
10.00	32.80	9.00	29.52	138.51	454.313	5.7907	0.09651	0.058
9.00	29.52	8.00	26.24	94.80	310.944	3.7371	0.06228	0.037
8.00	26.24	7.00	22.96	33.58	110.142	1.1270	0.01878	0.011
				764.40	2507.23200	30.53758	0.50896	**0.305**

Existing
Project Area P3

13.00	42.64	12.00	39.36	48.79	160.031	1.7352	0.02892	0.017
12.00	39.36	11.00	36.08	21.31	69.897	0.6665	0.01111	0.007
11.00	36.08	10.00	32.80	54.29	178.071	1.9630	0.03272	0.020
10.00	32.80	9.00	29.52	55.42	181.778	2.0103	0.03350	0.020
9.00	29.52	8.00	26.24	67.52	221.466	2.5253	0.04209	0.025
8.00	26.24	7.00	22.96	64.99	213.167	2.4163	0.04027	0.024

7.00	22.96	6.00	19.68	50.21	164.689	1.7936	0.02989	0.018
				362.53	1189.09840	13.11020	0.21850	**0.131**

Proposed
Project Area P1A

11.00	36.08	10.00	32.80	94.14	308.779	3.7070	0.06178	0.037
10.00	32.80	9.00	29.52	158.54	520.011	6.7683	0.11280	0.068
9.00	29.52	8.00	26.24	104.10	341.448	4.1636	0.06939	0.042
8.00	26.24	7.00	22.96	147.53	483.898	6.2284	0.10381	0.062
7.00	22.96	6.00	19.68	156.03	511.778	6.6447	0.11074	0.066
				660.34	2165.91520	27.51198	0.45853	**0.275**

Proposed
Project Area P1B1

12.00	39.36	11.00	36.08	57.22	187.682	2.0859	0.03476	0.021
11.00	36.08	10.00	32.80	60.60	198.768	2.2288	0.03715	0.022
10.00	32.80	9.00	29.52	71.30	233.864	2.6893	0.04482	0.027
9.00	29.52	8.00	26.24	50.74	166.427	1.8155	0.03026	0.018
				239.86	786.74080	8.81946	0.14699	**0.088**

Proposed
Project Area P1B2

11.00	36.08	10.00	32.80	88.71	290.969	3.4612	0.05769	0.035
10.00	32.80	9.00	29.52	51.92	170.298	1.8644	0.03107	0.019
9.00	29.52	8.00	26.24	141.09	462.775	5.9154	0.09859	0.059
8.00	26.24	7.00	22.96	222.16	728.685	9.9935	0.16656	0.100
7.00	22.96	6.00	19.68	172.62	566.194	7.4672	0.12445	0.075
				676.50	2218.92000	28.70164	0.47836	**0.287**

Proposed
Project Area P2A

15.00	49.20	14.00	45.92	37.68	123.590	1.2874	0.02146	0.013
14.00	45.92	13.00	42.64	26.57	87.150	0.8600	0.01433	0.009
13.00	42.64	12.00	39.36	25.75	84.460	0.8294	0.01382	0.008
12.00	39.36	11.00	36.08	39.89	130.839	1.3750	0.02292	0.014
11.00	36.08	10.00	32.80	58.59	192.175	2.1436	0.03573	0.021
10.00	32.80	9.00	29.52	68.74	225.467	2.5781	0.04297	0.026
9.00	29.52	8.00	26.24	34.61	113.521	1.1671	0.01945	0.012
				291.83	957.20240	10.24064	0.17068	**0.102**

Proposed
Project Area P2B

20.00	65.60	15.00	49.20	46.89	153.799	0.8919	0.01486	0.009
15.00	49.20	14.00	45.92	32.81	107.617	1.0972	0.01829	0.011
14.00	45.92	13.00	42.64	35.91	117.785	1.2178	0.02030	0.012
13.00	42.64	12.00	39.36	19.76	64.813	0.6109	0.01018	0.006
12.00	39.36	11.00	36.08	56.09	183.975	2.0384	0.03397	0.020
11.00	36.08	10.00	32.80	47.47	155.702	1.6811	0.02802	0.017
10.00	32.80	9.00	29.52	68.07	223.270	2.5491	0.04248	0.025
				307.00	1006.96000	10.08633	0.16811	**0.101**

Proposed
Project Area P3

15.00	49.20	14.00	45.92	82.16	269.485	3.1677	0.05280	0.032
14.00	45.92	13.00	42.64	74.23	243.474	2.8173	0.04696	0.028
13.00	42.64	12.00	39.36	72.26	237.013	2.7311	0.04552	0.027
12.00	39.36	11.00	36.08	82.32	270.010	3.1749	0.05291	0.032
11.00	36.08	10.00	32.80	88.07	288.866	3.4323	0.05721	0.034
10.00	32.80	9.00	29.52	81.35	266.828	3.1317	0.05220	0.031
9.00	29.52	8.00	26.24	70.02	229.666	2.6336	0.04389	0.026

8.00	26.24	7.00	22.96	111.97	367.262	4.5293	0.07549	0.045
7.00	22.96	6.00	19.68	97.98	321.374	3.8822	0.06470	0.039
				760.36	2493.97752	29.50022	0.49167	**0.295**

APPENDIX B

HEC-1 RESULTS FOR EXISTING CONDITION

```
*                                      *                                                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
*            VERSION 4.1               *                                                    *          609 SECOND STREET           *
*  RGMHEC2000                HEC-1.COM *                                                    *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE   17OCT08  TIME  12:01:02  *                                                    *           (916) 756-1104             *
*                                      *                                                    *                                      *
****************************************                                                    ****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID        HYDROLOGIC ANALYSIS
  2           ID        PROJECT:  LOS PALACIOS, HUMACAO, P.R.
  3           ID        TRIANGULAR DISTRIBUTION
  4           ID        FREQUENCY OF OCCURRENCE: 2, 10, 25, 50 AND 100 YEARS
  5           ID        CA ENGINEERING, OCTOBER 2008
  6           ID        EXISTING CONDITION
  7           IT       5                    289
  8           IO       4
  9           JP       5

 10           KK     E1A
 11           KP       1
 12           BA   0.077
 13           LS       0      88
 14           UD   0.281
 15           IN      15
 16           KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 17           PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 18           KP       2
 19           KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 20           PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 21           KP       3
 22           KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 23           PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 24           KP       4
 25           KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 26           PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 27           KP       5
 28           KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 29           PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

 30           KK     E1B
 31           KP       1
 32           BA   0.102
 33           LS       0      89
 34           UD   0.316
 35           IN      15
 36           KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 37           PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 38           KP       2
 39           KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 40           PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 41           KP       3
 42           KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 43           PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 44           KP       4
 45           KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 46           PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 47           KP       5
 48           KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 49           PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 50           KK     E1C
 51           KP       1
 52           BA   0.011
 53           LS       0      89
 54           UD   0.017
 55           IN      15
 56           KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 57           PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 58           KP       2
 59           KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 60           PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 61           KP       3
 62           KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 63           PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 64           KP       4
 65           KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 66           PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 67           KP       5
 68           KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 69           PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
```

```
 70          KK   COMB1
 71          HC       2

 72          KK   COMB2
 73          HC       2

 74          KK      P1
 75          KP       1
 76          BA   0.113
 77          LS       0      89
 78          UD    0.28
 79          IN      15
 80          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 81          PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 82          KP       2
 83          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 84          PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 85          KP       3
 86          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 87          PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 88          KP       4
 89          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 90          PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 91          KP       5
 92          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 93          PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

 94          KK   COMB3
 95          HC       2
1                                        HEC-1 INPUT                                          PAGE  3

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 96          KK      E2
 97          KP       1
 98          BA   0.236
 99          LS       0      88
100          UD   0.310
101          IN      15
102          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
103          PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
104          KP       2
105          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
106          PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
107          KP       3
108          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
109          PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
110          KP       4
111          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
112          PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
113          KP       5
114          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
115          PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

116          KK      P2
117          KP       1
118          BA   0.107
119          LS       0      87
120          UD   0.305
121          IN      15
122          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
123          PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
124          KP       2
125          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
126          PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
127          KP       3
128          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
129          PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
130          KP       4
131          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
132          PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
133          KP       5
134          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
135          PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

136          KK     E3B
137          KP       1
138          BA   0.046
139          LS       0      87
140          UD   0.080
```

```
          141          IN      15
          142          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          143          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          144          KP       2
          145          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          146          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          147          KP       3
1                                                HEC-1 INPUT                                          PAGE  4

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          148          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          149          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          150          KP       4
          151          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          152          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          153          KP       5
          154          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          155          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

          156          KK      P3
          157          KP       1
          158          BA   0.056
          159          LS       0      89
          160          UD   0.131
          161          IN      15
          162          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          163          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          164          KP       2
          165          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          166          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          167          KP       3
          168          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          169          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          170          KP       4
          171          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          172          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          173          KP       5
          174          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          175          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

          176          KK   COMB4
          177          HC       2

          178          KK     E3A
          179          KP       1
          180          BA   0.311
          181          LS       0      89
          182          UD   0.346
          183          IN      15
          184          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          185          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          186          KP       2
          187          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          188          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          189          KP       3
          190          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          191          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          192          KP       4
          193          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          194          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          195          KP       5
          196          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          197          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
          198          ZZ
1****************************************                                                  ****************************************
 *                                      *                                                  *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                                  *          609 SECOND STREET           *
 *  RGMHEC2000               HEC-1.COM  *                                                  *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   17OCT08  TIME  12:01:02  *                                                  *           (916) 756-1104             *
 *                                      *                                                  *                                      *
 ****************************************                                                  ****************************************


                                 HYDROLOGIC ANALYSIS
                                 PROJECT:  LOS PALACIOS, HUMACAO, P.R.
```

```
                              TRIANGULAR DISTRIBUTION
                              FREQUENCY OF OCCURRENCE: 2, 10, 25, 50 AND 100 YEARS
                              CA ENGINEERING, OCTOBER 2008
                              EXISTING CONDITION

  8 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           4  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         289  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME        0000  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   24.00 HOURS

         ENGLISH UNITS
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

    JP          MULTI-PLAN OPTION
                      NPLAN           5  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF RUNOFF
                   1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 10 KK     *       E1A  *
           *            *
           **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 11 KP        PLAN  1 FOR STATION      E1A
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 12 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .08  SUBBASIN AREA

                PRECIPITATION DATA

 17 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                   STORM AREA =     .08

 13 LS          SCS LOSS RATE
                      STRTL         .27  INITIAL ABSTRACTION
                     CRVNBR       88.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 14 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
```

```
                18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                 8.        5.        4.        2.        2.        1.        1.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  18 KP        PLAN  2 FOR STATION      E1A
                                  RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA

  20 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .08

  13 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
                18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                 8.        5.        4.        2.        2.        1.        1.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  21 KP        PLAN  3 FOR STATION      E1A
                                  RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA

  23 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .08

  13 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
                18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                 8.        5.        4.        2.        2.        1.        1.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  24 KP        PLAN  4 FOR STATION      E1A
                                  RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA
```

```
 12 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .08  SUBBASIN AREA

                PRECIPITATION DATA

 26 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .08

 13 LS          SCS LOSS RATE
                      STRTL         .27  INITIAL ABSTRACTION
                     CRVNBR       88.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 14 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
               18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                8.        5.        4.        2.        2.        1.        1.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 27 KP        PLAN  5 FOR STATION      E1A
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 12 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .08  SUBBASIN AREA

                PRECIPITATION DATA

 29 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .08

 13 LS          SCS LOSS RATE
                      STRTL         .27  INITIAL ABSTRACTION
                     CRVNBR       88.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 14 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
               18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                8.        5.        4.        2.        2.        1.        1.        0.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 30 KK      *       E1B  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 31 KP        PLAN  1 FOR STATION      E1B
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA
```

```
 32 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .10  SUBBASIN AREA

                PRECIPITATION DATA

 37 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .10

 33 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 34 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .32  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
               18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
               16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 38 KP        PLAN  2 FOR STATION      E1B
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 32 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .10  SUBBASIN AREA

                PRECIPITATION DATA

 40 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .10

 33 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 34 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .32  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
               18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
               16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 41 KP        PLAN  3 FOR STATION      E1B
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 32 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .10  SUBBASIN AREA

                PRECIPITATION DATA

 43 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00
```

```
                                                STORM AREA =     .10

  33 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  34 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .32  LAG

                                                     ***

                                                UNIT HYDROGRAPH
                                            21 END-OF-PERIOD ORDINATES
                18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
                16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                 0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  44 KP        PLAN  4 FOR STATION      E1B
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  32 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .10  SUBBASIN AREA

                 PRECIPITATION DATA

  46 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .10

  33 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  34 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .32  LAG

                                                     ***

                                                UNIT HYDROGRAPH
                                            21 END-OF-PERIOD ORDINATES
                18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
                16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                 0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  47 KP        PLAN  5 FOR STATION      E1B
                                RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  32 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .10  SUBBASIN AREA

                 PRECIPITATION DATA

  49 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .10

  33 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  34 UD          SCS DIMENSIONLESS UNITGRAPH
```

```
                    TLAG         .32  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                              21 END-OF-PERIOD ORDINATES
              18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
              16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
               0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
  50 KK    *       E1C  *
           *            *
           **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  51 KP        PLAN  1 FOR STATION      E1C
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  57 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .02  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                               5 END-OF-PERIOD ORDINATES
              63.       18.        3.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  58 KP        PLAN  2 FOR STATION      E1C
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  60 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
```

```
                TLAG         .02  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            5 END-OF-PERIOD ORDINATES
          63.       18.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  61 KP        PLAN  3 FOR STATION      E1C
                                RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  63 PH                             DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .02  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            5 END-OF-PERIOD ORDINATES
          63.       18.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  64 KP        PLAN  4 FOR STATION      E1C
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  66 PH                             DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .02  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            5 END-OF-PERIOD ORDINATES
          63.       18.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  67 KP        PLAN  5 FOR STATION      E1C
                                RUNOFF COMPUTATION 100-YRS STORM IN BASIN
```

```
              SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  69 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                   STORM AREA =     .01

  53 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .02  LAG

                                                                  ***

                                                              UNIT HYDROGRAPH
                                                          5 END-OF-PERIOD ORDINATES
               63.       18.        3.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  70 KK     *     COMB1  *
            *            *
            **************

  71 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  72 KK     *     COMB2  *
            *            *
            **************

  73 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  74 KK     *        P1  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  75 KP        PLAN  1 FOR STATION       P1
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

  76 BA          SUBBASIN CHARACTERISTICS
```

```
                    TAREA         .11  SUBBASIN AREA

              PRECIPITATION DATA

  81 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
              ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
              5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .11

  77 LS       SCS LOSS RATE
                    STRTL         .25  INITIAL ABSTRACTION
                   CRVNBR       89.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

  78 UD       SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
             26.       86.      154.      169.      147.      104.       65.       43.       28.       18.
             12.        8.        5.        3.        2.        2.        1.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  82 KP     PLAN  2 FOR STATION       P1
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

            SUBBASIN RUNOFF DATA

  76 BA       SUBBASIN CHARACTERISTICS
                    TAREA         .11  SUBBASIN AREA

              PRECIPITATION DATA

  84 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
              ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
              5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .11

  77 LS       SCS LOSS RATE
                    STRTL         .25  INITIAL ABSTRACTION
                   CRVNBR       89.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

  78 UD       SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
             26.       86.      154.      169.      147.      104.       65.       43.       28.       18.
             12.        8.        5.        3.        2.        2.        1.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  85 KP     PLAN  3 FOR STATION       P1
                                RUNOFF COMPUTATION 25-YRS STORM IN BASIN

            SUBBASIN RUNOFF DATA

  76 BA       SUBBASIN CHARACTERISTICS
                    TAREA         .11  SUBBASIN AREA

              PRECIPITATION DATA

  87 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
              ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
              5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .11
```

```
 77 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 78 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                           19 END-OF-PERIOD ORDINATES
                26.       86.      154.      169.      147.      104.       65.       43.       28.       18.
                12.        8.        5.        3.        2.        2.        1.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 88 KP        PLAN  4 FOR STATION       P1
                                 RUNOFF COMPUTATION 50-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 76 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .11  SUBBASIN AREA

                PRECIPITATION DATA

 90 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .11

 77 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 78 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                           19 END-OF-PERIOD ORDINATES
                26.       86.      154.      169.      147.      104.       65.       43.       28.       18.
                12.        8.        5.        3.        2.        2.        1.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 91 KP        PLAN  5 FOR STATION       P1
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 76 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .11  SUBBASIN AREA

                PRECIPITATION DATA

 93 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .11

 77 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 78 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                    ***

                                                UNIT HYDROGRAPH
```

```
                                                  19 END-OF-PERIOD ORDINATES
               26.       86.      154.      169.      147.      104.       65.       43.       28.       18.
               12.        8.        5.        3.        2.        2.        1.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  94 KK     *     COMB3  *
            *            *
            **************

  95 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                 ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  96 KK     *        E2  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  97 KP        PLAN  1 FOR STATION       E2
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  98 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .24  SUBBASIN AREA

                 PRECIPITATION DATA

 103 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                   STORM AREA =     .24

  99 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 100 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .31  LAG

                                                                 ***

                                                      UNIT HYDROGRAPH
                                                  21 END-OF-PERIOD ORDINATES
               43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
               34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 104 KP        PLAN  2 FOR STATION       E2
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  98 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .24  SUBBASIN AREA

                 PRECIPITATION DATA

 106 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
```

```
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .24

  99 LS           SCS LOSS RATE
                        STRTL         .27  INITIAL ABSTRACTION
                       CRVNBR       88.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 100 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .31  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                 34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                  0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 107 KP        PLAN  3 FOR STATION       E2
                                  RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  98 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .24  SUBBASIN AREA

                  PRECIPITATION DATA

 109 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .24

  99 LS           SCS LOSS RATE
                        STRTL         .27  INITIAL ABSTRACTION
                       CRVNBR       88.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 100 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .31  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                 34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                  0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 110 KP        PLAN  4 FOR STATION       E2
                                  RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  98 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .24  SUBBASIN AREA

                  PRECIPITATION DATA

 112 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .24

  99 LS           SCS LOSS RATE
                        STRTL         .27  INITIAL ABSTRACTION
                       CRVNBR       88.00  CURVE NUMBER
```

```
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 100 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG         .31  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                           21 END-OF-PERIOD ORDINATES
               43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
               34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 113 KP        PLAN  5 FOR STATION       E2
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  98 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .24  SUBBASIN AREA

                 PRECIPITATION DATA

 115 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .24

  99 LS          SCS LOSS RATE
                      STRTL         .27  INITIAL ABSTRACTION
                     CRVNBR       88.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 100 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG         .31  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                           21 END-OF-PERIOD ORDINATES
               43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
               34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 116 KK     *        P2  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 117 KP        PLAN  1 FOR STATION       P2
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 118 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .11  SUBBASIN AREA

                 PRECIPITATION DATA

 123 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .11

 119 LS          SCS LOSS RATE
```

```
                    STRTL         .30  INITIAL ABSTRACTION
                   CRVNBR       87.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 120 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .31  LAG

                                                   ***

                                                UNIT HYDROGRAPH
                                            20 END-OF-PERIOD ORDINATES
               20.       66.      126.      149.      139.      110.       71.       48.       33.       22.
               15.       10.        7.        5.        3.        2.        1.        1.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 124 KP        PLAN  2 FOR STATION       P2
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 118 BA          SUBBASIN CHARACTERISTICS
                    TAREA         .11  SUBBASIN AREA

                 PRECIPITATION DATA

 126 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .11

 119 LS          SCS LOSS RATE
                    STRTL         .30  INITIAL ABSTRACTION
                   CRVNBR       87.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 120 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .31  LAG

                                                   ***

                                                UNIT HYDROGRAPH
                                            20 END-OF-PERIOD ORDINATES
               20.       66.      126.      149.      139.      110.       71.       48.       33.       22.
               15.       10.        7.        5.        3.        2.        1.        1.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 127 KP        PLAN  3 FOR STATION       P2
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 118 BA          SUBBASIN CHARACTERISTICS
                    TAREA         .11  SUBBASIN AREA

                 PRECIPITATION DATA

 129 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .11

 119 LS          SCS LOSS RATE
                    STRTL         .30  INITIAL ABSTRACTION
                   CRVNBR       87.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 120 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .31  LAG

                                                   ***

                                                UNIT HYDROGRAPH
                                            20 END-OF-PERIOD ORDINATES
```

```
                20.       66.      126.      149.      139.      110.       71.       48.       33.       22.
                15.       10.        7.        5.        3.        2.        1.        1.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 130 KP        PLAN  4 FOR STATION       P2
                                   RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 118 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .11  SUBBASIN AREA

                 PRECIPITATION DATA

 132 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .11

 119 LS          SCS LOSS RATE
                       STRTL         .30  INITIAL ABSTRACTION
                      CRVNBR       87.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 120 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .31  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 20 END-OF-PERIOD ORDINATES
                20.       66.      126.      149.      139.      110.       71.       48.       33.       22.
                15.       10.        7.        5.        3.        2.        1.        1.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 133 KP        PLAN  5 FOR STATION       P2
                                   RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 118 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .11  SUBBASIN AREA

                 PRECIPITATION DATA

 135 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .11

 119 LS          SCS LOSS RATE
                       STRTL         .30  INITIAL ABSTRACTION
                      CRVNBR       87.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 120 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .31  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 20 END-OF-PERIOD ORDINATES
                20.       66.      126.      149.      139.      110.       71.       48.       33.       22.
                15.       10.        7.        5.        3.        2.        1.        1.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 136 KK     *       E3B  *
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            *            *
            **************

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 137 KP        PLAN  1 FOR STATION      E3B
                                  RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 138 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 143 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .05

 139 LS          SCS LOSS RATE
                       STRTL         .30  INITIAL ABSTRACTION
                      CRVNBR       87.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 140 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .08  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                  7 END-OF-PERIOD ORDINATES
               143.      144.       47.       15.        5.        2.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 144 KP        PLAN  2 FOR STATION      E3B
                                  RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 138 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 146 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .05

 139 LS          SCS LOSS RATE
                       STRTL         .30  INITIAL ABSTRACTION
                      CRVNBR       87.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 140 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .08  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                  7 END-OF-PERIOD ORDINATES
               143.      144.       47.       15.        5.        2.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 147 KP        PLAN  3 FOR STATION      E3B
                                  RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 138 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA
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```
                PRECIPITATION DATA

 149 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .05

 139 LS         SCS LOSS RATE
                      STRTL         .30  INITIAL ABSTRACTION
                     CRVNBR       87.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 140 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .08  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
              143.      144.       47.       15.        5.        2.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 150 KP        PLAN  4 FOR STATION      E3B
                                 RUNOFF COMPUTATION 50-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 138 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .05  SUBBASIN AREA

                PRECIPITATION DATA

 152 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .05

 139 LS         SCS LOSS RATE
                      STRTL         .30  INITIAL ABSTRACTION
                     CRVNBR       87.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 140 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .08  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
              143.      144.       47.       15.        5.        2.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 153 KP        PLAN  5 FOR STATION      E3B
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 138 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .05  SUBBASIN AREA

                PRECIPITATION DATA

 155 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .05

 139 LS         SCS LOSS RATE
                      STRTL         .30  INITIAL ABSTRACTION
                     CRVNBR       87.00  CURVE NUMBER
```

```
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 140 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG         .08  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
              143.      144.       47.       15.        5.        2.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 156 KK    *        P3  *
           *            *
           **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 157 KP        PLAN  1 FOR STATION       P3
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 158 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 163 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .06

 159 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 160 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG         .13  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                10 END-OF-PERIOD ORDINATES
               70.      157.      115.       50.       23.       10.        5.        2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 164 KP        PLAN  2 FOR STATION       P3
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 158 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 166 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .06

 159 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA
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 160 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .13  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            10 END-OF-PERIOD ORDINATES
                70.      157.      115.       50.       23.       10.        5.        2.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 167 KP        PLAN  3 FOR STATION       P3
                                   RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 158 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 169 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .06

 159 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 160 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .13  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            10 END-OF-PERIOD ORDINATES
                70.      157.      115.       50.       23.       10.        5.        2.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 170 KP        PLAN  4 FOR STATION       P3
                                   RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 158 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 172 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .06

 159 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 160 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .13  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            10 END-OF-PERIOD ORDINATES
                70.      157.      115.       50.       23.       10.        5.        2.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 173 KP        PLAN  5 FOR STATION       P3
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                                RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 158 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 175 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                   STORM AREA =     .06

 159 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 160 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .13  LAG

                                                                 ***

                                                          UNIT HYDROGRAPH
                                                       10 END-OF-PERIOD ORDINATES
               70.      157.      115.       50.       23.       10.        5.        2.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 176 KK    *     COMB4  *
           *            *
           **************

 177 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                 ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 178 KK    *       E3A  *
           *            *
           **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 179 KP        PLAN  1 FOR STATION      E3A
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 180 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 185 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                   STORM AREA =     .31

 181 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA
```

```
 182 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 186 KP        PLAN  2 FOR STATION      E3A
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 180 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 188 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .31

 181 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 182 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 189 KP        PLAN  3 FOR STATION      E3A
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 180 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 191 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .31

 181 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 182 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
```

```
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 192 KP        PLAN  4 FOR STATION      E3A
                                  RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 180 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 194 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                 STORM AREA =     .31

 181 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 182 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 195 KP        PLAN  5 FOR STATION      E3A
                                  RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 180 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 197 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                 STORM AREA =     .31

 181 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 182 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.
1

               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                  FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                 TIME TO PEAK IN HOURS
```

```
                                                                  RATIOS APPLIED TO FLOWS
 OPERATION       STATION     AREA    PLAN            RATIO 1
                                                        1.00

 HYDROGRAPH AT
+                   E1A       .08     1   FLOW         112.
                                          TIME        12.33
                                        2   FLOW         196.
                                          TIME        12.33
                                        3   FLOW         240.
                                          TIME        12.33
                                        4   FLOW         273.
                                          TIME        12.33
                                        5   FLOW         306.
                                          TIME        12.33

 HYDROGRAPH AT
+                   E1B       .10     1   FLOW         144.
                                          TIME        12.33
                                        2   FLOW         251.
                                          TIME        12.33
                                        3   FLOW         307.
                                          TIME        12.33
                                        4   FLOW         348.
                                          TIME        12.33
                                        5   FLOW         391.
                                          TIME        12.33

 HYDROGRAPH AT
+                   E1C       .01     1   FLOW          30.
                                          TIME        12.08
                                        2   FLOW          52.
                                          TIME        12.08
                                        3   FLOW          63.
                                          TIME        12.08
                                        4   FLOW          71.
                                          TIME        12.08
                                        5   FLOW          80.
                                          TIME        12.08

  2 COMBINED AT
+                  COMB1       .11     1   FLOW         154.
                                          TIME        12.33
                                        2   FLOW         268.
                                          TIME        12.33
                                        3   FLOW         327.
                                          TIME        12.33
                                        4   FLOW         371.
                                          TIME        12.33
                                        5   FLOW         417.
                                          TIME        12.33

  2 COMBINED AT
+                  COMB2       .19     1   FLOW         266.
                                          TIME        12.33
                                        2   FLOW         464.
                                          TIME        12.33
                                        3   FLOW         568.
                                          TIME        12.33
                                        4   FLOW         644.
                                          TIME        12.33
                                        5   FLOW         723.
                                          TIME        12.33

 HYDROGRAPH AT
+                    P1       .11     1   FLOW         168.
                                          TIME        12.33
                                        2   FLOW         291.
                                          TIME        12.33
                                        3   FLOW         355.
                                          TIME        12.33
                                        4   FLOW         402.
                                          TIME        12.33
                                        5   FLOW         451.
                                          TIME        12.33

  2 COMBINED AT
+                  COMB3       .30     1   FLOW         434.
                                          TIME        12.33
                                        2   FLOW         755.
                                          TIME        12.33
```

```
                                        3   FLOW         923.
                                            TIME        12.33
                                        4   FLOW        1046.
                                            TIME        12.33
                                        5   FLOW        1175.
                                            TIME        12.33

 HYDROGRAPH AT
+                     E2       .24      1   FLOW         329.
                                            TIME        12.33
                                        2   FLOW         580.
                                            TIME        12.33
                                        3   FLOW         711.
                                            TIME        12.33
                                        4   FLOW         807.
                                            TIME        12.33
                                        5   FLOW         907.
                                            TIME        12.33

 HYDROGRAPH AT
+                     P2       .11      1   FLOW         147.
                                            TIME        12.33
                                        2   FLOW         263.
                                            TIME        12.33
                                        3   FLOW         323.
                                            TIME        12.33
                                        4   FLOW         367.
                                            TIME        12.33
                                        5   FLOW         413.
                                            TIME        12.33

 HYDROGRAPH AT
+                    E3B       .05      1   FLOW          92.
                                            TIME        12.08
                                        2   FLOW         162.
                                            TIME        12.08
                                        3   FLOW         199.
                                            TIME        12.08
                                        4   FLOW         225.
                                            TIME        12.08
                                        5   FLOW         253.
                                            TIME        12.08

 HYDROGRAPH AT
+                     P3       .06      1   FLOW         108.
                                            TIME        12.17
                                        2   FLOW         186.
                                            TIME        12.17
                                        3   FLOW         226.
                                            TIME        12.17
                                        4   FLOW         256.
                                            TIME        12.17
                                        5   FLOW         287.
                                            TIME        12.17

  2 COMBINED AT
+                  COMB4       .10      1   FLOW         195.
                                            TIME        12.17
                                        2   FLOW         338.
                                            TIME        12.17
                                        3   FLOW         412.
                                            TIME        12.17
                                        4   FLOW         467.
                                            TIME        12.17
                                        5   FLOW         524.
                                            TIME        12.17

 HYDROGRAPH AT
+                    E3A       .31      1   FLOW         426.
                                            TIME        12.42
                                        2   FLOW         740.
                                            TIME        12.42
                                        3   FLOW         903.
                                            TIME        12.42
                                        4   FLOW        1024.
                                            TIME        12.42
                                        5   FLOW        1150.
                                            TIME        12.42
```

```
*** NORMAL END OF HEC-1 ***
```

APPENDIX C

HEC-1 RESULTS FOR PROPOSED CONDITION

```
*                                      *                                                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
*            VERSION 4.1               *                                                    *          609 SECOND STREET           *
*  RGMHEC2000                HEC-1.COM *                                                    *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE   17OCT08  TIME  11:48:16  *                                                    *           (916) 756-1104             *
*                                      *                                                    *                                      *
****************************************                                                    ****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID        HYDROLOGIC ANALYSIS
  2           ID        PROJECT:  LOS PALACIOS, HUMACAO, P.R.
  3           ID        TRIANGULAR DISTRIBUTION
  4           ID        FREQUENCY OF OCCURRENCE: 2, 10, 25, 50 AND 100 YEARS
  5           ID        CA ENGINEERING, OCTOBER 2008
  6           ID        PROPOSED CONDITION
  7           IT       5                    289
  8           IO       4
  9           JP       5

 10           KK     E1A
 11           KP       1
 12           BA   0.077
 13           LS       0      88
 14           UD   0.281
 15           IN      15
 16           KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 17           PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 18           KP       2
 19           KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 20           PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 21           KP       3
 22           KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 23           PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 24           KP       4
 25           KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 26           PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 27           KP       5
 28           KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 29           PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

 30           KK     E1B
 31           KP       1
 32           BA   0.102
 33           LS       0      89
 34           UD   0.316
 35           IN      15
 36           KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 37           PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 38           KP       2
 39           KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 40           PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 41           KP       3
 42           KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 43           PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 44           KP       4
 45           KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 46           PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 47           KP       5
 48           KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 49           PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 50           KK     E1C
 51           KP       1
 52           BA   0.011
 53           LS       0      89
 54           UD   0.017
 55           IN      15
 56           KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 57           PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 58           KP       2
 59           KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 60           PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 61           KP       3
 62           KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 63           PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 64           KP       4
 65           KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 66           PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 67           KP       5
 68           KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 69           PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
```

```
 70          KK   COMB1
 71          HC       3

 72          KK    P1B1
 73          KP       1
 74          BA   0.022
 75          LS       0      93
 76          UD   0.088
 77          IN      15
 78          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 79          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 80          KP       2
 81          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 82          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 83          KP       3
 84          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 85          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 86          KP       4
 87          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 88          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 89          KP       5
 90          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 91          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

 92          KK    P1B2
 93          KP       1
 94          BA   0.082
 95          LS       0      93
 96          UD   0.287
 97          IN      15
 98          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 99          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
100          KP       2
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

101          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
102          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
103          KP       3
104          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
105          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
106          KP       4
107          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
108          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
109          KP       5
110          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
111          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

112          KK   COMB2
113          HC       2

114          KK     P1A
115          KP       1
116          BA   0.038
117          LS       0      93
118          UD   0.275
119          IN      15
120          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
121          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
122          KP       2
123          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
124          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
125          KP       3
126          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
127          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
128          KP       4
129          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
130          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
131          KP       5
132          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
133          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

134          KK   COMB3
135          HC       2

136          KK   COMB4
137          HC       2

138          KK      E2
139          KP       1
```

```
 140          BA   0.236
 141          LS       0      88
 142          UD   0.310
 143          IN      15
 144          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 145          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 146          KP       2
 147          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 148          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 149          KP       3
 150          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
1                                          HEC-1 INPUT                                          PAGE  4

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 151          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 152          KP       4
 153          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 154          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 155          KP       5
 156          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 157          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

 158          KK     P2A
 159          KP       1
 160          BA   0.025
 161          LS       0      93
 162          UD   0.102
 163          IN      15
 164          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 165          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 166          KP       2
 167          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 168          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 169          KP       3
 170          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 171          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 172          KP       4
 173          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 174          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 175          KP       5
 176          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 177          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

 178          KK     P2B
 179          KP       1
 180          BA   0.049
 181          LS       0      93
 182          UD   0.101
 183          IN      15
 184          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 185          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 186          KP       2
 187          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 188          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 189          KP       3
 190          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 191          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 192          KP       4
 193          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 194          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 195          KP       5
 196          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 197          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
1                                          HEC-1 INPUT                                          PAGE  5

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 198          KK   COMB5
 199          HC       2

 200          KK     E3B
 201          KP       1
 202          BA   0.046
 203          LS       0      87
 204          UD   0.080
 205          IN      15
 206          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 207          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 208          KP       2
```

```
          209          KM          RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          210          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          211          KP       3
          212          KM          RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          213          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          214          KP       4
          215          KM          RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          216          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          217          KP       5
          218          KM          RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          219          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

          220          KK      P3
          221          KP       1
          222          BA   0.059
          223          LS       0      93
          224          UD   0.295
          225          IN      15
          226          KM          RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          227          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          228          KP       2
          229          KM          RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          230          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          231          KP       3
          232          KM          RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          233          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          234          KP       4
          235          KM          RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          236          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          237          KP       5
          238          KM          RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          239          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

          240          KK   COMB6
          241          HC       2

          242          KK     E3A
          243          KP       1
          244          BA   0.311
          245          LS       0      89
          246          UD   0.346
          247          IN      15
1                                          HEC-1 INPUT                                          PAGE  6

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          248          KM          RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          249          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          250          KP       2
          251          KM          RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          252          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          253          KP       3
          254          KM          RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          255          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          256          KP       4
          257          KM          RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          258          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          259          KP       5
          260          KM          RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          261          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
          262          ZZ
1****************************************                                                  ****************************************
 *                                      *                                                  *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                  *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                                                  *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                                  *          609 SECOND STREET           *
 *  RGMHEC2000               HEC-1.COM  *                                                  *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   17OCT08  TIME  11:48:16  *                                                  *           (916) 756-1104             *
 *                                      *                                                  *                                      *
 ****************************************                                                  ****************************************


                                 HYDROLOGIC ANALYSIS
                                 PROJECT:  LOS PALACIOS, HUMACAO, P.R.
                                 TRIANGULAR DISTRIBUTION
                                 FREQUENCY OF OCCURRENCE: 2, 10, 25, 50 AND 100 YEARS
                                 CA ENGINEERING, OCTOBER 2008
                                 PROPOSED CONDITION
```

```
  8 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           4  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         289  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME        0000  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   24.00 HOURS

         ENGLISH UNITS
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT

    JP          MULTI-PLAN OPTION
                      NPLAN           5  NUMBER OF PLANS

    JR          MULTI-RATIO OPTION
                    RATIOS OF RUNOFF
                   1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 10 KK     *       E1A  *
           *            *
           **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 11 KP        PLAN  1 FOR STATION      E1A
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 12 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .08  SUBBASIN AREA

                PRECIPITATION DATA

 17 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .08

 13 LS          SCS LOSS RATE
                      STRTL         .27  INITIAL ABSTRACTION
                     CRVNBR       88.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 14 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
               18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                8.        5.        4.        2.        2.        1.        1.        0.        0.
```

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***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  18 KP        PLAN  2 FOR STATION      E1A
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA

  20 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .08

  13 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
                18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                 8.        5.        4.        2.        2.        1.        1.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  21 KP        PLAN  3 FOR STATION      E1A
                                RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA

  23 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .08

  13 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
                18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                 8.        5.        4.        2.        2.        1.        1.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  24 KP        PLAN  4 FOR STATION      E1A
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA
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```
 26 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .08

 13 LS           SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 14 UD           SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                                ***

                                                          UNIT HYDROGRAPH
                                                     19 END-OF-PERIOD ORDINATES
                18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                 8.        5.        4.        2.        2.        1.        1.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 27 KP        PLAN  5 FOR STATION      E1A
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                PRECIPITATION DATA

 29 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .08

 13 LS           SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 14 UD           SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                                ***

                                                          UNIT HYDROGRAPH
                                                     19 END-OF-PERIOD ORDINATES
                18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                 8.        5.        4.        2.        2.        1.        1.        0.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 30 KK      *       E1B  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 31 KP        PLAN  1 FOR STATION      E1B
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 32 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .10  SUBBASIN AREA

                PRECIPITATION DATA
```

```
 37 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .10

 33 LS           SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 34 UD           SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .32  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
                 16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                  0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 38 KP         PLAN  2 FOR STATION      E1B
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 32 BA           SUBBASIN CHARACTERISTICS
                       TAREA         .10  SUBBASIN AREA

                 PRECIPITATION DATA

 40 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .10

 33 LS           SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 34 UD           SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .32  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
                 16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                  0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 41 KP         PLAN  3 FOR STATION      E1B
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 32 BA           SUBBASIN CHARACTERISTICS
                       TAREA         .10  SUBBASIN AREA

                 PRECIPITATION DATA

 43 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .10

 33 LS           SCS LOSS RATE
```

```
                    STRTL         .25  INITIAL ABSTRACTION
                   CRVNBR       89.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

  34 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .32  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            21 END-OF-PERIOD ORDINATES
               18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
               16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  44 KP        PLAN  4 FOR STATION      E1B
                                 RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  32 BA          SUBBASIN CHARACTERISTICS
                    TAREA         .10  SUBBASIN AREA

                 PRECIPITATION DATA

  46 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .10

  33 LS          SCS LOSS RATE
                    STRTL         .25  INITIAL ABSTRACTION
                   CRVNBR       89.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

  34 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .32  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            21 END-OF-PERIOD ORDINATES
               18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
               16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  47 KP        PLAN  5 FOR STATION      E1B
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  32 BA          SUBBASIN CHARACTERISTICS
                    TAREA         .10  SUBBASIN AREA

                 PRECIPITATION DATA

  49 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .10

  33 LS          SCS LOSS RATE
                    STRTL         .25  INITIAL ABSTRACTION
                   CRVNBR       89.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

  34 UD          SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .32  LAG

                                                    ***
```

```
                                                UNIT HYDROGRAPH
                                            21 END-OF-PERIOD ORDINATES
              18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
              16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
               0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
  50 KK    *       E1C  *
           *            *
           **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  51 KP        PLAN  1 FOR STATION      E1C
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  57 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .02  LAG

                                                          ***

                                                UNIT HYDROGRAPH
                                             5 END-OF-PERIOD ORDINATES
              63.       18.        3.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  58 KP        PLAN  2 FOR STATION      E1C
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  60 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .02  LAG

                                                          ***
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                                                    UNIT HYDROGRAPH
                                                 5 END-OF-PERIOD ORDINATES
                63.       18.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  61 KP        PLAN  3 FOR STATION      E1C
                                  RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  63 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .02  LAG

                                                          ***

                                                    UNIT HYDROGRAPH
                                                 5 END-OF-PERIOD ORDINATES
                63.       18.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  64 KP        PLAN  4 FOR STATION      E1C
                                  RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  66 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .02  LAG

