

VEI Consultants

Architectural, Engineering and Surveying Consultants
Serving All of Alaska
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August 28, 1992

Mr. Matt Holmstrom, PE
City of Engineer
Department of Public Works
City of Kodiak
P.O. Box 1397
Kodiak, AK 99615

RE: Wye Intersection Storm Drain Relocation,
Drainage Study and Preliminary Design

Dear Mr. Holmstrom,

VEI Consultants is under contract with the City of Kodiak to design a relocation of the major storm drain which traverses the Wye intersection. Enclosed for your review is a preliminary copy of the Wye Basin Drainage Study and Wye Drainage Relocation Plans. The drainage study is intended as an insert to the Mill Bay Road Drainage Study completed in March, 1991.

The Alaska DOT&PF initiated the Kodiak Wye Intersection Improvement Project. VEI received survey information and a preliminary set of plans from Ron Waisanen and Jim Childers of the DOT&PF Traffic Section. The enclosed VEI plans reflect grades and drainage contained in the DOT&PF preliminary design and it is intended that the VEI plans become a part of the DOT&PF final design.

The following notes relate to design and maintenance of this project:

1. VEI's design calls for a pair of 60" x 46" arched pipes to accommodate the calculated flow. The space and grade requirements necessitate that changes be made to the storm drain design in the DOT&PF preliminary plans. These include:
 - a. The low point that locates Structure S3 should be moved down-station to avoid a conflict with the proposed location of the pipe arches. From this new location, a lateral could lead from S3 into the pipe arch.
 - b. Line P4B originates from a Russian well which dates from the 1780's. Roy Ecklund of Ecklund Surveying has determined that the slope of Line P4B is 0.36%. He also has indicated that the flow from the well is of a low but steady volume. This flat slope, plus the constraint

imposed by the sanitary sewer crossing immediately downstream, forces the invert of proposed Manhole #C to be common with that of Line P4B. We anticipate that extra maintenance attention will be required at this location so that the outlet of Pipe P4B does not become silted in and clogged. Perhaps in final design we can add another manhole along Pipe P4B and increase the pipe diameter in the outlet section in Pipe P4B.

- c. The hydraulic design includes flow from Basin VI described in the drainage study. An investigation should be conducted as part of the ongoing design of the Rezanof Drive improvements to determine if this drainage should be piped to the Wye Storm Drain.
 - d. The storm drain proposed by VEI is generally higher than that of the existing storm drain. The additional storm drain improvements in this intersection need to be redesigned to match the tops of pipes if possible.
2. Wayne Coleman of the Kodiak Department of Public Works has indicated that there is a television cable which enters the existing 48" storm drain system at the manhole near Union Tire & Brake. This cable leaves the storm drain at the manhole in the parking lot at Kraft's Market. This cable should be removed from the storm drain system.
 3. The Mill Bay Road Reconstruction Project needs to have the first 3 stations of its proposed storm drain constructed prior to disrupting the existing drainage system within the Wye Intersection. The Mill Bay Road project is currently scheduled for advertisement in December 1992 with construction planned in 1993.
 4. City of Kodiak personnel have indicated that they would smoke test the existing storm drain system (intended to be abandoned) to locate other possible sources of inflow. This needs to be completed.
 5. Hydraulics provide a 26% safety factor over calculated flows. This is less than the 30% safety factor recommended in the May 1991 Mill Bay Road Drainage Study; but based on system performance during the October 31, 1991 storm, we feel this reduction is justified.

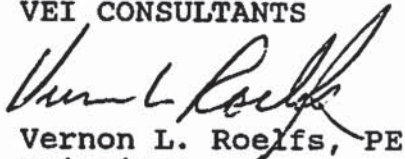
Mr. Matt Holmstrom, PE
August 28, 1992
Page Three

6. Our investigations have determined that the existing arch pipes downstream of the proposed improvements have approximately 18" of sediment in the bottom. This sediment needs to be removed in order to accommodate the necessary flow. We have conflicting invert elevation information on the downstream system; however, it appears that the capacity of the downstream system is slightly insufficient, even with the pipes completely clean.

Please review the enclosed material and contact us with any recommendations you may have. We would like to finalize the plans by September 18th. We anticipate that our final submittal will include plotted drawings and AutoCAD files so that modifications can be made when DOT&PF finalizes the intersection plans. If you have any questions or concerns, please do not hesitate to call.

Sincerely,

VEI CONSULTANTS



Vernon L. Roelfs, PE
Principal

Attachments as noted.