                                                          ***

                                                    UNIT HYDROGRAPH
                                                 5 END-OF-PERIOD ORDINATES
                63.       18.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  67 KP        PLAN  5 FOR STATION      E1C
                                  RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
```

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                    TAREA         .01  SUBBASIN AREA

               PRECIPITATION DATA

  69 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
               ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
               5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS        SCS LOSS RATE
                    STRTL         .25  INITIAL ABSTRACTION
                   CRVNBR       89.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD        SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .02  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 5 END-OF-PERIOD ORDINATES
              63.       18.        3.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
  70 KK   *     COMB1  *
          *            *
          **************

  71 HC        HYDROGRAPH COMBINATION
                    ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
  72 KK   *      P1B1  *
          *            *
          **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  73 KP       PLAN  1 FOR STATION     P1B1
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

  74 BA        SUBBASIN CHARACTERISTICS
                    TAREA         .02  SUBBASIN AREA

               PRECIPITATION DATA

  79 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
               ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
               5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .02

  75 LS        SCS LOSS RATE
                    STRTL         .15  INITIAL ABSTRACTION
                   CRVNBR       93.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

  76 UD        SCS DIMENSIONLESS UNITGRAPH
                     TLAG         .09  LAG

                                                          ***
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                                                    UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
                59.       71.       26.        9.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  80 KP        PLAN  2 FOR STATION     P1B1
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  74 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

  82 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .02

  75 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  76 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .09  LAG

                                                          ***

                                                    UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
                59.       71.       26.        9.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  83 KP        PLAN  3 FOR STATION     P1B1
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  74 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

  85 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .02

  75 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  76 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .09  LAG

                                                          ***

                                                    UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
                59.       71.       26.        9.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  86 KP        PLAN  4 FOR STATION     P1B1
                                 RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA
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 74 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .02  SUBBASIN AREA

                PRECIPITATION DATA

 88 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                   STORM AREA =     .02

 75 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 76 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .09  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
               59.       71.       26.        9.        3.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 89 KP        PLAN  5 FOR STATION     P1B1
                                RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 74 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .02  SUBBASIN AREA

                PRECIPITATION DATA

 91 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                   STORM AREA =     .02

 75 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 76 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .09  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
               59.       71.       26.        9.        3.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 92 KK      *      P1B2  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 93 KP        PLAN  1 FOR STATION     P1B2
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 94 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .08  SUBBASIN AREA
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                PRECIPITATION DATA

  99 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .08

  95 LS         SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

  96 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .29  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
               18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
                9.        6.        4.        3.        2.        1.        1.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 100 KP        PLAN  2 FOR STATION     P1B2
                                   RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  94 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .08  SUBBASIN AREA

                PRECIPITATION DATA

 102 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .08

  95 LS         SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

  96 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .29  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
               18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
                9.        6.        4.        3.        2.        1.        1.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 103 KP        PLAN  3 FOR STATION     P1B2
                                   RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  94 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .08  SUBBASIN AREA

                PRECIPITATION DATA

 105 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .08

  95 LS         SCS LOSS RATE
```

```
                    STRTL         .15  INITIAL ABSTRACTION
                   CRVNBR       93.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 96 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG         .29  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            19 END-OF-PERIOD ORDINATES
              18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
               9.        6.        4.        3.        2.        1.        1.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 106 KP       PLAN  4 FOR STATION     P1B2
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 94 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .08  SUBBASIN AREA

                PRECIPITATION DATA

 108 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .08

 95 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                   CRVNBR       93.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 96 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG         .29  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            19 END-OF-PERIOD ORDINATES
              18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
               9.        6.        4.        3.        2.        1.        1.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 109 KP       PLAN  5 FOR STATION     P1B2
                                RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 94 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .08  SUBBASIN AREA

                PRECIPITATION DATA

 111 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .08

 95 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                   CRVNBR       93.00  CURVE NUMBER
                    RTIMP         .00  PERCENT IMPERVIOUS AREA

 96 UD          SCS DIMENSIONLESS UNITGRAPH
                      TLAG         .29  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            19 END-OF-PERIOD ORDINATES
```

```
                18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
                 9.        6.        4.        3.        2.        1.        1.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *     COMB2  *
            *            *
            **************

 113 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 114 KK     *       P1A  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 115 KP        PLAN  1 FOR STATION      P1A
                                  RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 116 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

 121 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                   STORM AREA =     .04

 117 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 118 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                                  ***

                                                          UNIT HYDROGRAPH
                                                     18 END-OF-PERIOD ORDINATES
                 9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                 4.        3.        2.        1.        1.        0.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 122 KP        PLAN  2 FOR STATION      P1A
                                  RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 116 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

 124 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
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                .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .04

 117 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 118 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                              18 END-OF-PERIOD ORDINATES
                 9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                 4.        3.        2.        1.        1.        0.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 125 KP        PLAN  3 FOR STATION      P1A
                                RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 116 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

 127 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .04

 117 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 118 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                              18 END-OF-PERIOD ORDINATES
                 9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                 4.        3.        2.        1.        1.        0.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 128 KP        PLAN  4 FOR STATION      P1A
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 116 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

 130 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .04

 117 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 118 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG
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                                                  ***

                                                UNIT HYDROGRAPH
                                            18 END-OF-PERIOD ORDINATES
                 9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                 4.        3.        2.        1.        1.        0.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 131 KP        PLAN  5 FOR STATION      P1A
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 116 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

 133 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .04

 117 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 118 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                  ***

                                                UNIT HYDROGRAPH
                                            18 END-OF-PERIOD ORDINATES
                 9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                 4.        3.        2.        1.        1.        0.        0.        0.

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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            *            *
 134 KK     *     COMB3  *
            *            *
            **************

 135 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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            *            *
 136 KK     *     COMB4  *
            *            *
            **************

 137 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

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            *           *
 138 KK     *        E2 *
            *           *
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***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 139 KP        PLAN  1 FOR STATION       E2
                                  RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 140 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .24  SUBBASIN AREA

                 PRECIPITATION DATA

 145 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .24

 141 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 142 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .31  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                 34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                  0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 146 KP        PLAN  2 FOR STATION       E2
                                  RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 140 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .24  SUBBASIN AREA

                 PRECIPITATION DATA

 148 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .24

 141 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 142 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .31  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                 34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                  0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 149 KP        PLAN  3 FOR STATION       E2
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                                RUNOFF COMPUTATION 25-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 140 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .24  SUBBASIN AREA

                PRECIPITATION DATA

 151 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                  STORM AREA =     .24

 141 LS         SCS LOSS RATE
                      STRTL         .27  INITIAL ABSTRACTION
                     CRVNBR       88.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 142 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .31  LAG

                                                         ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
               43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
               34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 152 KP       PLAN  4 FOR STATION       E2
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 140 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .24  SUBBASIN AREA

                PRECIPITATION DATA

 154 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                  STORM AREA =     .24

 141 LS         SCS LOSS RATE
                      STRTL         .27  INITIAL ABSTRACTION
                     CRVNBR       88.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 142 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .31  LAG

                                                         ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
               43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
               34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 155 KP       PLAN  5 FOR STATION       E2
                                RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 140 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .24  SUBBASIN AREA

                PRECIPITATION DATA
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 157 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .24

 141 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 142 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .31  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                 0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


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            *            *
 158 KK     *       P2A  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 159 KP        PLAN  1 FOR STATION      P2A
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 160 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

 165 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .03

 161 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 162 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .10  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                  8 END-OF-PERIOD ORDINATES
                53.       81.       37.       14.        6.        2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 166 KP        PLAN  2 FOR STATION      P2A
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 160 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA
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168 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .03

161 LS           SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

162 UD           SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .10  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 8 END-OF-PERIOD ORDINATES
                53.       81.       37.       14.        6.        2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

169 KP         PLAN  3 FOR STATION      P2A
                                  RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

160 BA           SUBBASIN CHARACTERISTICS
                       TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

171 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .03

161 LS           SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

162 UD           SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .10  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 8 END-OF-PERIOD ORDINATES
                53.       81.       37.       14.        6.        2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

172 KP         PLAN  4 FOR STATION      P2A
                                  RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

160 BA           SUBBASIN CHARACTERISTICS
                       TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

174 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .03

161 LS           SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

162 UD           SCS DIMENSIONLESS UNITGRAPH
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```
                TLAG         .10  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            8 END-OF-PERIOD ORDINATES
        53.       81.       37.       14.        6.        2.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 175 KP        PLAN  5 FOR STATION      P2A
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 160 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

 177 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .03

 161 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 162 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .10  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            8 END-OF-PERIOD ORDINATES
        53.       81.       37.       14.        6.        2.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 178 KK     *       P2B  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 179 KP        PLAN  1 FOR STATION      P2B
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 180 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 185 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .05

 181 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 182 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .10  LAG
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                                                  ***

                                                UNIT HYDROGRAPH
                                            8 END-OF-PERIOD ORDINATES
                105.      159.       71.       28.       11.        4.        2.        1.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 186 KP         PLAN  2 FOR STATION      P2B
                                     RUNOFF COMPUTATION 10-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

 180 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .05  SUBBASIN AREA

                  PRECIPITATION DATA

 188 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .05

 181 LS           SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 182 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .10  LAG

                                                  ***

                                                UNIT HYDROGRAPH
                                            8 END-OF-PERIOD ORDINATES
                105.      159.       71.       28.       11.        4.        2.        1.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 189 KP         PLAN  3 FOR STATION      P2B
                                     RUNOFF COMPUTATION 25-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

 180 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .05  SUBBASIN AREA

                  PRECIPITATION DATA

 191 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .05

 181 LS           SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 182 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .10  LAG

                                                  ***

                                                UNIT HYDROGRAPH
                                            8 END-OF-PERIOD ORDINATES
                105.      159.       71.       28.       11.        4.        2.        1.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 192 KP         PLAN  4 FOR STATION      P2B
                                     RUNOFF COMPUTATION 50-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA
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 180 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 194 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .05

 181 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 182 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .10  LAG

                                                              ***

                                                         UNIT HYDROGRAPH
                                                     8 END-OF-PERIOD ORDINATES
               105.      159.       71.       28.       11.        4.        2.        1.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 195 KP        PLAN  5 FOR STATION      P2B
                                  RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 180 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 197 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .05

 181 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 182 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .10  LAG

                                                              ***

                                                         UNIT HYDROGRAPH
                                                     8 END-OF-PERIOD ORDINATES
               105.      159.       71.       28.       11.        4.        2.        1.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 198 KK     *     COMB5  *
            *            *
            **************

 199 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                              ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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            **************
            *            *
 200 KK     *       E3B  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 201 KP        PLAN  1 FOR STATION      E3B
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 202 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 207 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                 STORM AREA =     .05

 203 LS          SCS LOSS RATE
                       STRTL         .30  INITIAL ABSTRACTION
                      CRVNBR       87.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 204 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .08  LAG

                                                            ***

                                                        UNIT HYDROGRAPH
                                                    7 END-OF-PERIOD ORDINATES
               143.      144.       47.       15.        5.        2.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 208 KP        PLAN  2 FOR STATION      E3B
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 202 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 210 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                 STORM AREA =     .05

 203 LS          SCS LOSS RATE
                       STRTL         .30  INITIAL ABSTRACTION
                      CRVNBR       87.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 204 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .08  LAG

                                                            ***

                                                        UNIT HYDROGRAPH
                                                    7 END-OF-PERIOD ORDINATES
               143.      144.       47.       15.        5.        2.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 211 KP        PLAN  3 FOR STATION      E3B
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN
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                SUBBASIN RUNOFF DATA

 202 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .05  SUBBASIN AREA

                  PRECIPITATION DATA

 213 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .05

 203 LS           SCS LOSS RATE
                        STRTL         .30  INITIAL ABSTRACTION
                       CRVNBR       87.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 204 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .08  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                  7 END-OF-PERIOD ORDINATES
                143.      144.       47.       15.        5.        2.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 214 KP         PLAN  4 FOR STATION      E3B
                                     RUNOFF COMPUTATION 50-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

 202 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .05  SUBBASIN AREA

                  PRECIPITATION DATA

 216 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .05

 203 LS           SCS LOSS RATE
                        STRTL         .30  INITIAL ABSTRACTION
                       CRVNBR       87.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 204 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .08  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                  7 END-OF-PERIOD ORDINATES
                143.      144.       47.       15.        5.        2.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 217 KP         PLAN  5 FOR STATION      E3B
                                     RUNOFF COMPUTATION 100-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

 202 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .05  SUBBASIN AREA

                  PRECIPITATION DATA

 219 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .05
```

```
 203 LS          SCS LOSS RATE
                       STRTL         .30  INITIAL ABSTRACTION
                      CRVNBR       87.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 204 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .08  LAG

                                                          ***

                                                   UNIT HYDROGRAPH
                                             7 END-OF-PERIOD ORDINATES
               143.      144.       47.       15.        5.        2.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 220 KK     *        P3  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 221 KP        PLAN  1 FOR STATION       P3
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 222 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 227 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .06

 223 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 224 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .29  LAG

                                                          ***

                                                   UNIT HYDROGRAPH
                                            20 END-OF-PERIOD ORDINATES
                12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                 8.        5.        3.        2.        1.        1.        1.        0.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 228 KP        PLAN  2 FOR STATION       P3
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 222 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 230 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .06
```

```
 223 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 224 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .29  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                             20 END-OF-PERIOD ORDINATES
                12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                 8.        5.        3.        2.        1.        1.        1.        0.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 231 KP        PLAN  3 FOR STATION       P3
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 222 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 233 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .06

 223 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 224 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .29  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                             20 END-OF-PERIOD ORDINATES
                12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                 8.        5.        3.        2.        1.        1.        1.        0.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 234 KP        PLAN  4 FOR STATION       P3
                                 RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 222 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 236 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .06

 223 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 224 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .29  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
```

```
                                                  20 END-OF-PERIOD ORDINATES
                12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                 8.        5.        3.        2.        1.        1.        1.        0.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 237 KP        PLAN  5 FOR STATION       P3
                                  RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 222 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 239 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                     STORM AREA =     .06

 223 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 224 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .29  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                  20 END-OF-PERIOD ORDINATES
                12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                 8.        5.        3.        2.        1.        1.        1.        0.        0.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 240 KK     *     COMB6  *
            *            *
            **************

 241 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                          ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 242 KK     *       E3A  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 243 KP        PLAN  1 FOR STATION      E3A
                                  RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 244 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 249 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
```

```
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .31

 245 LS         SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 246 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 250 KP        PLAN  2 FOR STATION      E3A
                                   RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 244 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .31  SUBBASIN AREA

                PRECIPITATION DATA

 252 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .31

 245 LS         SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 246 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 253 KP        PLAN  3 FOR STATION      E3A
                                   RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 244 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .31  SUBBASIN AREA

                PRECIPITATION DATA

 255 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .31

 245 LS         SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA
```

```
 246 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 256 KP        PLAN  4 FOR STATION      E3A
                                 RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 244 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 258 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .31

 245 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 246 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 259 KP        PLAN  5 FOR STATION      E3A
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 244 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 261 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .31

 245 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 246 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
```

```
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.
1

              PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                          TIME TO PEAK IN HOURS


                                                                  RATIOS APPLIED TO FLOWS
 OPERATION       STATION     AREA    PLAN            RATIO 1
                                                        1.00

 HYDROGRAPH AT
+                    E1A       .08     1   FLOW         112.
                                             TIME       12.33
                                         2   FLOW         196.
                                             TIME       12.33
                                         3   FLOW         240.
                                             TIME       12.33
                                         4   FLOW         273.
                                             TIME       12.33
                                         5   FLOW         306.
                                             TIME       12.33

 HYDROGRAPH AT
+                    E1B       .10     1   FLOW         144.
                                             TIME       12.33
                                         2   FLOW         251.
                                             TIME       12.33
                                         3   FLOW         307.
                                             TIME       12.33
                                         4   FLOW         348.
                                             TIME       12.33
                                         5   FLOW         391.
                                             TIME       12.33

 HYDROGRAPH AT
+                    E1C       .01     1   FLOW          30.
                                             TIME       12.08
                                         2   FLOW          52.
                                             TIME       12.08
                                         3   FLOW          63.
                                             TIME       12.08
                                         4   FLOW          71.
                                             TIME       12.08
                                         5   FLOW          80.
                                             TIME       12.08

  3 COMBINED AT
+                  COMB1       .19     1   FLOW         266.
                                             TIME       12.33
                                         2   FLOW         464.
                                             TIME       12.33
                                         3   FLOW         568.
                                             TIME       12.33
                                         4   FLOW         644.
                                             TIME       12.33
                                         5   FLOW         723.
                                             TIME       12.33

 HYDROGRAPH AT
+                   P1B1       .02     1   FLOW          47.
                                             TIME       12.17
                                         2   FLOW          77.
                                             TIME       12.17
                                         3   FLOW          93.
                                             TIME       12.17
                                         4   FLOW         105.
                                             TIME       12.17
                                         5   FLOW         117.
                                             TIME       12.17

 HYDROGRAPH AT
+                   P1B2       .08     1   FLOW         130.
                                             TIME       12.33
                                         2   FLOW         215.
                                             TIME       12.33
                                         3   FLOW         260.
                                             TIME       12.33
                                         4   FLOW         293.
```

```
                                        TIME        12.33
                                    5   FLOW         328.
                                        TIME        12.33

  2 COMBINED AT
+                  COMB2       .10     1   FLOW         159.
                                         TIME        12.25
                                    2   FLOW         263.
                                         TIME        12.25
                                    3   FLOW         318.
                                         TIME        12.25
                                    4   FLOW         359.
                                         TIME        12.25
                                    5   FLOW         402.
                                         TIME        12.25

 HYDROGRAPH AT
+                    P1A       .04     1   FLOW          61.
                                         TIME        12.33
                                    2   FLOW         101.
                                         TIME        12.33
                                    3   FLOW         122.
                                         TIME        12.33
                                    4   FLOW         138.
                                         TIME        12.33
                                    5   FLOW         154.
                                         TIME        12.33

  2 COMBINED AT
+                  COMB3       .14     1   FLOW         219.
                                         TIME        12.33
                                    2   FLOW         361.
                                         TIME        12.25
                                    3   FLOW         437.
                                         TIME        12.25
                                    4   FLOW         494.
                                         TIME        12.25
                                    5   FLOW         552.
                                         TIME        12.25

  2 COMBINED AT
+                  COMB4       .33     1   FLOW         485.
                                         TIME        12.33
                                    2   FLOW         825.
                                         TIME        12.33
                                    3   FLOW        1003.
                                         TIME        12.33
                                    4   FLOW        1136.
                                         TIME        12.33
                                    5   FLOW        1273.
                                         TIME        12.33

 HYDROGRAPH AT
+                     E2       .24     1   FLOW         329.
                                         TIME        12.33
                                    2   FLOW         580.
                                         TIME        12.33
                                    3   FLOW         711.
                                         TIME        12.33
                                    4   FLOW         807.
                                         TIME        12.33
                                    5   FLOW         907.
                                         TIME        12.33

 HYDROGRAPH AT
+                    P2A       .03     1   FLOW          54.
                                         TIME        12.17
                                    2   FLOW          89.
                                         TIME        12.17
                                    3   FLOW         107.
                                         TIME        12.17
                                    4   FLOW         120.
                                         TIME        12.17
                                    5   FLOW         135.
                                         TIME        12.17

 HYDROGRAPH AT
+                    P2B       .05     1   FLOW         106.
                                         TIME        12.17
                                    2   FLOW         174.
                                         TIME        12.17
```

```
                                        3   FLOW         209.
                                            TIME        12.17
                                        4   FLOW         236.
                                            TIME        12.17
                                        5   FLOW         264.
                                            TIME        12.17

  2 COMBINED AT
+                   COMB5       .07     1   FLOW         160.
                                            TIME        12.17
                                        2   FLOW         262.
                                            TIME        12.17
                                        3   FLOW         316.
                                            TIME        12.17
                                        4   FLOW         356.
                                            TIME        12.17
                                        5   FLOW         398.
                                            TIME        12.17

 HYDROGRAPH AT
+                     E3B       .05     1   FLOW          92.
                                            TIME        12.08
                                        2   FLOW         162.
                                            TIME        12.08
                                        3   FLOW         199.
                                            TIME        12.08
                                        4   FLOW         225.
                                            TIME        12.08
                                        5   FLOW         253.
                                            TIME        12.08

 HYDROGRAPH AT
+                      P3       .06     1   FLOW          93.
                                            TIME        12.33
                                        2   FLOW         153.
                                            TIME        12.33
                                        3   FLOW         185.
                                            TIME        12.33
                                        4   FLOW         209.
                                            TIME        12.33
                                        5   FLOW         234.
                                            TIME        12.33

  2 COMBINED AT
+                   COMB6       .11     1   FLOW         160.
                                            TIME        12.17
                                        2   FLOW         275.
                                            TIME        12.17
                                        3   FLOW         336.
                                            TIME        12.17
                                        4   FLOW         380.
                                            TIME        12.17
                                        5   FLOW         427.
                                            TIME        12.17

 HYDROGRAPH AT
+                     E3A       .31     1   FLOW         426.
                                            TIME        12.42
                                        2   FLOW         740.
                                            TIME        12.42
                                        3   FLOW         903.
                                            TIME        12.42
                                        4   FLOW        1024.
                                            TIME        12.42
                                        5   FLOW        1150.
                                            TIME        12.42


 *** NORMAL END OF HEC-1 ***
```

APPENDIX D

DETENTION STRUCTURE VOLUME AND

DISCHARGE TO DEPTH RELATIONS

FLOW & VOLUME vs. DEPTH

P1B2

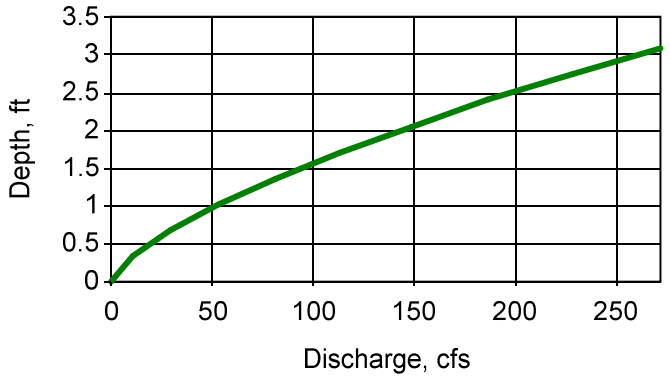
Project: Palacios de Humacao

Location: Humacao

Flow Rating Curve Delta

Structure	Head	m	0	0.1	0.21	0.31	0.42	0.52	0.63	0.73	0.84	0.94
		ft	0	0.34	0.69	1.03	1.37	1.71	2.06	2.4	2.74	3.08
	Invert El (m)		0	0	0	0	0	0	0	0	0	0
Rect	(feet)		0	0	0	0	0	0	0	0	0	0
WEIR	Width (feet)		18	18	18	18	18	18	18	18	18	18
	Cc		0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
	Head above weir (feet)		0	0.34	0.69	1.03	1.37	1.71	2.06	2.4	2.74	3.08
	Flow (cfs)		0	10.09	28.55	52.45	80.75	112.85	148.34	186.93	228.38	272.52
	FLOW SUMMATION (cfs)		0	10.09	28.55	52.45	80.75	112.85	148.34	186.93	228.38	272.52
	Lado A de la Base, ft		340	340	340	340	340	340	340	340	340	340
	Lado B de la Base, ft		0	340	340	340	340	340	340	340	340	340
Rectangular	h (ft)		0	0.34	0.69	1.03	1.37	1.71	2.06	2.4	2.74	3.08
Lagoon	Slope 1:		2	2	2	2	2	2	2	2	2	2
	Area (sq ft)		115600	116534	117471	118412	119357	120306	121258	122215	123175	124138
	(acre)		2.6557	2.6772	2.6987	2.7203	2.7421	2.7638	2.7857	2.8077	2.8297	2.8519
	Volume, acre-ft		0	0.914	1.835	2.763	3.7	4.643	5.594	6.553	7.519	8.493
	Lado A del Tope		340	341.37	342.74	344.11	345.48	346.85	348.22	349.59	350.96	352.33
	Lado B del Tope		340	341.37	342.74	344.11	345.48	346.85	348.22	349.59	350.96	352.33

DEPTH-DISCHARGE CURVE



DEPTH-AREA CURVE

Project: Los Palacios
Humacao, Puerto Rico.
Description: Detention Pond for area P2B

FLOW RATING CURVE		DELTA	**0.2**									
Structure	Head	m	0	**0.2**	**0.4**	**0.6**	**0.8**	**1**	**1.2**	**1.4**	**1.6**	**1.8**
	stage	ft	**0**	**0.656**	**1.312**	**1.968**	**2.624**	**3.28**	**3.936**	**4.592**	**5.248**	**5.904**
30	Diameter (feet)		**2.5**	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
0.7622	Number		**4**	4	4	4	4	4	4	4	4	4
	Head over CL (feet)		-1.25	-0.594	0.062	0.718	1.374	2.03	2.686	3.342	3.998	4.654
ORIF #1	Discharge Coef		**0.61**	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
	Flow (cfs)		0	0	23.9331	81.4453	112.67	136.947	157.5276	175.714	192.187	207.356
	Head over invert (feet)		0	0.656	1.312	1.968	2.624	3.28	3.936	4.592	5.248	5.904
	Velocity (fps)		0	0	4.87561	16.5919	22.952	27.8985	32.09119	35.7961	39.152	42.2421
	Invert El (m)		**1.5**	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	(feet)		4.92	4.92	4.92	4.92	4.92	4.92	4.92	4.92	4.92	4.92
	Diameter (feet)		**2.5**	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	Number		**0**	0	0	0	0	0	0	0	0	0
ORIF #2	Head over CL (feet)		-6.17	-5.514	-4.858	-4.202	-3.546	-2.89	-2.234	-1.578	-0.922	-0.266
	Discharge Coef		**0.61**	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
	Flow (cfs)		0	0	0	0	0	0	0	0	0	0
	Velocity (fps)		0	0	0	0	0	0	0	0	0	0
	Invert El (m)		**15**	15	15	15	15	15	15	15	15	15
	(feet)		49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2
V-notch	ALFA, degres		**90**	90	90	90	90	90	90	90	90	90
	Cc		**0.585**	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585	0.585
	Head over weir (feet)		-49.2	-48.544	-47.888	-47.232	-46.576	-45.92	-45.264	-44.608	-43.952	-43.296
	Flow (cfs)		0	0	0	0	0	0	0	0	0	0
	Invert El (m)		**1.6**	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Rect	(feet)		5.248	5.248	5.248	5.248	5.248	5.248	5.248	5.248	5.248	5.248
WEIR	Width (feet)		**22**	22	22	22	22	22	22	22	22	22
	Cc		**0.66**	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
	Head over weir (feet)		-5.248	-4.592	-3.936	-3.28	-2.624	-1.968	-1.312	-0.656	0	0.656
	Flow (cfs)		0	0	0	0	0	0	0	0	0	32.6888
	FLOW SUMMATION (cfs)		**0**	**0**	**23.9331**	**81.4453**	**112.67**	**136.947**	**157.5276**	**175.714**	**192.187**	**240.045**
RECTANGULAR LAGOON			Area=	1500.08	m2							
45.7317	Lado A de la Base, ft		**150**	150	150	150	150	150	150	150	150	150
32.8018	Lado B de la Base, ft		**107.59**	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59	107.59
	h (ft)		**0**	**0.656**	**1.312**	**1.968**	**2.624**	**3.28**	**3.936**	**4.592**	**5.248**	**5.904**
	Slope 1V:_H		**2**	2	2	2	2	2	2	2	2	2
	Area (sqft)		16139	16821	17518	18228	18952	19690	20442	21207	21986	22779
	(acre)		**0.37**	**0.39**	**0.40**	**0.42**	**0.44**	**0.45**	**0.47**	**0.49**	**0.51**	**0.52**
	Volume, acre-ft		**0.00**	**0.25**	**0.51**	**0.78**	**1.06**	**1.35**	**1.65**	**1.97**	**2.30**	**2.64**
	Lado A del Tope		150	152.624	155.248	157.872	160.5	163.12	165.744	168.368	170.992	173.616
	Lado B del Tope		107.59	110.214	112.838	115.462	118.09	120.71	123.334	125.958	128.582	131.206

APPENDIX E

HEC-1 RESULTS FOR PROPOSED CONDITION WITH MITIGATION

```
*                                      *                                                    *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
*            VERSION 4.1               *                                                    *          609 SECOND STREET           *
*  RGMHEC2000               HEC-1.COM  *                                                    *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE   17OCT08  TIME  11:55:49  *                                                    *           (916) 756-1104             *
*                                      *                                                    *                                      *
****************************************                                                    ****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  1           ID        HYDROLOGIC ANALYSIS
  2           ID        PROJECT:  LOS PALACIOS, HUMACAO, P.R.
  3           ID        TRIANGULAR DISTRIBUTION
  4           ID        FREQUENCY OF OCCURRENCE: 2, 10, 25, 50 AND 100 YEARS
  5           ID        CA ENGINEERING, OCTOBER 2008
  6           ID        PROPOSED CONDITION W/MITIGATION
  7           IT       5                    289
  8           IO       4
  9           JP       5

 10           KK     E1A
 11           KP       1
 12           BA   0.077
 13           LS       0      88
 14           UD   0.281
 15           IN      15
 16           KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 17           PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 18           KP       2
 19           KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 20           PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 21           KP       3
 22           KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 23           PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 24           KP       4
 25           KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 26           PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 27           KP       5
 28           KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 29           PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

 30           KK     E1B
 31           KP       1
 32           BA   0.102
 33           LS       0      89
 34           UD   0.316
 35           IN      15
 36           KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 37           PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 38           KP       2
 39           KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 40           PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 41           KP       3
 42           KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 43           PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 44           KP       4
 45           KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 46           PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 47           KP       5
 48           KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 49           PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 50           KK     E1C
 51           KP       1
 52           BA   0.011
 53           LS       0      89
 54           UD   0.017
 55           IN      15
 56           KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 57           PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 58           KP       2
 59           KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 60           PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 61           KP       3
 62           KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 63           PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 64           KP       4
 65           KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 66           PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 67           KP       5
 68           KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 69           PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
```

```
 70          KK   COMB1
 71          HC       3

 72          KK    P1B1
 73          KP       1
 74          BA   0.022
 75          LS       0      93
 76          UD   0.088
 77          IN      15
 78          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 79          PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
 80          KP       2
 81          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
 82          PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
 83          KP       3
 84          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
 85          PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
 86          KP       4
 87          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
 88          PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
 89          KP       5
 90          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
 91          PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

 92          KK    P1B2
 93          KP       1
 94          BA   0.082
 95          LS       0      93
 96          UD   0.287
 97          IN      15
 98          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
 99          PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
100          KP       2
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

101          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
102          PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
103          KP       3
104          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
105          PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
106          KP       4
107          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
108          PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
109          KP       5
110          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
111          PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

112          KK    POND
113          KM    RUNOFF MITIGATION POND CALCULATION
114          KO    3.00    1.00                  22.00
115          RS    1.00    ELEV    0.00
116          SQ       0   10.09   28.55   52.45   80.75  112.85  148.34  186.93  228.38  272.52
117          SV       0  0.9138  1.8349  2.7635  3.6995  4.6431  5.5942  6.5529  7.5192  8.4932
118          SE       0    0.34    0.69    1.03    1.37    1.71    2.06     2.4    2.74    3.08

119          KK   COMB2
120          HC       2

121          KK     P1A
122          KP       1
123          BA   0.038
124          LS       0      93
125          UD   0.275
126          IN      15
127          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
128          PH                    0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
129          KP       2
130          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
131          PH                    0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
132          KP       3
133          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
134          PH                    0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
135          KP       4
136          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
137          PH                    0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
138          KP       5
139          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
140          PH                    1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
```

```
          141          KK   COMB3
          142          HC       2

          143          KK   COMB4
          144          HC       2
1                                          HEC-1 INPUT                                                PAGE  4

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


          145          KK      E2
          146          KP       1
          147          BA   0.236
          148          LS       0      88
          149          UD   0.310
          150          IN      15
          151          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          152          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          153          KP       2
          154          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          155          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          156          KP       3
          157          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          158          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          159          KP       4
          160          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          161          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          162          KP       5
          163          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          164          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

          165          KK     P2A
          166          KP       1
          167          BA   0.025
          168          LS       0      93
          169          UD   0.102
          170          IN      15
          171          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          172          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          173          KP       2
          174          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          175          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          176          KP       3
          177          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          178          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          179          KP       4
          180          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          181          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          182          KP       5
          183          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          184          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

          185          KK     P2B
          186          KP       1
          187          BA   0.049
          188          LS       0      93
          189          UD   0.101
          190          IN      15
          191          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          192          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          193          KP       2
          194          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          195          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          196          KP       3
1                                          HEC-1 INPUT                                                PAGE  5

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          197          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          198          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          199          KP       4
          200          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          201          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          202          KP       5
          203          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          204          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

          205          KK    POND
          206          KM   RUNOFF MITIGATION POND CALCULATION
          207          KO    3.00    1.00                   22.00
          208          RS    1.00    ELEV    0.00
```

```
          209          SQ    0.00    0.00   23.93   81.45  112.67  136.95  157.53  175.71  192.19  240.04
          210          SV   0.000   0.248   0.507   0.777   1.058   1.350   1.654   1.970   2.299   2.640
          211          SE    0.00    0.66    1.31    1.97    2.62    3.28    3.94    4.59    5.25    5.90

          212          KK   COMB5
          213          HC       2

          214          KK     E3B
          215          KP       1
          216          BA   0.046
          217          LS       0      87
          218          UD   0.080
          219          IN      15
          220          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          221          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          222          KP       2
          223          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          224          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          225          KP       3
          226          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          227          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          228          KP       4
          229          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          230          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          231          KP       5
          232          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          233          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

          234          KK      P3
          235          KP       1
          236          BA   0.059
          237          LS       0      93
          238          UD   0.295
          239          IN      15
          240          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          241          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          242          KP       2
          243          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          244          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          245          KP       3
          246          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          247          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
1                                                  HEC-1 INPUT                                                PAGE  6

         LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

          248          KP       4
          249          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          250          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          251          KP       5
          252          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          253          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89

          254          KK   COMB6
          255          HC       2

          256          KK     E3A
          257          KP       1
          258          BA   0.311
          259          LS       0      89
          260          UD   0.346
          261          IN      15
          262          KM           RUNOFF COMPUTATION 2-YRS STORM IN BASIN
          263          PH                   0.47    0.82    1.94    2.52    2.82    3.57    4.40    5.20
          264          KP       2
          265          KM           RUNOFF COMPUTATION 10-YRS STORM IN BASIN
          266          PH                   0.74    1.29    3.07    4.30    4.99    6.66    8.38   10.23
          267          KP       3
          268          KM           RUNOFF COMPUTATION 25-YRS STORM IN BASIN
          269          PH                   0.88    1.55    3.68    5.28    6.23    8.51   10.79   13.41
          270          KP       4
          271          KM           RUNOFF COMPUTATION 50-YRS STORM IN BASIN
          272          PH                   0.99    1.74    4.14    6.04    7.21    9.99   12.76   16.03
          273          KP       5
          274          KM           RUNOFF COMPUTATION 100-YRS STORM IN BASIN
          275          PH                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89
          276          ZZ
1*************************************                                          *************************************
 *                                   *                                          *                                   *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                          *    U.S. ARMY CORPS OF ENGINEERS     *
 *               JUN   1998            *                                          *    HYDROLOGIC ENGINEERING CENTER    *
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*           VERSION 4.1                *                                                    *          609 SECOND STREET          *
*  RGMHEC2000               HEC-1.COM   *                                                    *       DAVIS, CALIFORNIA 95616       *
*  RUN DATE   17OCT08  TIME  11:55:49   *                                                    *           (916) 756-1104            *
*                                       *                                                    *                                     *
*****************************************                                                    *****************************************


                                HYDROLOGIC ANALYSIS
                                PROJECT:  LOS PALACIOS, HUMACAO, P.R.
                                TRIANGULAR DISTRIBUTION
                                FREQUENCY OF OCCURRENCE: 2, 10, 25, 50 AND 100 YEARS
                                CA ENGINEERING, OCTOBER 2008
                                PROPOSED CONDITION W/MITIGATION

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           4  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         289  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2    0  ENDING DATE
                      NDTIME        0000  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .08 HOURS
                        TOTAL TIME BASE   24.00 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           5  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF RUNOFF
                    1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  10 KK     *       E1A  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  11 KP        PLAN  1 FOR STATION      E1A
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA

  17 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                 STORM AREA =     .08
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```
  13 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            19 END-OF-PERIOD ORDINATES
                18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                 8.        5.        4.        2.        2.        1.        1.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  18 KP        PLAN  2 FOR STATION      E1A
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA

  20 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .08

  13 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            19 END-OF-PERIOD ORDINATES
                18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                 8.        5.        4.        2.        2.        1.        1.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  21 KP        PLAN  3 FOR STATION      E1A
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA

  23 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .08

  13 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                    ***

                                                UNIT HYDROGRAPH
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                                                  19 END-OF-PERIOD ORDINATES
                 18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                  8.        5.        4.        2.        2.        1.        1.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  24 KP        PLAN  4 FOR STATION      E1A
                                  RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA

  26 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .08

  13 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                  19 END-OF-PERIOD ORDINATES
                 18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                  8.        5.        4.        2.        2.        1.        1.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  27 KP        PLAN  5 FOR STATION      E1A
                                  RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  12 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .08  SUBBASIN AREA

                 PRECIPITATION DATA

  29 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .08

  13 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  14 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .28  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                  19 END-OF-PERIOD ORDINATES
                 18.       58.      104.      115.      100.       72.       44.       30.       20.       13.
                  8.        5.        4.        2.        2.        1.        1.        0.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


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            *            *
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```
 30 KK     *       E1B  *
           *            *
           **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 31 KP        PLAN  1 FOR STATION      E1B
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 32 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .10  SUBBASIN AREA

                PRECIPITATION DATA

 37 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .10

 33 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 34 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .32  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
               18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
               16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 38 KP        PLAN  2 FOR STATION      E1B
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 32 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .10  SUBBASIN AREA

                PRECIPITATION DATA

 40 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .10

 33 LS          SCS LOSS RATE
                      STRTL         .25  INITIAL ABSTRACTION
                     CRVNBR       89.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 34 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .32  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
               18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
               16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 41 KP        PLAN  3 FOR STATION      E1B
                                RUNOFF COMPUTATION 25-YRS STORM IN BASIN
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                SUBBASIN RUNOFF DATA

  32 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .10  SUBBASIN AREA

                  PRECIPITATION DATA

  43 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .10

  33 LS           SCS LOSS RATE
                        STRTL         .25  INITIAL ABSTRACTION
                       CRVNBR       89.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  34 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .32  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
                 16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                  0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  44 KP         PLAN  4 FOR STATION      E1B
                                    RUNOFF COMPUTATION 50-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

  32 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .10  SUBBASIN AREA

                  PRECIPITATION DATA

  46 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .10

  33 LS           SCS LOSS RATE
                        STRTL         .25  INITIAL ABSTRACTION
                       CRVNBR       89.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  34 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .32  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
                 16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                  0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  47 KP         PLAN  5 FOR STATION      E1B
                                    RUNOFF COMPUTATION 100-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

  32 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .10  SUBBASIN AREA

                  PRECIPITATION DATA

  49 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
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                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .10

  33 LS           SCS LOSS RATE
                        STRTL         .25  INITIAL ABSTRACTION
                       CRVNBR       89.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  34 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .32  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                 18.       57.      113.      137.      131.      108.       73.       48.       34.       23.
                 16.       11.        7.        5.        3.        2.        2.        1.        1.        0.
                  0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  50 KK     *       E1C  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  51 KP        PLAN  1 FOR STATION      E1C
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  57 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS           SCS LOSS RATE
                        STRTL         .25  INITIAL ABSTRACTION
                       CRVNBR       89.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .02  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                  5 END-OF-PERIOD ORDINATES
                 63.       18.        3.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  58 KP        PLAN  2 FOR STATION      E1C
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  60 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
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                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS           SCS LOSS RATE
                        STRTL         .25  INITIAL ABSTRACTION
                       CRVNBR       89.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .02  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 5 END-OF-PERIOD ORDINATES
                 63.       18.        3.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  61 KP         PLAN  3 FOR STATION      E1C
                                   RUNOFF COMPUTATION 25-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

  52 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .01  SUBBASIN AREA

                  PRECIPITATION DATA

  63 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS           SCS LOSS RATE
                        STRTL         .25  INITIAL ABSTRACTION
                       CRVNBR       89.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .02  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 5 END-OF-PERIOD ORDINATES
                 63.       18.        3.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  64 KP         PLAN  4 FOR STATION      E1C
                                   RUNOFF COMPUTATION 50-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

  52 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .01  SUBBASIN AREA

                  PRECIPITATION DATA

  66 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS           SCS LOSS RATE
                        STRTL         .25  INITIAL ABSTRACTION
                       CRVNBR       89.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .02  LAG
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                                                  ***

                                                UNIT HYDROGRAPH
                                            5 END-OF-PERIOD ORDINATES
               63.       18.        3.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  67 KP        PLAN  5 FOR STATION      E1C
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  52 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .01  SUBBASIN AREA

                 PRECIPITATION DATA

  69 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .01

  53 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  54 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .02  LAG

                                                  ***

                                                UNIT HYDROGRAPH
                                            5 END-OF-PERIOD ORDINATES
               63.       18.        3.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  70 KK     *     COMB1  *
            *            *
            **************

  71 HC          HYDROGRAPH COMBINATION
                       ICOMP           3  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  72 KK     *      P1B1  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  73 KP        PLAN  1 FOR STATION     P1B1
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

  74 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA
```

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 79 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .02

 75 LS           SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 76 UD           SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .09  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
                59.       71.       26.        9.        3.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 80 KP         PLAN  2 FOR STATION     P1B1
                                  RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 74 BA           SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

 82 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .02

 75 LS           SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 76 UD           SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .09  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
                59.       71.       26.        9.        3.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 83 KP         PLAN  3 FOR STATION     P1B1
                                  RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 74 BA           SUBBASIN CHARACTERISTICS
                       TAREA         .02  SUBBASIN AREA

                 PRECIPITATION DATA

 85 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .02

 75 LS           SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 76 UD           SCS DIMENSIONLESS UNITGRAPH
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```
                TLAG         .09  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            7 END-OF-PERIOD ORDINATES
        59.       71.       26.        9.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 86 KP        PLAN  4 FOR STATION     P1B1
                              RUNOFF COMPUTATION 50-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 74 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .02  SUBBASIN AREA

                PRECIPITATION DATA

 88 PH                            DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .02

 75 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 76 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .09  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            7 END-OF-PERIOD ORDINATES
        59.       71.       26.        9.        3.        1.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 89 KP        PLAN  5 FOR STATION     P1B1
                              RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 74 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .02  SUBBASIN AREA

                PRECIPITATION DATA

 91 PH                            DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .02

 75 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 76 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .09  LAG

                                                    ***

                                                UNIT HYDROGRAPH
                                            7 END-OF-PERIOD ORDINATES
        59.       71.       26.        9.        3.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
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              **************
              *            *
   92 KK      *      P1B2  *
              *            *
              **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

   93 KP        PLAN  1 FOR STATION     P1B2
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

   94 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .08  SUBBASIN AREA

                  PRECIPITATION DATA

   99 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .08

   95 LS          SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

   96 UD          SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .29  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
                 18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
                  9.        6.        4.        3.        2.        1.        1.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  100 KP        PLAN  2 FOR STATION     P1B2
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

   94 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .08  SUBBASIN AREA

                  PRECIPITATION DATA

  102 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .08

   95 LS          SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

   96 UD          SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .29  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
                 18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
                  9.        6.        4.        3.        2.        1.        1.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  103 KP        PLAN  3 FOR STATION     P1B2
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN
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```
                SUBBASIN RUNOFF DATA

  94 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .08  SUBBASIN AREA

                  PRECIPITATION DATA

 105 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .08

  95 LS           SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  96 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .29  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
                 18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
                  9.        6.        4.        3.        2.        1.        1.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 106 KP          PLAN  4 FOR STATION     P1B2
                                   RUNOFF COMPUTATION 50-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

  94 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .08  SUBBASIN AREA

                  PRECIPITATION DATA

 108 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .08

  95 LS           SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  96 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .29  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                 19 END-OF-PERIOD ORDINATES
                 18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
                  9.        6.        4.        3.        2.        1.        1.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 109 KP          PLAN  5 FOR STATION     P1B2
                                   RUNOFF COMPUTATION 100-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

  94 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .08  SUBBASIN AREA

                  PRECIPITATION DATA

 111 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
```

```
                 1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .08

  95 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

  96 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .29  LAG

                                                                ***

                                                        UNIT HYDROGRAPH
                                                   19 END-OF-PERIOD ORDINATES
               18.       58.      107.      121.      107.       79.       49.       33.       22.       14.
                9.        6.        4.        3.        2.        1.        1.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 112 KK     *      POND  *
            *            *
            **************
                            RUNOFF MITIGATION POND CALCULATION

 114 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           1  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
                      IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                       IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                      ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                      ISAV2         289  LAST ORDINATE PUNCHED OR SAVED
                     TIMINT        .083  TIME INTERVAL IN HOURS


               HYDROGRAPH ROUTING DATA

 115 RS          STORAGE ROUTING
                      NSTPS           1  NUMBER OF SUBREACHES
                       ITYP        ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC         .00  INITIAL CONDITION
                          X         .00 WORKING R AND D COEFFICIENT

 117 SV            STORAGE          .0        .9       1.8       2.8       3.7       4.6       5.6       6.6       7.5       8.5


 118 SE          ELEVATION         .00       .34       .69      1.03      1.37      1.71      2.06      2.40      2.74      3.08


 116 SQ          DISCHARGE          0.       10.       29.       52.       81.      113.      148.      187.      228.      273.


                                                                ***

      ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     POND
                            FOR PLAN 1, RATIO = 1.00

 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
                          (CFS)
+      91.     12.58                   29.         10.         10.          10.
                       (INCHES)     3.234       4.311       4.311        4.311
                        (AC-FT)       14.         19.         19.          19.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        4.     12.58                    2.          1.          1.           1.

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR     24.00-HR
```

```
+   (FEET)      (HR)
      1.48     12.58                  .63         .24         .24          .24

                        CUMULATIVE AREA =     .08 SQ MI


 ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

                PLAN  2 INPUT DATA FOR STATION     POND ARE SAME AS FOR PLAN  1

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     POND
                            FOR PLAN 2, RATIO = 1.00

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
                            (CFS)
+     165.     12.58                 56.         20.         20.          20.
                         (INCHES)    6.404       9.182       9.182        9.182
                          (AC-FT)     28.         40.         40.          40.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        6.     12.58                  3.          1.          1.           1.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+   (FEET)      (HR)
      2.20     12.58                 1.03         .45         .45          .45

                        CUMULATIVE AREA =     .08 SQ MI


 ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

                PLAN  3 INPUT DATA FOR STATION     POND ARE SAME AS FOR PLAN  1

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     POND
                            FOR PLAN 3, RATIO = 1.00

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
                            (CFS)
+     203.     12.58                 73.         27.         27.          27.
                         (INCHES)    8.268      12.272      12.272       12.272
                          (AC-FT)     36.         54.         54.          54.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        7.     12.58                  3.          2.          2.           2.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+   (FEET)      (HR)
      2.53     12.58                 1.22         .56         .56          .56

                        CUMULATIVE AREA =     .08 SQ MI


 ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

                PLAN  4 INPUT DATA FOR STATION     POND ARE SAME AS FOR PLAN  1

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     POND
                            FOR PLAN 4, RATIO = 1.00

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
```

```
                          (CFS)
+     233.     12.50                    86.         33.         33.          33.
                        (INCHES)     9.756      14.839      14.839       14.839
                         (AC-FT)       43.         65.         65.          65.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        8.     12.50                     4.          2.          2.           2.

  PEAK STAGE    TIME                         MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR     24.00-HR
+   (FEET)      (HR)
      2.78     12.50                    1.37         .65         .65          .65

                         CUMULATIVE AREA =     .08 SQ MI


 ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

                PLAN  5 INPUT DATA FOR STATION     POND ARE SAME AS FOR PLAN  1

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     POND
                            FOR PLAN 5, RATIO = 1.00

  PEAK FLOW     TIME                         MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
                          (CFS)
+     264.     12.50                   100.         39.         39.          39.
                        (INCHES)    11.332      17.638      17.638       17.638
                         (AC-FT)       50.         77.         77.          77.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        8.     12.50                     4.          2.          2.           2.

  PEAK STAGE    TIME                         MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR     24.00-HR
+   (FEET)      (HR)
      3.02     12.50                    1.52         .74         .74          .74

                         CUMULATIVE AREA =     .08 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  119 KK    *     COMB2  *
            *            *
            **************

  120 HC          HYDROGRAPH COMBINATION
                        ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  121 KK    *       P1A  *
            *            *
            **************


 ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

  122 KP        PLAN  1 FOR STATION      P1A
                                  RUNOFF COMPUTATION 2-YRS STORM IN BASIN
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                SUBBASIN RUNOFF DATA

 123 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .04  SUBBASIN AREA

                  PRECIPITATION DATA

 128 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .04

 124 LS           SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 125 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .28  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                 18 END-OF-PERIOD ORDINATES
                  9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                  4.        3.        2.        1.        1.        0.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 129 KP        PLAN  2 FOR STATION      P1A
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

 123 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .04  SUBBASIN AREA

                  PRECIPITATION DATA

 131 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .04

 124 LS           SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 125 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .28  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                 18 END-OF-PERIOD ORDINATES
                  9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                  4.        3.        2.        1.        1.        0.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 132 KP        PLAN  3 FOR STATION      P1A
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

                SUBBASIN RUNOFF DATA

 123 BA           SUBBASIN CHARACTERISTICS
                        TAREA         .04  SUBBASIN AREA

                  PRECIPITATION DATA

 134 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
```

```
                .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .04

 124 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 125 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                              18 END-OF-PERIOD ORDINATES
                 9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                 4.        3.        2.        1.        1.        0.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 135 KP        PLAN  4 FOR STATION      P1A
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 123 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

 137 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .04

 124 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 125 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                              18 END-OF-PERIOD ORDINATES
                 9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                 4.        3.        2.        1.        1.        0.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 138 KP        PLAN  5 FOR STATION      P1A
                                RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 123 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

 140 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .04

 124 LS          SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 125 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .28  LAG
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                                                  ***

                                              UNIT HYDROGRAPH
                                          18 END-OF-PERIOD ORDINATES
                9.       30.       53.       58.       49.       34.       21.       14.        9.        6.
                4.        3.        2.        1.        1.        0.        0.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 141 KK    *     COMB3  *
           *            *
           **************

 142 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 143 KK    *     COMB4  *
           *            *
           **************

 144 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                  ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 145 KK    *        E2  *
           *            *
           **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 146 KP        PLAN  1 FOR STATION       E2
                                 RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 147 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .24  SUBBASIN AREA

                 PRECIPITATION DATA

 152 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                   STORM AREA =     .24

 148 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 149 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .31  LAG

                                                  ***
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                                                  UNIT HYDROGRAPH
                                              21 END-OF-PERIOD ORDINATES
                43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                 0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 153 KP        PLAN  2 FOR STATION       E2
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 147 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .24  SUBBASIN AREA

                 PRECIPITATION DATA

 155 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .24

 148 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 149 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .31  LAG

                                                          ***

                                                  UNIT HYDROGRAPH
                                              21 END-OF-PERIOD ORDINATES
                43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                 0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 156 KP        PLAN  3 FOR STATION       E2
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 147 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .24  SUBBASIN AREA

                 PRECIPITATION DATA

 158 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .24

 148 LS          SCS LOSS RATE
                       STRTL         .27  INITIAL ABSTRACTION
                      CRVNBR       88.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 149 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .31  LAG

                                                          ***

                                                  UNIT HYDROGRAPH
                                              21 END-OF-PERIOD ORDINATES
                43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                 0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***
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159 KP        PLAN  4 FOR STATION       E2
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

147 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .24  SUBBASIN AREA

                PRECIPITATION DATA

161 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .24

148 LS          SCS LOSS RATE
                      STRTL         .27  INITIAL ABSTRACTION
                     CRVNBR       88.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

149 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .31  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                 0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

162 KP        PLAN  5 FOR STATION       E2
                                RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

147 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .24  SUBBASIN AREA

                PRECIPITATION DATA

164 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .24

148 LS          SCS LOSS RATE
                      STRTL         .27  INITIAL ABSTRACTION
                     CRVNBR       88.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

149 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .31  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 21 END-OF-PERIOD ORDINATES
                43.      139.      270.      323.      305.      246.      163.      108.       75.       51.
                34.       23.       16.       11.        7.        5.        3.        3.        2.        1.
                 0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
165 KK      *       P2A  *
            *            *
            **************
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***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 166 KP        PLAN  1 FOR STATION      P2A
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 167 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

 172 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                   STORM AREA =     .03

 168 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 169 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .10  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                  8 END-OF-PERIOD ORDINATES
                53.       81.       37.       14.        6.        2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 173 KP        PLAN  2 FOR STATION      P2A
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 167 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

 175 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                   STORM AREA =     .03

 168 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 169 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .10  LAG

                                                          ***

                                                      UNIT HYDROGRAPH
                                                  8 END-OF-PERIOD ORDINATES
                53.       81.       37.       14.        6.        2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 176 KP        PLAN  3 FOR STATION      P2A
                                RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 167 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

 178 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
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                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .03

 168 LS           SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 169 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .10  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 8 END-OF-PERIOD ORDINATES
                 53.       81.       37.       14.        6.        2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 179 KP        PLAN  4 FOR STATION      P2A
                                 RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 167 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

 181 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                    .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .03

 168 LS           SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 169 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .10  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 8 END-OF-PERIOD ORDINATES
                 53.       81.       37.       14.        6.        2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 182 KP        PLAN  5 FOR STATION      P2A
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 167 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .03  SUBBASIN AREA

                 PRECIPITATION DATA

 184 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .03

 168 LS           SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

 169 UD           SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .10  LAG
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                                                  ***

                                                UNIT HYDROGRAPH
                                             8 END-OF-PERIOD ORDINATES
              53.       81.       37.       14.        6.        2.        1.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
 185 KK    *       P2B  *
           *            *
           **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 186 KP        PLAN  1 FOR STATION      P2B
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 187 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 192 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .05

 188 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 189 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .10  LAG

                                                  ***

                                                UNIT HYDROGRAPH
                                             8 END-OF-PERIOD ORDINATES
               105.      159.       71.       28.       11.        4.        2.        1.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 193 KP        PLAN  2 FOR STATION      P2B
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 187 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 195 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .05

 188 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 189 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .10  LAG

                                                  ***
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                                                  UNIT HYDROGRAPH
                                              8 END-OF-PERIOD ORDINATES
              105.      159.       71.       28.       11.        4.        2.        1.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 196 KP       PLAN  3 FOR STATION      P2B
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 187 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .05  SUBBASIN AREA

                PRECIPITATION DATA

 198 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .05

 188 LS         SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 189 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .10  LAG

                                                          ***

                                                  UNIT HYDROGRAPH
                                              8 END-OF-PERIOD ORDINATES
              105.      159.       71.       28.       11.        4.        2.        1.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 199 KP       PLAN  4 FOR STATION      P2B
                                 RUNOFF COMPUTATION 50-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 187 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .05  SUBBASIN AREA

                PRECIPITATION DATA

 201 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .05

 188 LS         SCS LOSS RATE
                      STRTL         .15  INITIAL ABSTRACTION
                     CRVNBR       93.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 189 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .10  LAG

                                                          ***

                                                  UNIT HYDROGRAPH
                                              8 END-OF-PERIOD ORDINATES
              105.      159.       71.       28.       11.        4.        2.        1.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 202 KP       PLAN  5 FOR STATION      P2B
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA
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  187 BA          SUBBASIN CHARACTERISTICS
                        TAREA         .05  SUBBASIN AREA

                  PRECIPITATION DATA

  204 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                  ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                  5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                   STORM AREA =     .05

  188 LS          SCS LOSS RATE
                        STRTL         .15  INITIAL ABSTRACTION
                       CRVNBR       93.00  CURVE NUMBER
                        RTIMP         .00  PERCENT IMPERVIOUS AREA

  189 UD          SCS DIMENSIONLESS UNITGRAPH
                         TLAG         .10  LAG

                                                                  ***

                                                                UNIT HYDROGRAPH
                                                            8 END-OF-PERIOD ORDINATES
                 105.      159.       71.       28.       11.        4.        2.        1.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


             **************
             *            *
  205 KK     *      POND  *
             *            *
             **************
                            RUNOFF MITIGATION POND CALCULATION

  207 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           3  PRINT CONTROL
                       IPLOT           1  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          22  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2         289  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT        .083  TIME INTERVAL IN HOURS


                 HYDROGRAPH ROUTING DATA

  208 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
                      RSVRIC         .00  INITIAL CONDITION
                           X         .00 WORKING R AND D COEFFICIENT

  210 SV            STORAGE          .0        .2        .5        .8       1.1       1.4       1.7       2.0       2.3       2.6


  211 SE          ELEVATION         .00       .66      1.31      1.97      2.62      3.28      3.94      4.59      5.25      5.90


  209 SQ          DISCHARGE          0.        0.       24.       81.      113.      137.      158.      176.      192.      240.


                                                                  ***

       ***             ***             ***             ***             ***

                          HYDROGRAPH AT STATION     POND
                            FOR PLAN 1, RATIO = 1.00

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
                            (CFS)
+      92.     12.25                 17.          6.          6.           6.
                         (INCHES)  3.287       4.285       4.285        4.285
                          (AC-FT)     9.         11.         11.          11.
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 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        1.     12.25                   0.          0.          0.           0.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+   (FEET)      (HR)
      2.20     12.25                  1.05         .64         .64          .64

                         CUMULATIVE AREA =     .05 SQ MI


 ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

                PLAN  2 INPUT DATA FOR STATION     POND ARE SAME AS FOR PLAN  1

       ***             ***             ***             ***             ***

                           HYDROGRAPH AT STATION     POND
                             FOR PLAN 2, RATIO = 1.00

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
                            (CFS)
+     143.     12.25                  34.         12.         12.          12.
                         (INCHES)    6.471       9.250       9.250        9.250
                          (AC-FT)      17.         24.         24.          24.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        1.     12.25                   1.          0.          0.           0.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+   (FEET)      (HR)
      3.46     12.25                  1.40         .87         .87          .87

                         CUMULATIVE AREA =     .05 SQ MI


 ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

                PLAN  3 INPUT DATA FOR STATION     POND ARE SAME AS FOR PLAN  1

       ***             ***             ***             ***             ***

                           HYDROGRAPH AT STATION     POND
                             FOR PLAN 3, RATIO = 1.00

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
                            (CFS)
+     167.     12.25                  44.         16.         16.          16.
                         (INCHES)    8.350      12.403      12.403       12.403
                          (AC-FT)      22.         32.         32.          32.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        2.     12.25                   1.          0.          0.           0.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+   (FEET)      (HR)
      4.26     12.25                  1.61         .99         .99          .99

                         CUMULATIVE AREA =     .05 SQ MI


 ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

                PLAN  4 INPUT DATA FOR STATION     POND ARE SAME AS FOR PLAN  1

       ***             ***             ***             ***             ***
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                        HYDROGRAPH AT STATION     POND
                          FOR PLAN 4, RATIO = 1.00

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
                          (CFS)
+     183.     12.25                 52.         20.         20.          20.
                        (INCHES)    9.847      15.004      15.004       15.004
                         (AC-FT)     26.         39.         39.          39.

 PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        2.     12.25                  1.          0.          0.           0.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+   (FEET)      (HR)
      4.89     12.25                 1.75        1.07        1.07         1.07

                        CUMULATIVE AREA =     .05 SQ MI


 ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

                PLAN  5 INPUT DATA FOR STATION     POND ARE SAME AS FOR PLAN  1

       ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION     POND
                          FOR PLAN 5, RATIO = 1.00

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.00-HR
+   (CFS)       (HR)
                          (CFS)
+     210.     12.25                 60.         24.         24.          24.
                        (INCHES)   11.443      17.844      17.844       17.844
                         (AC-FT)     30.         47.         47.          47.

 PEAK STORAGE   TIME                       MAXIMUM AVERAGE STORAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+  (AC-FT)      (HR)
        2.     12.25                  1.          0.          0.           0.

  PEAK STAGE    TIME                        MAXIMUM AVERAGE STAGE
                                     6-HR       24-HR       72-HR     24.00-HR
+   (FEET)      (HR)
      5.49     12.25                 1.88        1.16        1.16         1.16

                        CUMULATIVE AREA =     .05 SQ MI


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  212 KK    *     COMB5  *
            *            *
            **************

  213 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                                  ***


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  214 KK    *       E3B  *
            *            *
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              **************

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 215 KP        PLAN  1 FOR STATION      E3B
                                RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 216 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 221 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                   STORM AREA =     .05

 217 LS          SCS LOSS RATE
                       STRTL         .30  INITIAL ABSTRACTION
                      CRVNBR       87.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 218 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .08  LAG

                                                             ***

                                                        UNIT HYDROGRAPH
                                                    7 END-OF-PERIOD ORDINATES
               143.      144.       47.       15.        5.        2.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 222 KP        PLAN  2 FOR STATION      E3B
                                RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 216 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA

                 PRECIPITATION DATA

 224 PH                                 DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                   STORM AREA =     .05

 217 LS          SCS LOSS RATE
                       STRTL         .30  INITIAL ABSTRACTION
                      CRVNBR       87.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 218 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .08  LAG

                                                             ***

                                                        UNIT HYDROGRAPH
                                                    7 END-OF-PERIOD ORDINATES
               143.      144.       47.       15.        5.        2.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 225 KP        PLAN  3 FOR STATION      E3B
                                RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 216 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .05  SUBBASIN AREA
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                PRECIPITATION DATA

 227 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .05

 217 LS         SCS LOSS RATE
                      STRTL         .30  INITIAL ABSTRACTION
                     CRVNBR       87.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 218 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .08  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
              143.      144.       47.       15.        5.        2.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 228 KP       PLAN  4 FOR STATION      E3B
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 216 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .05  SUBBASIN AREA

                PRECIPITATION DATA

 230 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .05

 217 LS         SCS LOSS RATE
                      STRTL         .30  INITIAL ABSTRACTION
                     CRVNBR       87.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA

 218 UD         SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .08  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
              143.      144.       47.       15.        5.        2.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 231 KP       PLAN  5 FOR STATION      E3B
                                RUNOFF COMPUTATION 100-YRS STORM IN BASIN

              SUBBASIN RUNOFF DATA

 216 BA         SUBBASIN CHARACTERISTICS
                      TAREA         .05  SUBBASIN AREA

                PRECIPITATION DATA

 233 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .05

 217 LS         SCS LOSS RATE
                      STRTL         .30  INITIAL ABSTRACTION
                     CRVNBR       87.00  CURVE NUMBER
                      RTIMP         .00  PERCENT IMPERVIOUS AREA
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 218 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .08  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 7 END-OF-PERIOD ORDINATES
                 143.      144.       47.       15.        5.        2.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 234 KK     *        P3  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 235 KP        PLAN  1 FOR STATION       P3
                                  RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 236 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 241 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                STORM AREA =     .06

 237 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 238 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .29  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                20 END-OF-PERIOD ORDINATES
                  12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                   8.        5.        3.        2.        1.        1.        1.        0.        0.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 242 KP        PLAN  2 FOR STATION       P3
                                  RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 236 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 244 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .06

 237 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA
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```
 238 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .29  LAG

                                                   ***

                                                UNIT HYDROGRAPH
                                           20 END-OF-PERIOD ORDINATES
                12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                 8.        5.        3.        2.        1.        1.        1.        0.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 245 KP        PLAN  3 FOR STATION       P3
                                RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 236 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 247 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .06

 237 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 238 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .29  LAG

                                                   ***

                                                UNIT HYDROGRAPH
                                           20 END-OF-PERIOD ORDINATES
                12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                 8.        5.        3.        2.        1.        1.        1.        0.        0.        0.

***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 248 KP        PLAN  4 FOR STATION       P3
                                RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 236 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 250 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .06

 237 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 238 UD          SCS DIMENSIONLESS UNITGRAPH
                       TLAG         .29  LAG

                                                   ***

                                                UNIT HYDROGRAPH
                                           20 END-OF-PERIOD ORDINATES
                12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                 8.        5.        3.        2.        1.        1.        1.        0.        0.        0.
```

```
***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 251 KP        PLAN  5 FOR STATION       P3
                                  RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 236 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .06  SUBBASIN AREA

                 PRECIPITATION DATA

 253 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                 STORM AREA =     .06

 237 LS          SCS LOSS RATE
                       STRTL         .15  INITIAL ABSTRACTION
                      CRVNBR       93.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 238 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .29  LAG

                                                            ***

                                                       UNIT HYDROGRAPH
                                                  20 END-OF-PERIOD ORDINATES
                 12.       39.       74.       85.       77.       59.       37.       25.       17.       11.
                  8.        5.        3.        2.        1.        1.        1.        0.        0.        0.


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 254 KK     *     COMB6  *
            *            *
            **************

 255 HC          HYDROGRAPH COMBINATION
                       ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE

                                                            ***


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
 256 KK     *       E3A  *
            *            *
            **************


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 257 KP        PLAN  1 FOR STATION      E3A
                                  RUNOFF COMPUTATION 2-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 258 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 263 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 ......   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .47     .82    1.94    2.52    2.82    3.57    4.40    5.20     .00     .00     .00     .00

                                                 STORM AREA =     .31
```

```
 259 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 260 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                 44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                 61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                  2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 264 KP        PLAN  2 FOR STATION      E3A
                                 RUNOFF COMPUTATION 10-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 258 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 266 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .74    1.29    3.07    4.30    4.99    6.66    8.38   10.23     .00     .00     .00     .00

                                                STORM AREA =     .31

 259 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 260 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .35  LAG

                                                          ***

                                                     UNIT HYDROGRAPH
                                                 23 END-OF-PERIOD ORDINATES
                 44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                 61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                  2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 267 KP        PLAN  3 FOR STATION      E3A
                                 RUNOFF COMPUTATION 25-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 258 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 269 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .88    1.55    3.68    5.28    6.23    8.51   10.79   13.41     .00     .00     .00     .00

                                                STORM AREA =     .31

 259 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 260 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .35  LAG

                                                          ***
```

```
                                                  UNIT HYDROGRAPH
                                              23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 270 KP        PLAN  4 FOR STATION      E3A
                                 RUNOFF COMPUTATION 50-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 258 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 272 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                   .99    1.74    4.14    6.04    7.21    9.99   12.76   16.03     .00     .00     .00     .00

                                                STORM AREA =     .31

 259 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 260 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .35  LAG

                                                          ***

                                                  UNIT HYDROGRAPH
                                              23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.


***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***     ***

 273 KP        PLAN  5 FOR STATION      E3A
                                 RUNOFF COMPUTATION 100-YRS STORM IN BASIN

               SUBBASIN RUNOFF DATA

 258 BA          SUBBASIN CHARACTERISTICS
                       TAREA         .31  SUBBASIN AREA

                 PRECIPITATION DATA

 275 PH                                DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
                 ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
                 5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                  1.11    1.94    4.62    6.82    8.24   11.57   14.84   18.89     .00     .00     .00     .00

                                                STORM AREA =     .31

 259 LS          SCS LOSS RATE
                       STRTL         .25  INITIAL ABSTRACTION
                      CRVNBR       89.00  CURVE NUMBER
                       RTIMP         .00  PERCENT IMPERVIOUS AREA

 260 UD          SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .35  LAG

                                                          ***

                                                  UNIT HYDROGRAPH
                                              23 END-OF-PERIOD ORDINATES
                44.      139.      284.      374.      385.      336.      261.      173.      121.       87.
                61.       43.       30.       21.       15.       11.        8.        5.        4.        3.
                 2.        1.        0.
1

               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
```

FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN		RATIO 1
					1.00
HYDROGRAPH AT					
+	E1A	.08	1	FLOW	112.
				TIME	12.33
			2	FLOW	196.
				TIME	12.33
			3	FLOW	240.
				TIME	12.33
			4	FLOW	273.
				TIME	12.33
			5	FLOW	306.
				TIME	12.33
HYDROGRAPH AT					
+	E1B	.10	1	FLOW	144.
				TIME	12.33
			2	FLOW	251.
				TIME	12.33
			3	FLOW	307.
				TIME	12.33
			4	FLOW	348.
				TIME	12.33
			5	FLOW	391.
				TIME	12.33
HYDROGRAPH AT					
+	E1C	.01	1	FLOW	30.
				TIME	12.08
			2	FLOW	52.
				TIME	12.08
			3	FLOW	63.
				TIME	12.08
			4	FLOW	71.
				TIME	12.08
			5	FLOW	80.
				TIME	12.08
3 COMBINED AT					
+	COMB1	.19	1	FLOW	266.
				TIME	12.33
			2	FLOW	464.
				TIME	12.33
			3	FLOW	568.
				TIME	12.33
			4	FLOW	644.
				TIME	12.33
			5	FLOW	723.
				TIME	12.33
HYDROGRAPH AT					
+	P1B1	.02	1	FLOW	47.
				TIME	12.17
			2	FLOW	77.
				TIME	12.17
			3	FLOW	93.
				TIME	12.17
			4	FLOW	105.
				TIME	12.17
			5	FLOW	117.
				TIME	12.17
HYDROGRAPH AT					
+	P1B2	.08	1	FLOW	130.
				TIME	12.33
			2	FLOW	215.
				TIME	12.33
			3	FLOW	260.
				TIME	12.33
			4	FLOW	293.
				TIME	12.33
			5	FLOW	328.
				TIME	12.33
ROUTED TO					

```
+                    POND       .08     1   FLOW          91.
                                           TIME        12.58
                                        2   FLOW         165.
                                           TIME        12.58
                                        3   FLOW         203.
                                           TIME        12.58
                                        4   FLOW         233.
                                           TIME        12.50
                                        5   FLOW         264.
                                           TIME        12.50

                                        ** PEAK STAGES IN FEET **
                                        1   STAGE        1.48
                                           TIME        12.58
                                        2   STAGE        2.20
                                           TIME        12.58
                                        3   STAGE        2.53
                                           TIME        12.58
                                        4   STAGE        2.78
                                           TIME        12.50
                                        5   STAGE        3.02
                                           TIME        12.50

  2 COMBINED AT
+                   COMB2       .10     1   FLOW         105.
                                           TIME        12.50
                                        2   FLOW         191.
                                           TIME        12.50
                                        3   FLOW         236.
                                           TIME        12.50
                                        4   FLOW         271.
                                           TIME        12.50
                                        5   FLOW         306.
                                           TIME        12.50

 HYDROGRAPH AT
+                     P1A       .04     1   FLOW          61.
                                           TIME        12.33
                                        2   FLOW         101.
                                           TIME        12.33
                                        3   FLOW         122.
                                           TIME        12.33
                                        4   FLOW         138.
                                           TIME        12.33
                                        5   FLOW         154.
                                           TIME        12.33

  2 COMBINED AT
+                   COMB3       .14     1   FLOW         159.
                                           TIME        12.42
                                        2   FLOW         282.
                                           TIME        12.42
                                        3   FLOW         348.
                                           TIME        12.33
                                        4   FLOW         398.
                                           TIME        12.33
                                        5   FLOW         450.
                                           TIME        12.33

  2 COMBINED AT
+                   COMB4       .33     1   FLOW         424.
                                           TIME        12.33
                                        2   FLOW         746.
                                           TIME        12.33
                                        3   FLOW         916.
                                           TIME        12.33
                                        4   FLOW        1042.
                                           TIME        12.33
                                        5   FLOW        1173.
                                           TIME        12.33

 HYDROGRAPH AT
+                      E2       .24     1   FLOW         329.
                                           TIME        12.33
                                        2   FLOW         580.
                                           TIME        12.33
                                        3   FLOW         711.
                                           TIME        12.33
                                        4   FLOW         807.
                                           TIME        12.33
                                        5   FLOW         907.
```

```
                                        TIME        12.33

 HYDROGRAPH AT
+                    P2A       .03     1   FLOW          54.
                                           TIME        12.17
                                        2   FLOW          89.
                                           TIME        12.17
                                        3   FLOW         107.
                                           TIME        12.17
                                        4   FLOW         120.
                                           TIME        12.17
                                        5   FLOW         135.
                                           TIME        12.17

 HYDROGRAPH AT
+                    P2B       .05     1   FLOW         106.
                                           TIME        12.17
                                        2   FLOW         174.
                                           TIME        12.17
                                        3   FLOW         209.
                                           TIME        12.17
                                        4   FLOW         236.
                                           TIME        12.17
                                        5   FLOW         264.
                                           TIME        12.17

 ROUTED TO
+                   POND       .05     1   FLOW          92.
                                           TIME        12.25
                                        2   FLOW         143.
                                           TIME        12.25
                                        3   FLOW         167.
                                           TIME        12.25
                                        4   FLOW         183.
                                           TIME        12.25
                                        5   FLOW         210.
                                           TIME        12.25

                                        ** PEAK STAGES IN FEET **
                                        1   STAGE        2.20
                                           TIME        12.25
                                        2   STAGE        3.46
                                           TIME        12.25
                                        3   STAGE        4.26
                                           TIME        12.25
                                        4   STAGE        4.89
                                           TIME        12.25
                                        5   STAGE        5.49
                                           TIME        12.25

  2 COMBINED AT
+                  COMB5       .07     1   FLOW         146.
                                           TIME        12.17
                                        2   FLOW         226.
                                           TIME        12.17
                                        3   FLOW         265.
                                           TIME        12.17
                                        4   FLOW         293.
                                           TIME        12.17
                                        5   FLOW         322.
                                           TIME        12.17

 HYDROGRAPH AT
+                    E3B       .05     1   FLOW          92.
                                           TIME        12.08
                                        2   FLOW         162.
                                           TIME        12.08
                                        3   FLOW         199.
                                           TIME        12.08
                                        4   FLOW         225.
                                           TIME        12.08
                                        5   FLOW         253.
                                           TIME        12.08

 HYDROGRAPH AT
+                     P3       .06     1   FLOW          93.
                                           TIME        12.33
                                        2   FLOW         153.
                                           TIME        12.33
                                        3   FLOW         185.
                                           TIME        12.33
```

```
                                        4   FLOW         209.
                                            TIME        12.33
                                        5   FLOW         234.
                                            TIME        12.33

  2 COMBINED AT
+                   COMB6       .11     1   FLOW         160.
                                            TIME        12.17
                                        2   FLOW         275.
                                            TIME        12.17
                                        3   FLOW         336.
                                            TIME        12.17
                                        4   FLOW         380.
                                            TIME        12.17
                                        5   FLOW         427.
                                            TIME        12.17

 HYDROGRAPH AT
+                     E3A       .31     1   FLOW         426.
                                            TIME        12.42
                                        2   FLOW         740.
                                            TIME        12.42
                                        3   FLOW         903.
                                            TIME        12.42
                                        4   FLOW        1024.
                                            TIME        12.42
                                        5   FLOW        1150.
                                            TIME        12.42


 *** NORMAL END OF HEC-1 ***
```

APPENDIX F

HEC-RAS RESULTS EXISTING CONDITIONS

WATERCOURSE ONE

```
                    HEC-RAS Version 3.1.3 May 2005
                     U.S. Army Corp of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California


          X     X  XXXXXX    XXXX        XXXX       XX      XXXX
          X     X  X        X    X       X   X     X  X    X
          X     X  X        X            X   X    X    X   X
          XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
          X     X  X        X            X  X     X    X        X
          X     X  X        X    X       X   X    X    X        X
          X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Palacios de Humacao
Project File : ph.prj
Run Date and Time: 10/16/2008 2:06:29 PM

Project in SI units

PLAN DATA

Plan Title: Existing - Watercourse 1
Plan File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.p01

Geometry Title: Existing - Watercourse 1
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g01

Flow Title : Existing - Watercourse 1
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f01

Plan Summary Information:
Number of: Cross Sections = 17 Multiple Openings = 0
Culverts = 2 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculation tolerance = 0.003
Maximum number of iterations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Existing - Watercourse 1
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f01

Flow Data (m3/s)

River	Reach	RS	100yrs	50yrs	25yrs	10yrs	2yrs
Watercourse one	#3	5	8.67	7.74	6.8	5.56	3.17
Watercourse one	#1	10	11.82	10.52	9.27	7.6	4.37
Watercourse one	#2	4	20.49	18.25	16.1	13.15	7.54
Watercourse one	#2	2	33.3	29.65	26.16	21.4	12.3

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Watercourse one	#3	100yrs	Critical	
Watercourse one	#3	50yrs	Critical	
Watercourse one	#3	25yrs	Critical	
Watercourse one	#3	10yrs	Critical	
Watercourse one	#3	2yrs	Critical	
Watercourse one	#1	100yrs	Critical	
Watercourse one	#1	50yrs	Critical	
Watercourse one	#1	25yrs	Critical	
Watercourse one	#1	10yrs	Critical	
Watercourse one	#1	2yrs	Critical	
Watercourse one	#2	100yrs		Normal S = 0.004
Watercourse one	#2	50yrs		Normal S = 0.004
Watercourse one	#2	25yrs		Normal S = 0.004
Watercourse one	#2	10yrs		Normal S = 0.004
Watercourse one	#2	2yrs		Normal S = 0.004

GEOMETRY DATA

Geometry Title: Existing - Watercourse 1
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
Watercourse one	#3		A
Watercourse one	#1		A
Watercourse one	#2	A	

JUNCTION INFORMATION

Name: A
Description:
Energy computation Method

Length across Junction River	Reach	Tributary River	Reach	Length	Angle
Watercourse one #1		to Watercourse one #2		130	
Watercourse one #3		to Watercourse one #2		32	

CROSS SECTION

RIVER: Watercourse one
REACH: #3 RS: 5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-55.5	15.54	-2.5	15.54	-2.5	13.57	2.5	13.57	2.5	15.54
55.5	15.54								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-55.5	.013	-2.5	.013	2.5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-2.5	2.5	13	13	13	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

			Left OB	Channel	Right OB
E.G. Elev (m)	16.01	Element			
Vel Head (m)	0.00	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (m)	16.01	Reach Len. (m)	13.00	13.00	13.00
Crit W.S. (m)	14.24	Flow Area (m2)	25.07	12.21	25.07
E.G. Slope (m/m)	0.000006	Area (m2)	25.07	12.21	25.07
Q Total (m3/s)	8.67	Flow (m3/s)	2.90	2.88	2.90
Top Width (m)	111.00	Top Width (m)	53.00	5.00	53.00
Vel Total (m/s)	0.14	Avg. Vel. (m/s)	0.12	0.24	0.12
Max Chl Dpth (m)	2.44	Hydr. Depth (m)	0.47	2.44	0.47
Conv. Total (m3/s)	3484.9	Conv. (m3/s)	1164.0	1156.9	1164.0
Length Wtd. (m)	13.00	Wetted Per. (m)	53.47	8.94	53.47

```
  Min Ch El (m)            13.57    Shear (N/m2)              0.03       0.08       0.03
  Alpha                     1.41    Stream Power (N/m s)      0.00       0.02       0.00
  Frctn Loss (m)                    Cum Volume (1000 m3)      2.75       0.90       2.75
  C & E Loss (m)                    Cum SA (1000 m2)          9.71       0.98       9.71


CULVERT


RIVER: Watercourse one
REACH: #3                RS: 4.5

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =      12
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   -55.5    15.9            55.5    15.9

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -55.5   15.54    -2.5   15.54    -2.5   13.57     2.5   13.57     2.5   15.54
    55.5   15.54

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -55.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -2.5     2.5             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   -55.5    15.9            55.5    15.9

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -55.5   15.11    -2.5   15.11    -2.5   13.14     2.5   13.14     2.5   15.11
    55.5   15.11

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -55.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -2.5     2.5             .1       .3

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =    15.9
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular    1.06
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 .5      12     .013     .013        0                   .5                1
Upstream   Elevation =  13.57
           Centerline Station =  0
Downstream Elevation =  13.14
           Centerline Station =  0

CULVERT OUTPUT  Profile #100yrs  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       2.43    Culv Full Len (m)        12.00
  # Barrels                    1    Culv Vel US (m/s)         2.76
  Q Barrel (m3/s)           2.43    Culv Vel DS (m/s)         2.76
  E.G. US. (m)             16.01    Culv Inv El Up (m)       13.57
```

W.S. US. (m)	16.01	Culv Inv El Dn (m)	13.14
E.G. DS (m)	15.35	Culv Frctn Ls (m)	0.09
W.S. DS (m)	15.34	Culv Exit Loss (m)	0.38
Delta EG (m)	0.66	Culv Entr Loss (m)	0.19
Delta WS (m)	0.67	Q Weir (m3/s)	6.24
E.G. IC (m)	16.01	Weir Sta Lft (m)	-55.50
E.G. OC (m)	16.01	Weir Sta Rgt (m)	55.50
Culvert Control	Outlet	Weir Submerg	0.00
Culv WS Inlet (m)	14.63	Weir Max Depth (m)	0.12
Culv WS Outlet (m)	14.20	Weir Avg Depth (m)	0.12
Culv Nml Depth (m)		Weir Flow Area (m2)	12.77
Culv Crt Depth (m)	0.88	Min El Weir Flow (m)	15.90

CROSS SECTION

RIVER: Watercourse one
REACH: #3 RS: 4.1

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-55.5	15.11	-2.5	15.11	-2.5	13.14	2.5	13.14	2.5	15.11
55.5	15.11								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-55.5	.013	-2.5	.013	2.5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-2.5	2.5	1	1	1	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	15.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (m)	15.34	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)		Flow Area (m2)	12.39	11.02	12.39
E.G. Slope (m/m)	0.000026	Area (m2)	12.39	11.02	12.39
Q Total (m3/s)	8.67	Flow (m3/s)	1.84	4.98	1.84
Top Width (m)	111.00	Top Width (m)	53.00	5.00	53.00
Vel Total (m/s)	0.24	Avg. Vel. (m/s)	0.15	0.45	0.15
Max Chl Dpth (m)	2.20	Hydr. Depth (m)	0.23	2.20	0.23
Conv. Total (m3/s)	1695.1	Conv. (m3/s)	360.4	974.3	360.4
Length Wtd. (m)	1.00	Wetted Per. (m)	53.23	8.94	53.23
Min Ch El (m)	13.14	Shear (N/m2)	0.06	0.32	0.06
Alpha	2.16	Stream Power (N/m s)	0.01	0.14	0.01
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	2.51	0.75	2.51
C & E Loss (m)	0.01	Cum SA (1000 m2)	9.02	0.91	9.02

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse one
REACH: #3 RS: 4

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-22	15.11	-1.06	15.11	-.15	13.14	.15	13.14	1.06	15.11
22	15.11								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-22	.035	-1.06	.035	1.06	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.06	1.06	161	161	161	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	15.34	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	15.26	Reach Len. (m)	161.00	161.00	161.00
Crit W.S. (m)	15.26	Flow Area (m2)	3.24	2.71	3.24
E.G. Slope (m/m)	0.006543	Area (m2)	3.24	2.71	3.24
Q Total (m3/s)	8.67	Flow (m3/s)	2.14	4.38	2.14
Top Width (m)	44.00	Top Width (m)	20.94	2.12	20.94
Vel Total (m/s)	0.94	Avg. Vel. (m/s)	0.66	1.62	0.66
Max Chl Dpth (m)	2.12	Hydr. Depth (m)	0.15	1.28	0.15
Conv. Total (m3/s)	107.2	Conv. (m3/s)	26.5	54.2	26.5
Length Wtd. (m)	161.00	Wetted Per. (m)	21.09	4.64	21.09
Min Ch El (m)	13.14	Shear (N/m2)	9.85	37.50	9.85
Alpha	1.72	Stream Power (N/m s)	6.52	60.57	6.52
Frctn Loss (m)	0.97	Cum Volume (1000 m3)	2.50	0.74	2.50
C & E Loss (m)	0.01	Cum SA (1000 m2)	8.98	0.91	8.98

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Watercourse one
REACH: #3 RS: 3

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-22	12.66	-1.06	12.66	-.15	12.05	.15	12.05	1.06	12.66
22	12.66								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-22	.035	-1.06	.035	1.06	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.06	1.06	112	112	112	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	13.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.28	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	12.76	Reach Len. (m)	112.00	112.00	112.00
Crit W.S. (m)	12.82	Flow Area (m2)	2.01	0.94	2.01
E.G. Slope (m/m)	0.051616	Area (m2)	2.01	0.94	2.01
Q Total (m3/s)	8.67	Flow (m3/s)	2.74	3.20	2.74
Top Width (m)	44.00	Top Width (m)	20.94	2.12	20.94
Vel Total (m/s)	1.74	Avg. Vel. (m/s)	1.36	3.39	1.36
Max Chl Dpth (m)	0.71	Hydr. Depth (m)	0.10	0.44	0.10
Conv. Total (m3/s)	38.2	Conv. (m3/s)	12.0	14.1	12.0
Length Wtd. (m)	112.00	Wetted Per. (m)	21.04	2.49	21.04
Min Ch El (m)	12.05	Shear (N/m2)	48.47	191.40	48.47
Alpha	1.78	Stream Power (N/m s)	65.84	649.66	65.84
Frctn Loss (m)	2.29	Cum Volume (1000 m3)	2.08	0.44	2.08
C & E Loss (m)	0.02	Cum SA (1000 m2)	5.61	0.57	5.61

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse one
REACH: #3 RS: 2

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-22	11.75	-1.06	11.75	-.15	11.15	.15	11.15	1.06	11.75
22	11.75								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-22	.035	-1.06	.035	1.06	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.06	1.06	156	156	156	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

			Left OB	Channel	Right OB
E.G. Elev (m)	11.99	Element			
Vel Head (m)	0.08	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	11.91	Reach Len. (m)	156.00	156.00	156.00
Crit W.S. (m)	11.91	Flow Area (m2)	3.40	1.07	3.40
E.G. Slope (m/m)	0.013331	Area (m2)	3.40	1.07	3.40
Q Total (m3/s)	8.67	Flow (m3/s)	3.33	2.02	3.33
Top Width (m)	44.00	Top Width (m)	20.94	2.12	20.94
Vel Total (m/s)	1.10	Avg. Vel. (m/s)	0.98	1.88	0.98
Max Chl Dpth (m)	0.76	Hydr. Depth (m)	0.16	0.51	0.16
Conv. Total (m3/s)	75.1	Conv. (m3/s)	28.8	17.5	28.8
Length Wtd. (m)	156.00	Wetted Per. (m)	21.10	2.48	21.10
Min Ch El (m)	11.15	Shear (N/m2)	21.08	56.44	21.08
Alpha	1.29	Stream Power (N/m s)	20.61	106.35	20.61
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	1.78	0.33	1.78
C & E Loss (m)	0.02	Cum SA (1000 m2)	3.27	0.33	3.27

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Watercourse one
REACH: #3 RS: 1

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-22	10.47	-1.06	10.47	-.15	9.87	.15	9.87	1.06	10.47
22	10.47								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-22	.035	-1.06	.035	1.06	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.06	1.06	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