CC: Carl Nelson, ADOT&PF

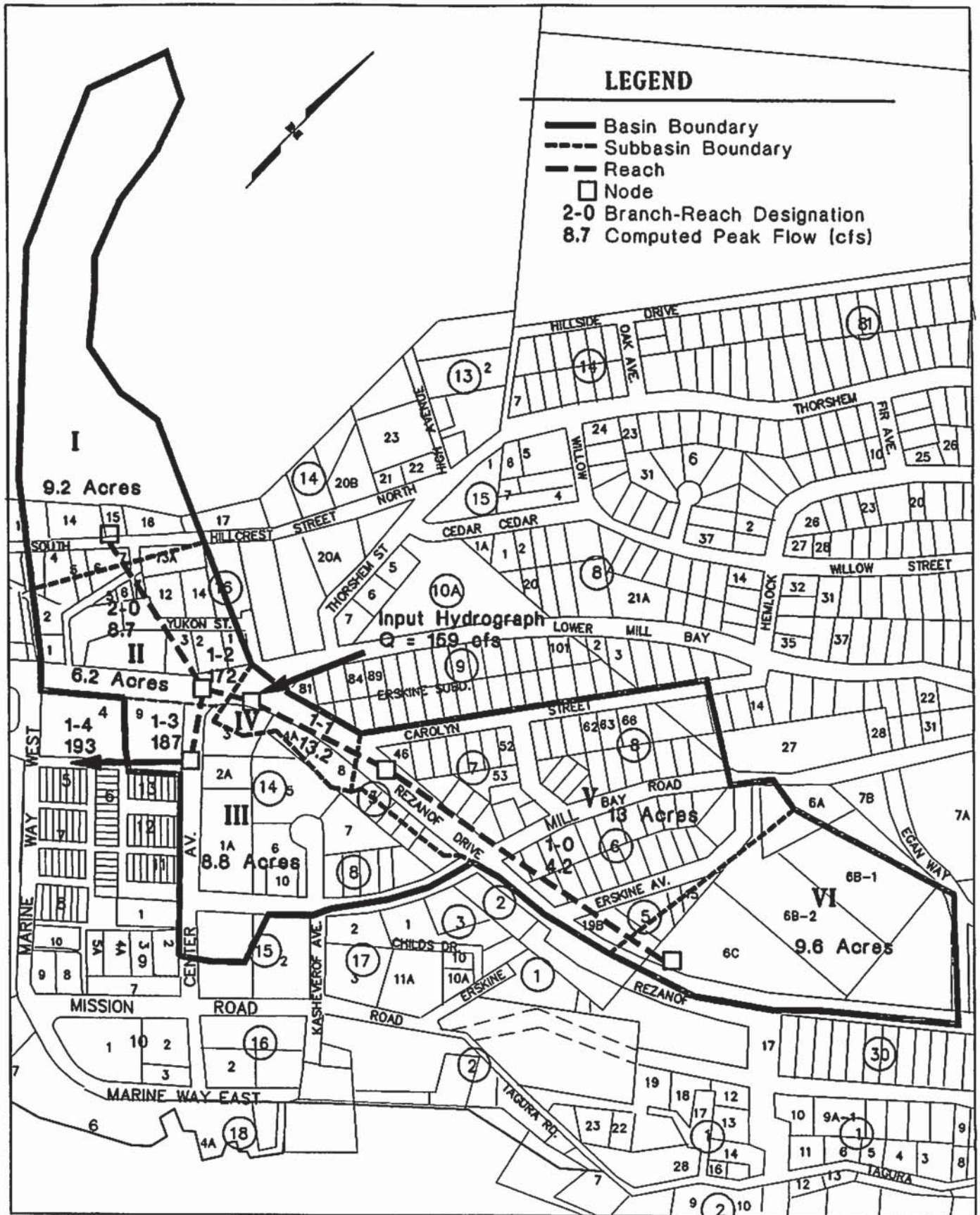
5. Wye Basin (Basin 5)

Wye Basin consists of residential and commercial land along the Wye intersection, with additional residential areas in the Aleutian Homes Subdivision. The natural areas in the Wye Basin exist at its periphery, along the slopes of Pillar Mountain and north of the bridge to Near Island. Wye Basin consists of 48 acres and discharges into the Kodiak Small Boat Harbor. The basin is divided into 6 subbasins, as follows:

SUBBASIN NO.	AREA DRAINED (Acres)	DOWNSTREAM REACHES	DESCRIPTION
			N=Natural I=Institutional C=Commercial R=Residential
I	9.2	2-0	N (38% Slopes)
II	6.2	1-3	C, R
III	8.8	1-4	C, R
IV	1.3	1-2	C
V	13	1-1	R
VI	9.6	1-0	N, R