			Left OB	Channel	Right OB
E.G. Elev (m)	11.19	Element			
Vel Head (m)	0.00	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	11.19	Reach Len. (m)	32.00	32.00	32.00
Crit W.S. (m)	10.63	Flow Area (m2)	14.99	2.24	14.99
E.G. Slope (m/m)	0.000141	Area (m2)	14.99	2.24	14.99
Q Total (m3/s)	8.67	Flow (m3/s)	3.98	0.71	3.98
Top Width (m)	44.00	Top Width (m)	20.94	2.12	20.94
Vel Total (m/s)	0.27	Avg. Vel. (m/s)	0.27	0.32	0.27
Max Chl Dpth (m)	1.32	Hydr. Depth (m)	0.72	1.06	0.72

```
  Conv. Total (m3/s)       730.4    Conv. (m3/s)             335.2       60.0      335.2
  Length Wtd. (m)          32.00    Wetted Per. (m)          21.66       2.48      21.66
  Min Ch El (m)             9.87    Shear (N/m2)              0.96       1.25       0.96
  Alpha                     1.01    Stream Power (N/m s)      0.25       0.40       0.25
  Frctn Loss (m)            0.03    Cum Volume (1000 m3)      0.34       0.07       0.34
  C & E Loss (m)            0.01    Cum SA (1000 m2)


Warning: The cross-section end points had to be extended vertically for the computed water surface.
Note:    Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 10

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -55.5   14.42    -2.5   14.42    -2.5    12.8     2.5    12.8     2.5   14.42
    55.5   14.42

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -55.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          -2.5     2.5               13      13      13             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            14.58    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.04    Wt. n-Val.               0.013      0.013      0.013
  W.S. Elev (m)            14.54    Reach Len. (m)           13.00      13.00      13.00
  Crit W.S. (m)            13.63    Flow Area (m2)            6.44       8.71       6.44
  E.G. Slope (m/m)      0.000159    Area (m2)                 6.44       8.71       6.44
  Q Total (m3/s)           11.82    Flow (m3/s)               1.53       8.76       1.53
  Top Width (m)           111.00    Top Width (m)            53.00       5.00      53.00
  Vel Total (m/s)           0.55    Avg. Vel. (m/s)           0.24       1.01       0.24
  Max Chl Dpth (m)          1.74    Hydr. Depth (m)           0.12       1.74       0.12
  Conv. Total (m3/s)       937.4    Conv. (m3/s)             121.3      694.9      121.3
  Length Wtd. (m)          13.00    Wetted Per. (m)          53.12       8.24      53.12
  Min Ch El (m)            12.80    Shear (N/m2)              0.19       1.65       0.19
  Alpha                     2.55    Stream Power (N/m s)      0.04       1.66       0.04
  Frctn Loss (m)                    Cum Volume (1000 m3)      2.47       1.11       2.46
  C & E Loss (m)                    Cum SA (1000 m2)          5.30       0.96       5.28


CULVERT


RIVER: Watercourse one
REACH: #1                 RS: 9.5

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =      12
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   -55.5   14.42            55.5   14.42

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -55.5   14.42    -2.5   14.42    -2.5    12.8     2.5    12.8     2.5   14.42
    55.5   14.42

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -55.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -2.5     2.5             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
```

```
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   -55.5   14.42            55.5   14.42

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -55.5   14.21    -2.5   14.21    -2.5   12.46     2.5   12.46     2.5   14.21
    55.5   14.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -55.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -2.5     2.5             .1       .3

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =   14.42
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular    1.52
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 .5      12     .013     .013        0                   .5                1
Upstream   Elevation =  12.8
           Centerline Station =  0
Downstream Elevation =  12.46
           Centerline Station =  0

CULVERT OUTPUT  Profile #100yrs  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       2.76    Culv Full Len (m)        12.00
  # Barrels                    1    Culv Vel US (m/s)         1.52
  Q Barrel (m3/s)           2.76    Culv Vel DS (m/s)         1.52
  E.G. US. (m)             14.58    Culv Inv El Up (m)       12.80
  W.S. US. (m)             14.54    Culv Inv El Dn (m)       12.46
  E.G. DS (m)              14.41    Culv Frctn Ls (m)         0.02
  W.S. DS (m)              14.39    Culv Exit Loss (m)        0.10
  Delta EG (m)              0.17    Culv Entr Loss (m)        0.06
  Delta WS (m)              0.15    Q Weir (m3/s)             9.06
  E.G. IC (m)              14.55    Weir Sta Lft (m)        -55.50
  E.G. OC (m)              14.58    Weir Sta Rgt (m)         55.50
  Culvert Control         Outlet    Weir Submerg              0.00
  Culv WS Inlet (m)        14.32    Weir Max Depth (m)        0.15
  Culv WS Outlet (m)       13.98    Weir Avg Depth (m)        0.15
  Culv Nml Depth (m)                Weir Flow Area (m2)      16.37
  Culv Crt Depth (m)        0.86    Min El Weir Flow (m)     14.42


CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 9.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -55.5   14.21    -2.5   14.21    -2.5   12.46     2.5   12.46     2.5   14.21
    55.5   14.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -55.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          -2.5     2.5                1       1       1             .1       .3
```

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	14.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.013	0.013	0.013
W.S. Elev (m)	14.39	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)		Flow Area (m2)	9.37	9.63	9.37
E.G. Slope (m/m)	0.000088	Area (m2)	9.37	9.63	9.37
Q Total (m3/s)	11.82	Flow (m3/s)	2.13	7.57	2.13
Top Width (m)	111.00	Top Width (m)	53.00	5.00	53.00
Vel Total (m/s)	0.42	Avg. Vel. (m/s)	0.23	0.79	0.23
Max Chl Dpth (m)	1.93	Hydr. Depth (m)	0.18	1.93	0.18
Conv. Total (m3/s)	1258.7	Conv. (m3/s)	226.5	805.7	226.5
Length Wtd. (m)	1.00	Wetted Per. (m)	53.18	8.50	53.18
Min Ch El (m)	12.46	Shear (N/m2)	0.15	0.98	0.15
Alpha	2.38	Stream Power (N/m s)	0.03	0.77	0.03
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	2.36	0.99	2.36
C & E Loss (m)	0.00	Cum SA (1000 m2)	4.61	0.89	4.59

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse one
REACH: #1 RS: 9

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-50	14.21	-.91	14.21	0	12.46	.61	12.46	1.52	14.21
50	14.21								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-50	.035	-.91	.035	1.52	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-.91	1.52	28	28	28	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	14.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	14.34	Reach Len. (m)	28.00	28.00	28.00
Crit W.S. (m)	14.34	Flow Area (m2)	6.52	2.98	6.44
E.G. Slope (m/m)	0.005428	Area (m2)	6.52	2.98	6.44
Q Total (m3/s)	11.82	Flow (m3/s)	3.56	4.73	3.52
Top Width (m)	100.00	Top Width (m)	49.09	2.43	48.48
Vel Total (m/s)	0.74	Avg. Vel. (m/s)	0.55	1.59	0.55
Max Chl Dpth (m)	1.88	Hydr. Depth (m)	0.13	1.23	0.13
Conv. Total (m3/s)	160.4	Conv. (m3/s)	48.4	64.3	47.8
Length Wtd. (m)	28.00	Wetted Per. (m)	49.22	4.56	48.61
Min Ch El (m)	12.46	Shear (N/m2)	7.05	34.85	7.05
Alpha	2.16	Stream Power (N/m s)	3.85	55.32	3.85
Frctn Loss (m)	0.13	Cum Volume (1000 m3)	2.35	0.98	2.35
C & E Loss (m)	0.00	Cum SA (1000 m2)	4.56	0.89	4.54

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Watercourse one
REACH: #1 RS: 8

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.2	12.33	-1.21	12.33	-.3	11.72	.31	11.72	1.22	12.33
12.2	12.33								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.2	.035	-1.21	.035	1.22	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.21	1.22	95	95	95	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	13.81	Element	Left OB	Channel	Right OB
Vel Head (m)	1.39	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	12.42	Reach Len. (m)	95.00	95.00	95.00
Crit W.S. (m)	12.61	Flow Area (m2)	0.98	1.14	0.98
E.G. Slope (m/m)	0.165625	Area (m2)	0.98	1.14	0.98
Q Total (m3/s)	11.82	Flow (m3/s)	2.25	7.32	2.25
Top Width (m)	24.40	Top Width (m)	10.99	2.43	10.98
Vel Total (m/s)	3.82	Avg. Vel. (m/s)	2.30	6.40	2.30
Max Chl Dpth (m)	0.70	Hydr. Depth (m)	0.09	0.47	0.09
Conv. Total (m3/s)	29.0	Conv. (m3/s)	5.5	18.0	5.5
Length Wtd. (m)	95.00	Wetted Per. (m)	11.08	2.80	11.07
Min Ch El (m)	11.72	Shear (N/m2)	143.28	663.06	143.28
Alpha	1.88	Stream Power (N/m s)	330.15	4242.85	330.14
Frctn Loss (m)	0.46	Cum Volume (1000 m3)	2.25	0.93	2.25
C & E Loss (m)	0.13	Cum SA (1000 m2)	3.71	0.82	3.71

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse one
REACH: #1 RS: 7

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.2	11.94	-1.21	11.94	-.3	11.34	.31	11.34	1.22	11.94
12.2	11.94								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.2	.035	-1.21	.035	1.22	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.21	1.22	122	122	122	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	12.43	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	12.38	Reach Len. (m)	122.00	122.00	122.00
Crit W.S. (m)	12.22	Flow Area (m2)	4.81	1.98	4.81
E.G. Slope (m/m)	0.003523	Area (m2)	4.81	1.98	4.81
Q Total (m3/s)	11.82	Flow (m3/s)	4.58	2.66	4.58
Top Width (m)	24.40	Top Width (m)	10.99	2.43	10.98
Vel Total (m/s)	1.02	Avg. Vel. (m/s)	0.95	1.35	0.95
Max Chl Dpth (m)	1.04	Hydr. Depth (m)	0.44	0.81	0.44
Conv. Total (m3/s)	199.1	Conv. (m3/s)	77.2	44.8	77.1
Length Wtd. (m)	122.00	Wetted Per. (m)	11.43	2.79	11.42
Min Ch El (m)	11.34	Shear (N/m2)	14.54	24.46	14.54

```
  Alpha                     1.07    Stream Power (N/m s)     13.85      32.95      13.85
  Frctn Loss (m)            0.51    Cum Volume (1000 m3)      1.98       0.78       1.97
  C & E Loss (m)            0.00    Cum SA (1000 m2)          2.67       0.59       2.67


Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Note:    Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 6

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -12.2   11.46   -1.21   11.46     -.3   10.86     .31   10.86    1.22   11.46
    12.2   11.46

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -12.2    .035   -1.21    .035    1.22    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -1.21    1.22              121     121     121             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            11.92    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.07    Wt. n-Val.               0.035      0.035      0.035
  W.S. Elev (m)            11.84    Reach Len. (m)          121.00     121.00     121.00
  Crit W.S. (m)                     Flow Area (m2)            4.23       1.85       4.23
  E.G. Slope (m/m)      0.005128    Area (m2)                 4.23       1.85       4.23
  Q Total (m3/s)           11.82    Flow (m3/s)               4.48       2.87       4.47
  Top Width (m)            24.40    Top Width (m)            10.99       2.43      10.98
  Vel Total (m/s)           1.15    Avg. Vel. (m/s)           1.06       1.55       1.06
  Max Chl Dpth (m)          0.98    Hydr. Depth (m)           0.38       0.76       0.38
  Conv. Total (m3/s)       165.1    Conv. (m3/s)              62.5       40.1       62.5
  Length Wtd. (m)         121.00    Wetted Per. (m)          11.37       2.79      11.36
  Min Ch El (m)            10.86    Shear (N/m2)             18.70      33.29      18.70
  Alpha                     1.09    Stream Power (N/m s)     19.79      51.75      19.79
  Frctn Loss (m)            0.34    Cum Volume (1000 m3)      1.42       0.54       1.42
  C & E Loss (m)            0.01    Cum SA (1000 m2)          1.33       0.29       1.33


Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 5

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -12.2   10.98   -1.21   10.98     -.3   10.38     .31   10.38    1.22   10.98
    12.2   10.98

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -12.2    .035   -1.21    .035    1.22    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -1.21    1.22                0       0       0             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            11.57    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.04    Wt. n-Val.               0.035      0.035      0.035
  W.S. Elev (m)            11.53    Reach Len. (m)          130.00     130.00     130.00
  Crit W.S. (m)                     Flow Area (m2)            6.03       2.25       6.03
```

```
  E.G. Slope (m/m)      0.001795    Area (m2)                 6.03       2.25       6.03
  Q Total (m3/s)           11.82    Flow (m3/s)               4.74       2.35       4.73
  Top Width (m)            24.40    Top Width (m)            10.99       2.43      10.98
  Vel Total (m/s)           0.83    Avg. Vel. (m/s)           0.79       1.05       0.79
  Max Chl Dpth (m)          1.15    Hydr. Depth (m)           0.55       0.92       0.55
  Conv. Total (m3/s)       279.0    Conv. (m3/s)             111.8       55.5      111.7
  Length Wtd. (m)         130.00    Wetted Per. (m)          11.54       2.79      11.53
  Min Ch El (m)            10.38    Shear (N/m2)              9.20      14.16       9.20
  Alpha                     1.04    Stream Power (N/m s)      7.22      14.83       7.22
  Frctn Loss (m)            0.40    Cum Volume (1000 m3)      0.80       0.30       0.80
  C & E Loss (m)            0.01    Cum SA (1000 m2)

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse one
REACH: #2                 RS: 4

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -12.2   10.48   -1.21   10.48     -.3    9.87     .31    9.87    1.22   10.48
    12.2   10.48

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -12.2    .035   -1.21    .035    1.22    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -1.21    1.22              139     139     139             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            11.15    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.10    Wt. n-Val.               0.035      0.035      0.035
  W.S. Elev (m)            11.05    Reach Len. (m)          139.00     139.00     139.00
  Crit W.S. (m)                     Flow Area (m2)            6.32       2.32       6.31
  E.G. Slope (m/m)      0.004669    Area (m2)                 6.32       2.32       6.31
  Q Total (m3/s)           20.49    Flow (m3/s)               8.25       4.01       8.24
  Top Width (m)            24.40    Top Width (m)            10.99       2.43      10.98
  Vel Total (m/s)           1.37    Avg. Vel. (m/s)           1.30       1.72       1.30
  Max Chl Dpth (m)          1.18    Hydr. Depth (m)           0.57       0.96       0.57
  Conv. Total (m3/s)       299.9    Conv. (m3/s)             120.7       58.6      120.6
  Length Wtd. (m)         139.00    Wetted Per. (m)          11.56       2.80      11.55
  Min Ch El (m)             9.87    Shear (N/m2)             25.02      38.00      25.02
  Alpha                     1.04    Stream Power (N/m s)     32.64      65.50      32.64
  Frctn Loss (m)            0.38    Cum Volume (1000 m3)      3.05       0.92       2.74
  C & E Loss (m)            0.01    Cum SA (1000 m2)          4.04       0.81       3.66

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse one
REACH: #2                 RS: 3

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -12.2    9.92   -1.21    9.92     -.3    9.31     .31    9.31    1.22    9.92
    12.2    9.92

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -12.2    .035   -1.21    .035    1.22    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -1.21    1.22             96.4    96.4    96.4             .1       .3
```

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	10.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	10.71	Reach Len. (m)	96.40	96.40	96.40
Crit W.S. (m)		Flow Area (m2)	8.68	2.85	8.68
E.G. Slope (m/m)	0.001770	Area (m2)	8.68	2.85	8.68
Q Total (m3/s)	20.49	Flow (m3/s)	8.52	3.46	8.51
Top Width (m)	24.40	Top Width (m)	10.99	2.43	10.98
Vel Total (m/s)	1.01	Avg. Vel. (m/s)	0.98	1.22	0.98
Max Chl Dpth (m)	1.40	Hydr. Depth (m)	0.79	1.17	0.79
Conv. Total (m3/s)	487.1	Conv. (m3/s)	202.5	82.3	202.3
Length Wtd. (m)	96.40	Wetted Per. (m)	11.78	2.80	11.77
Min Ch El (m)	9.31	Shear (N/m2)	12.79	17.64	12.79
Alpha	1.02	Stream Power (N/m s)	12.55	21.44	12.55
Frctn Loss (m)	0.30	Cum Volume (1000 m3)	2.01	0.56	1.70
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.51	0.47	2.13

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse one
REACH: #2 RS: 2

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.2	9.53	-1.21	9.53	-.3	8.92	.31	8.92	1.22	9.53
12.2	9.53								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.2	.035	-1.21	.035	1.22	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.21	1.22	132.39	98	98	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	10.46	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	10.31	Reach Len. (m)	132.39	98.00	98.00
Crit W.S. (m)		Flow Area (m2)	8.60	2.83	8.59
E.G. Slope (m/m)	0.004821	Area (m2)	8.60	2.83	8.59
Q Total (m3/s)	33.30	Flow (m3/s)	13.83	5.65	13.82
Top Width (m)	24.40	Top Width (m)	10.99	2.43	10.98
Vel Total (m/s)	1.66	Avg. Vel. (m/s)	1.61	2.00	1.61
Max Chl Dpth (m)	1.39	Hydr. Depth (m)	0.78	1.16	0.78
Conv. Total (m3/s)	479.6	Conv. (m3/s)	199.2	81.3	199.0
Length Wtd. (m)	112.32	Wetted Per. (m)	11.77	2.80	11.76
Min Ch El (m)	8.92	Shear (N/m2)	34.53	47.74	34.53
Alpha	1.02	Stream Power (N/m s)	55.55	95.31	55.55
Frctn Loss (m)	0.49	Cum Volume (1000 m3)	1.17	0.28	0.87
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.45	0.24	1.08

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse one
REACH: #2 RS: 1

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.2	9	-1.21	9	-.3	8.39	.31	8.39	1.22	9
12.2	9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.2	.035	-1.21	.035	1.22	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.21	1.22	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

			Left OB	Channel	Right OB
E.G. Elev (m)	9.96	Element			
Vel Head (m)	0.13	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	9.83	Reach Len. (m)			
Crit W.S. (m)	9.55	Flow Area (m2)	9.13	2.95	9.13
E.G. Slope (m/m)	0.004001	Area (m2)	9.13	2.95	9.13
Q Total (m3/s)	33.30	Flow (m3/s)	13.90	5.51	13.89
Top Width (m)	24.40	Top Width (m)	10.99	2.43	10.98
Vel Total (m/s)	1.57	Avg. Vel. (m/s)	1.52	1.87	1.52
Max Chl Dpth (m)	1.44	Hydr. Depth (m)	0.83	1.21	0.83
Conv. Total (m3/s)	526.4	Conv. (m3/s)	219.8	87.1	219.6
Length Wtd. (m)		Wetted Per. (m)	11.82	2.80	11.81
Min Ch El (m)	8.39	Shear (N/m2)	30.32	41.28	30.32
Alpha	1.02	Stream Power (N/m s)	46.14	77.18	46.14
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Watercourse one

Reach	River Sta.	n1	n2	n3
#3	5	.013	.013	.013
#3	4.5	Culvert		
#3	4.1	.013	.013	.013
#3	4	.035	.035	.035
#3	3	.035	.035	.035
#3	2	.035	.035	.035
#3	1	.035	.035	.035
#1	10	.013	.013	.013
#1	9.5	Culvert		
#1	9.1	.013	.013	.013
#1	9	.035	.035	.035
#1	8	.035	.035	.035
#1	7	.035	.035	.035
#1	6	.035	.035	.035
#1	5	.035	.035	.035
#2	4	.035	.035	.035
#2	3	.035	.035	.035
#2	2	.035	.035	.035
#2	1	.035	.035	.035

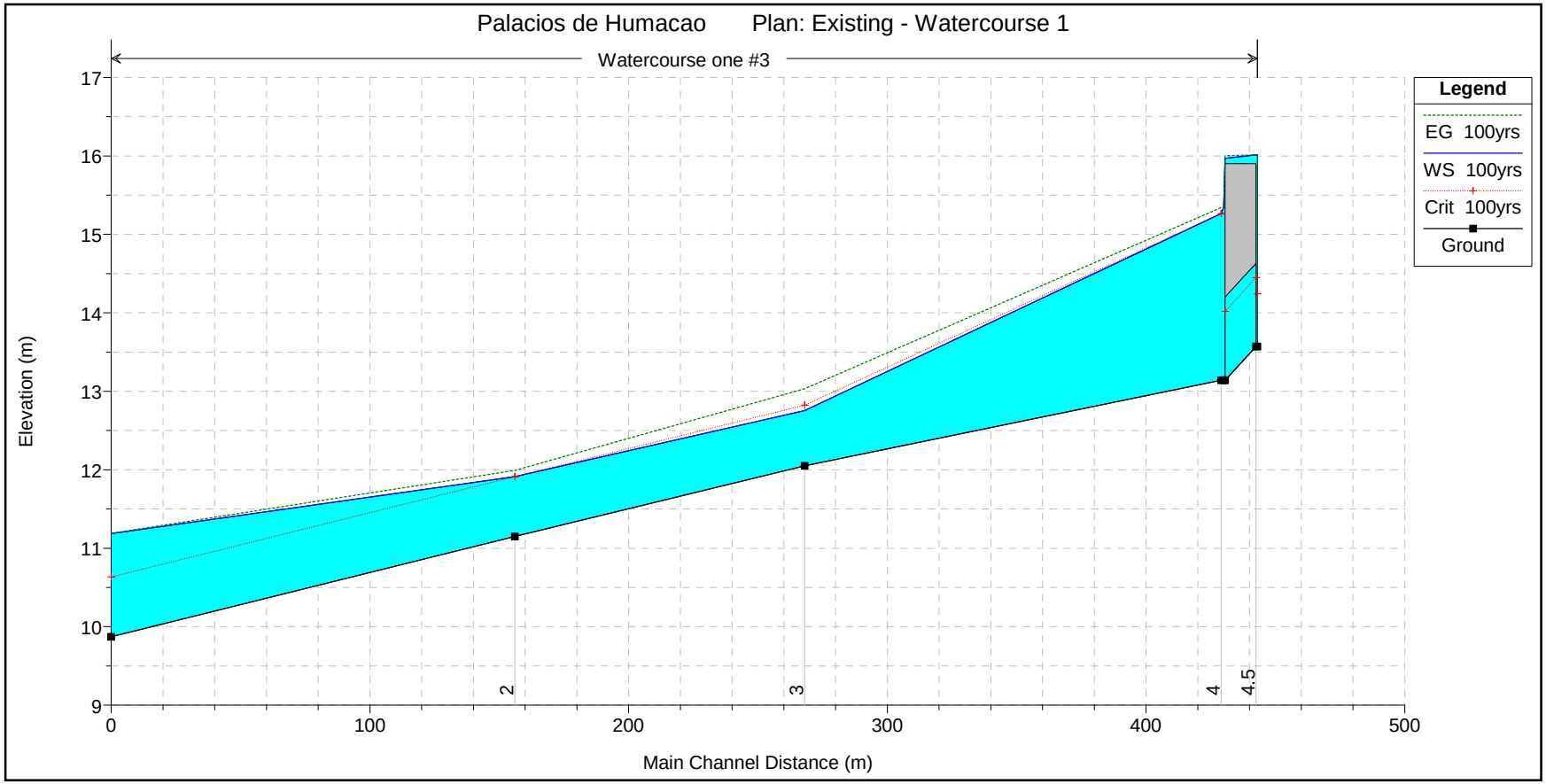
SUMMARY OF REACH LENGTHS

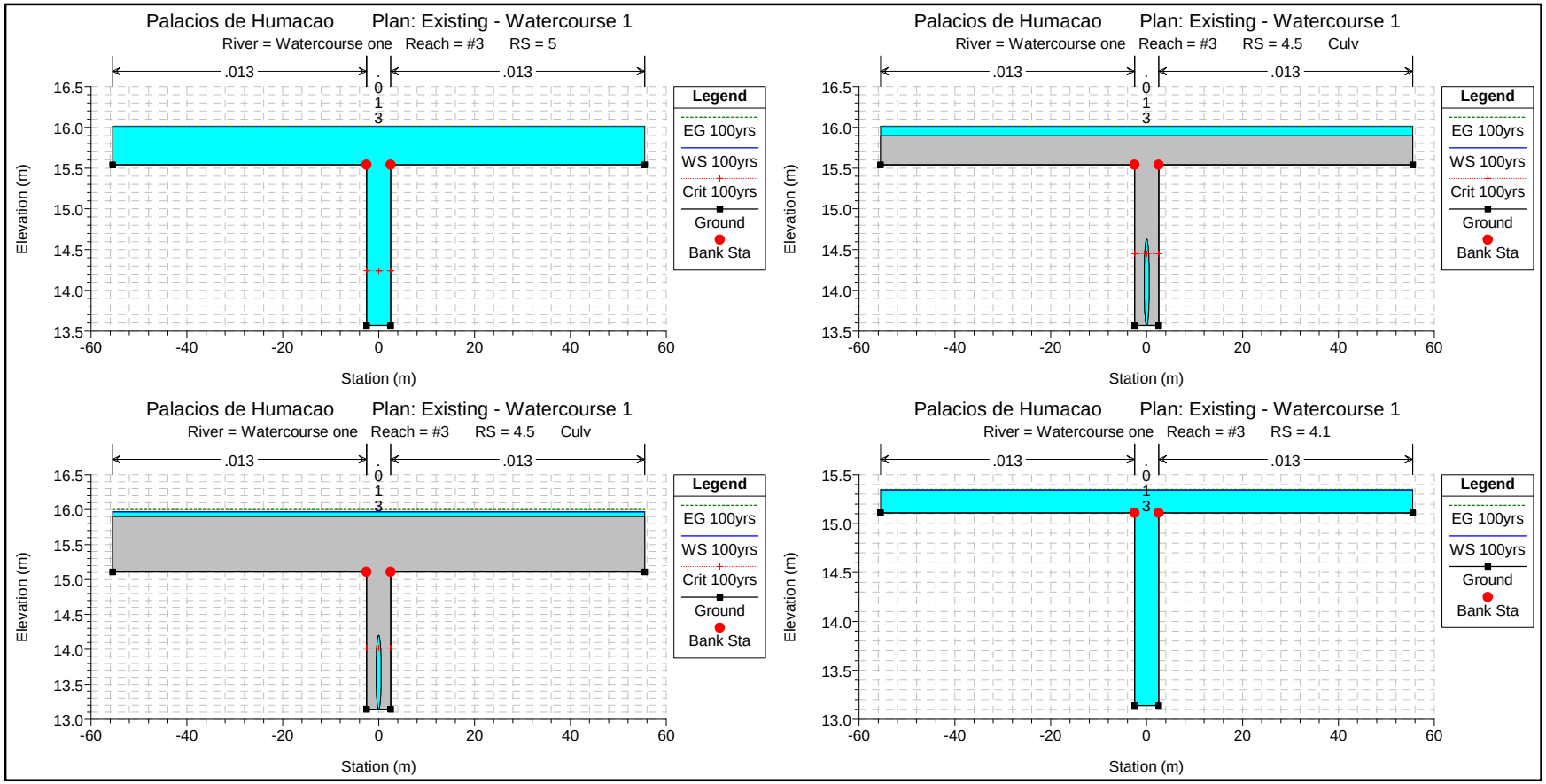
River: Watercourse one

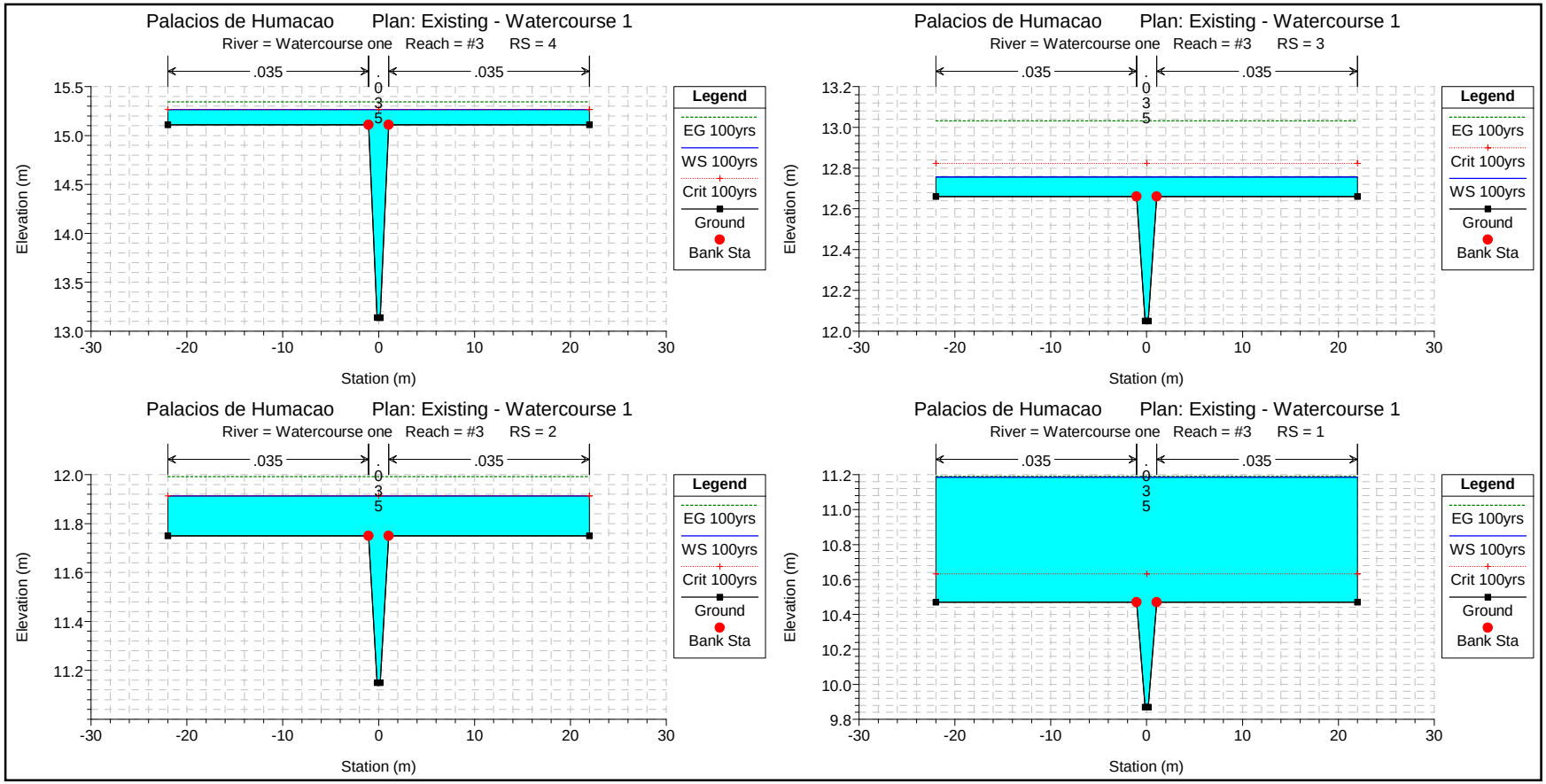
Reach	River Sta.	Left	Channel	Right
#3	5	13	13	13
#3	4.5	Culvert		
#3	4.1	1	1	1
#3	4	161	161	161
#3	3	112	112	112
#3	2	156	156	156
#3	1	0	0	0
#1	10	13	13	13
#1	9.5	Culvert		
#1	9.1	1	1	1
#1	9	28	28	28
#1	8	95	95	95
#1	7	122	122	122
#1	6	121	121	121
#1	5	0	0	0
#2	4	139	139	139
#2	3	96.4	96.4	96.4
#2	2	132.39	98	98
#2	1	0	0	0

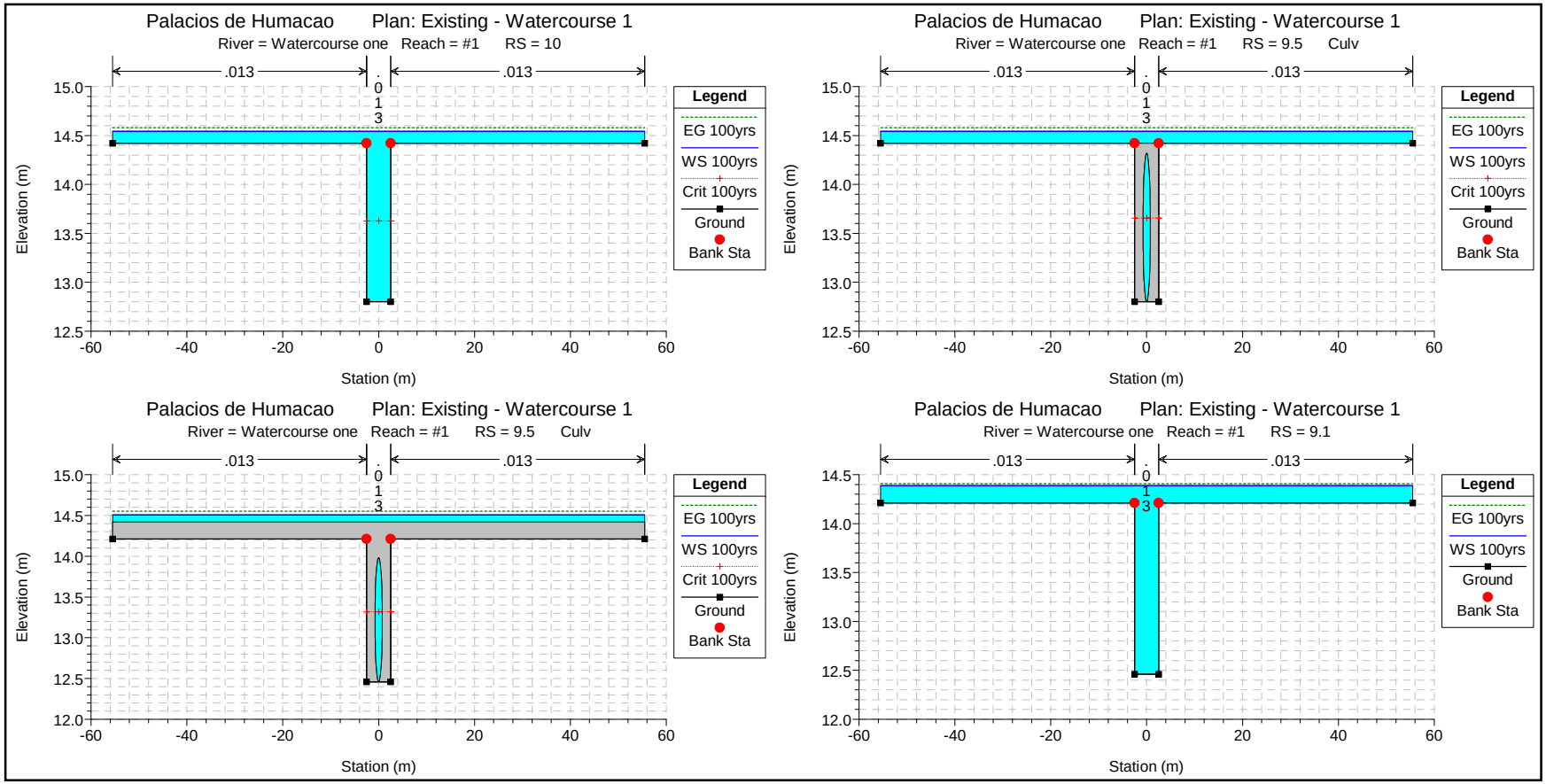
Profile Output Table - Standard Table 1

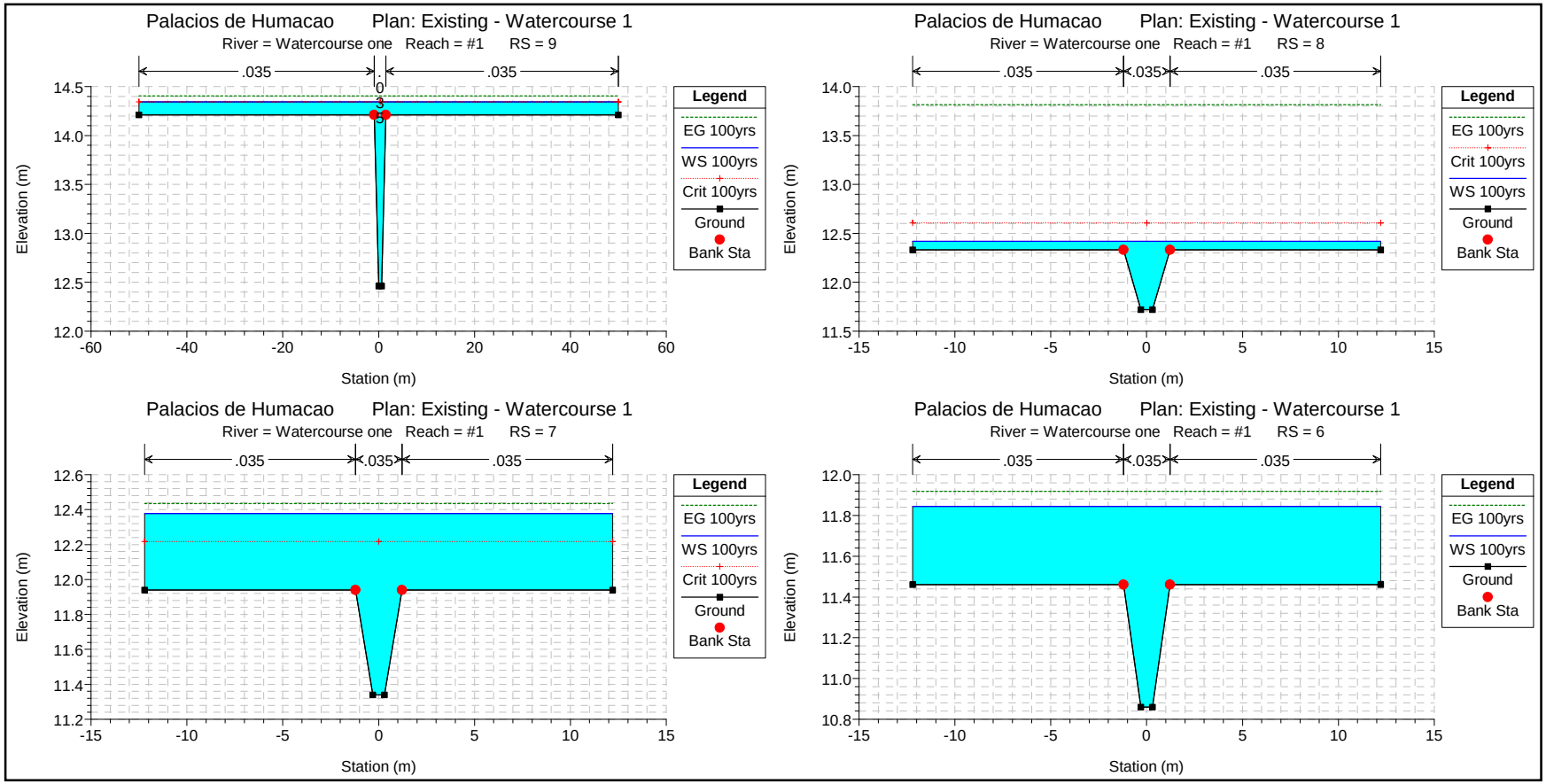
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
#3	5	100yrs	8.67	13.57	16.01	14.24	16.01	0.00001	0.24	62.36	111.00	0.05
#3	4.5		Culvert									
#3	4.1	100yrs	8.67	13.14	15.34		15.35	0.00003	0.45	35.79	111.00	0.10
#3	4	100yrs	8.67	13.14	15.26	15.26	15.34	0.00654	1.62	9.19	44.00	0.46
#3	3	100yrs	8.67	12.05	12.76	12.82	13.03	0.05162	3.39	4.97	44.00	1.63
#3	2	100yrs	8.67	11.15	11.91	11.91	11.99	0.01333	1.88	7.88	44.00	0.85
#3	1	100yrs	8.67	9.87	11.19	10.63	11.19	0.00014	0.32	32.23	44.00	0.10
#1	10	100yrs	11.82	12.80	14.54	13.63	14.58	0.00016	1.01	21.58	111.00	0.24
#1	9.5		Culvert									
#1	9.1	100yrs	11.82	12.46	14.39		14.41	0.00009	0.79	28.37	111.00	0.18
#1	9	100yrs	11.82	12.46	14.34	14.34	14.40	0.00543	1.59	15.94	100.00	0.46
#1	8	100yrs	11.82	11.72	12.42	12.61	13.81	0.16562	6.40	3.10	24.40	2.98
#1	7	100yrs	11.82	11.34	12.38	12.22	12.43	0.00352	1.35	11.59	24.40	0.48
#1	6	100yrs	11.82	10.86	11.84		11.92	0.00513	1.55	10.30	24.40	0.57
#1	5	100yrs	11.82	10.38	11.53		11.57	0.00179	1.05	14.30	24.40	0.35
#2	4	100yrs	20.49	9.87	11.05		11.15	0.00467	1.72	14.96	24.40	0.56
#2	3	100yrs	20.49	9.31	10.71		10.76	0.00177	1.22	20.21	24.40	0.36
#2	2	100yrs	33.30	8.92	10.31		10.46	0.00482	2.00	20.02	24.40	0.59
#2	1	100yrs	33.30	8.39	9.83	9.55	9.96	0.00400	1.87	21.21	24.40	0.54

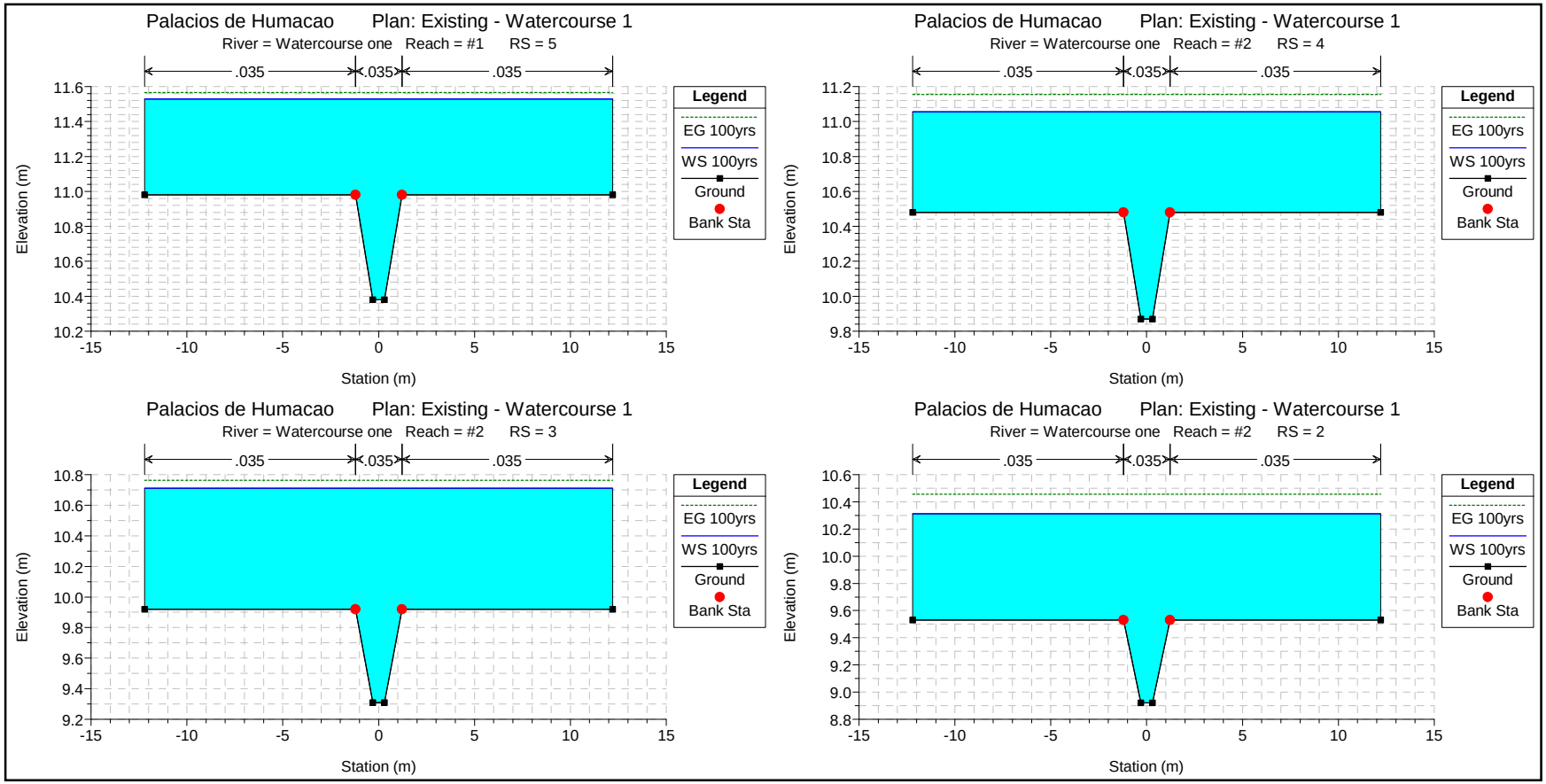

Palacios de Humacao
Plan: Existing - Watercourse 1
Watercourse one #3
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Elevation (m)
Main Channel Distance (m)
17
16
15
14
13
12
11
10
9
0
100
200
300
400
500
2
3
4
4.5

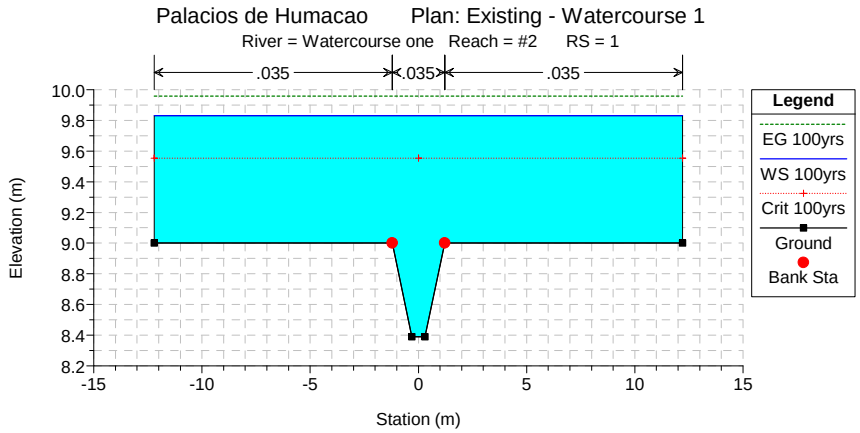

Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #3 RS = 5
.013
.013
.013
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #3 RS = 4.5 Culv
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #3 RS = 4.5 Culv
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #3 RS = 4.1


Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #3 RS = 4
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #3 RS = 3
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #3 RS = 2
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #3 RS = 1
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #1 RS = 10
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #1 RS = 9.5 Culv
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #1 RS = 9.5 Culv
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #1 RS = 9.1
.013
.013
.013
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #1 RS = 9
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #1 RS = 8
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #1 RS = 7
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #1 RS = 6
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #1 RS = 5
.035 .035 .035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #2 RS = 4
.035 .035 .035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #2 RS = 3
.035 .035 .035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #2 RS = 2
.035 .035 .035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Existing - Watercourse 1
River = Watercourse one Reach = #2 RS = 1
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta

APPENDIX G

HEC-RAS RESULTS PROPOSED CONDITION

WATERCOURSE ONE

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Palacios de Humacao
Project File : ph.prj
Run Date and Time: 10/16/2008 3:35:05 PM

Project in SI units

PLAN DATA

Plan Title: Proposed - Watercourse 1
Plan File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.p02

Geometry Title: Proposed - Watercourse 1
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g02

Flow Title : Proposed - Watercourse 1
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f02

Plan Summary Information:
Number of: Cross Sections = 12 Multiple Openings = 0
Culverts = 2 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculation tolerance = 0.003
Maximum number of iterations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Proposed - Watercourse 1
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f02

Flow Data (m3/s)

River	Reach	RS	100yrs	50yrs	25yrs	10yrs	2yrs
Watercourse one	#1	10	20.49	18.25	16.1	13.15	7.54
Watercourse one	#1	4	23.81	21.23	18.74	15.33	8.87
Watercourse one	#1	2	33.25	29.54	25.96	21.15	12.02

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Watercourse one	#1	100yrs	Critical	Normal S = 0.004
Watercourse one	#1	50yrs	Critical	Normal S = 0.004
Watercourse one	#1	25yrs	Critical	Normal S = 0.004
Watercourse one	#1	10yrs	Critical	Normal S = 0.004

```
  Watercourse one #1              2yrs                            Critical            Normal S = 0.004



GEOMETRY DATA

Geometry Title: Proposed - Watercourse 1
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g02

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 10

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -25.5   14.42    -2.5   14.42    -2.5    12.8     2.5    12.8     2.5   14.42
    25.5   14.42

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -25.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          -2.5     2.5               20      20      20             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            14.77    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.07    Wt. n-Val.               0.013      0.013      0.013
  W.S. Elev (m)            14.70    Reach Len. (m)           20.00      20.00      20.00
  Crit W.S. (m)            13.99    Flow Area (m2)            6.49       9.51       6.49
  E.G. Slope (m/m)      0.000277    Area (m2)                 6.49       9.51       6.49
  Q Total (m3/s)           20.49    Flow (m3/s)               3.55      13.39       3.55
  Top Width (m)            51.00    Top Width (m)            23.00       5.00      23.00
  Vel Total (m/s)           0.91    Avg. Vel. (m/s)           0.55       1.41       0.55
  Max Chl Dpth (m)          1.90    Hydr. Depth (m)           0.28       1.90       0.28
  Conv. Total (m3/s)      1231.7    Conv. (m3/s)             213.3      805.1      213.3
  Length Wtd. (m)          20.00    Wetted Per. (m)          23.28       8.24      23.28
  Min Ch El (m)            12.80    Shear (N/m2)              0.76       3.13       0.76
  Alpha                     1.69    Stream Power (N/m s)      0.41       4.41       0.41
  Frctn Loss (m)                    Cum Volume (1000 m3)      0.07       9.68       0.16
  C & E Loss (m)                    Cum SA (1000 m2)          0.31       7.73       0.50


CULVERT


RIVER: Watercourse one
REACH: #1                 RS: 9.5

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =      19
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      -3   14.42              11   14.42

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -25.5   14.42    -2.5   14.42    -2.5    12.8     2.5    12.8     2.5   14.42
    25.5   14.42

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -25.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -2.5     2.5             .1       .3
```

```
Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      -3   14.42              11   14.42

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -25.5   14.42    -2.5   14.42    -2.5   12.46     2.5   12.46     2.5   14.42
    25.5   14.42

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -25.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -2.5     2.5             .1       .3

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =   14.42
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular    1.52
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                .5      19     .013     .013        0                   .5                1
Upstream   Elevation =  12.8
           Centerline Station =  0
Downstream Elevation =  12.46
           Centerline Station =  0

CULVERT OUTPUT  Profile #100yrs  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       4.83    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         3.30
  Q Barrel (m3/s)           4.83    Culv Vel DS (m/s)         4.41
  E.G. US. (m)             14.77    Culv Inv El Up (m)       12.80
  W.S. US. (m)             14.70    Culv Inv El Dn (m)       12.46
  E.G. DS (m)              14.25    Culv Frctn Ls (m)         0.16
  W.S. DS (m)              13.65    Culv Exit Loss (m)        0.08
  Delta EG (m)              0.52    Culv Entr Loss (m)        0.28
  Delta WS (m)              1.05    Q Weir (m3/s)            15.66
  E.G. IC (m)              14.73    Weir Sta Lft (m)        -25.50
  E.G. OC (m)              14.77    Weir Sta Rgt (m)         25.50
  Culvert Control          Inlet    Weir Submerg              0.00
  Culv WS Inlet (m)        13.94    Weir Max Depth (m)        0.36
  Culv WS Outlet (m)       13.34    Weir Avg Depth (m)        0.36
  Culv Nml Depth (m)        0.75    Weir Flow Area (m2)      18.20
  Culv Crt Depth (m)        1.14    Min El Weir Flow (m)     14.42


Warning: The flow through the culvert is supercritical.  However, since there is flow over the road (weir
         flow), the program cannot determine if the downstream cross section should be subcritical or
         supercritical.  The program used the downstream subcritical answer, even though it may not be
         valid.
Warning: During the supercritical analysis, the program could not converge on a supercritical answer in
         the downstream cross section.  The program used the solution with the least error.
Note:    The flow in the culvert is entirely supercritical.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 9.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -25.5   14.42    -2.5   14.42    -2.5   12.46     2.5   12.46     2.5   14.42
    25.5   14.42
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -25.5    .013    -2.5    .013     2.5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          -2.5     2.5                1       1       1             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            14.25    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.60    Wt. n-Val.                          0.013
  W.S. Elev (m)            13.65    Reach Len. (m)            1.00       1.00       1.00
  Crit W.S. (m)            13.65    Flow Area (m2)                       5.96
  E.G. Slope (m/m)      0.002656    Area (m2)                            5.96
  Q Total (m3/s)           20.49    Flow (m3/s)                         20.49
  Top Width (m)             5.00    Top Width (m)                        5.00
  Vel Total (m/s)           3.44    Avg. Vel. (m/s)                      3.44
  Max Chl Dpth (m)          1.19    Hydr. Depth (m)                      1.19
  Conv. Total (m3/s)       397.6    Conv. (m3/s)                        397.6
  Length Wtd. (m)           1.00    Wetted Per. (m)                      7.38
  Min Ch El (m)            12.46    Shear (N/m2)                        21.03
  Alpha                     1.00    Stream Power (N/m s)                72.28
  Frctn Loss (m)            0.00    Cum Volume (1000 m3)      0.00       9.52       0.09
  C & E Loss (m)            0.10    Cum SA (1000 m2)          0.08       7.63       0.27


Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there
         is not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 9

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12   14.34   -4.88   14.34   -1.22    11.9    1.22    11.9    4.88   14.04
    8.88   14.04

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88                28      28      28             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            14.18    Element                 Left OB    Channel   Right OB
  Vel Head (m)              1.27    Wt. n-Val.                          0.035
  W.S. Elev (m)            12.91    Reach Len. (m)           28.00      28.00      28.00
  Crit W.S. (m)            13.32    Flow Area (m2)                       4.10
  E.G. Slope (m/m)      0.053623    Area (m2)                            4.10
  Q Total (m3/s)           20.49    Flow (m3/s)                         20.49
  Top Width (m)             5.68    Top Width (m)                        5.68
  Vel Total (m/s)           4.99    Avg. Vel. (m/s)                      4.99
  Max Chl Dpth (m)          1.01    Hydr. Depth (m)                      0.72
  Conv. Total (m3/s)        88.5    Conv. (m3/s)                         88.5
  Length Wtd. (m)          28.00    Wetted Per. (m)                      6.26
  Min Ch El (m)            11.90    Shear (N/m2)                       344.61
  Alpha                     1.00    Stream Power (N/m s)              1720.17
  Frctn Loss (m)            0.01    Cum Volume (1000 m3)      0.00       9.52       0.09
  C & E Loss (m)            0.07    Cum SA (1000 m2)          0.08       7.62       0.27


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
```

CROSS SECTION

RIVER: Watercourse one
REACH: #1 RS: 8

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.12	14.15	-4.88	14.15	-1.22	11.71	1.22	11.71	4.88	13.85
8.88	13.85								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-6.12	.035	-4.88	.035	4.88	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	95	95	95	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	13.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.26	Wt. n-Val.		0.035	
W.S. Elev (m)	13.44	Reach Len. (m)	95.00	95.00	95.00
Crit W.S. (m)	13.13	Flow Area (m2)		9.00	
E.G. Slope (m/m)	0.006331	Area (m2)		9.00	
Q Total (m3/s)	20.49	Flow (m3/s)		20.49	
Top Width (m)	7.98	Top Width (m)		7.98	
Vel Total (m/s)	2.28	Avg. Vel. (m/s)		2.28	
Max Chl Dpth (m)	1.73	Hydr. Depth (m)		1.13	
Conv. Total (m3/s)	257.5	Conv. (m3/s)		257.5	
Length Wtd. (m)	95.00	Wetted Per. (m)		8.97	
Min Ch El (m)	11.71	Shear (N/m2)		62.25	
Alpha	1.00	Stream Power (N/m s)		141.77	
Frctn Loss (m)	0.58	Cum Volume (1000 m3)	0.00	9.33	0.09
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.08	7.43	0.27

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: Watercourse one
REACH: #1 RS: 7

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.12	13.55	-4.88	13.55	-1.22	11.11	1.22	11.11	4.88	13.25
8.88	13.25								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-6.12	.035	-4.88	.035	4.88	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	120	120	120	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	13.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.25	Wt. n-Val.		0.035	
W.S. Elev (m)	12.86	Reach Len. (m)	120.00	120.00	120.00
Crit W.S. (m)		Flow Area (m2)		9.19	
E.G. Slope (m/m)	0.005979	Area (m2)		9.19	
Q Total (m3/s)	20.49	Flow (m3/s)		20.49	
Top Width (m)	8.06	Top Width (m)		8.06	
Vel Total (m/s)	2.23	Avg. Vel. (m/s)		2.23	
Max Chl Dpth (m)	1.75	Hydr. Depth (m)		1.14	
Conv. Total (m3/s)	265.0	Conv. (m3/s)		265.0	
Length Wtd. (m)	120.00	Wetted Per. (m)		9.06	
Min Ch El (m)	11.11	Shear (N/m2)		59.45	
Alpha	1.00	Stream Power (N/m s)		132.55	
Frctn Loss (m)	0.61	Cum Volume (1000 m3)	0.00	8.47	0.09
C & E Loss (m)	0.02	Cum SA (1000 m2)	0.08	6.67	0.27

```
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 6

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12   12.84   -4.88   12.84   -1.22    10.4    1.22    10.4    4.88   12.54
    8.88   12.54

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88              121     121     121             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            12.49    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.20    Wt. n-Val.                          0.035
  W.S. Elev (m)            12.29    Reach Len. (m)          121.00     121.00     121.00
  Crit W.S. (m)                     Flow Area (m2)                      10.35
  E.G. Slope (m/m)      0.004334    Area (m2)                           10.35
  Q Total (m3/s)           20.49    Flow (m3/s)                         20.49
  Top Width (m)             8.51    Top Width (m)                        8.51
  Vel Total (m/s)           1.98    Avg. Vel. (m/s)                      1.98
  Max Chl Dpth (m)          1.89    Hydr. Depth (m)                      1.22
  Conv. Total (m3/s)       311.2    Conv. (m3/s)                        311.2
  Length Wtd. (m)         121.00    Wetted Per. (m)                      9.60
  Min Ch El (m)            10.40    Shear (N/m2)                        45.86
  Alpha                     1.00    Stream Power (N/m s)                90.76
  Frctn Loss (m)            0.24    Cum Volume (1000 m3)      0.00       7.30       0.09
  C & E Loss (m)            0.04    Cum SA (1000 m2)          0.08       5.67       0.27


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 5.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12   12.08   -4.88   12.08   -1.22    9.64    1.22    9.64    4.88   11.78
    8.88   11.78

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88               13      13      13             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            12.21    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.08    Wt. n-Val.               0.035      0.035      0.035
  W.S. Elev (m)            12.13    Reach Len. (m)           13.00      13.00      13.00
  Crit W.S. (m)            11.05    Flow Area (m2)            0.06      15.94       1.41
  E.G. Slope (m/m)      0.001166    Area (m2)                 0.06      15.94       1.41
  Q Total (m3/s)           20.49    Flow (m3/s)               0.01      19.83       0.65
  Top Width (m)            15.00    Top Width (m)             1.24       9.76       4.00
  Vel Total (m/s)           1.18    Avg. Vel. (m/s)           0.13       1.24       0.46
  Max Chl Dpth (m)          2.49    Hydr. Depth (m)           0.05       1.63       0.35
  Conv. Total (m3/s)       600.0    Conv. (m3/s)               0.3      580.7       19.0
  Length Wtd. (m)          13.00    Wetted Per. (m)           1.29      11.08       4.35
  Min Ch El (m)             9.64    Shear (N/m2)              0.57      16.46       3.70
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  Alpha                     1.09    Stream Power (N/m s)      0.08      20.47       1.71
  Frctn Loss (m)                    Cum Volume (1000 m3)      0.00       5.70       0.01
  C & E Loss (m)                    Cum SA (1000 m2)          0.01       4.57       0.03


CULVERT


RIVER: Watercourse one
REACH: #1                 RS: 5.05

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =      12
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   -6.12   12.53            8.88   12.53

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12   12.08   -4.88   12.08   -1.22    9.64    1.22    9.64    4.88   11.78
    8.88   11.78

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
         -4.88    4.88             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   -6.12   12.53            8.88   12.53

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12   12.04   -4.88   12.04   -1.22     9.6    1.22     9.6    4.88   11.74
    8.88   11.74

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
         -4.88    4.88             .1       .3

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =   12.53
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box    2.44    3.65
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 .5      12     .013     .013        0                   .5                1
Upstream   Elevation =  9.64
           Centerline Station =  0
Downstream Elevation =  9.6
           Centerline Station =  0

CULVERT OUTPUT  Profile #100yrs  Culv Group:  Culvert #1

  Q Culv Group (m3/s)      20.49    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         2.93
  Q Barrel (m3/s)          20.49    Culv Vel DS (m/s)         2.87
  E.G. US. (m)             12.21    Culv Inv El Up (m)        9.64
  W.S. US. (m)             12.13    Culv Inv El Dn (m)        9.60
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  E.G. DS (m)              11.73    Culv Frctn Ls (m)         0.02
  W.S. DS (m)              11.55    Culv Exit Loss (m)        0.24
  Delta EG (m)              0.48    Culv Entr Loss (m)        0.22
  Delta WS (m)              0.58    Q Weir (m3/s)
  E.G. IC (m)              12.02    Weir Sta Lft (m)
  E.G. OC (m)              12.21    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)        11.56    Weir Max Depth (m)
  Culv WS Outlet (m)       11.55    Weir Avg Depth (m)
  Culv Nml Depth (m)        1.46    Weir Flow Area (m2)
  Culv Crt Depth (m)        1.48    Min El Weir Flow (m)     12.53


CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 5

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12   12.04   -4.88   12.04   -1.22     9.6    1.22     9.6    4.88   11.74
    8.88   11.74

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88              120     120     120             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            11.73    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.18    Wt. n-Val.                          0.035
  W.S. Elev (m)            11.55    Reach Len. (m)          120.00     120.00     120.00
  Crit W.S. (m)                     Flow Area (m2)                      10.90
  E.G. Slope (m/m)      0.003770    Area (m2)                           10.90
  Q Total (m3/s)           20.49    Flow (m3/s)                         20.49
  Top Width (m)             8.72    Top Width (m)                        8.72
  Vel Total (m/s)           1.88    Avg. Vel. (m/s)                      1.88
  Max Chl Dpth (m)          1.95    Hydr. Depth (m)                      1.25
  Conv. Total (m3/s)       333.7    Conv. (m3/s)                        333.7
  Length Wtd. (m)         120.00    Wetted Per. (m)                      9.84
  Min Ch El (m)             9.60    Shear (N/m2)                        40.98
  Alpha                     1.00    Stream Power (N/m s)                77.01
  Frctn Loss (m)            0.50    Cum Volume (1000 m3)                 5.53
  C & E Loss (m)            0.00    Cum SA (1000 m2)                     4.45


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 4

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12   11.44   -4.88   11.44   -1.22       9    1.22       9    4.88   11.14
    8.88   11.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88              139     139     139             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            11.23    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.22    Wt. n-Val.                          0.035
  W.S. Elev (m)            11.00    Reach Len. (m)          139.00     139.00     139.00
  Crit W.S. (m)                     Flow Area (m2)                      11.34
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  E.G. Slope (m/m)      0.004587    Area (m2)                          11.34
  Q Total (m3/s)           23.81    Flow (m3/s)                        23.81
  Top Width (m)             8.87    Top Width (m)                       8.87
  Vel Total (m/s)           2.10    Avg. Vel. (m/s)                     2.10
  Max Chl Dpth (m)          2.00    Hydr. Depth (m)                     1.28
  Conv. Total (m3/s)       351.6    Conv. (m3/s)                       351.6
  Length Wtd. (m)         139.00    Wetted Per. (m)                    10.02
  Min Ch El (m)             9.00    Shear (N/m2)                       50.87
  Alpha                     1.00    Stream Power (N/m s)              106.85
  Frctn Loss (m)            0.76    Cum Volume (1000 m3)                4.20
  C & E Loss (m)            0.01    Cum SA (1000 m2)                    3.39


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 3

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12   10.77   -4.88   10.77   -1.22    8.33    1.22    8.33    4.88   10.47
    8.88   10.47

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88               98      98      98             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            10.46    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.30    Wt. n-Val.                         0.035
  W.S. Elev (m)            10.16    Reach Len. (m)          98.00      98.00      98.00
  Crit W.S. (m)                     Flow Area (m2)                      9.86
  E.G. Slope (m/m)      0.006669    Area (m2)                           9.86
  Q Total (m3/s)           23.81    Flow (m3/s)                        23.81
  Top Width (m)             8.32    Top Width (m)                       8.32
  Vel Total (m/s)           2.41    Avg. Vel. (m/s)                     2.41
  Max Chl Dpth (m)          1.83    Hydr. Depth (m)                     1.19
  Conv. Total (m3/s)       291.6    Conv. (m3/s)                       291.6
  Length Wtd. (m)          98.00    Wetted Per. (m)                     9.38
  Min Ch El (m)             8.33    Shear (N/m2)                       68.82
  Alpha                     1.00    Stream Power (N/m s)              166.11
  Frctn Loss (m)            0.56    Cum Volume (1000 m3)                2.72
  C & E Loss (m)            0.01    Cum SA (1000 m2)                    2.20


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 2

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -8.49    10.4   -7.49    10.4   -2.83    7.96    2.83    7.96    7.49    10.4
    8.49    10.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -8.49    .035   -7.49    .035    7.49    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -7.49    7.49               98      98      98             .1       .3
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CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)             9.89    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.26    Wt. n-Val.                          0.035
  W.S. Elev (m)             9.63    Reach Len. (m)           98.00      98.00      98.00
  Crit W.S. (m)                     Flow Area (m2)                      14.76
  E.G. Slope (m/m)      0.005171    Area (m2)                           14.76
  Q Total (m3/s)           33.25    Flow (m3/s)                         33.25
  Top Width (m)            12.03    Top Width (m)                       12.03
  Vel Total (m/s)           2.25    Avg. Vel. (m/s)                      2.25
  Max Chl Dpth (m)          1.67    Hydr. Depth (m)                      1.23
  Conv. Total (m3/s)       462.4    Conv. (m3/s)                        462.4
  Length Wtd. (m)          98.00    Wetted Per. (m)                     12.85
  Min Ch El (m)             7.96    Shear (N/m2)                        58.23
  Alpha                     1.00    Stream Power (N/m s)               131.19
  Frctn Loss (m)            0.44    Cum Volume (1000 m3)                 1.52
  C & E Loss (m)            0.01    Cum SA (1000 m2)                     1.20


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse one
REACH: #1                 RS: 1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -8.49    9.87   -7.49    9.87   -2.83    7.43    2.83    7.43    7.49    9.87
    8.49    9.87

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -8.49    .035   -7.49    .035    7.49    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -7.49    7.49                0       0       0             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)             9.43    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.22    Wt. n-Val.                          0.035
  W.S. Elev (m)             9.21    Reach Len. (m)
  Crit W.S. (m)             8.73    Flow Area (m2)                      16.18
  E.G. Slope (m/m)      0.004003    Area (m2)                           16.18
  Q Total (m3/s)           33.25    Flow (m3/s)                         33.25
  Top Width (m)            12.48    Top Width (m)                       12.48
  Vel Total (m/s)           2.05    Avg. Vel. (m/s)                      2.05
  Max Chl Dpth (m)          1.78    Hydr. Depth (m)                      1.30
  Conv. Total (m3/s)       525.6    Conv. (m3/s)                        525.6
  Length Wtd. (m)                   Wetted Per. (m)                     13.35
  Min Ch El (m)             7.43    Shear (N/m2)                        47.57
  Alpha                     1.00    Stream Power (N/m s)                97.73
  Frctn Loss (m)                    Cum Volume (1000 m3)
  C & E Loss (m)                    Cum SA (1000 m2)
```

SUMMARY OF MANNING'S N VALUES

River:Watercourse one

Reach	River Sta.	n1	n2	n3
#1	10	.013	.013	.013
#1	9.5	Culvert		
#1	9.1	.013	.013	.013
#1	9	.035	.035	.035
#1	8	.035	.035	.035
#1	7	.035	.035	.035
#1	6	.035	.035	.035
#1	5.1	.035	.035	.035
#1	5.05	Culvert		
#1	5	.035	.035	.035
#1	4	.035	.035	.035
#1	3	.035	.035	.035
#1	2	.035	.035	.035
#1	1	.035	.035	.035

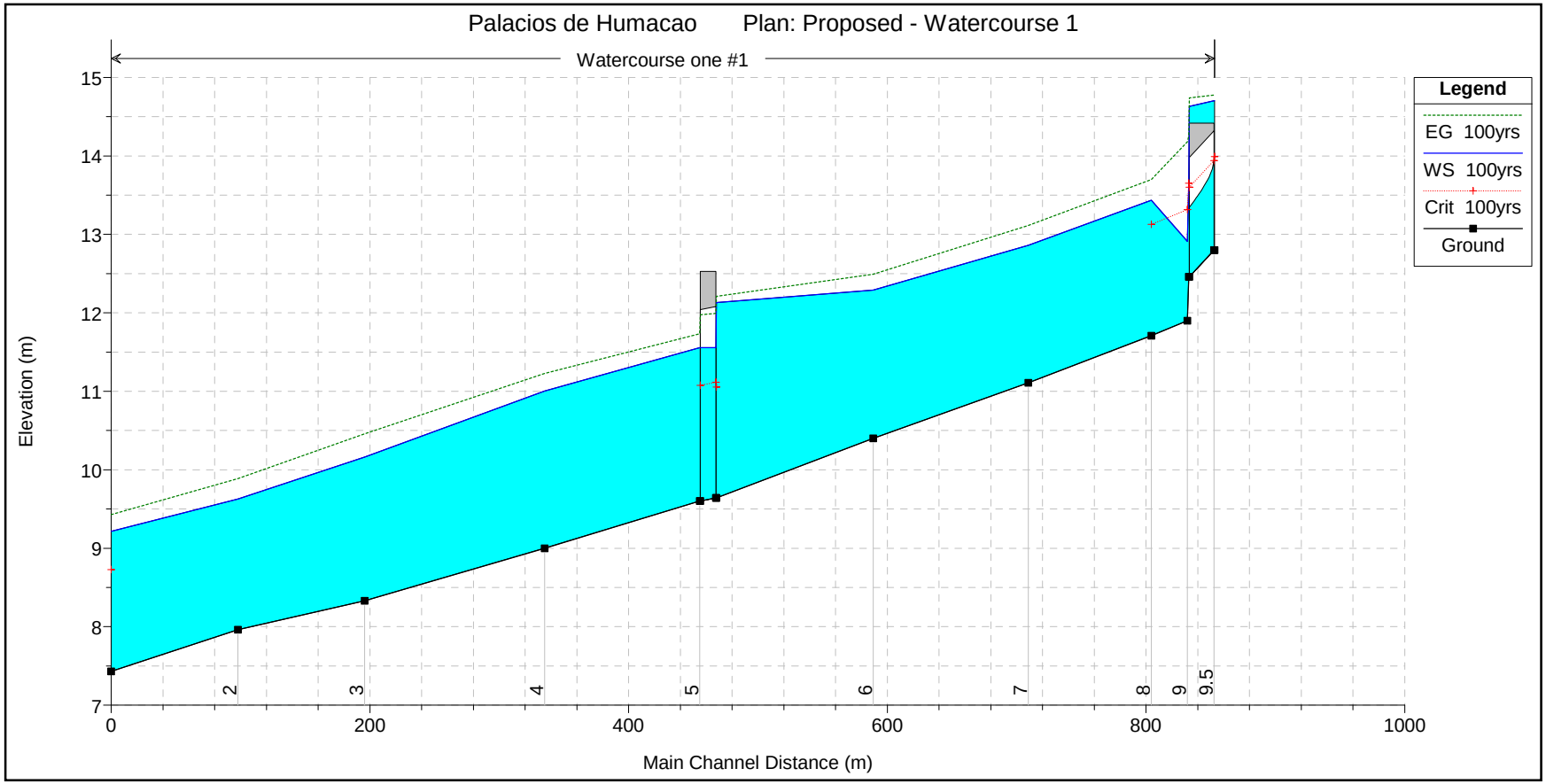
SUMMARY OF REACH LENGTHS

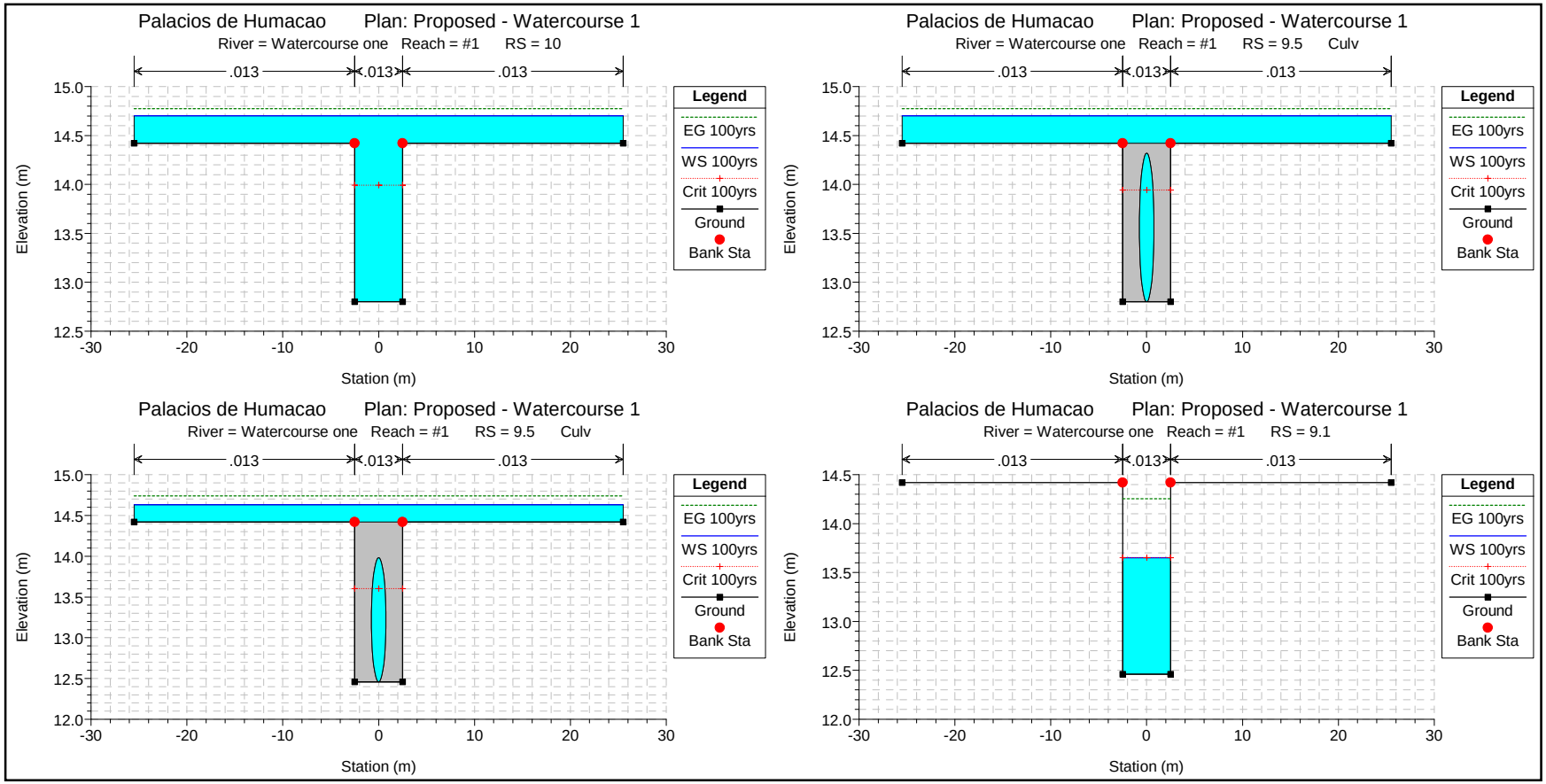
River: Watercourse one

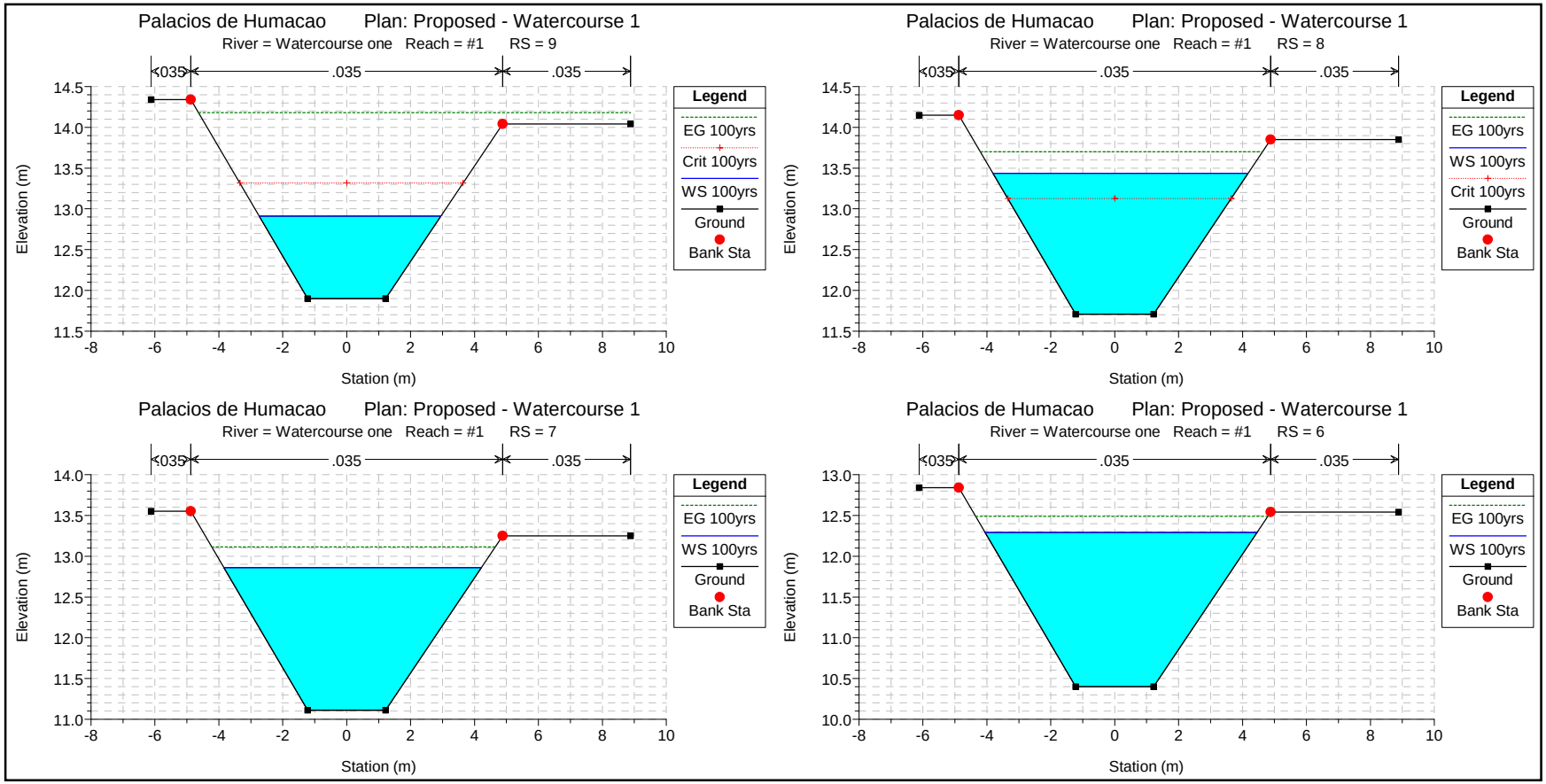
Reach	River Sta.	Left	Channel	Right
#1	10	20	20	20
#1	9.5	Culvert		
#1	9.1	1	1	1
#1	9	28	28	28
#1	8	95	95	95
#1	7	120	120	120
#1	6	121	121	121
#1	5.1	13	13	13
#1	5.05	Culvert		
#1	5	120	120	120
#1	4	139	139	139
#1	3	98	98	98
#1	2	98	98	98
#1	1	0	0	0