A graphic sheet follows this section which describes the drainage subbasins and the ILLUDAS model map. The computer run for Wye Basin is included on the following pages. The computer printout includes input data and computed values from the evaluation. Data is indexed by branch and reach numbers which are shown graphically on page 2. Areas of specific interest are discussed as follows:

Rezanof Drive forms the southern boundary of Subbasin VI. Cross culverts under Rezanof currently drain much of this area. City personnel have indicated that the flow downstream from some of these culverts is channeled; but these still cross private property and additional investigation is warranted. VEI performed the drainage study with the existing configuration and then repeated the analysis with the discharge directed towards the Wye intersection. The results indicated that the flow from Subbasin VI was not a major contributing factor to the Wye Basin and could be included without affecting the design pipe diameter.



VEI Consultants

WYE DRAINAGE STUDY, W/ DRAINAGE BASINS,
SUBBASINS AND ILLUDAS MODEL MAP

CITY OF KODIAK
DEPARTMENT OF PUBLIC WORKS

DRAWN
KMM

JOB NUMBER
9206

SCALE
1" = 500'

DATE
8/12/92

FILE NAME
C:\YSHI\YSTUDY2.DWG

ILUDRAIN --- URBAN DRAINAGE AREA HYDROLOGIC SIMULATOR
Version 2.1 Updated Sep 1988

(C) Copyrights = Hydroware-1987 & C.E. Software-1987

TIME-SHIFT ROUTING METHOD ACTIVATED

MILL BAY ROAD
WYE INTERSECTION BASIN
KODIAK AK
7-09-92; VEI/KMM

RAINFALL PATTERN

0.000	0.025	0.025	0.025	0.025	0.027	0.027	0.027	0.027	0.027
0.027	0.027	0.029	0.029	0.029	0.029	0.041	0.064	0.162	0.111
0.057	0.033	0.029	0.029	0.029	0.029	0.027	0.027	0.027	0.027
0.027	0.027	0.027	0.025	0.025	0.025	0.025			

USER-DEFINED

Histogram of Distributed Rainfall

Time since start:	0	36	72	108	144	180 Mn
Accumulated rain:	0	0.186	0.388	0.890	1.092	1.278 In
Percent of storm:	0	14.59	30.33	69.67	85.41	100.0 %

RUN NUMBER	BASIN AREA ACRES	TIME INCREMENT MINUTES	SOIL TYPE 1234=ABCD
10	48.13	5.0	3

TOTAL RAIN INCHES	FREQUENCY YEARS	DURATION MINUTES	AMC PCT	IMP ABS INCHES	PER ABS INCHES
1.28	0	180	100.	0.10	0.20

----- BEGIN BRANCH 1 - REACH 0 -----

PAVED AREA HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.354	0.375	0.375	0.375	0.375
0.375	0.375	0.401	0.403	0.403	0.403	0.560	0.871	2.173	1.581
0.833	0.477	0.406	0.403	0.403	0.403	0.376	0.375	0.375	0.375
0.375	0.375	0.375	0.349	0.347	0.347	0.347	0.019		

GRASSED AREA HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.448	2.578
3.040	3.204	3.319	3.434	3.550	3.665	2.624	1.515	0.998	0.860
0.825	0.800	0.776	0.727	0.697	0.672	0.648	0.557	0.466	0.375
0.285	0.213	0.147	0.081	0.014					

LOCAL SURFACE HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.354	0.375	0.375	0.375	0.375
0.375	0.375	0.401	0.403	0.403	0.403	0.560	0.871	3.620	4.159
3.873	3.681	3.725	3.837	3.952	4.068	3.000	1.890	1.373	1.234
1.199	1.175	1.151	1.075	1.044	1.020	0.995	0.577	0.466	0.375
0.285	0.213	0.147	0.081	0.014					

ROUTING CONTINUITY CHECK --- INFLOW VOLUME = 16161 CU FT
ROUTING CONTINUITY CHECK --- OUTFLOW VOLUME = 16161 CU FT

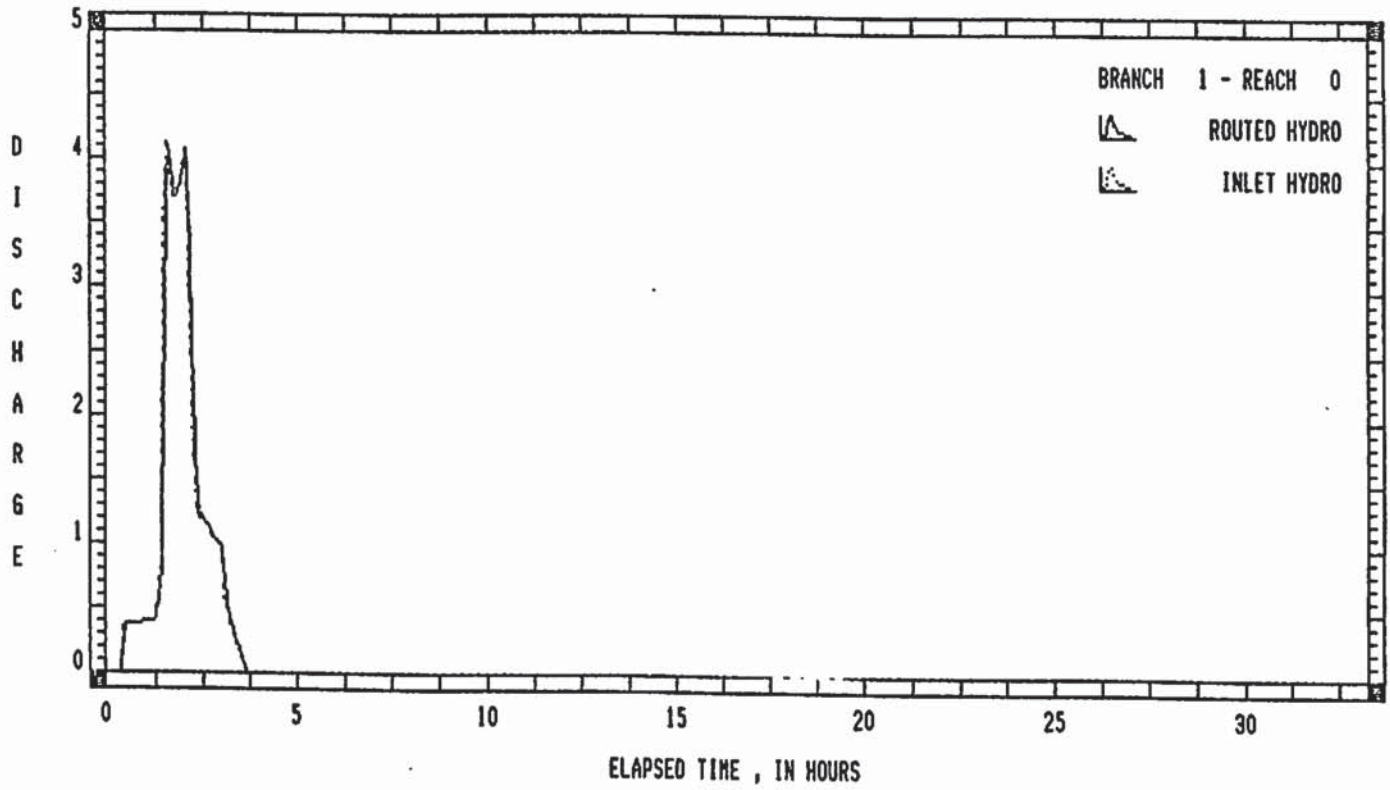
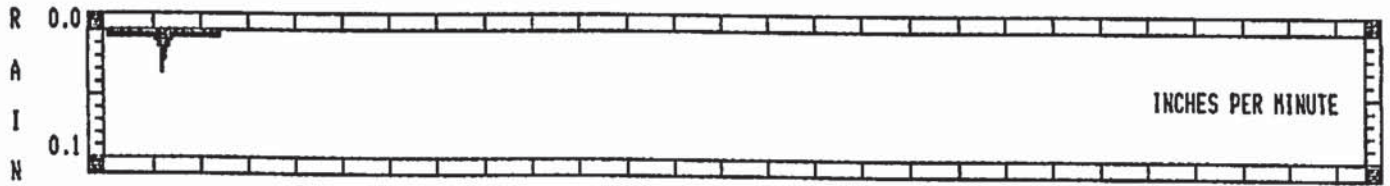
- B-R - 1 - 0 -----

LOCAL AREA : CPA = 1.16	SPA = 0.48	CGA = 8.00
UPSTREAM AREA : CPA = 1.16	SPA = 0.48	CGA = 8.00
RAINFALL FACTOR = 1.000	BASE FLOW = 0.00 CFS	SOIL TYPE = 3
REACH : LENGTH = 930 FT	SLOPE = 5.27 %	ROUGH = 0.0000
PAVED FLOW : LEN = 1000 FT	SLP = 4.000 %	ENTRY = 5.30 MIN
GRASS FLOW : LEN = 550 FT	SLP = 4.500 %	ENTRY = 41.09 MIN
PEAKS(CFS) : INLET = 4.159	DESIGN = 4.159	OUTLET = 4.016
VOLS : ROUTED = 16161	GROSS = 16161	%PAVED = 30.36