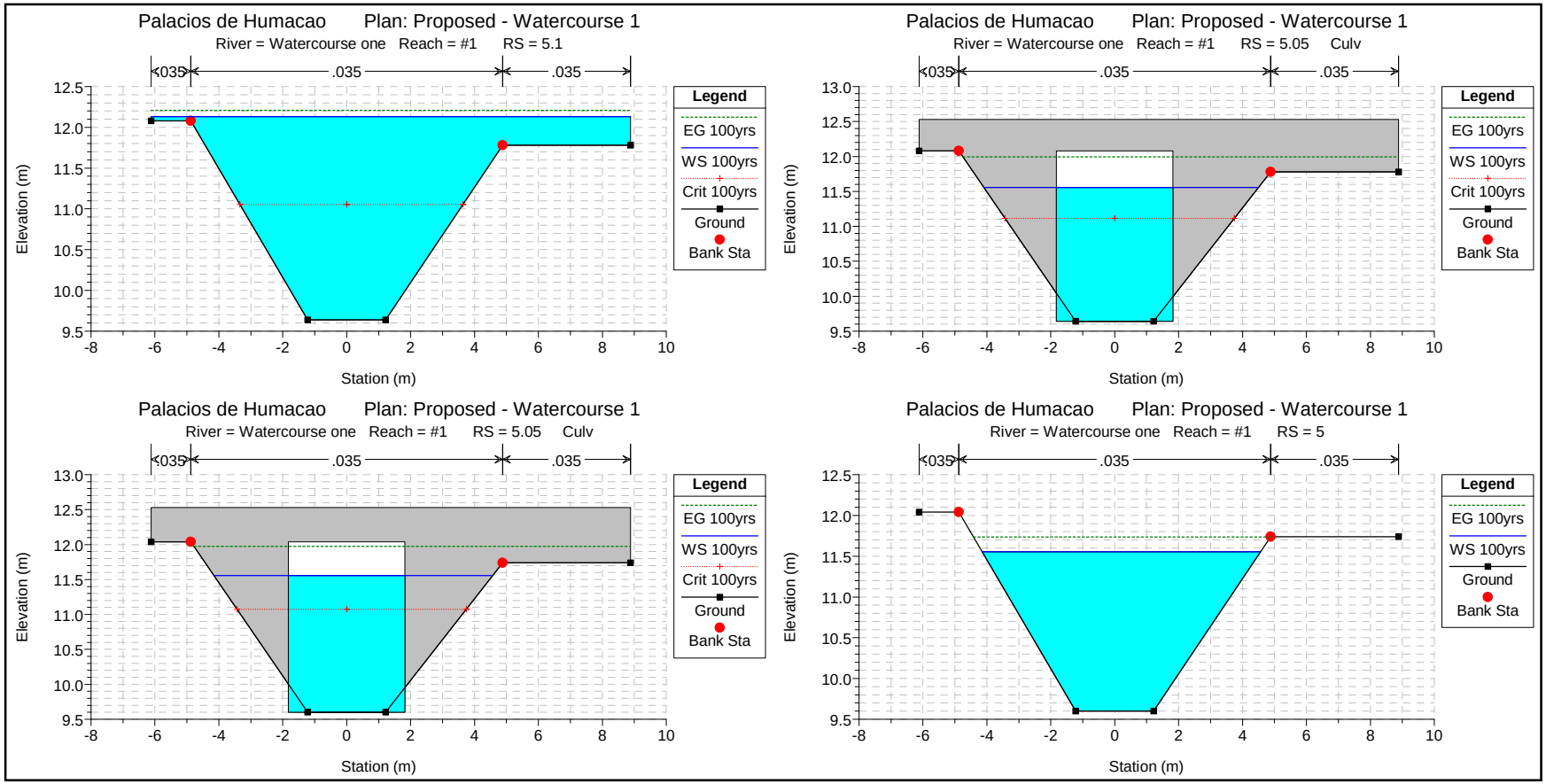
Profile Output Table - Standard Table 1

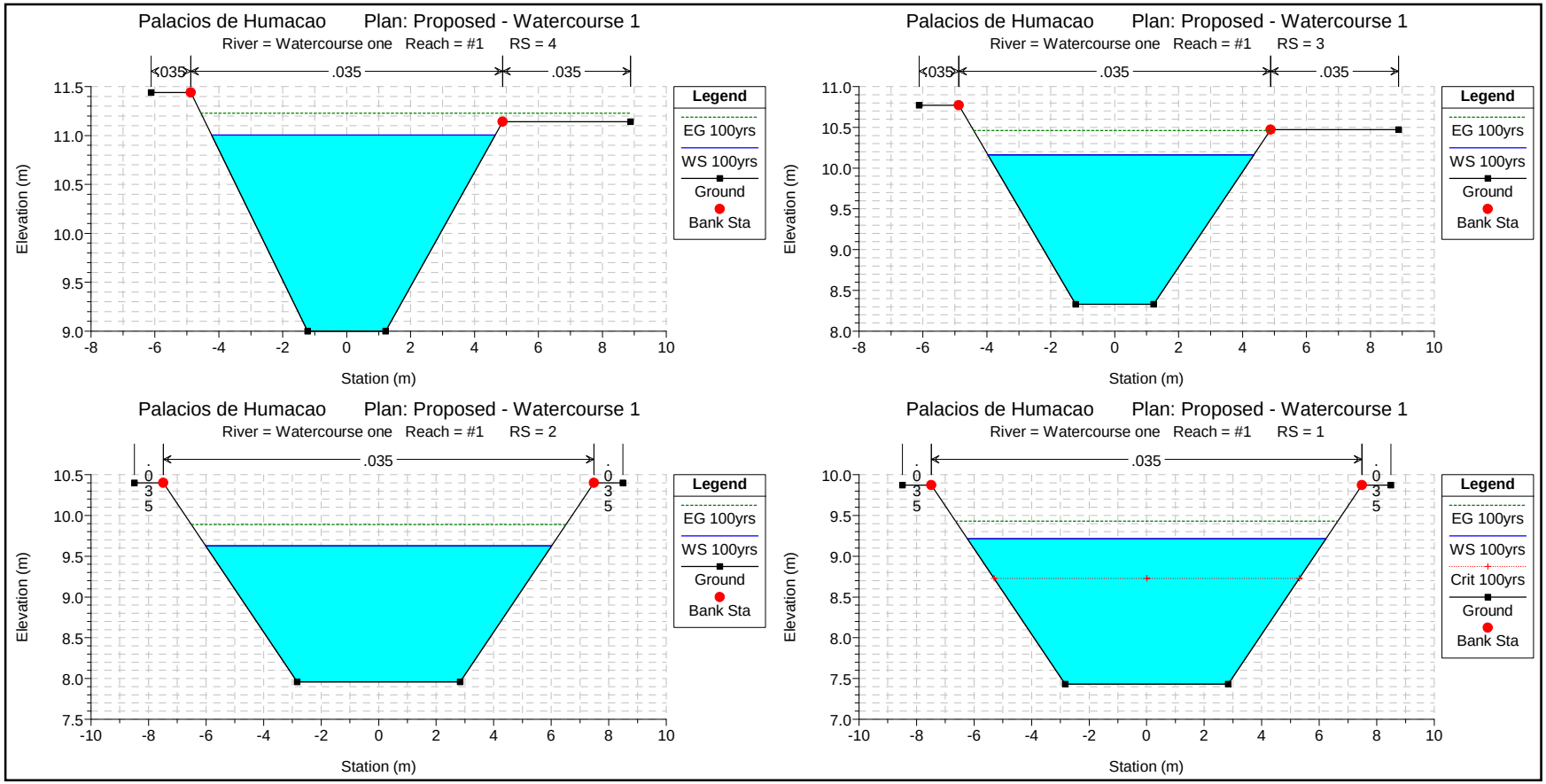
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
#1	10	100yrs	20.49	12.80	14.70	13.99	14.77	0.00028	1.41	22.50	51.00	0.33
#1	9.5		Culvert									
#1	9.1	100yrs	20.49	12.46	13.65	13.65	14.25	0.00266	3.44	5.96	5.00	1.00
#1	9	100yrs	20.49	11.90	12.91	13.32	14.18	0.05362	4.99	4.10	5.68	1.87
#1	8	100yrs	20.49	11.71	13.44	13.13	13.70	0.00633	2.28	9.00	7.98	0.68
#1	7	100yrs	20.49	11.11	12.86		13.11	0.00598	2.23	9.19	8.06	0.67
#1	6	100yrs	20.49	10.40	12.29		12.49	0.00433	1.98	10.35	8.51	0.57
#1	5.1	100yrs	20.49	9.64	12.13	11.05	12.21	0.00117	1.24	17.42	15.00	0.31
#1	5.05		Culvert									
#1	5	100yrs	20.49	9.60	11.55		11.73	0.00377	1.88	10.90	8.72	0.54
#1	4	100yrs	23.81	9.00	11.00		11.23	0.00459	2.10	11.34	8.87	0.59
#1	3	100yrs	23.81	8.33	10.16		10.46	0.00667	2.41	9.86	8.32	0.71
#1	2	100yrs	33.25	7.96	9.63		9.89	0.00517	2.25	14.76	12.03	0.65
#1	1	100yrs	33.25	7.43	9.21	8.73	9.43	0.00400	2.05	16.18	12.48	0.58


Palacios de Humacao
Plan: Proposed - Watercourse 1
Watercourse one #1
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Elevation (m)
Main Channel Distance (m)
15
14
13
12
11
10
9
8
7
0
200
400
600
800
1000
2
3
4
5
6
7
8
9
9.5


Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 10
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 9.5 Culv
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 9.5 Culv
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 9.1
.013
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 9
<.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 8
<.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 7
<.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 6
<.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 5.1
<035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 5.05 Culv
<035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 5.05 Culv
<035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 5
<035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 4
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 3
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 2
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 1
River = Watercourse one Reach = #1 RS = 1
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta

APPENDIX H

HEC-RAS RESULTS EXISTING CONDITION

WATERCOURSE TWO

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Palacios de Humacao
Project File : ph.prj
Run Date and Time: 10/16/2008 4:07:54 PM

Project in SI units

PLAN DATA

Plan Title: Existing - Watercourse 2
Plan File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.p03

Geometry Title: Existing - Watercourse 2
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g03

Flow Title : Existing - Watercourse 2
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f03

Plan Summary Information:
Number of: Cross Sections = 7 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculation tolerance = 0.003
Maximum number of iterations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Existing - Watercourse 2
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f03

Flow Data (m3/s)

River	Reach	RS	100yrs	50yrs	25yrs	10yrs	2yrs
Watercourse 2	one	6	25.71	22.87	20.15	16.44	9.33

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Watercourse 2	one	100yrs	Critical	Normal S = 0.004
Watercourse 2	one	50yrs	Critical	Normal S = 0.004
Watercourse 2	one	25yrs	Critical	Normal S = 0.004
Watercourse 2	one	10yrs	Critical	Normal S = 0.004
Watercourse 2	one	2yrs	Critical	Normal S = 0.004

GEOMETRY DATA

Geometry Title: Existing - Watercourse 2
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g03

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 6

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-50	19.4	-1.5	19.4	-1.5	15.87	1.5	15.87	1.5	19.4
50	19.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-50	.013	-1.5	.013	1.5	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.5	1.5	18	18	18	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

			Left OB	Channel	Right OB
E.G. Elev (m)	19.64	Element			
Vel Head (m)	0.31	Wt. n-Val.		0.013	
W.S. Elev (m)	19.33	Reach Len. (m)	18.00	18.00	18.00
Crit W.S. (m)	17.82	Flow Area (m2)		10.37	
E.G. Slope (m/m)	0.000978	Area (m2)		10.37	
Q Total (m3/s)	25.71	Flow (m3/s)		25.71	
Top Width (m)	3.00	Top Width (m)		3.00	
Vel Total (m/s)	2.48	Avg. Vel. (m/s)		2.48	
Max Chl Dpth (m)	3.46	Hydr. Depth (m)		3.46	
Conv. Total (m3/s)	822.0	Conv. (m3/s)		822.0	
Length Wtd. (m)	18.00	Wetted Per. (m)		9.91	
Min Ch El (m)	15.87	Shear (N/m2)		10.04	
Alpha	1.00	Stream Power (N/m s)		24.88	
Frctn Loss (m)		Cum Volume (1000 m3)	1.94	1.30	1.94
C & E Loss (m)		Cum SA (1000 m2)	4.47	1.22	4.47

CULVERT

RIVER: Watercourse 2
REACH: one RS: 5.5

INPUT
Description:
Distance from Upstream XS = .5
Deck/Roadway Width = 17
Weir Coefficient = 1.44
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-50	19.4		50	19.4	

Upstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-50	19.4	-1.5	19.4	-1.5	15.87	1.5	15.87	1.5	19.4
50	19.4								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-50	.013	-1.5	.013	1.5	.013

Bank Sta: Left	Right	Coeff Contr.	Expan.
-1.5	1.5	.1	.3

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-50	19.4		50	19.4	

```
Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     -50   19.28    -1.5   19.28    -1.5   15.62     1.5   15.62     1.5   19.28
      50   19.28

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     -50    .013    -1.5    .013     1.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -1.5     1.5             .1       .3

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =    19.4
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular    1.52
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  .5      17     .013     .013        0                   .5                1
Upstream   Elevation =  15.87
           Centerline Station =  0
Downstream Elevation =  15.62
           Centerline Station =  0

CULVERT OUTPUT  Profile #100yrs  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       8.86    Culv Full Len (m)        17.00
  # Barrels                    1    Culv Vel US (m/s)         4.88
  Q Barrel (m3/s)           8.86    Culv Vel DS (m/s)         4.88
  E.G. US. (m)             19.64    Culv Inv El Up (m)       15.87
  W.S. US. (m)             19.33    Culv Inv El Dn (m)       15.62
  E.G. DS (m)              18.55    Culv Frctn Ls (m)         0.25
  W.S. DS (m)              17.57    Culv Exit Loss (m)        0.23
  Delta EG (m)              1.09    Culv Entr Loss (m)        0.61
  Delta WS (m)              1.76    Q Weir (m3/s)            16.96
  E.G. IC (m)              19.63    Weir Sta Lft (m)        -50.00
  E.G. OC (m)              19.64    Weir Sta Rgt (m)         50.00
  Culvert Control          Inlet    Weir Submerg              0.00
  Culv WS Inlet (m)        17.39    Weir Max Depth (m)        0.24
  Culv WS Outlet (m)       17.14    Weir Avg Depth (m)        0.24
  Culv Nml Depth (m)        1.24    Weir Flow Area (m2)      24.01
  Culv Crt Depth (m)        1.52    Min El Weir Flow (m)     19.40


Note:    Culvert critical depth exceeds the height of the culvert.
Note:    During the supercritical calculations a hydraulic jump occurred inside of the culvert.
Note:    The culvert inlet is submerged and the culvert flows full over part or all of its length.  Therefore,
         the culvert inlet equations are not valid and the supercritical result has been discarded.  The
         outlet answer will be used.

CROSS SECTION


RIVER: Watercourse 2
REACH: one                RS: 5

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     -50   19.28    -1.5   19.28    -1.5   15.62     1.5   15.62     1.5   19.28
      50   19.28

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     -50    .013    -1.5    .013     1.5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          -1.5     1.5              120     120     120             .1       .3
```

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	18.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.98	Wt. n-Val.		0.013	
W.S. Elev (m)	17.57	Reach Len. (m)	120.00	120.00	120.00
Crit W.S. (m)	17.57	Flow Area (m2)		5.85	
E.G. Slope (m/m)	0.004064	Area (m2)		5.85	
Q Total (m3/s)	25.71	Flow (m3/s)		25.71	
Top Width (m)	3.00	Top Width (m)		3.00	
Vel Total (m/s)	4.39	Avg. Vel. (m/s)		4.39	
Max Chl Dpth (m)	1.95	Hydr. Depth (m)		1.95	
Conv. Total (m3/s)	403.3	Conv. (m3/s)		403.3	
Length Wtd. (m)	120.00	Wetted Per. (m)		6.90	
Min Ch El (m)	15.62	Shear (N/m2)		33.80	
Alpha	1.00	Stream Power (N/m s)		148.48	
Frctn Loss (m)	0.76	Cum Volume (1000 m3)	1.94	1.15	1.94
C & E Loss (m)	0.23	Cum SA (1000 m2)	4.47	1.17	4.47

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 4

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.215	14.03	-2.215	14.03	-1.215	14.03	-.305	13.43	.305	13.43
1.215	14.03	2.215	14.03	12.215	14.03				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.215	.035	-1.215	.035	1.215	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.215	1.215	153	153	153	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	16.81	Element	Left OB	Channel	Right OB
Vel Head (m)	2.64	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	14.17	Reach Len. (m)	153.00	153.00	153.00
Crit W.S. (m)	14.50	Flow Area (m2)	1.58	1.26	1.58
E.G. Slope (m/m)	0.316752	Area (m2)	1.58	1.26	1.58
Q Total (m3/s)	25.71	Flow (m3/s)	6.89	11.93	6.89
Top Width (m)	24.43	Top Width (m)	11.00	2.43	11.00
Vel Total (m/s)	5.82	Avg. Vel. (m/s)	4.37	9.47	4.37
Max Chl Dpth (m)	0.74	Hydr. Depth (m)	0.14	0.52	0.14
Conv. Total (m3/s)	45.7	Conv. (m3/s)	12.2	21.2	12.2
Length Wtd. (m)	153.00	Wetted Per. (m)	11.14	2.79	11.14
Min Ch El (m)	13.43	Shear (N/m2)	439.71	1403.20	439.71
Alpha	1.53	Stream Power (N/m s)	1920.49	13284.20	1920.49
Frctn Loss (m)	1.57	Cum Volume (1000 m3)	1.85	0.72	1.85
C & E Loss (m)	0.17	Cum SA (1000 m2)	3.81	0.84	3.81

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 3

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.215	12.5	-2.215	12.5	-1.215	12.5	-.305	11.9	.305	11.9
1.215	12.5	2.215	12.5	12.215	12.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.215	.035	-1.215	.035	1.215	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.215	1.215	147	147	147	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	13.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	13.04	Reach Len. (m)	147.00	147.00	147.00
Crit W.S. (m)	12.97	Flow Area (m2)	5.96	2.23	5.96
E.G. Slope (m/m)	0.008821	Area (m2)	5.96	2.23	5.96
Q Total (m3/s)	25.71	Flow (m3/s)	10.28	5.14	10.28
Top Width (m)	24.43	Top Width (m)	11.00	2.43	11.00
Vel Total (m/s)	1.82	Avg. Vel. (m/s)	1.73	2.31	1.73
Max Chl Dpth (m)	1.14	Hydr. Depth (m)	0.54	0.92	0.54
Conv. Total (m3/s)	273.7	Conv. (m3/s)	109.5	54.8	109.5
Length Wtd. (m)	147.00	Wetted Per. (m)	11.54	2.79	11.54
Min Ch El (m)	11.90	Shear (N/m2)	44.64	69.07	44.64
Alpha	1.04	Stream Power (N/m s)	77.07	159.51	77.07
Frctn Loss (m)	1.05	Cum Volume (1000 m3)	1.27	0.46	1.27
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.12	0.47	2.12

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 2

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.215	11.4	-2.215	11.4	-1.215	11.4	-.305	10.8	.305	10.8
1.215	11.4	2.215	11.4	12.215	11.4				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.215	.035	-1.215	.035	1.215	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.215	1.215	26	26	26	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	12.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	12.02	Reach Len. (m)	26.00	26.00	26.00
Crit W.S. (m)		Flow Area (m2)	6.79	2.41	6.79
E.G. Slope (m/m)	0.005938	Area (m2)	6.79	2.41	6.79
Q Total (m3/s)	25.71	Flow (m3/s)	10.45	4.82	10.45
Top Width (m)	24.43	Top Width (m)	11.00	2.43	11.00
Vel Total (m/s)	1.61	Avg. Vel. (m/s)	1.54	2.00	1.54
Max Chl Dpth (m)	1.22	Hydr. Depth (m)	0.62	0.99	0.62
Conv. Total (m3/s)	333.6	Conv. (m3/s)	135.6	62.5	135.6
Length Wtd. (m)	26.00	Wetted Per. (m)	11.62	2.79	11.62
Min Ch El (m)	10.80	Shear (N/m2)	34.03	50.34	34.03
Alpha	1.03	Stream Power (N/m s)	52.36	100.56	52.36
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	0.33	0.12	0.33
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.51	0.11	0.51

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 1

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.215	11.23	-2.215	11.23	-1.215	11.23	-.305	10.63	.305	10.63
1.215	11.23	2.215	11.23	12.215	11.23				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.215	.035	-1.215	.035	1.215	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.215	1.215	20	20	20	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	12.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	11.89	Reach Len. (m)	20.00	20.00	20.00
Crit W.S. (m)		Flow Area (m2)	7.26	2.52	7.26
E.G. Slope (m/m)	0.004845	Area (m2)	7.26	2.52	7.26
Q Total (m3/s)	25.71	Flow (m3/s)	10.52	4.67	10.52
Top Width (m)	24.43	Top Width (m)	11.00	2.43	11.00
Vel Total (m/s)	1.51	Avg. Vel. (m/s)	1.45	1.86	1.45
Max Chl Dpth (m)	1.26	Hydr. Depth (m)	0.66	1.04	0.66
Conv. Total (m3/s)	369.4	Conv. (m3/s)	151.2	67.1	151.2
Length Wtd. (m)	20.00	Wetted Per. (m)	11.66	2.79	11.66
Min Ch El (m)	10.63	Shear (N/m2)	29.57	42.83	29.57
Alpha	1.03	Stream Power (N/m s)	42.87	79.49	42.87
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	0.15	0.05	0.15
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.22	0.05	0.22

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 0

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.215	11.11	-2.215	11.11	-1.215	11.11	-.305	10.5	.305	10.5
1.215	11.11	2.215	11.11	12.215	11.11				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.215	.035	-1.215	.035	1.215	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.215	1.215	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	11.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	11.81	Reach Len. (m)			
Crit W.S. (m)	11.57	Flow Area (m2)	7.72	2.63	7.72
E.G. Slope (m/m)	0.004007	Area (m2)	7.72	2.63	7.72
Q Total (m3/s)	25.71	Flow (m3/s)	10.57	4.57	10.57
Top Width (m)	24.43	Top Width (m)	11.00	2.43	11.00
Vel Total (m/s)	1.42	Avg. Vel. (m/s)	1.37	1.73	1.37
Max Chl Dpth (m)	1.31	Hydr. Depth (m)	0.70	1.08	0.70
Conv. Total (m3/s)	406.2	Conv. (m3/s)	167.0	72.1	167.0
Length Wtd. (m)		Wetted Per. (m)	11.70	2.80	11.70
Min Ch El (m)	10.50	Shear (N/m2)	25.91	36.92	25.91
Alpha	1.03	Stream Power (N/m s)	35.50	64.05	35.50
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Watercourse 2

Reach	River Sta.	n1	n2	n3
one	6	.013	.013	.013
one	5.5	Culvert		
one	5	.013	.013	.013
one	4	.035	.035	.035
one	3	.035	.035	.035
one	2	.035	.035	.035
one	1	.035	.035	.035
one	0	.035	.035	.035

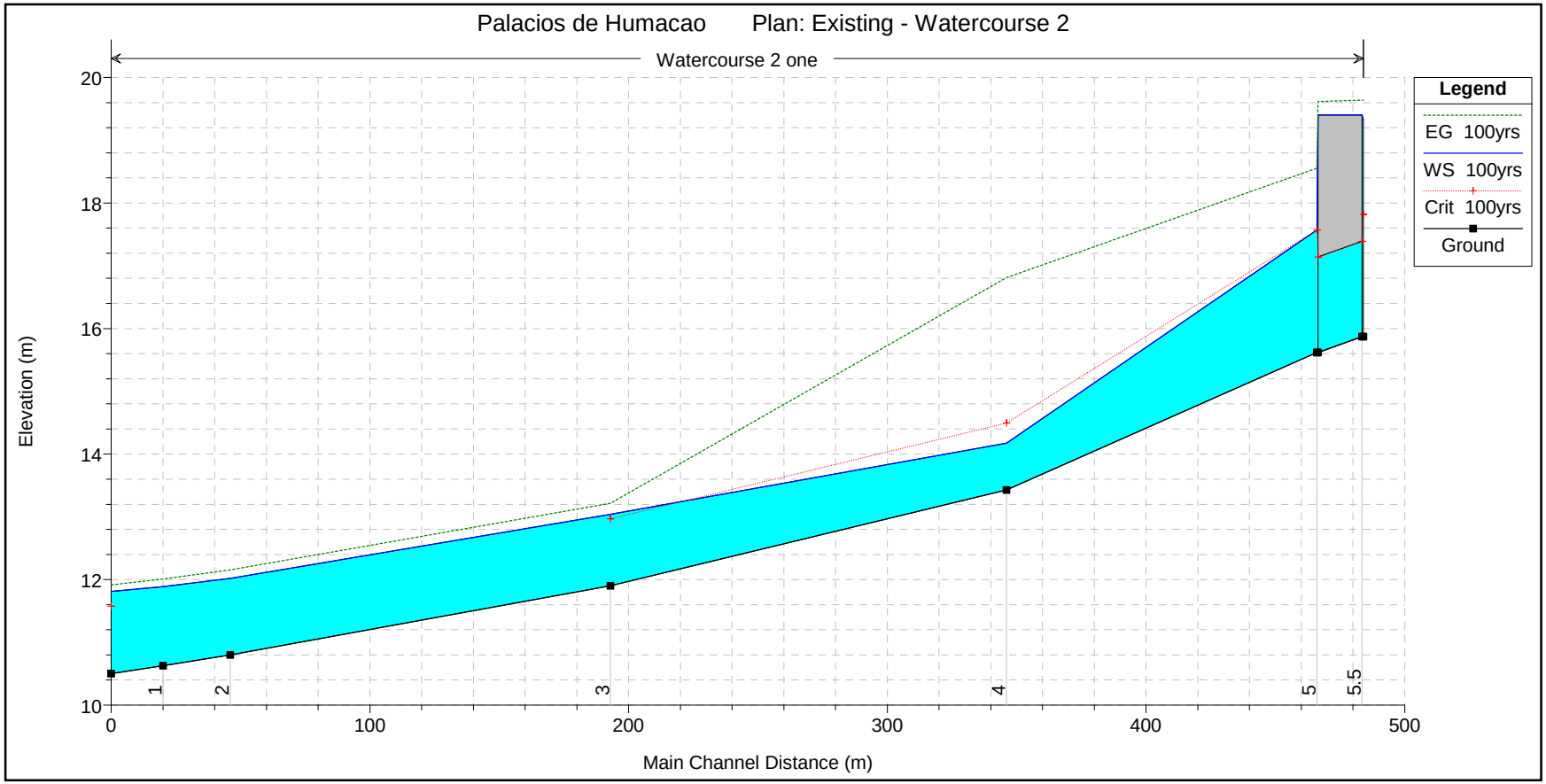
SUMMARY OF REACH LENGTHS

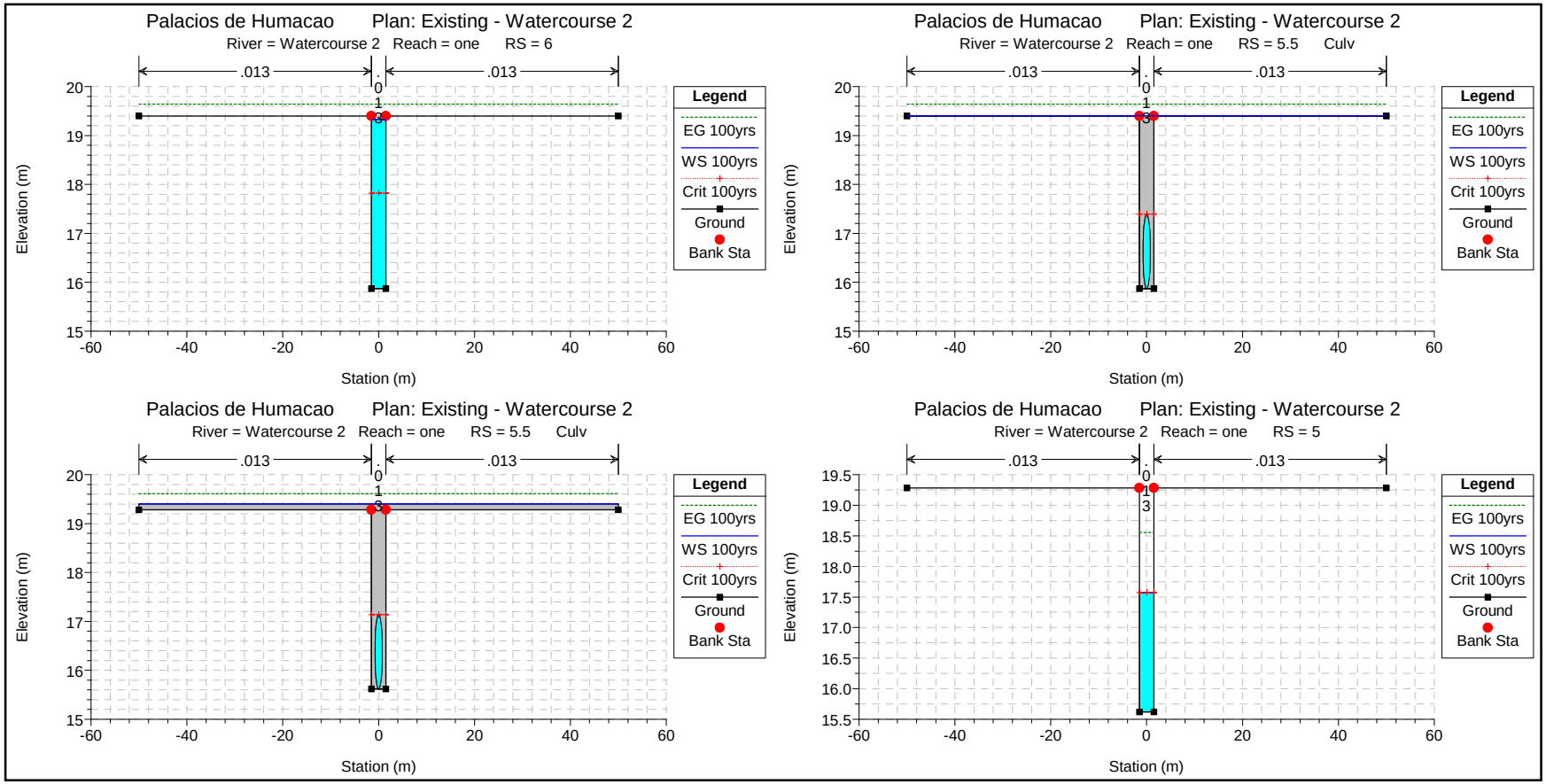
River: Watercourse 2

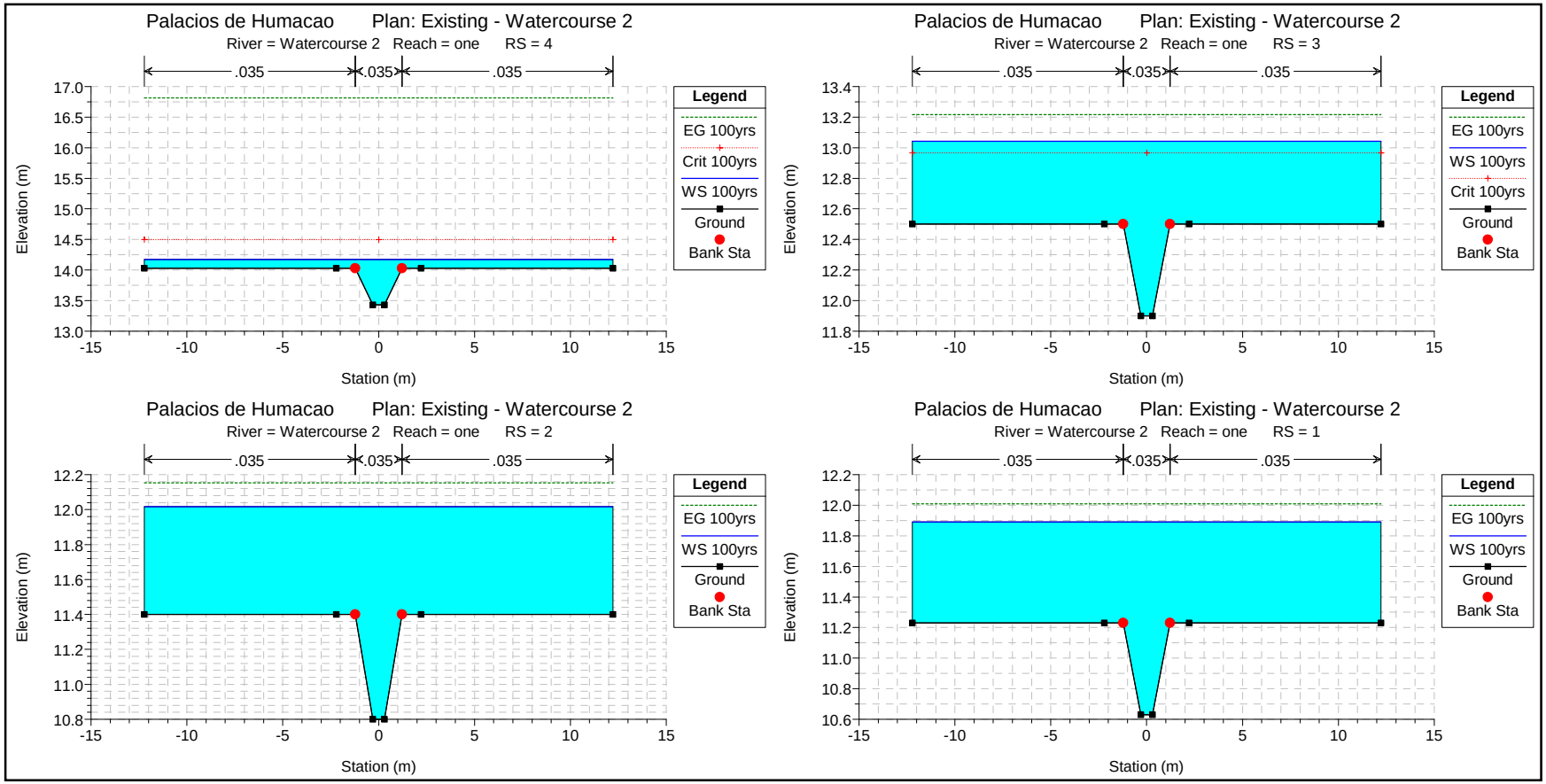
Reach	River Sta.	Left	Channel	Right
one	6	18	18	18
one	5.5	Culvert		
one	5	120	120	120
one	4	153	153	153
one	3	147	147	147
one	2	26	26	26
one	1	20	20	20
one	0	0	0	0

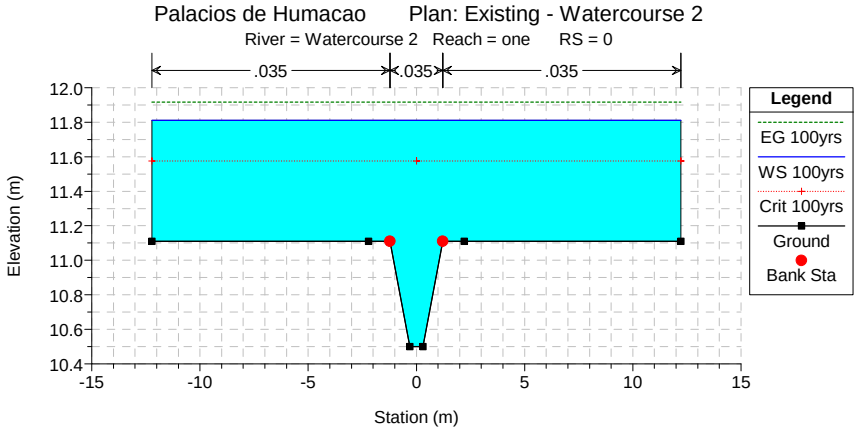
Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
one	6	100yrs	25.71	15.87	19.33	17.82	19.64	0.00098	2.48	10.37	3.00	0.43
one	5.5		Culvert									
one	5	100yrs	25.71	15.62	17.57	17.57	18.55	0.00406	4.39	5.85	3.00	1.00
one	4	100yrs	25.71	13.43	14.17	14.50	16.81	0.31675	9.47	4.42	24.43	4.20
one	3	100yrs	25.71	11.90	13.04	12.97	13.22	0.00882	2.31	14.14	24.43	0.77
one	2	100yrs	25.71	10.80	12.02		12.15	0.00594	2.00	15.99	24.43	0.64
one	1	100yrs	25.71	10.63	11.89		12.01	0.00484	1.86	17.03	24.43	0.58
one	0	100yrs	25.71	10.50	11.81	11.57	11.92	0.00401	1.73	18.06	24.43	0.53


Palacios de Humacao
Plan: Existing - Watercourse 2
Watercourse 2 one
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Elevation (m)
Main Channel Distance (m)
20
18
16
14
12
10
0
100
200
300
400
500
1
2
3
4
5
5.5


Palacios de Humacao Plan: Existing - Watercourse 2
River = Watercourse 2 Reach = one RS = 6
.013
.013
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Elevation (m)
Station (m)
Palacios de Humacao Plan: Existing - Watercourse 2
River = Watercourse 2 Reach = one RS = 5.5 Culv
.013
.013
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Elevation (m)
Station (m)
Palacios de Humacao Plan: Existing - Watercourse 2
River = Watercourse 2 Reach = one RS = 5.5 Culv
.013
.013
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Elevation (m)
Station (m)
Palacios de Humacao Plan: Existing - Watercourse 2
River = Watercourse 2 Reach = one RS = 5
.013
.013
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Elevation (m)
Station (m)


Palacios de Humacao Plan: Existing - Watercourse 2
River = Watercourse 2 Reach = one RS = 4
.035 .035 .035
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 2
River = Watercourse 2 Reach = one RS = 3
.035 .035 .035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 2
River = Watercourse 2 Reach = one RS = 2
.035 .035 .035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Existing - Watercourse 2
River = Watercourse 2 Reach = one RS = 1
.035 .035 .035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao
Plan: Existing - Watercourse 2
River = Watercourse 2
Reach = one
RS = 0
.035
.035
.035
Elevation (m)
12.0
11.8
11.6
11.4
11.2
11.0
10.8
10.6
10.4
-15
-10
-5
0
5
10
15
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta

APPENDIX I

HEC-RAS RESULTS PROPOSED CONDITION

WATERCOURSE TWO

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Palacios de Humacao
Project File : ph.prj
Run Date and Time: 10/17/2008 11:14:43 AM

Project in SI units

PLAN DATA

Plan Title: Proposed - Watercourse 2
Plan File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.p04

Geometry Title: Proposed - Watercourse 2
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g04

Flow Title : Proposed - Watercourse 2
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f04

Plan Summary Information:
Number of: Cross Sections = 10 Multiple Openings = 0
Culverts = 2 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculation tolerance = 0.003
Maximum number of iterations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Proposed - Watercourse 2
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f04

Flow Data (m3/s)

River	Reach	RS	100yrs	50yrs	25yrs	10yrs	2yrs
Watercourse 2	one	6	25.71	22.87	20.15	16.44	9.33
Watercourse 2	one	1	34.84	31.18	27.66	22.85	13.46

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Watercourse 2	one	100yrs	Critical	Normal S = 0.008
Watercourse 2	one	50yrs	Critical	Normal S = 0.008
Watercourse 2	one	25yrs	Critical	Normal S = 0.008
Watercourse 2	one	10yrs	Critical	Normal S = 0.008
Watercourse 2	one	2yrs	Critical	Normal S = 0.008

```
GEOMETRY DATA

Geometry Title: Proposed - Watercourse 2
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g04

CROSS SECTION


RIVER: Watercourse 2
REACH: one                RS: 6

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     -50    19.4    -1.5    19.4    -1.5   15.87     1.5   15.87     1.5    19.4
      50    19.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     -50    .013    -1.5    .013     1.5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          -1.5     1.5               18      18      18             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            19.64    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.31    Wt. n-Val.                          0.013
  W.S. Elev (m)            19.32    Reach Len. (m)           18.00      18.00      18.00
  Crit W.S. (m)            17.82    Flow Area (m2)                      10.36
  E.G. Slope (m/m)      0.000982    Area (m2)                           10.36
  Q Total (m3/s)           25.71    Flow (m3/s)                         25.71
  Top Width (m)             3.00    Top Width (m)                        3.00
  Vel Total (m/s)           2.48    Avg. Vel. (m/s)                      2.48
  Max Chl Dpth (m)          3.45    Hydr. Depth (m)                      3.45
  Conv. Total (m3/s)       820.6    Conv. (m3/s)                        820.6
  Length Wtd. (m)          18.00    Wetted Per. (m)                      9.90
  Min Ch El (m)            15.87    Shear (N/m2)                        10.07
  Alpha                     1.00    Stream Power (N/m s)                24.99
  Frctn Loss (m)                    Cum Volume (1000 m3)      0.04       4.89       0.26
  C & E Loss (m)                    Cum SA (1000 m2)          0.09       3.71       0.60


CULVERT


RIVER: Watercourse 2
REACH: one                RS: 5.5

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =      12
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      -4   19.28               4   19.28

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     -50    19.4    -1.5    19.4    -1.5   15.87     1.5   15.87     1.5    19.4
      50    19.4

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     -50    .013    -1.5    .013     1.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -1.5     1.5             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      -4   19.28               4   19.28
```

```
Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     -50   19.28    -1.5   19.28    -1.5   15.62     1.5   15.62     1.5   19.28
      50   19.28

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     -50    .013    -1.5    .013     1.5    .013

Bank Sta: Left   Right    Coeff Contr.   Expan.
          -1.5     1.5             .1       .3

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =   19.28
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular    1.52
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  .5      12     .013     .013        0                   .5                1
Upstream   Elevation =  15.87
           Centerline Station =  0
Downstream Elevation =  15.62
           Centerline Station =  0

CULVERT OUTPUT  Profile #100yrs  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       9.00    Culv Full Len (m)        12.00
  # Barrels                    1    Culv Vel US (m/s)         4.96
  Q Barrel (m3/s)           9.00    Culv Vel DS (m/s)         4.96
  E.G. US. (m)             19.64    Culv Inv El Up (m)       15.87
  W.S. US. (m)             19.32    Culv Inv El Dn (m)       15.62
  E.G. DS (m)              18.55    Culv Frctn Ls (m)         0.18
  W.S. DS (m)              17.58    Culv Exit Loss (m)        0.27
  Delta EG (m)              1.08    Culv Entr Loss (m)        0.63
  Delta WS (m)              1.75    Q Weir (m3/s)            16.71
  E.G. IC (m)              19.63    Weir Sta Lft (m)        -50.00
  E.G. OC (m)              19.64    Weir Sta Rgt (m)         50.00
  Culvert Control          Inlet    Weir Submerg              0.00
  Culv WS Inlet (m)        17.39    Weir Max Depth (m)        0.35
  Culv WS Outlet (m)       17.14    Weir Avg Depth (m)        0.24
  Culv Nml Depth (m)        1.08    Weir Flow Area (m2)      23.74
  Culv Crt Depth (m)        1.52    Min El Weir Flow (m)     19.28


Note:    Culvert critical depth exceeds the height of the culvert.
Note:    During the supercritical calculations a hydraulic jump occurred inside of the culvert.
Note:    The culvert inlet is submerged and the culvert flows full over part or all of its length.  Therefore,
         the culvert inlet equations are not valid and the supercritical result has been discarded.  The
         outlet answer will be used.

CROSS SECTION


RIVER: Watercourse 2
REACH: one                RS: 5.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     -50   19.28    -1.5   19.28    -1.5   15.62     1.5   15.62     1.5   19.28
      50   19.28

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     -50    .013    -1.5    .013     1.5    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          -1.5     1.5                1       1       1             .1       .3
```

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	18.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.98	Wt. n-Val.		0.013	
W.S. Elev (m)	17.58	Reach Len. (m)	1.00	1.00	1.00
Crit W.S. (m)	17.58	Flow Area (m2)		5.87	
E.G. Slope (m/m)	0.004038	Area (m2)		5.87	
Q Total (m3/s)	25.71	Flow (m3/s)		25.71	
Top Width (m)	3.00	Top Width (m)		3.00	
Vel Total (m/s)	4.38	Avg. Vel. (m/s)		4.38	
Max Chl Dpth (m)	1.96	Hydr. Depth (m)		1.96	
Conv. Total (m3/s)	404.6	Conv. (m3/s)		404.6	
Length Wtd. (m)	1.00	Wetted Per. (m)		6.91	
Min Ch El (m)	15.62	Shear (N/m2)		33.62	
Alpha	1.00	Stream Power (N/m s)		147.32	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.04	4.75	0.26
C & E Loss (m)	0.14	Cum SA (1000 m2)	0.09	3.65	0.60

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.12	18.06	-4.88	18.06	-1.22	15.62	1.22	15.62	4.88	17.76
8.88	17.76								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-6.12	.013	-4.88	.013	4.88	.013

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	120	120	120	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	19.28	Element	Left OB	Channel	Right OB
Vel Head (m)	2.76	Wt. n-Val.		0.013	
W.S. Elev (m)	16.52	Reach Len. (m)	120.00	120.00	120.00
Crit W.S. (m)	17.22	Flow Area (m2)		3.50	
E.G. Slope (m/m)	0.018152	Area (m2)		3.50	
Q Total (m3/s)	25.71	Flow (m3/s)		25.71	
Top Width (m)	5.33	Top Width (m)		5.33	
Vel Total (m/s)	7.36	Avg. Vel. (m/s)		7.36	
Max Chl Dpth (m)	0.90	Hydr. Depth (m)		0.66	
Conv. Total (m3/s)	190.8	Conv. (m3/s)		190.8	
Length Wtd. (m)	120.00	Wetted Per. (m)		5.84	
Min Ch El (m)	15.62	Shear (N/m2)		106.45	
Alpha	1.00	Stream Power (N/m s)		783.04	
Frctn Loss (m)	0.00	Cum Volume (1000 m3)	0.04	4.74	0.26
C & E Loss (m)	0.26	Cum SA (1000 m2)	0.09	3.65	0.60

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 4

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.12	15.68	-4.88	15.68	-1.22	13.24	1.22	13.24	4.88	15.38
8.88	15.38								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-6.12	.03	-4.88	.03	4.88	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	109	109	109	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