----- DESIGN CHARACTERISTICS -----
PIPE : DIAMETER = 12 INCHES ROUGHNESS = 0.0220
DESIGN : CAP = 4.830 CFS VEL = 6.150 FPS TRV = 2.241 MIN

ROUTED DESIGN HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.195	0.365	0.375	0.375	0.375
0.375	0.375	0.389	0.402	0.403	0.403	0.489	0.731	2.388	3.917
4.001	3.767	3.705	3.787	3.900	4.016	3.478	2.387	1.604	1.297
1.215	1.186	1.162	1.109	1.058	1.031	1.006	0.764	0.516	0.416
0.325	0.245	0.176	0.110	0.044	0.006				



----- BEGIN BRANCH 1 - REACH 1 -----

PAVED AREA HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.718	0.718	0.718	0.718	0.718
0.718	0.718	0.771	0.771	0.771	0.771	1.091	1.703	4.309	2.953
1.516	0.878	0.771	0.771	0.771	0.771	0.718	0.718	0.718	0.718
0.718	0.718	0.718	0.665	0.665	0.665	0.665			

GRASSED AREA HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.784	4.398	6.735
7.720	8.105	7.752	4.952	2.662	1.709	1.448	1.380	1.330	1.281
1.231	1.222	1.223	1.173	1.123	1.073	1.023	0.788	0.592	0.406
0.221	0.035								

INPUT HYDRO HAS PEAK OF 158.90 CFS AND VOLUME = 587490 CU FT

0.0	0.0	0.0	0.0	0.0	4.8	9.3	10.4	10.6	10.6
10.6	10.6	13.7	18.0	22.6	27.3	36.3	55.2	117.2	157.8
158.9	147.7	138.1	131.3	122.2	99.7	74.5	57.5	50.0	47.4
46.5	45.9	45.3	44.2	43.2	42.4	41.7	33.3	24.4	18.4
13.7	9.4	5.4	1.7	0.4	0.1				

UPSTREAM ROUTED PLUS SURFACE HYDROGRAPH

0.00	0.00	0.00	0.00	0.00	0.91	1.08	1.09	1.09	1.09
1.09	1.09	1.16	1.17	1.17	1.17	1.58	3.22	11.09	13.60
13.24	12.75	12.23	9.51	7.33	6.50	5.64	4.49	3.65	3.30
3.16	3.13	3.10	2.95	2.85	2.77	2.69	1.55	1.11	0.82
0.55	0.28	0.18	0.11	0.04	0.01				

DESIGN HYDRO BEFORE ROUTING

0.0	0.0	0.0	0.0	0.0	5.7	10.4	11.5	11.7	11.7
11.7	11.7	14.9	19.2	23.8	28.5	37.9	58.4	128.3	171.4
172.1	160.4	150.3	140.8	129.5	106.2	80.1	62.0	53.7	50.7
49.7	49.0	48.4	47.1	46.0	45.2	44.4	34.9	25.5	19.2
14.2	9.7	5.6	1.8	0.4	0.1				

TRAVEL TIME SO SMALL THAT ROUTED APPROXIMATELY = DESIGN HYDROGRAPH

ROUTING CONTINUITY CHECK --- INFLOW VOLUME = 631162 CU FT
ROUTING CONTINUITY CHECK --- OUTFLOW VOLUME = 631162 CU FT

- B-R - 1 - 1 -----

LOCAL AREA : CPA = 2.22 SPA = 1.70 CGA = 9.13
UPSTREAM AREA : CPA = 3.37 SPA = 2.18 CGA = 17.13
RAINFALL FACTOR = 1.000 BASE FLOW = 0.00 CFS SOIL TYPE = 3

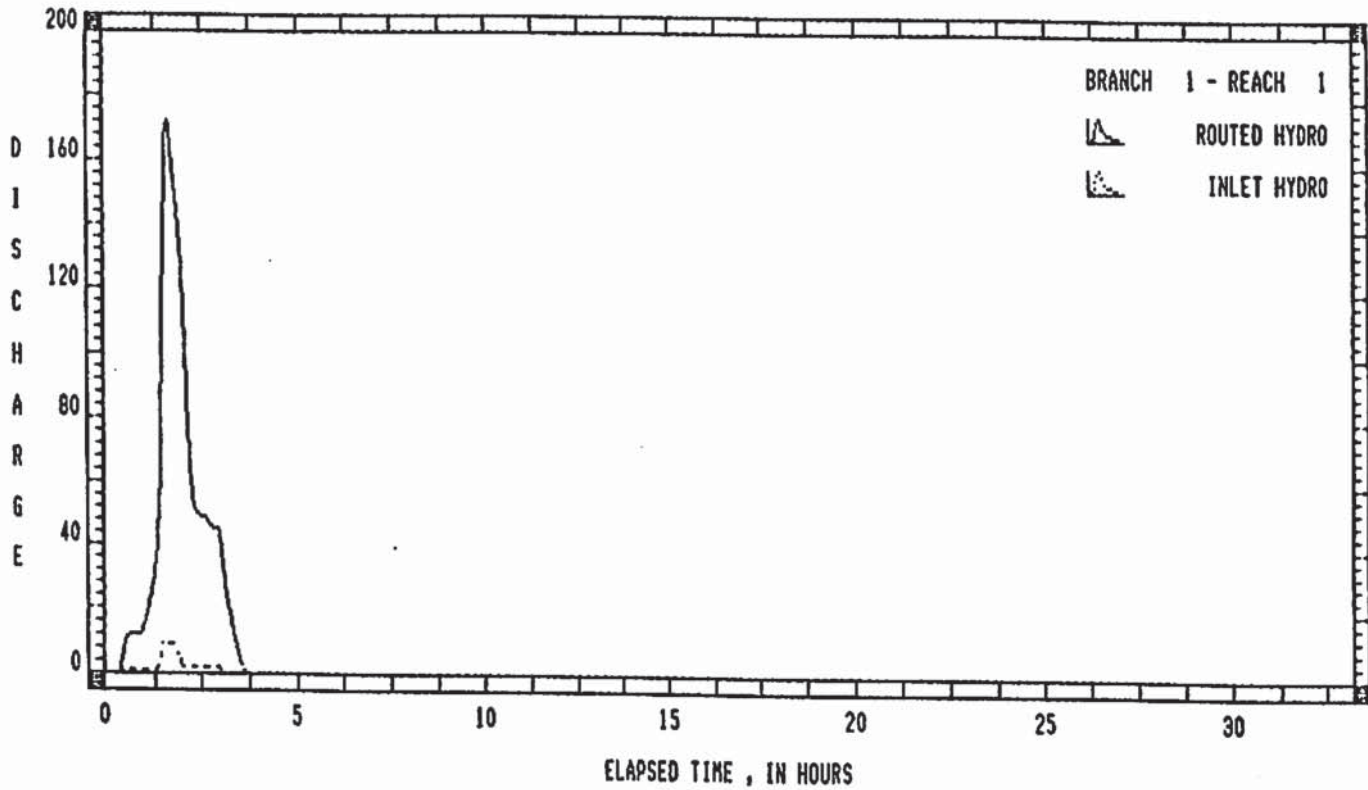
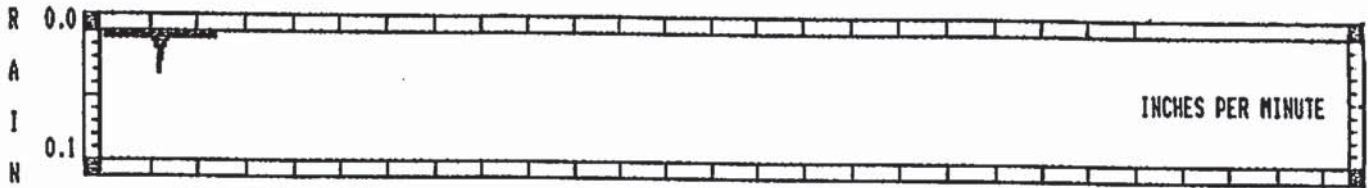
REACH : LENGTH = 470 FT SLOPE = 7.45 % ROUGH = 0.0000
PAVED FLOW : LEN = 1100 FT SLP = 9.100 % ENTRY = 4.40 MIN
GRASS FLOW : LEN = 300 FT SLP = 10.000 % ENTRY = 25.93 MIN

PEAKS(CFS) : INLET = 9.688 DESIGN = 172.137 OUTLET = 172.081
VOLTS : ROUTED = 631162 GROSS = 43672 %PAVED = 32.76

----- DESIGN CHARACTERISTICS -----
PIPE : DIAMETER = 48 INCHES ROUGHNESS = 0.0220
DESIGN : CAP = 231.538 CFS VEL = 18.425 FPS TRV = 0.388 MIN