			Left OB	Channel	Right OB
E.G. Elev (m)	15.80	Element			
Vel Head (m)	1.42	Wt. n-Val.		0.030	
W.S. Elev (m)	14.38	Reach Len. (m)	109.00	109.00	109.00
Crit W.S. (m)	14.84	Flow Area (m2)		4.87	
E.G. Slope (m/m)	0.038863	Area (m2)		4.87	
Q Total (m3/s)	25.71	Flow (m3/s)		25.71	
Top Width (m)	6.10	Top Width (m)		6.10	
Vel Total (m/s)	5.28	Avg. Vel. (m/s)		5.28	
Max Chl Dpth (m)	1.14	Hydr. Depth (m)		0.80	
Conv. Total (m3/s)	130.4	Conv. (m3/s)		130.4	
Length Wtd. (m)	109.00	Wetted Per. (m)		6.75	
Min Ch El (m)	13.24	Shear (N/m2)		274.67	
Alpha	1.00	Stream Power (N/m s)		1450.88	
Frctn Loss (m)	3.07	Cum Volume (1000 m3)	0.04	4.24	0.26
C & E Loss (m)	0.40	Cum SA (1000 m2)	0.09	2.96	0.60

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 3.2

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.12	12.6	-4.88	12.6	-1.22	10.16	1.22	10.16	4.88	12.3
8.88	12.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-6.12	.03	-4.88	.03	4.88	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	13	13	13	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

			Left OB	Channel	Right OB
E.G. Elev (m)	13.16	Element			
Vel Head (m)	0.06	Wt. n-Val.	0.030	0.030	0.030
W.S. Elev (m)	13.10	Reach Len. (m)	13.00	13.00	13.00
Crit W.S. (m)	11.76	Flow Area (m2)	0.62	20.28	3.19
E.G. Slope (m/m)	0.000543	Area (m2)	0.62	20.28	3.19
Q Total (m3/s)	25.71	Flow (m3/s)	0.24	23.58	1.89
Top Width (m)	15.00	Top Width (m)	1.24	9.76	4.00
Vel Total (m/s)	1.07	Avg. Vel. (m/s)	0.39	1.16	0.59
Max Chl Dpth (m)	2.94	Hydr. Depth (m)	0.50	2.08	0.80
Conv. Total (m3/s)	1103.2	Conv. (m3/s)	10.3	1011.9	80.9
Length Wtd. (m)	13.00	Wetted Per. (m)	1.74	11.08	4.80
Min Ch El (m)	10.16	Shear (N/m2)	1.89	9.75	3.54
Alpha	1.11	Stream Power (N/m s)	0.74	11.34	2.09

```
  Frctn Loss (m)                    Cum Volume (1000 m3)      0.01       2.87       0.09
  C & E Loss (m)                    Cum SA (1000 m2)          0.02       2.10       0.38


Note:    Hydraulic jump has occurred between this cross section and the previous upstream section.

CULVERT


RIVER: Watercourse 2
REACH: one               RS: 3.15

INPUT
Description:
Distance from Upstream XS =      .5
Deck/Roadway Width        =      12
Weir Coefficient          =    1.44
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   -6.12   13.38            8.88   13.38

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12    12.6   -4.88    12.6   -1.22   10.16    1.22   10.16    4.88    12.3
    8.88    12.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12     .03   -4.88     .03    4.88     .03

Bank Sta: Left   Right    Coeff Contr.   Expan.
         -4.88    4.88             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   -6.12   13.38            8.88   13.38

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -6.12   12.44   -4.88   12.44   -1.22      10    1.22      10    4.88   12.14
    8.88   12.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12     .03   -4.88     .03    4.88     .03

Bank Sta: Left   Right    Coeff Contr.   Expan.
         -4.88    4.88             .1       .3

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =   13.38
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box    2.44    3.65
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 .5      12     .013     .013        0                   .5                1
Upstream   Elevation =  10.16
           Centerline Station =  0
Downstream Elevation =  10
           Centerline Station =  0

CULVERT OUTPUT  Profile #100yrs  Culv Group:  Culvert #1

  Q Culv Group (m3/s)      25.71    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         4.10
  Q Barrel (m3/s)          25.71    Culv Vel DS (m/s)         4.97
  E.G. US. (m)             13.16    Culv Inv El Up (m)       10.16
```

W.S. US. (m)	13.10	Culv Inv El Dn (m)	10.00
E.G. DS (m)	12.25	Culv Frctn Ls (m)	0.06
W.S. DS (m)	11.97	Culv Exit Loss (m)	0.43
Delta EG (m)	0.92	Culv Entr Loss (m)	0.43
Delta WS (m)	1.13	Q Weir (m3/s)	
E.G. IC (m)	12.93	Weir Sta Lft (m)	
E.G. OC (m)	13.16	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	11.88	Weir Max Depth (m)	
Culv WS Outlet (m)	11.42	Weir Avg Depth (m)	
Culv Nml Depth (m)	1.04	Weir Flow Area (m2)	
Culv Crt Depth (m)	1.72	Min El Weir Flow (m)	13.38

Note: During the supercritical calculations a hydraulic jump occurred at the outlet of (leaving) the culvert.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 3.1

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.12	12.44	-4.88	12.44	-1.22	10	1.22	10	4.88	12.14
8.88	12.14								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-6.12	.03	-4.88	.03	4.88	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	30	30	30	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	12.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.28	Wt. n-Val.		0.030	
W.S. Elev (m)	11.97	Reach Len. (m)	30.00	30.00	30.00
Crit W.S. (m)		Flow Area (m2)		11.04	
E.G. Slope (m/m)	0.004217	Area (m2)		11.04	
Q Total (m3/s)	25.71	Flow (m3/s)		25.71	
Top Width (m)	8.77	Top Width (m)		8.77	
Vel Total (m/s)	2.33	Avg. Vel. (m/s)		2.33	
Max Chl Dpth (m)	1.97	Hydr. Depth (m)		1.26	
Conv. Total (m3/s)	395.9	Conv. (m3/s)		395.9	
Length Wtd. (m)	30.00	Wetted Per. (m)		9.90	
Min Ch El (m)	10.00	Shear (N/m2)		46.14	
Alpha	1.00	Stream Power (N/m s)		107.42	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)	0.01	2.67	0.07
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.01	1.98	0.36

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 3

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.12	12.34	-4.88	12.34	-1.22	9.9	1.22	9.9	4.88	12.04
8.88	12.04								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-6.12	.03	-4.88	.03	4.88	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	147	147	147	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	12.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.31	Wt. n-Val.		0.030	
W.S. Elev (m)	11.79	Reach Len. (m)	147.00	147.00	147.00
Crit W.S. (m)		Flow Area (m2)		10.34	
E.G. Slope (m/m)	0.005028	Area (m2)		10.34	
Q Total (m3/s)	25.71	Flow (m3/s)		25.71	
Top Width (m)	8.51	Top Width (m)		8.51	
Vel Total (m/s)	2.49	Avg. Vel. (m/s)		2.49	
Max Chl Dpth (m)	1.89	Hydr. Depth (m)		1.22	
Conv. Total (m3/s)	362.6	Conv. (m3/s)		362.6	
Length Wtd. (m)	147.00	Wetted Per. (m)		9.59	
Min Ch El (m)	9.90	Shear (N/m2)		53.18	
Alpha	1.00	Stream Power (N/m s)		132.19	
Frctn Loss (m)	0.44	Cum Volume (1000 m3)	0.01	2.35	0.07
C & E Loss (m)	0.05	Cum SA (1000 m2)	0.01	1.72	0.36

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 2

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.12	11.58	-4.88	11.58	-1.22	9.14	1.22	9.14	4.88	11.28
8.88	11.28								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-6.12	.03	-4.88	.03	4.88	.03

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	26	26	26	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	11.62	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	0.030
W.S. Elev (m)	11.46	Reach Len. (m)	26.00	26.00	26.00
Crit W.S. (m)		Flow Area (m2)		14.24	0.71
E.G. Slope (m/m)	0.001990	Area (m2)		14.24	0.71
Q Total (m3/s)	25.71	Flow (m3/s)		25.39	0.32
Top Width (m)	13.58	Top Width (m)		9.58	4.00
Vel Total (m/s)	1.72	Avg. Vel. (m/s)		1.78	0.46
Max Chl Dpth (m)	2.32	Hydr. Depth (m)		1.49	0.18
Conv. Total (m3/s)	576.3	Conv. (m3/s)		569.1	7.2
Length Wtd. (m)	26.00	Wetted Per. (m)		10.86	4.18
Min Ch El (m)	9.14	Shear (N/m2)		25.61	3.31
Alpha	1.06	Stream Power (N/m s)		45.64	1.51
Frctn Loss (m)	0.10	Cum Volume (1000 m3)	0.01	0.54	0.02
C & E Loss (m)	0.03	Cum SA (1000 m2)	0.01	0.39	0.06

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse 2
REACH: one RS: 1

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.12	11.44	-4.88	11.44	-1.22	9	1.22	9	4.88	11.14
8.88	11.14								

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -6.12     .03   -4.88     .03    4.88     .03

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88               20      20      20             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            11.49    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.47    Wt. n-Val.                          0.030
  W.S. Elev (m)            11.02    Reach Len. (m)           20.00      20.00      20.00
  Crit W.S. (m)            10.86    Flow Area (m2)                      11.49
  E.G. Slope (m/m)      0.006964    Area (m2)                           11.49
  Q Total (m3/s)           34.84    Flow (m3/s)                         34.84
  Top Width (m)             8.93    Top Width (m)                        8.93
  Vel Total (m/s)           3.03    Avg. Vel. (m/s)                      3.03
  Max Chl Dpth (m)          2.02    Hydr. Depth (m)                      1.29
  Conv. Total (m3/s)       417.5    Conv. (m3/s)                        417.5
  Length Wtd. (m)          20.00    Wetted Per. (m)                     10.09
  Min Ch El (m)             9.00    Shear (N/m2)                        77.77
  Alpha                     1.00    Stream Power (N/m s)               235.90
  Frctn Loss (m)            0.06    Cum Volume (1000 m3)      0.01       0.20       0.01
  C & E Loss (m)            0.02    Cum SA (1000 m2)          0.01       0.15       0.01


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse 2
REACH: one                RS: 0

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
      -4   10.11      -3   10.11   -1.22    8.92    1.22    8.92       3   10.11
       4   10.11

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
      -4    .013      -3    .013       3    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            -3       3                0       0       0             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            11.41    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.66    Wt. n-Val.               0.013      0.013      0.013
  W.S. Elev (m)            10.75    Reach Len. (m)
  Crit W.S. (m)            10.75    Flow Area (m2)            0.64       8.88       0.64
  E.G. Slope (m/m)      0.001582    Area (m2)                 0.64       8.88       0.64
  Q Total (m3/s)           34.84    Flow (m3/s)               1.05      32.73       1.05
  Top Width (m)             8.00    Top Width (m)             1.00       6.00       1.00
  Vel Total (m/s)           3.43    Avg. Vel. (m/s)           1.64       3.68       1.64
  Max Chl Dpth (m)          1.83    Hydr. Depth (m)           0.64       1.48       0.64
  Conv. Total (m3/s)       876.0    Conv. (m3/s)              26.5      823.0       26.5
  Length Wtd. (m)                   Wetted Per. (m)           1.64       6.72       1.64
  Min Ch El (m)             8.92    Shear (N/m2)              6.07      20.50       6.07
  Alpha                     1.10    Stream Power (N/m s)      9.95      75.54       9.95
  Frctn Loss (m)                    Cum Volume (1000 m3)
  C & E Loss (m)                    Cum SA (1000 m2)


Warning: Slope too steep for slope area to converge during supercritical flow calculations (normal depth
         is below critical depth). Water surface set to critical depth.
```

SUMMARY OF MANNING'S N VALUES

River:Watercourse 2

Reach	River Sta.	n1	n2	n3
one	6	.013	.013	.013
one	5.5	Culvert		
one	5.1	.013	.013	.013
one	5	.013	.013	.013
one	4	.03	.03	.03
one	3.2	.03	.03	.03
one	3.15	Culvert		
one	3.1	.03	.03	.03
one	3	.03	.03	.03
one	2	.03	.03	.03
one	1	.03	.03	.03
one	0	.013	.013	.013

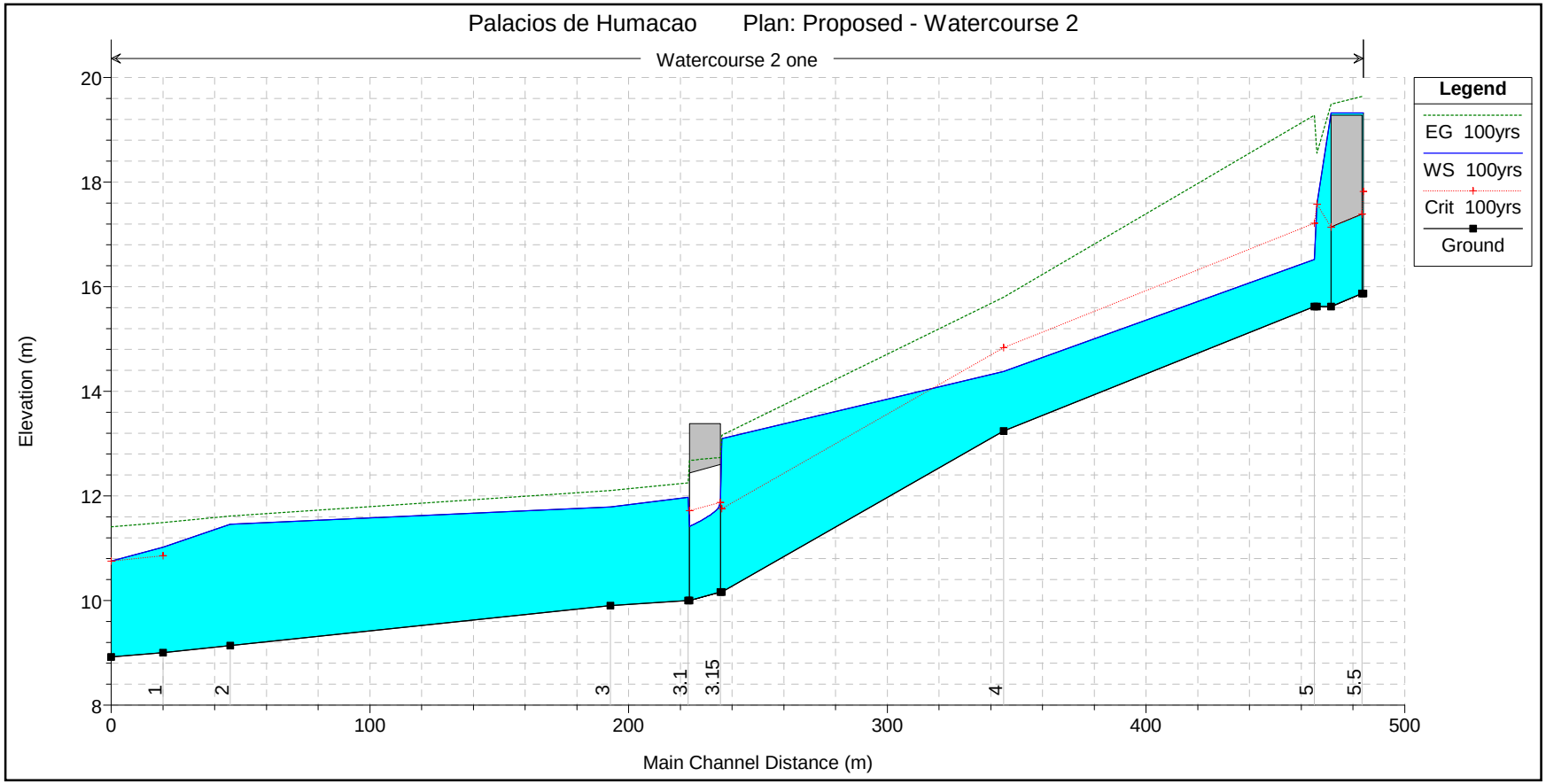
SUMMARY OF REACH LENGTHS

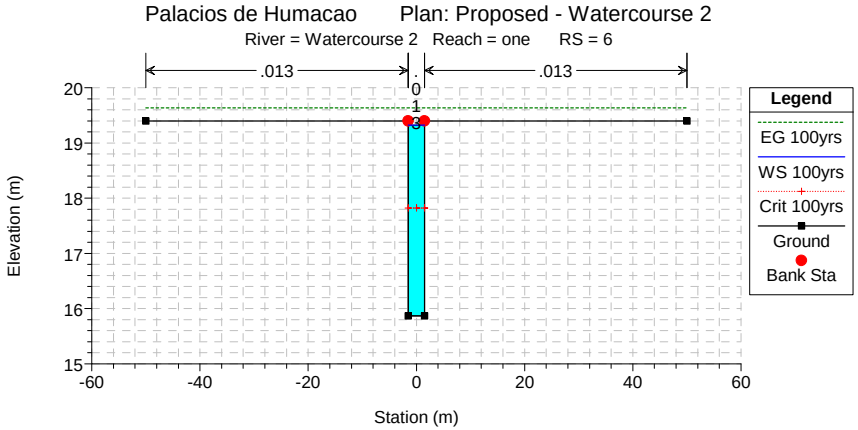
River: Watercourse 2

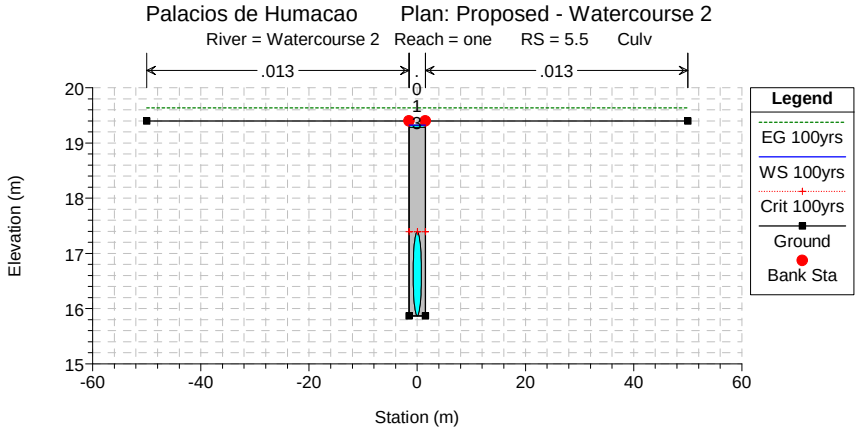
Reach	River Sta.	Left	Channel	Right
one	6	18	18	18
one	5.5	Culvert		
one	5.1	1	1	1
one	5	120	120	120
one	4	109	109	109
one	3.2	13	13	13
one	3.15	Culvert		
one	3.1	30	30	30
one	3	147	147	147
one	2	26	26	26
one	1	20	20	20
one	0	0	0	0

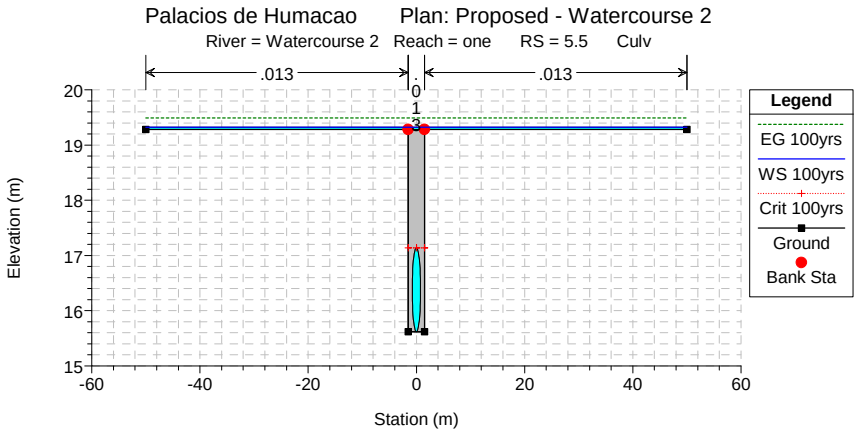
Profile Output Table - Standard Table 1

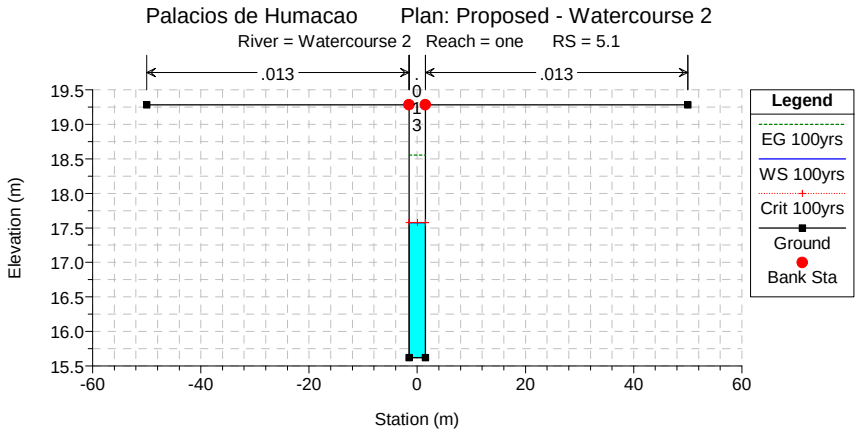
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
one	6	100yrs	25.71	15.87	19.32	17.82	19.64	0.00098	2.48	10.36	3.00	0.43
one	5.5		Culvert									
one	5.1	100yrs	25.71	15.62	17.58	17.58	18.55	0.00404	4.38	5.87	3.00	1.00
one	5	100yrs	25.71	15.62	16.52	17.22	19.28	0.01815	7.36	3.50	5.33	2.90
one	4	100yrs	25.71	13.24	14.38	14.84	15.80	0.03886	5.28	4.87	6.10	1.89
one	3.2	100yrs	25.71	10.16	13.10	11.76	13.16	0.00054	1.16	24.09	15.00	0.26
one	3.15		Culvert									
one	3.1	100yrs	25.71	10.00	11.97		12.25	0.00422	2.33	11.04	8.77	0.66
one	3	100yrs	25.71	9.90	11.79		12.10	0.00503	2.49	10.34	8.51	0.72
one	2	100yrs	25.71	9.14	11.46		11.62	0.00199	1.78	14.95	13.58	0.47
one	1	100yrs	34.84	9.00	11.02	10.86	11.49	0.00696	3.03	11.49	8.93	0.85
one	0	100yrs	34.84	8.92	10.75	10.75	11.41	0.00158	3.68	10.17	8.00	0.97

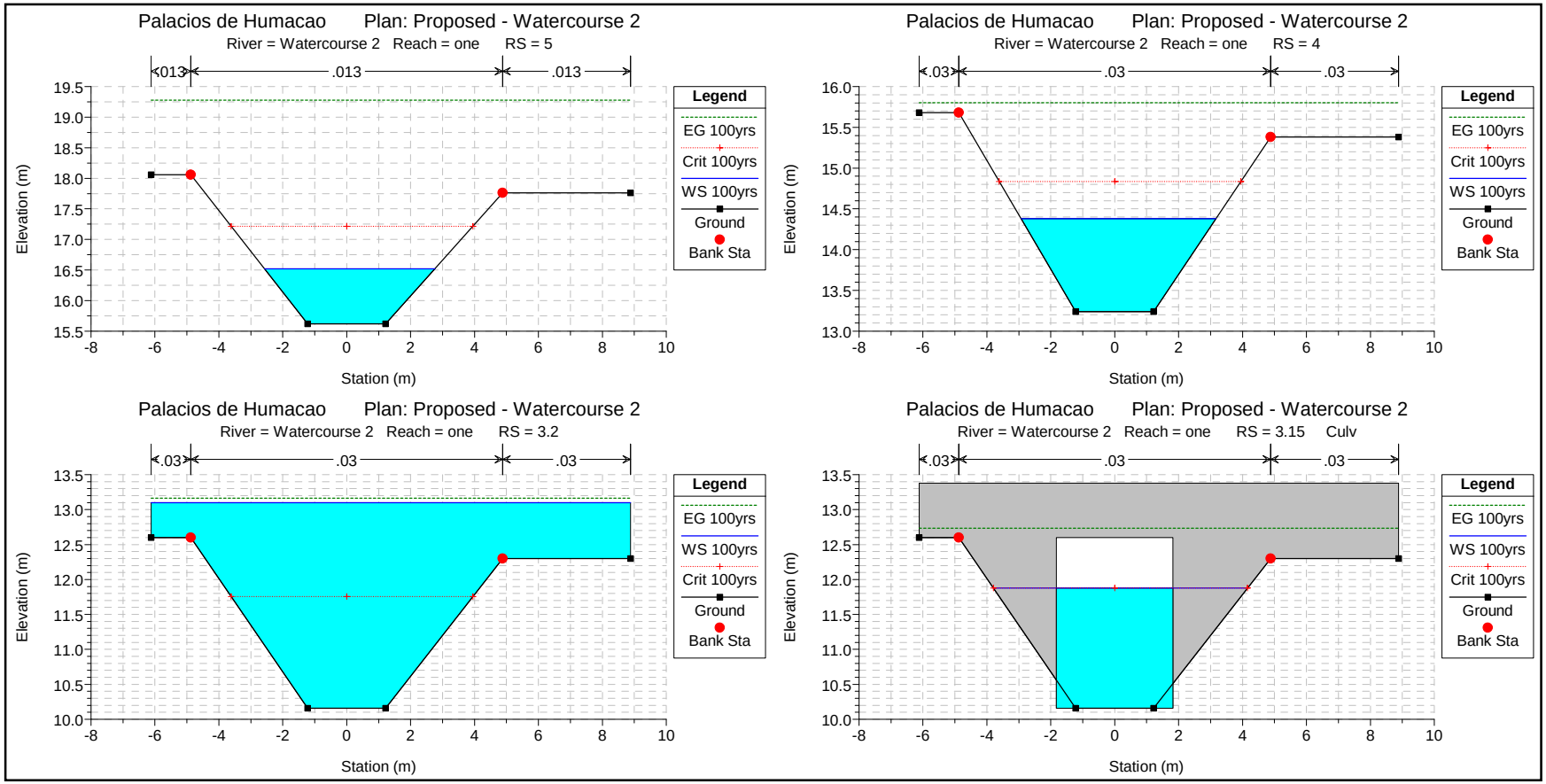

Palacios de Humacao
Plan: Proposed - Watercourse 2
Watercourse 2 one
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Elevation (m)
Main Channel Distance (m)
20
18
16
14
12
10
8
0
100
200
300
400
500
1
2
3
3.1
3.15
4
5
5.5

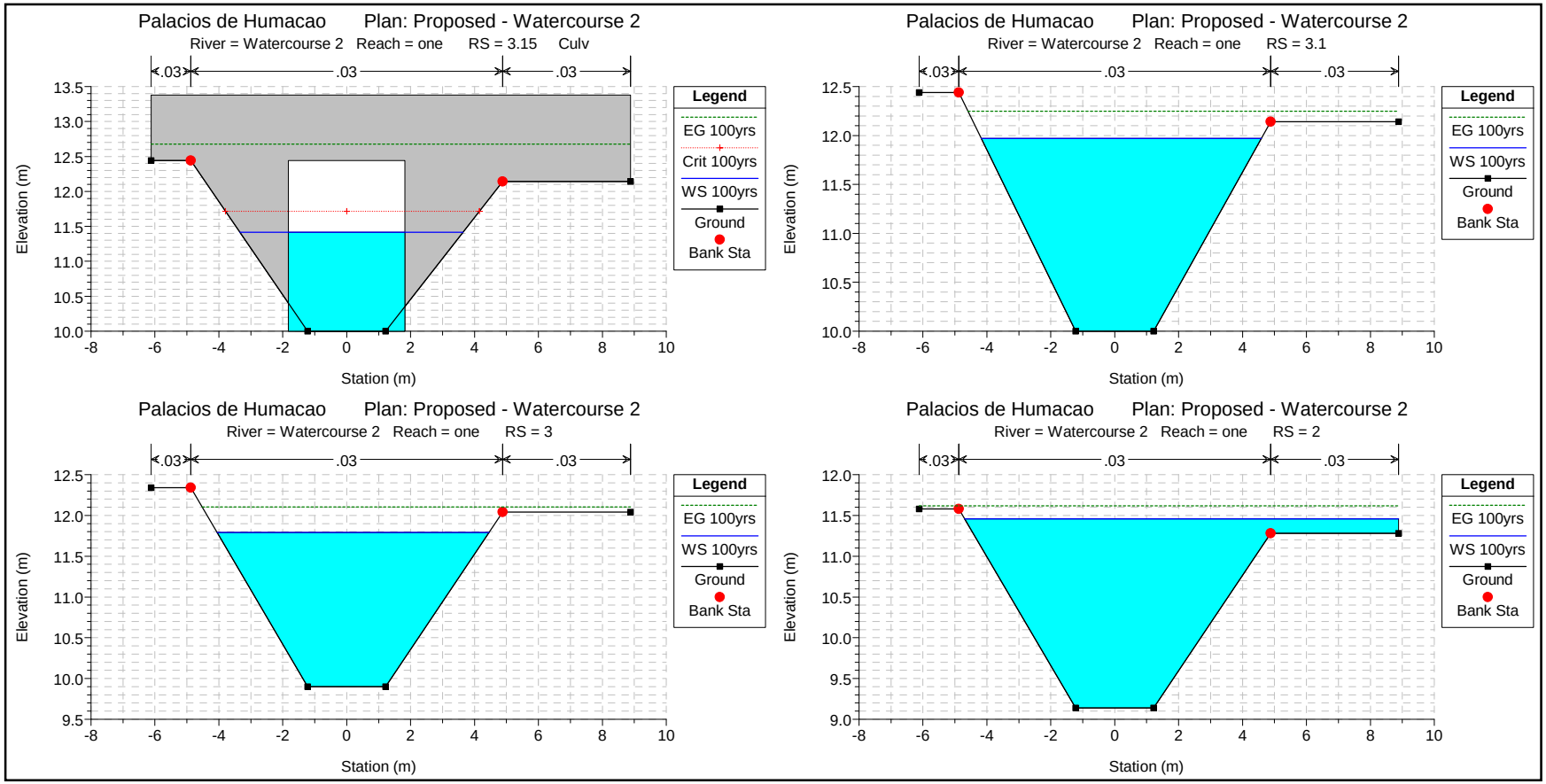

Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 6
.013
.013
.013
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Elevation (m)
Station (m)

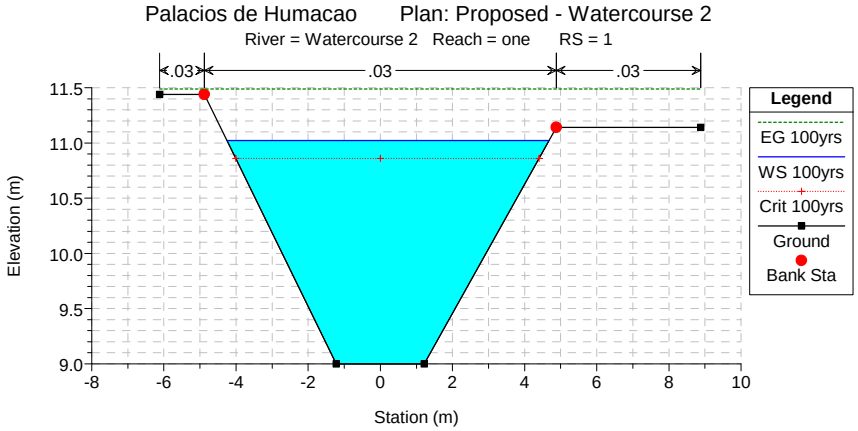

Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 5.5 Culv
.013
.013
.013
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Elevation (m)
Station (m)

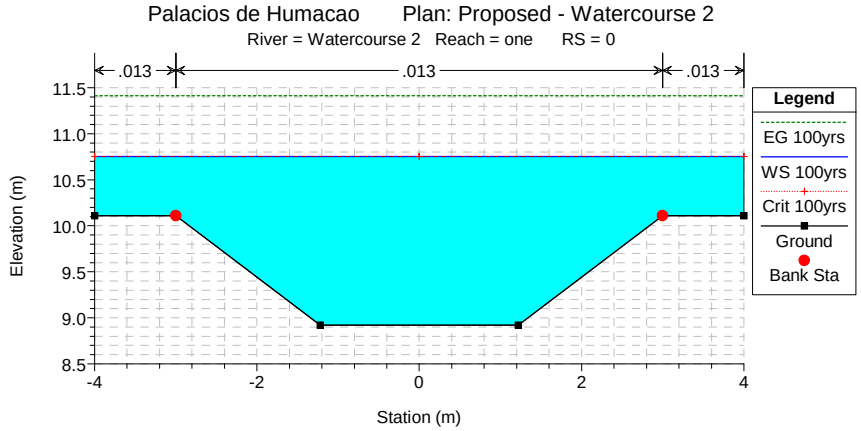

Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 5.5 Culv
.013
.013
.013
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Elevation (m)
Station (m)


Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 5.1
.013
.013
.013
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Elevation (m)
Station (m)


Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 5
.013
.013
.013
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 4
.03
.03
.03
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 3.2
.03
.03
.03
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 3.15 Culv
.03
.03
.03
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 3.15 Culv
.03 .03 .03
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 3.1
.03 .03 .03
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 3
.03 .03 .03
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 2
.03 .03 .03
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 1
.03
.03
.03
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Proposed - Watercourse 2
River = Watercourse 2 Reach = one RS = 0
.013
.013
.013
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta

APPENDIX J

HEC-RAS RESULTS EXISTING CONDITION

WATERCOURSE THREE

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Palacios de Humacao
Project File : ph.prj
Run Date and Time: 10/16/2008 4:36:16 PM

Project in SI units

PLAN DATA

Plan Title: Existing - Watercourse 3
Plan File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.p06

Geometry Title: Existing - Watercourse 3
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g06

Flow Title : Existing - Watercourse 3
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f06

Plan Summary Information:
Number of: Cross Sections = 7 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculation tolerance = 0.003
Maximum number of iterations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Existing - Watercourse 3
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f06

Flow Data (m3/s)

River	Reach	RS	100yrs	50yrs	25yrs	10yrs	2yrs
Watercourse 3	one	6	32.6	29.02	25.6	20.98	12.07

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Watercourse 3	one	100yrs	Critical	Normal S = 0.009
Watercourse 3	one	50yrs	Critical	Normal S = 0.009
Watercourse 3	one	25yrs	Critical	Normal S = 0.009
Watercourse 3	one	10yrs	Critical	Normal S = 0.009
Watercourse 3	one	2yrs	Critical	Normal S = 0.009

GEOMETRY DATA

Geometry Title: Existing - Watercourse 3
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g06

CROSS SECTION

RIVER: Watercourse 3
REACH: one RS: 6

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.21	17	-2.21	17	-1.21	17	-.3	16.4	.31	16.4
1.22	17	12.22	17						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.21	.035	-1.21	.035	1.22	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.21	1.22	46	46	46	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	17.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.28	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	17.54	Reach Len. (m)	46.00	46.00	46.00
Crit W.S. (m)	17.54	Flow Area (m2)	5.98	2.23	5.98
E.G. Slope (m/m)	0.013994	Area (m2)	5.98	2.23	5.98
Q Total (m3/s)	32.60	Flow (m3/s)	13.05	6.51	13.05
Top Width (m)	24.43	Top Width (m)	11.00	2.43	11.00
Vel Total (m/s)	2.30	Avg. Vel. (m/s)	2.18	2.91	2.18
Max Chl Dpth (m)	1.14	Hydr. Depth (m)	0.54	0.92	0.54
Conv. Total (m3/s)	275.6	Conv. (m3/s)	110.3	55.0	110.3
Length Wtd. (m)	46.00	Wetted Per. (m)	11.54	2.79	11.54
Min Ch El (m)	16.40	Shear (N/m2)	71.12	109.86	71.12
Alpha	1.04	Stream Power (N/m s)	155.08	320.12	155.08
Frctn Loss (m)	0.64	Cum Volume (1000 m3)	2.99	1.10	2.99
C & E Loss (m)	0.00	Cum SA (1000 m2)	5.25	1.16	5.25

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Watercourse 3
REACH: one RS: 5.5

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.215	16	-2.215	16	-1.215	16	-.305	15.4	.305	15.4
1.215	16	12.215	16						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.215	.035	-1.215	.035	1.215	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.215	1.215	22	22	22	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	16.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.47	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	16.42	Reach Len. (m)	22.00	22.00	22.00

```
  Crit W.S. (m)            16.54    Flow Area (m2)            4.60       1.93       4.60
  E.G. Slope (m/m)      0.030556    Area (m2)                 4.60       1.93       4.60
  Q Total (m3/s)           32.60    Flow (m3/s)              12.54       7.53      12.54
  Top Width (m)            24.43    Top Width (m)            11.00       2.43      11.00
  Vel Total (m/s)           2.93    Avg. Vel. (m/s)           2.72       3.90       2.72
  Max Chl Dpth (m)          1.02    Hydr. Depth (m)           0.42       0.79       0.42
  Conv. Total (m3/s)       186.5    Conv. (m3/s)              71.7       43.1       71.7
  Length Wtd. (m)          22.00    Wetted Per. (m)          11.42       2.79      11.42
  Min Ch El (m)            15.40    Shear (N/m2)            120.74     207.10     120.74
  Alpha                     1.08    Stream Power (N/m s)    328.98     808.55     328.98
  Frctn Loss (m)            0.92    Cum Volume (1000 m3)      2.75       1.00       2.75
  C & E Loss (m)            0.02    Cum SA (1000 m2)          4.74       1.05       4.74


Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse 3
REACH: one                RS: 5

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -12.215    15.5  -2.215    15.5  -1.215    15.5   -.305    14.9    .305    14.9
   1.215    15.5  12.215    15.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -12.215    .035  -1.215    .035   1.215    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -1.215   1.215               70      70      70             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            16.33    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.34    Wt. n-Val.               0.035      0.035      0.035
  W.S. Elev (m)            15.99    Reach Len. (m)           70.00      70.00      70.00
  Crit W.S. (m)            16.04    Flow Area (m2)            5.42       2.11       5.42
  E.G. Slope (m/m)      0.018773    Area (m2)                 5.42       2.11       5.42
  Q Total (m3/s)           32.60    Flow (m3/s)              12.87       6.86      12.87
  Top Width (m)            24.43    Top Width (m)            11.00       2.43      11.00
  Vel Total (m/s)           2.52    Avg. Vel. (m/s)           2.37       3.25       2.37
  Max Chl Dpth (m)          1.09    Hydr. Depth (m)           0.49       0.87       0.49
  Conv. Total (m3/s)       237.9    Conv. (m3/s)              93.9       50.0       93.9
  Length Wtd. (m)          70.00    Wetted Per. (m)          11.49       2.79      11.49
  Min Ch El (m)            14.90    Shear (N/m2)             86.89     139.24      86.89
  Alpha                     1.05    Stream Power (N/m s)    206.18     452.49     206.18
  Frctn Loss (m)            0.52    Cum Volume (1000 m3)      2.63       0.96       2.63
  C & E Loss (m)            0.04    Cum SA (1000 m2)          4.50       0.99       4.50


Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse 3
REACH: one                RS: 4

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -12.215      14  -2.215      14  -1.215      14   -.305    13.4    .305    13.4
   1.215      14  12.215      14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -12.215    .035  -1.215    .035   1.215    .035
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -1.215   1.215              108     108     108             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            14.85    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.40    Wt. n-Val.               0.035      0.035      0.035
  W.S. Elev (m)            14.46    Reach Len. (m)          108.00     108.00     108.00
  Crit W.S. (m)            14.54    Flow Area (m2)            5.01       2.02       5.01
  E.G. Slope (m/m)      0.023762    Area (m2)                 5.01       2.02       5.01
  Q Total (m3/s)           32.60    Flow (m3/s)              12.72       7.17      12.72
  Top Width (m)            24.43    Top Width (m)            11.00       2.43      11.00
  Vel Total (m/s)           2.71    Avg. Vel. (m/s)           2.54       3.55       2.54
  Max Chl Dpth (m)          1.06    Hydr. Depth (m)           0.46       0.83       0.46
  Conv. Total (m3/s)       211.5    Conv. (m3/s)              82.5       46.5       82.5
  Length Wtd. (m)         108.00    Wetted Per. (m)          11.46       2.79      11.46
  Min Ch El (m)            13.40    Shear (N/m2)            101.92     168.63     101.92
  Alpha                     1.06    Stream Power (N/m s)    258.66     598.64     258.66
  Frctn Loss (m)            1.47    Cum Volume (1000 m3)      2.27       0.81       2.27
  C & E Loss (m)            0.01    Cum SA (1000 m2)          3.73       0.82       3.73


Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse 3
REACH: one                RS: 3

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -12.215      12  -2.215      12  -1.215      12   -.305    11.4    .305    11.4
   1.215      12  12.215      12

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -12.215    .035  -1.215    .035   1.215    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -1.215   1.215               84      84      84             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            12.82    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.29    Wt. n-Val.               0.035      0.035      0.035
  W.S. Elev (m)            12.53    Reach Len. (m)           84.00      84.00      84.00
  Crit W.S. (m)            12.54    Flow Area (m2)            5.87       2.21       5.87
  E.G. Slope (m/m)      0.014798    Area (m2)                 5.87       2.21       5.87
  Q Total (m3/s)           32.60    Flow (m3/s)              13.01       6.57      13.01
  Top Width (m)            24.43    Top Width (m)            11.00       2.43      11.00
  Vel Total (m/s)           2.34    Avg. Vel. (m/s)           2.22       2.97       2.22
  Max Chl Dpth (m)          1.13    Hydr. Depth (m)           0.53       0.91       0.53
  Conv. Total (m3/s)       268.0    Conv. (m3/s)             107.0       54.0      107.0
  Length Wtd. (m)          84.00    Wetted Per. (m)          11.53       2.79      11.53
  Min Ch El (m)            11.40    Shear (N/m2)             73.89     114.91      73.89
  Alpha                     1.05    Stream Power (N/m s)    163.75     341.83     163.75
  Frctn Loss (m)            2.00    Cum Volume (1000 m3)      1.68       0.58       1.68
  C & E Loss (m)            0.03    Cum SA (1000 m2)          2.54       0.56       2.54


Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse 3
REACH: one                RS: 2

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -12.215      11  -2.215      11  -1.215      11   -.305    10.4    .305    10.4
   1.215      11  12.215      11
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -12.215    .035  -1.215    .035   1.215    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -1.215   1.215              147     147     147             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            11.89    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.16    Wt. n-Val.               0.035      0.035      0.035
  W.S. Elev (m)            11.73    Reach Len. (m)          147.00     147.00     147.00
  Crit W.S. (m)            11.54    Flow Area (m2)            8.02       2.68       8.02
  E.G. Slope (m/m)      0.005728    Area (m2)                 8.02       2.68       8.02
  Q Total (m3/s)           32.60    Flow (m3/s)              13.47       5.66      13.47
  Top Width (m)            24.43    Top Width (m)            11.00       2.43      11.00
  Vel Total (m/s)           1.74    Avg. Vel. (m/s)           1.68       2.11       1.68
  Max Chl Dpth (m)          1.33    Hydr. Depth (m)           0.73       1.10       0.73
  Conv. Total (m3/s)       430.7    Conv. (m3/s)             178.0       74.7      178.0
  Length Wtd. (m)         147.00    Wetted Per. (m)          11.73       2.79      11.73
  Min Ch El (m)            10.40    Shear (N/m2)             38.43      54.05      38.43
  Alpha                     1.02    Stream Power (N/m s)     64.52     113.91      64.52
  Frctn Loss (m)            1.04    Cum Volume (1000 m3)      1.10       0.38       1.10
  C & E Loss (m)            0.01    Cum SA (1000 m2)          1.62       0.36       1.62


Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.
Note:    Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION


RIVER: Watercourse 3
REACH: one                RS: 1

INPUT
Description:
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 -12.215      10  -2.215      10  -1.215      10   -.305     9.4    .305     9.4
   1.215      10  12.215      10

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 -12.215    .035  -1.215    .035   1.215    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        -1.215   1.215                0       0       0             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            10.84    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.21    Wt. n-Val.               0.035      0.035      0.035
  W.S. Elev (m)            10.63    Reach Len. (m)
  Crit W.S. (m)            10.54    Flow Area (m2)            6.92       2.44       6.92
  E.G. Slope (m/m)      0.009003    Area (m2)                 6.92       2.44       6.92
  Q Total (m3/s)           32.60    Flow (m3/s)              13.27       6.05      13.27
  Top Width (m)            24.43    Top Width (m)            11.00       2.43      11.00
  Vel Total (m/s)           2.00    Avg. Vel. (m/s)           1.92       2.48       1.92
  Max Chl Dpth (m)          1.23    Hydr. Depth (m)           0.63       1.00       0.63
  Conv. Total (m3/s)       343.6    Conv. (m3/s)             139.9       63.8      139.9
  Length Wtd. (m)                   Wetted Per. (m)          11.63       2.79      11.63
  Min Ch El (m)             9.40    Shear (N/m2)             52.54      77.24      52.54
  Alpha                     1.03    Stream Power (N/m s)    100.78     191.53     100.78
  Frctn Loss (m)                    Cum Volume (1000 m3)
  C & E Loss (m)                    Cum SA (1000 m2)
```

SUMMARY OF MANNING'S N VALUES

River:Watercourse 3

Reach	River Sta.	n1	n2	n3
one	6	.035	.035	.035
one	5.5	.035	.035	.035
one	5	.035	.035	.035
one	4	.035	.035	.035
one	3	.035	.035	.035
one	2	.035	.035	.035
one	1	.035	.035	.035

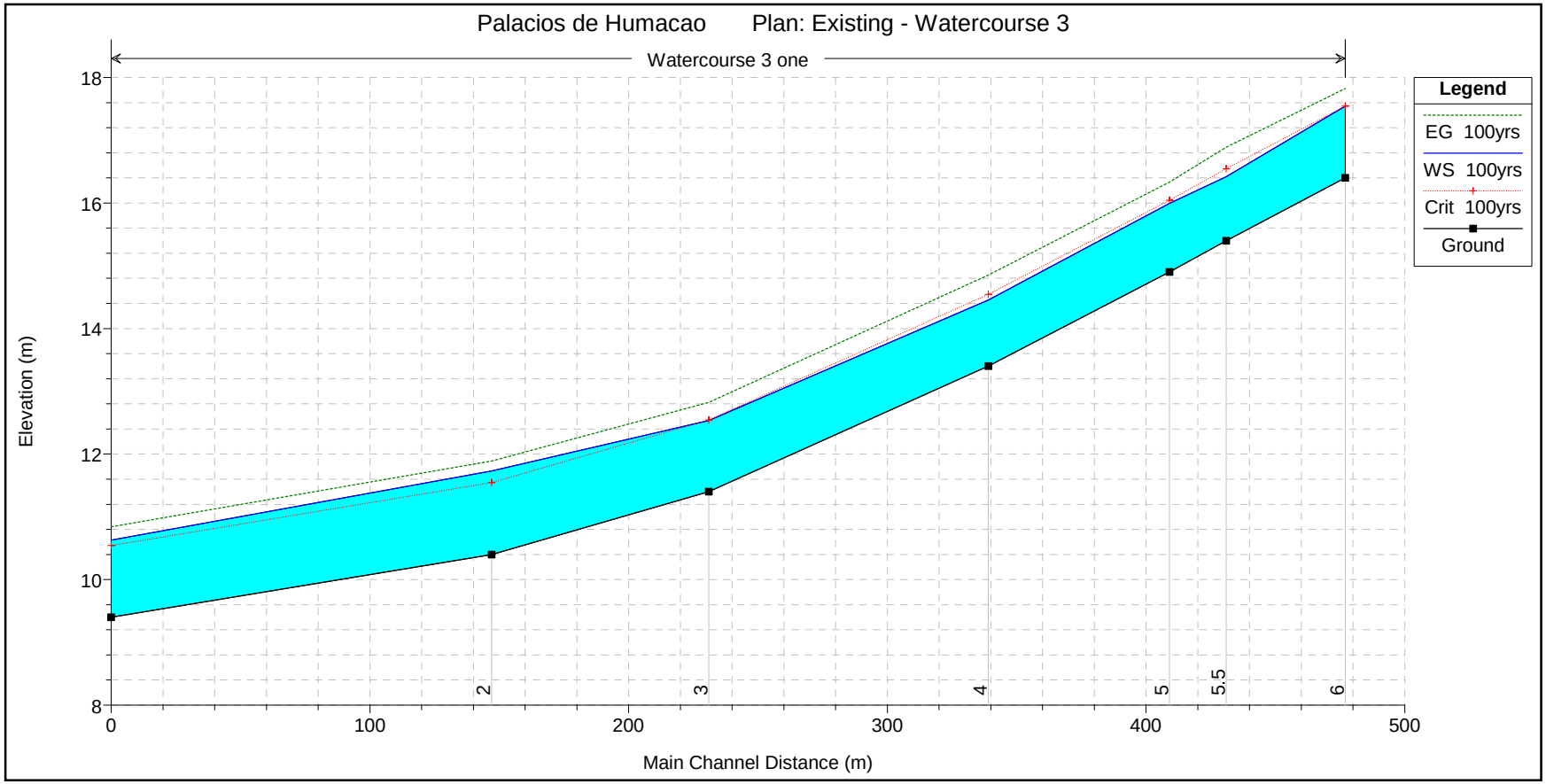
SUMMARY OF REACH LENGTHS

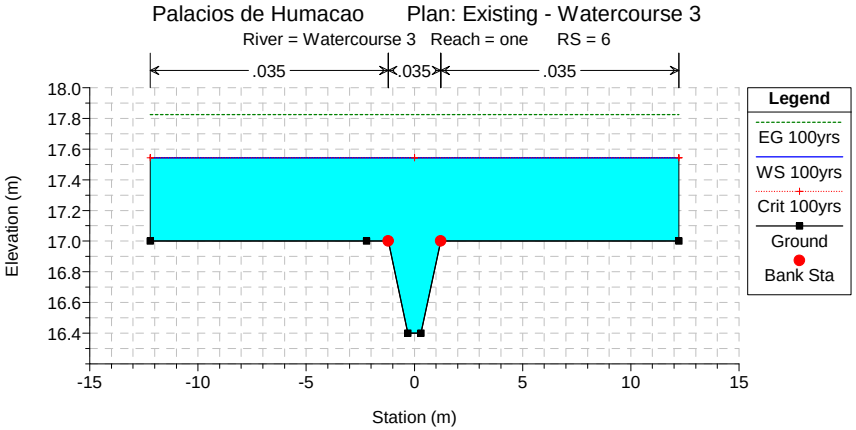
River: Watercourse 3

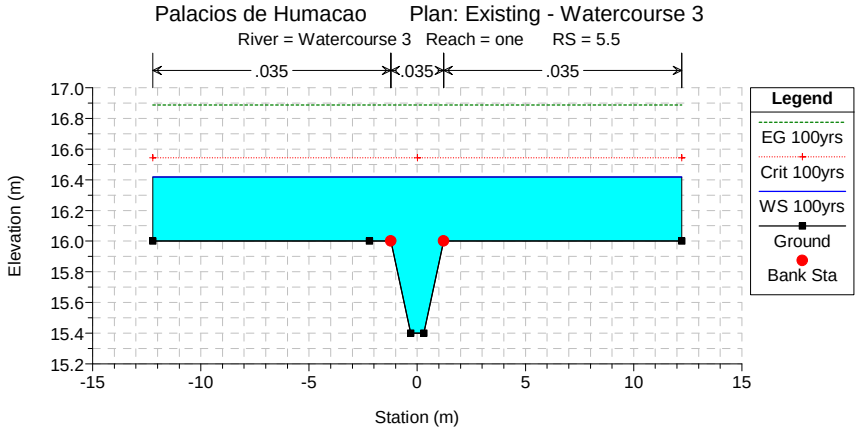
Reach	River Sta.	Left	Channel	Right
one	6	46	46	46
one	5.5	22	22	22
one	5	70	70	70
one	4	108	108	108
one	3	84	84	84
one	2	147	147	147
one	1	0	0	0

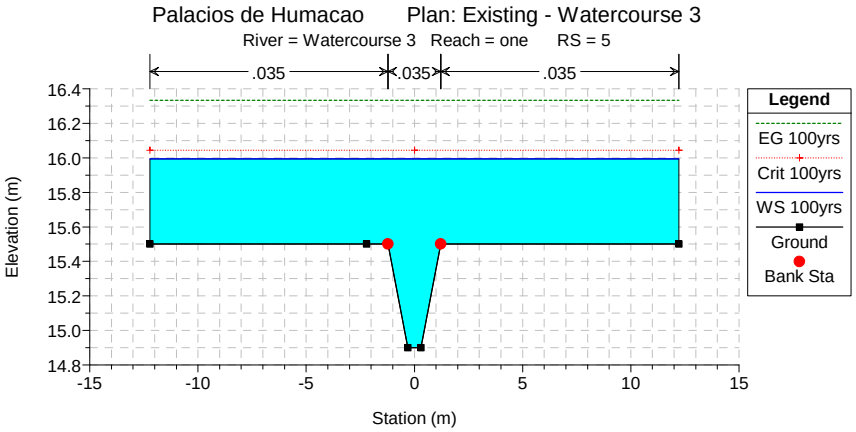
Profile Output Table - Standard Table 1

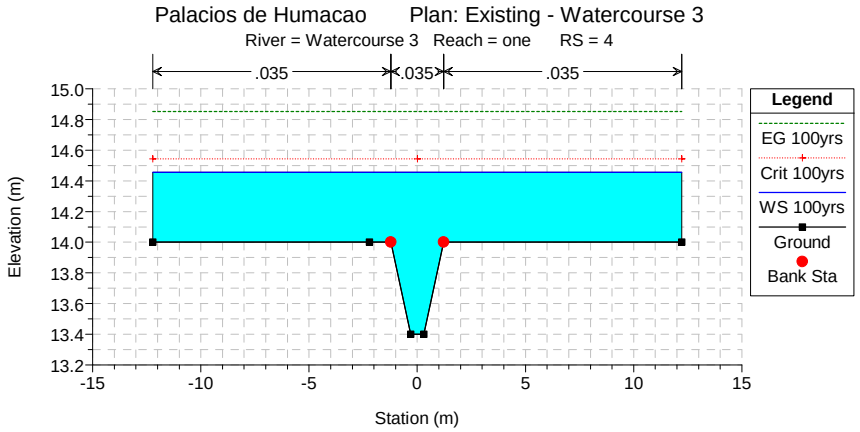
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
one	6	100yrs	32.60	16.40	17.54	17.54	17.82	0.01399	2.91	14.20	24.43	0.97
one	5.5	100yrs	32.60	15.40	16.42	16.54	16.89	0.03056	3.90	11.13	24.43	1.40
one	5	100yrs	32.60	14.90	15.99	16.04	16.33	0.01877	3.25	12.96	24.43	1.11
one	4	100yrs	32.60	13.40	14.46	14.54	14.85	0.02376	3.55	12.04	24.43	1.24
one	3	100yrs	32.60	11.40	12.53	12.54	12.82	0.01480	2.97	13.95	24.43	1.00
one	2	100yrs	32.60	10.40	11.73	11.54	11.89	0.00573	2.11	18.73	24.43	0.64
one	1	100yrs	32.60	9.40	10.63	10.54	10.84	0.00900	2.48	16.28	24.43	0.79

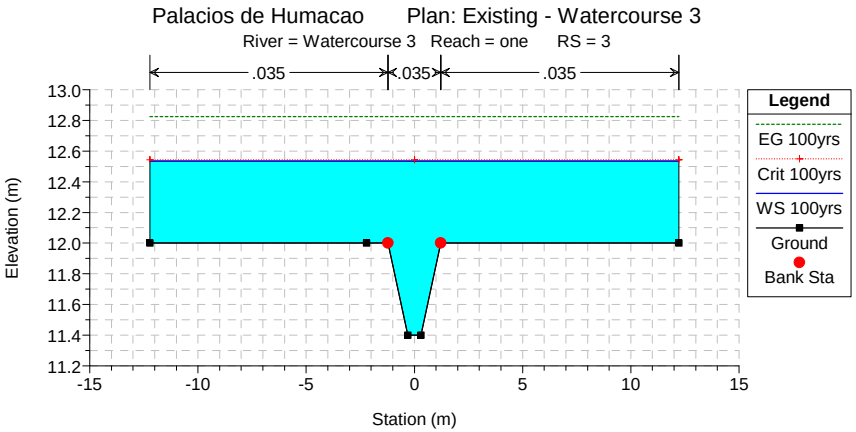

Palacios de Humacao
Plan: Existing - Watercourse 3
Watercourse 3 one
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Elevation (m)
Main Channel Distance (m)
18
16
14
12
10
8
0
100
200
300
400
500
2
3
4
5
5.5
6

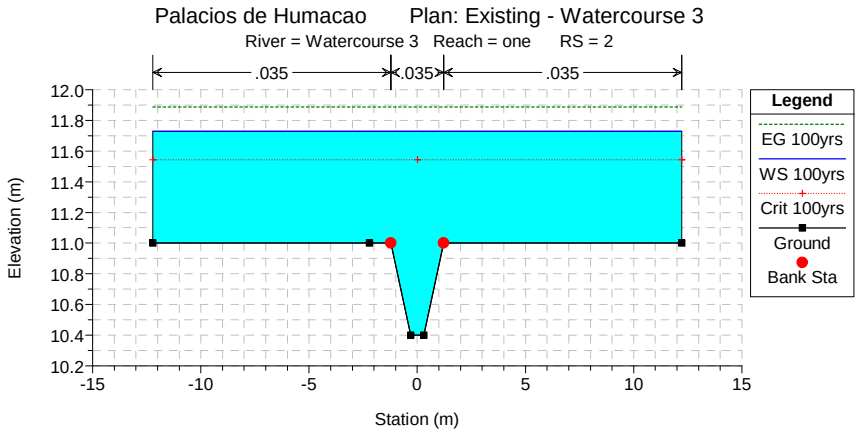

Palacios de Humacao Plan: Existing - Watercourse 3
River = Watercourse 3 Reach = one RS = 6
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta

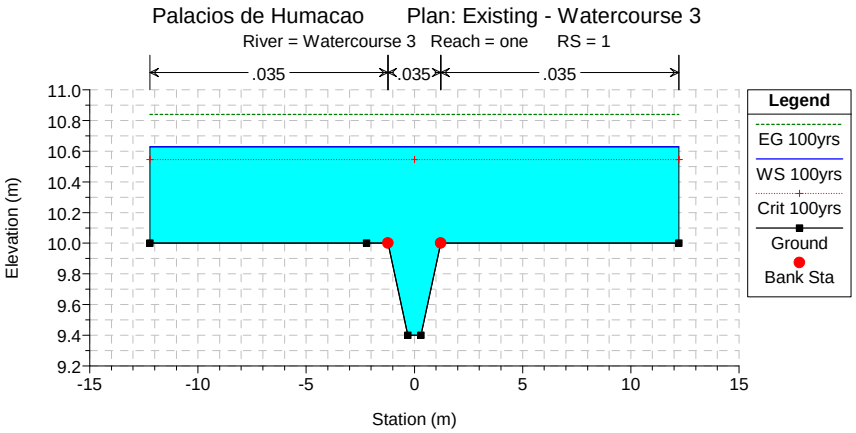

Palacios de Humacao Plan: Existing - Watercourse 3
River = Watercourse 3 Reach = one RS = 5.5
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Existing - Watercourse 3
River = Watercourse 3 Reach = one RS = 5
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Existing - Watercourse 3
River = Watercourse 3 Reach = one RS = 4
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Existing - Watercourse 3
River = Watercourse 3 Reach = one RS = 3
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
Crit 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Existing - Watercourse 3
River = Watercourse 3 Reach = one RS = 2
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Existing - Watercourse 3
River = Watercourse 3 Reach = one RS = 1
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta

APPENDIX K

HEC-RAS RESULTS PROPOSED CONDITION

WATERCOURSE THREE

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Palacios de Humacao
Project File : ph.prj
Run Date and Time: 10/17/2008 9:02:04 AM

Project in SI units

PLAN DATA

Plan Title: Proposed - Watercourse 3
Plan File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.p05

Geometry Title: Proposed - Watercourse 3
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g05

Flow Title : Proposed - Watercourse 3
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f05

Plan Summary Information:
Number of: Cross Sections = 8 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculation tolerance = 0.003
Maximum number of iterations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Proposed - Watercourse 3
Flow File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.f05

Flow Data (m3/s)

River	Reach	RS	100yrs	50yrs	25yrs	10yrs	2yrs
Watercourse 3	one	6	32.6	29.02	25.6	20.98	12.07

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Watercourse 3	one	100yrs	Critical	Normal S = 0.01
Watercourse 3	one	50yrs	Critical	Normal S = 0.01
Watercourse 3	one	25yrs	Critical	Normal S = 0.01
Watercourse 3	one	10yrs	Critical	Normal S = 0.01
Watercourse 3	one	2yrs	Critical	Normal S = 0.01

GEOMETRY DATA

Geometry Title: Proposed - Watercourse 3
Geometry File : p:\426-Palacios de Humacao\Revision-October-2008\HEC-RAS\ph.g05

CROSS SECTION

RIVER: Watercourse 3
REACH: one RS: 6

INPUT
Description:
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-12.21	17	-2.21	17	-1.21	17	-.3	16.4	.31	16.4
1.22	17	12.22	17						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-12.21	.035	-1.21	.035	1.22	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-1.21	1.22	46	46	46	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

			Left OB	Channel	Right OB
E.G. Elev (m)	17.82	Element			
Vel Head (m)	0.28	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (m)	17.54	Reach Len. (m)	46.00	46.00	46.00
Crit W.S. (m)	17.54	Flow Area (m2)	5.98	2.23	5.98
E.G. Slope (m/m)	0.013994	Area (m2)	5.98	2.23	5.98
Q Total (m3/s)	32.60	Flow (m3/s)	13.05	6.51	13.05
Top Width (m)	24.43	Top Width (m)	11.00	2.43	11.00
Vel Total (m/s)	2.30	Avg. Vel. (m/s)	2.18	2.91	2.18
Max Chl Dpth (m)	1.14	Hydr. Depth (m)	0.54	0.92	0.54
Conv. Total (m3/s)	275.6	Conv. (m3/s)	110.3	55.0	110.3
Length Wtd. (m)	46.00	Wetted Per. (m)	11.54	2.79	11.54
Min Ch El (m)	16.40	Shear (N/m2)	71.12	109.86	71.12
Alpha	1.04	Stream Power (N/m s)	155.08	320.12	155.08
Frctn Loss (m)	0.38	Cum Volume (1000 m3)	0.14	6.25	0.14
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.25	4.67	0.25

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Watercourse 3
REACH: one RS: 5.5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9.88	15.96	-4.88	15.96	-1.22	13.52	1.22	13.52	4.88	15.96
7.62	15.96								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9.88	.035	-4.88	.035	4.88	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	100	100	100	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	16.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.30	Wt. n-Val.		0.035	
W.S. Elev (m)	15.80	Reach Len. (m)	100.00	100.00	100.00
Crit W.S. (m)		Flow Area (m2)		13.35	
E.G. Slope (m/m)	0.005412	Area (m2)		13.35	
Q Total (m3/s)	32.60	Flow (m3/s)		32.60	
Top Width (m)	9.28	Top Width (m)		9.28	
Vel Total (m/s)	2.44	Avg. Vel. (m/s)		2.44	
Max Chl Dpth (m)	2.28	Hydr. Depth (m)		1.44	
Conv. Total (m3/s)	443.1	Conv. (m3/s)		443.1	
Length Wtd. (m)	100.00	Wetted Per. (m)		10.66	
Min Ch El (m)	13.52	Shear (N/m2)		66.48	
Alpha	1.00	Stream Power (N/m s)		162.39	
Frctn Loss (m)	0.68	Cum Volume (1000 m3)		5.89	
C & E Loss (m)	0.01	Cum SA (1000 m2)		4.40	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse 3
REACH: one RS: 4.5

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9.88	15.38	-4.88	15.38	-1.22	12.94	1.22	12.94	4.88	15.38
7.62	15.38								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9.88	.035	-4.88	.035	4.88	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	64	64	64	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	15.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.44	Wt. n-Val.		0.035	
W.S. Elev (m)	14.96	Reach Len. (m)	64.00	64.00	64.00
Crit W.S. (m)		Flow Area (m2)		11.08	
E.G. Slope (m/m)	0.008926	Area (m2)		11.08	
Q Total (m3/s)	32.60	Flow (m3/s)		32.60	
Top Width (m)	8.51	Top Width (m)		8.51	
Vel Total (m/s)	2.94	Avg. Vel. (m/s)		2.94	
Max Chl Dpth (m)	2.02	Hydr. Depth (m)		1.30	
Conv. Total (m3/s)	345.0	Conv. (m3/s)		345.0	
Length Wtd. (m)	64.00	Wetted Per. (m)		9.74	
Min Ch El (m)	12.94	Shear (N/m2)		99.62	
Alpha	1.00	Stream Power (N/m s)		293.11	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		4.67	
C & E Loss (m)	0.01	Cum SA (1000 m2)		3.51	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Watercourse 3
REACH: one RS: 4.1

INPUT
Description:
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-9.88	14.81	-4.88	14.81	-1.22	12.37	1.22	12.37	4.88	14.81
7.62	14.81								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-9.88	.035	-4.88	.035	4.88	.035

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88              115     115     115             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            14.86    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.40    Wt. n-Val.                          0.035
  W.S. Elev (m)            14.45    Reach Len. (m)          115.00     115.00     115.00
  Crit W.S. (m)                     Flow Area (m2)                      11.59
  E.G. Slope (m/m)      0.007902    Area (m2)                           11.59
  Q Total (m3/s)           32.60    Flow (m3/s)                         32.60
  Top Width (m)             8.69    Top Width (m)                        8.69
  Vel Total (m/s)           2.81    Avg. Vel. (m/s)                      2.81
  Max Chl Dpth (m)          2.08    Hydr. Depth (m)                      1.33
  Conv. Total (m3/s)       366.7    Conv. (m3/s)                        366.7
  Length Wtd. (m)         115.00    Wetted Per. (m)                      9.95
  Min Ch El (m)            12.37    Shear (N/m2)                        90.28
  Alpha                     1.00    Stream Power (N/m s)               253.87
  Frctn Loss (m)            0.89    Cum Volume (1000 m3)                 3.95
  C & E Loss (m)            0.00    Cum SA (1000 m2)                     2.96


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse 3
REACH: one                RS: 3.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -9.88   13.91   -4.88   13.91   -1.22   11.47    1.22   11.47    4.88   13.91
    7.62   13.91

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -9.88    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88              113     113     113             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            13.97    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.39    Wt. n-Val.                          0.035
  W.S. Elev (m)            13.58    Reach Len. (m)          113.00     113.00     113.00
  Crit W.S. (m)                     Flow Area (m2)                      11.81
  E.G. Slope (m/m)      0.007526    Area (m2)                           11.81
  Q Total (m3/s)           32.60    Flow (m3/s)                         32.60
  Top Width (m)             8.76    Top Width (m)                        8.76
  Vel Total (m/s)           2.76    Avg. Vel. (m/s)                      2.76
  Max Chl Dpth (m)          2.11    Hydr. Depth (m)                      1.35
  Conv. Total (m3/s)       375.8    Conv. (m3/s)                        375.8
  Length Wtd. (m)         113.00    Wetted Per. (m)                     10.04
  Min Ch El (m)            11.47    Shear (N/m2)                        86.79
  Alpha                     1.00    Stream Power (N/m s)               239.68
  Frctn Loss (m)            0.90    Cum Volume (1000 m3)                 2.60
  C & E Loss (m)            0.00    Cum SA (1000 m2)                     1.95


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse 3
REACH: one                RS: 2.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -9.88   13.03   -4.88   13.03   -1.22   10.59    1.22   10.59    4.88   13.03
    7.62   13.03

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
   -9.88    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88               83      83      83             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            13.06    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.42    Wt. n-Val.                          0.035
  W.S. Elev (m)            12.64    Reach Len. (m)           83.00      83.00      83.00
  Crit W.S. (m)                     Flow Area (m2)                      11.33
  E.G. Slope (m/m)      0.008406    Area (m2)                           11.33
  Q Total (m3/s)           32.60    Flow (m3/s)                         32.60
  Top Width (m)             8.60    Top Width (m)                        8.60
  Vel Total (m/s)           2.88    Avg. Vel. (m/s)                      2.88
  Max Chl Dpth (m)          2.05    Hydr. Depth (m)                      1.32
  Conv. Total (m3/s)       355.6    Conv. (m3/s)                        355.6
  Length Wtd. (m)          83.00    Wetted Per. (m)                      9.84
  Min Ch El (m)            10.59    Shear (N/m2)                        94.90
  Alpha                     1.00    Stream Power (N/m s)               273.08
  Frctn Loss (m)            0.65    Cum Volume (1000 m3)                 1.29
  C & E Loss (m)            0.01    Cum SA (1000 m2)                     0.97


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross
         section.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Watercourse 3
REACH: one                RS: 1.1

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -9.88   12.34   -4.88   12.34   -1.22     9.9    1.22     9.9    4.88   12.34
    7.62   12.34

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   -9.88    .035   -4.88    .035    4.88    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         -4.88    4.88               29      29      20             .1       .3

CROSS SECTION OUTPUT  Profile #100yrs

  E.G. Elev (m)            12.40    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.38    Wt. n-Val.                          0.035
  W.S. Elev (m)            12.03    Reach Len. (m)           29.00      29.00      20.00
  Crit W.S. (m)                     Flow Area (m2)                      11.97
  E.G. Slope (m/m)      0.007246    Area (m2)                           11.97
  Q Total (m3/s)           32.60    Flow (m3/s)                         32.60
  Top Width (m)             8.82    Top Width (m)                        8.82
  Vel Total (m/s)           2.72    Avg. Vel. (m/s)                      2.72
  Max Chl Dpth (m)          2.13    Hydr. Depth (m)                      1.36
  Conv. Total (m3/s)       383.0    Conv. (m3/s)                        383.0
  Length Wtd. (m)          29.00    Wetted Per. (m)                     10.11
  Min Ch El (m)             9.90    Shear (N/m2)                        84.18
  Alpha                     1.00    Stream Power (N/m s)               229.20
  Frctn Loss (m)            0.25    Cum Volume (1000 m3)                 0.33
  C & E Loss (m)            0.01    Cum SA (1000 m2)                     0.25


CROSS SECTION


RIVER: Watercourse 3
REACH: one                RS: 0

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   -9.88   12.14   -4.88   12.14   -1.22     9.7    1.22     9.7    4.88   12.14
    7.62   12.14

Manning's n Values        num=       3
```

Sta	n Val	Sta	n Val	Sta	n Val
-9.88	.035	-4.88	.035	4.88	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
-4.88	4.88	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #100yrs

E.G. Elev (m)	12.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.48	Wt. n-Val.		0.035	
W.S. Elev (m)	11.67	Reach Len. (m)			
Crit W.S. (m)	11.53	Flow Area (m2)		10.62	
E.G. Slope (m/m)	0.010007	Area (m2)		10.62	
Q Total (m3/s)	32.60	Flow (m3/s)		32.60	
Top Width (m)	8.35	Top Width (m)		8.35	
Vel Total (m/s)	3.07	Avg. Vel. (m/s)		3.07	
Max Chl Dpth (m)	1.97	Hydr. Depth (m)		1.27	
Conv. Total (m3/s)	325.9	Conv. (m3/s)		325.9	
Length Wtd. (m)		Wetted Per. (m)		9.54	
Min Ch El (m)	9.70	Shear (N/m2)		109.25	
Alpha	1.00	Stream Power (N/m s)		335.40	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Watercourse 3

Reach	River Sta.	n1	n2	n3
one	6	.035	.035	.035
one	5.5	.035	.035	.035
one	4.5	.035	.035	.035
one	4.1	.035	.035	.035
one	3.1	.035	.035	.035
one	2.1	.035	.035	.035
one	1.1	.035	.035	.035
one	0	.035	.035	.035

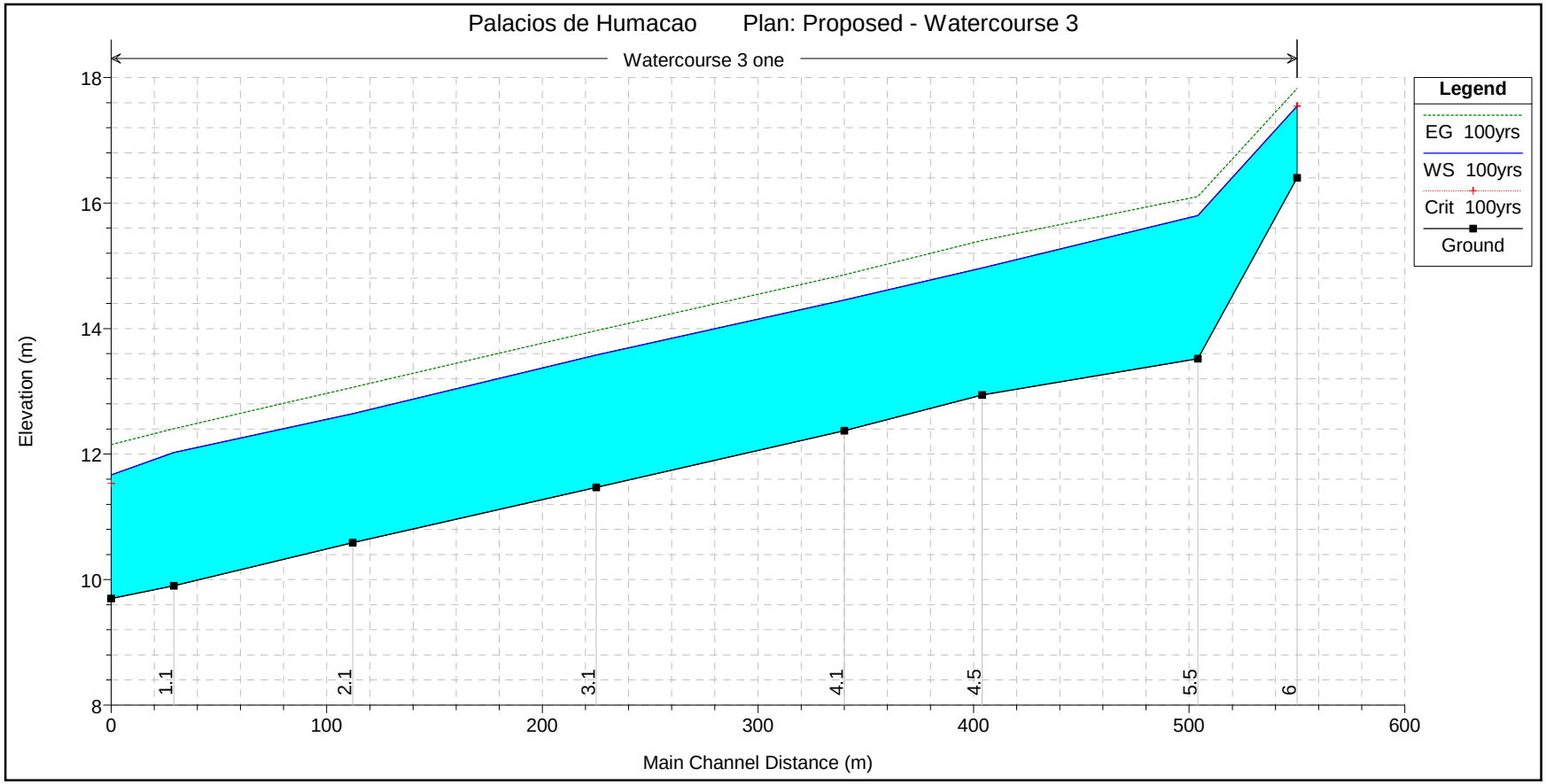
SUMMARY OF REACH LENGTHS

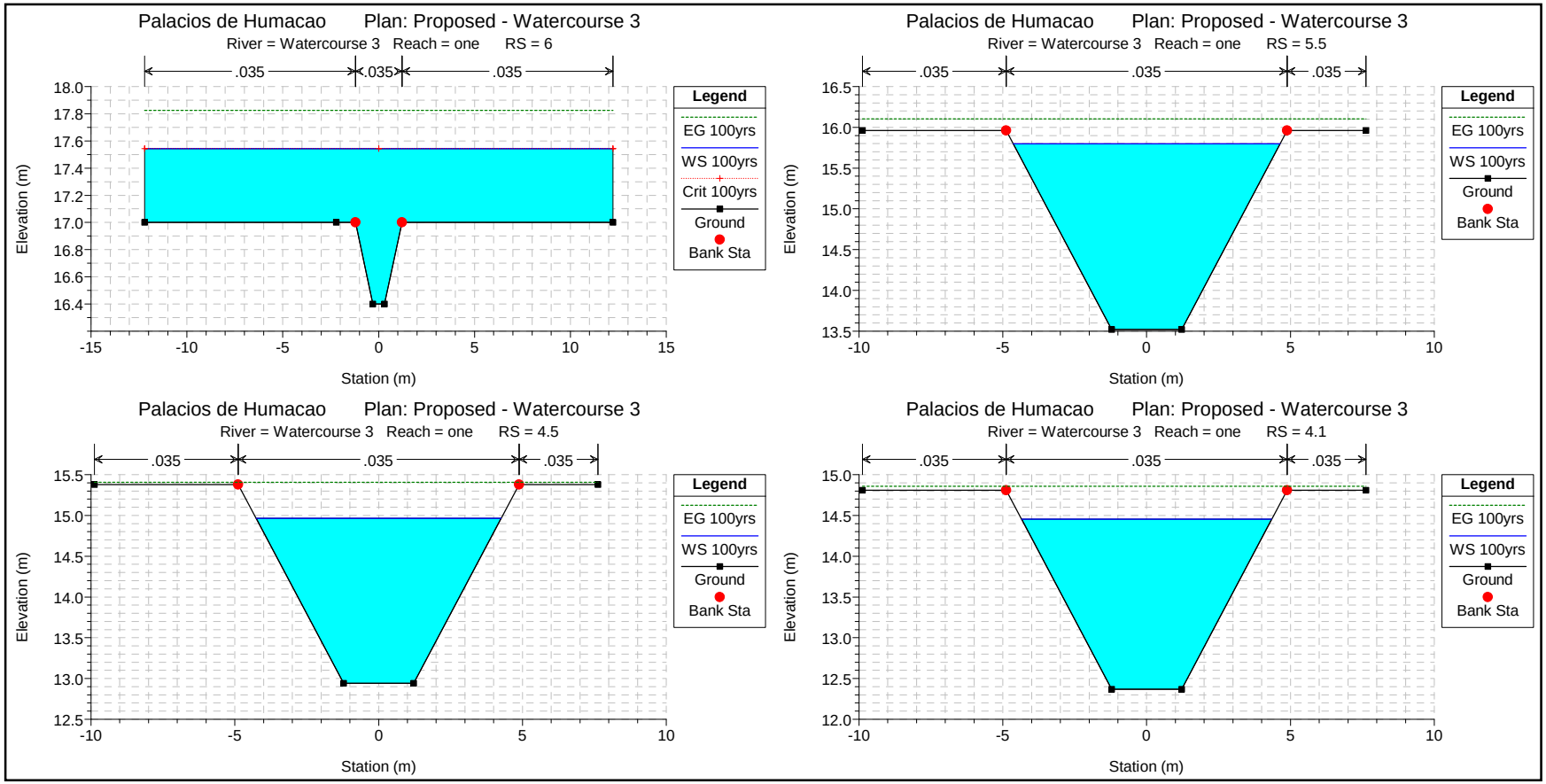
River: Watercourse 3

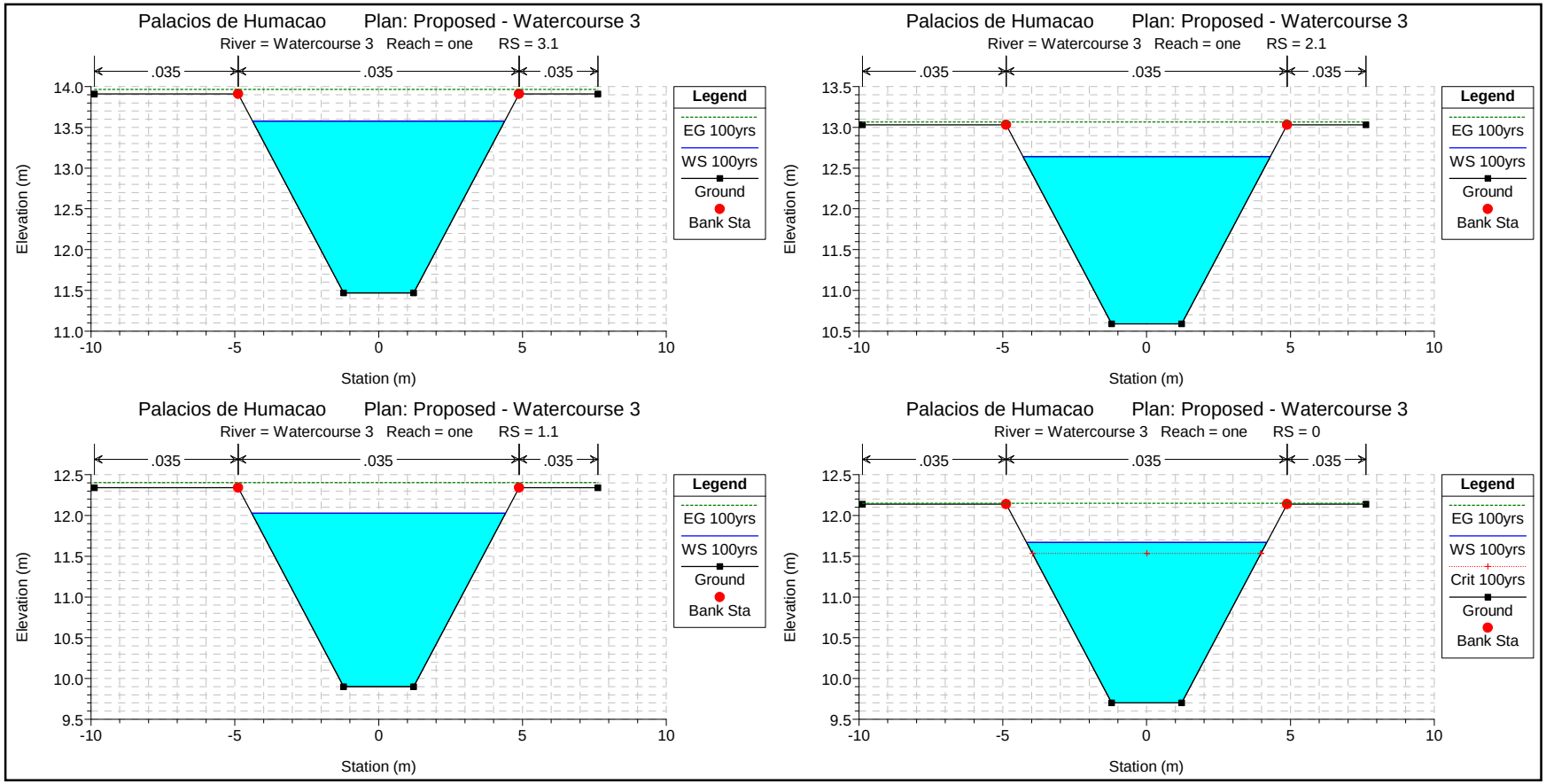
Reach	River Sta.	Left	Channel	Right
one	6	46	46	46
one	5.5	100	100	100
one	4.5	64	64	64
one	4.1	115	115	115
one	3.1	113	113	113
one	2.1	83	83	83
one	1.1	29	29	20
one	0	0	0	0

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
one	6	100yrs	32.60	16.40	17.54	17.54	17.82	0.01399	2.91	14.20	24.43	0.97
one	5.5	100yrs	32.60	13.52	15.80		16.10	0.00541	2.44	13.35	9.28	0.65
one	4.5	100yrs	32.60	12.94	14.96		15.40	0.00893	2.94	11.08	8.51	0.82
one	4.1	100yrs	32.60	12.37	14.45		14.86	0.00790	2.81	11.59	8.69	0.78
one	3.1	100yrs	32.60	11.47	13.58		13.97	0.00753	2.76	11.81	8.76	0.76
one	2.1	100yrs	32.60	10.59	12.64		13.06	0.00841	2.88	11.33	8.60	0.80
one	1.1	100yrs	32.60	9.90	12.03		12.40	0.00725	2.72	11.97	8.82	0.75
one	0	100yrs	32.60	9.70	11.67	11.53	12.15	0.01001	3.07	10.62	8.35	0.87


Palacios de Humacao Plan: Proposed - Watercourse 3
Watercourse 3 one
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Elevation (m)
Main Channel Distance (m)
18
16
14
12
10
8
0
100
200
300
400
500
600
1.1
2.1
3.1
4.1
4.5
5.5
6


Palacios de Humacao Plan: Proposed - Watercourse 3
River = Watercourse 3 Reach = one RS = 6
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 3
River = Watercourse 3 Reach = one RS = 5.5
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 3
River = Watercourse 3 Reach = one RS = 4.5
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 3
River = Watercourse 3 Reach = one RS = 4.1
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta


Palacios de Humacao Plan: Proposed - Watercourse 3
River = Watercourse 3 Reach = one RS = 3.1
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 3
River = Watercourse 3 Reach = one RS = 2.1
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 3
River = Watercourse 3 Reach = one RS = 1.1
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Ground
Bank Sta
Palacios de Humacao Plan: Proposed - Watercourse 3
River = Watercourse 3 Reach = one RS = 0
.035
.035
.035
Elevation (m)
Station (m)
Legend
EG 100yrs
WS 100yrs
Crit 100yrs
Ground
Bank Sta