ROUTED DESIGN HYDROGRAPH

0.0	0.0	0.0	0.0	0.0	5.3	10.0	11.4	11.7	11.7
11.7	11.7	14.6	18.8	23.4	28.1	37.1	56.8	122.9	168.1
172.1	161.4	151.1	141.5	130.4	108.0	82.2	63.4	54.3	50.9
49.7	49.1	48.5	47.2	46.1	45.2	44.5	35.6	26.2	19.7
14.6	10.0	5.9	2.1	0.6	0.1				



----- BEGIN BRANCH 1 - REACH 2 -----

PAVED AREA HYDROGRAPH

0.00	0.00	0.00	0.00	0.00	0.29	0.29	0.29	0.29	0.29
0.29	0.29	0.31	0.31	0.31	0.31	0.44	0.68	1.73	1.18
0.61	0.35	0.31	0.31	0.31	0.31	0.29	0.29	0.29	0.29
0.29	0.29	0.29	0.27	0.27	0.27	0.27			

GRASSED AREA HYDROGRAPH

0.00	0.00	0.00	0.00	0.01	0.04	0.07	0.09	0.09	0.09
0.09	0.09	0.09	0.10	0.10	0.10	0.12	0.18	0.40	0.50
0.45	0.25	0.14	0.11	0.10	0.10	0.10	0.09	0.09	0.09
0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.05	0.02	

UPSTREAM ROUTED PLUS SURFACE HYDROGRAPH

0.0	0.0	0.0	0.0	0.0	5.6	10.4	11.8	12.1	12.1
12.1	12.1	15.0	19.2	23.8	28.5	37.7	57.7	125.0	169.7
173.1	162.0	151.6	142.0	130.8	108.4	82.6	63.8	54.7	51.3
50.1	49.5	48.8	47.6	46.5	45.6	44.8	35.6	26.3	19.7
14.6	10.0	5.9	2.1	0.6	0.1				

TRAVEL TIME SO SMALL THAT ROUTED APPROXIMATELY = DESIGN HYDROGRAPH

ROUTING CONTINUITY CHECK --- INFLOW VOLUME = 636244 CU FT
ROUTING CONTINUITY CHECK --- OUTFLOW VOLUME = 636244 CU FT

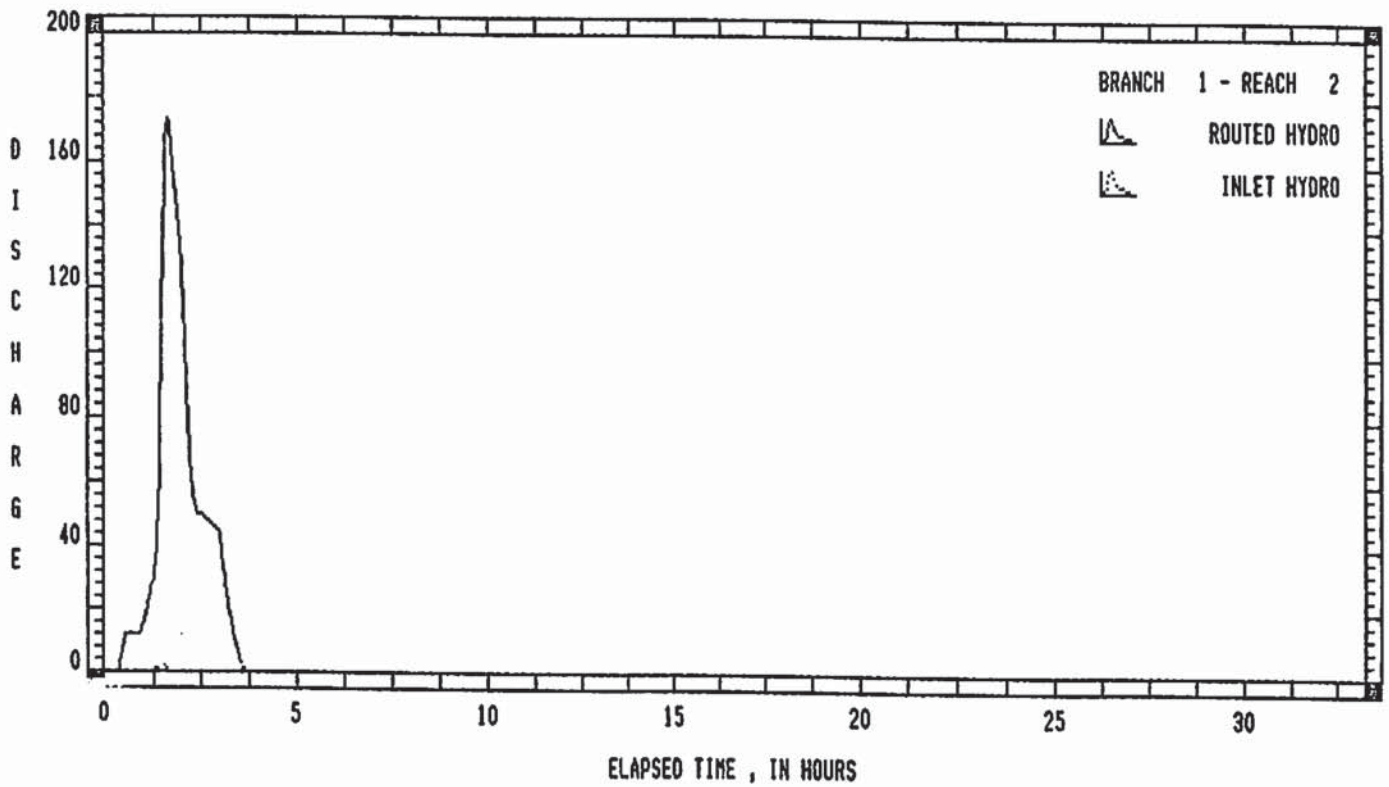
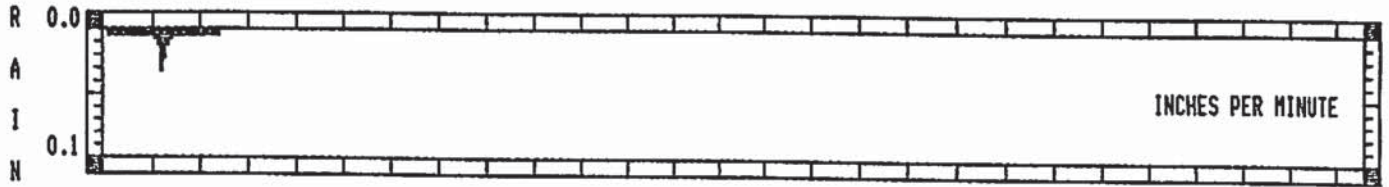
- B-R - 1 - 2 -----

LOCAL AREA : CPA = 0.89 SPA = 0.25 CGA = 0.13
UPSTREAM AREA : CPA = 4.26 SPA = 2.43 CGA = 17.26
RAINFALL FACTOR = 1.000 BASE FLOW = 0.00 CFS SOIL TYPE = 3
REACH : LENGTH = 100 FT SLOPE = 0.66 % ROUGH = 0.0000
PAVED FLOW : LEN = 400 FT SLP = 6.250 % ENTRY = 3.06 MIN
GRASS FLOW : LEN = 50 FT SLP = 10.000 % ENTRY = 13.57 MIN
PEAKS(CFS) : INLET = 2.126 DESIGN = 173.135 OUTLET = 172.995
VOLS : ROUTED = 636244 GROSS = 48754 %PAVED = 37.08

----- DESIGN CHARACTERISTICS -----
PIPE : DIAMETER = 72 INCHES ROUGHNESS = 0.0220
DESIGN : CAP = 203.189 CFS VEL = 7.186 FPS TRV = 0.207 MIN

ROUTED DESIGN HYDROGRAPH

0.0	0.0	0.0	0.0	0.0	5.4	10.2	11.7	12.0	12.1
12.1	12.1	14.9	19.1	23.6	28.3	37.3	56.9	122.2	167.9
173.0	162.4	152.0	142.4	131.3	109.3	83.6	64.6	55.1	51.4
50.2	49.5	48.9	47.7	46.5	45.6	44.8	36.0	26.6	20.0
14.8	10.2	6.1	2.3	0.6	0.1				



----- BEGIN BRANCH 2 - REACH 0 -----

GRASSED AREA HYDROGRAPH

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.40	0.86	1.32	1.78	2.49	3.32	6.28	8.10
8.71	8.51	7.64	4.73	2.96	2.36	2.23	2.19	2.14	2.10
2.06	2.06	2.06	2.01	1.97	1.92	1.88	1.47	1.10	0.73
0.35									

LOCAL SURFACE HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.399	0.859	1.318	1.777	2.486	3.321	6.276	8.097
8.708	8.509	7.641	4.733	2.962	2.362	2.232	2.188	2.143	2.099
2.056	2.056	2.056	2.012	1.967	1.923	1.879	1.466	1.095	0.725
0.355									

ROUTING CONTINUITY CHECK --- INFLOW VOLUME = 25711 CU FT
ROUTING CONTINUITY CHECK --- OUTFLOW VOLUME = 25711 CU FT

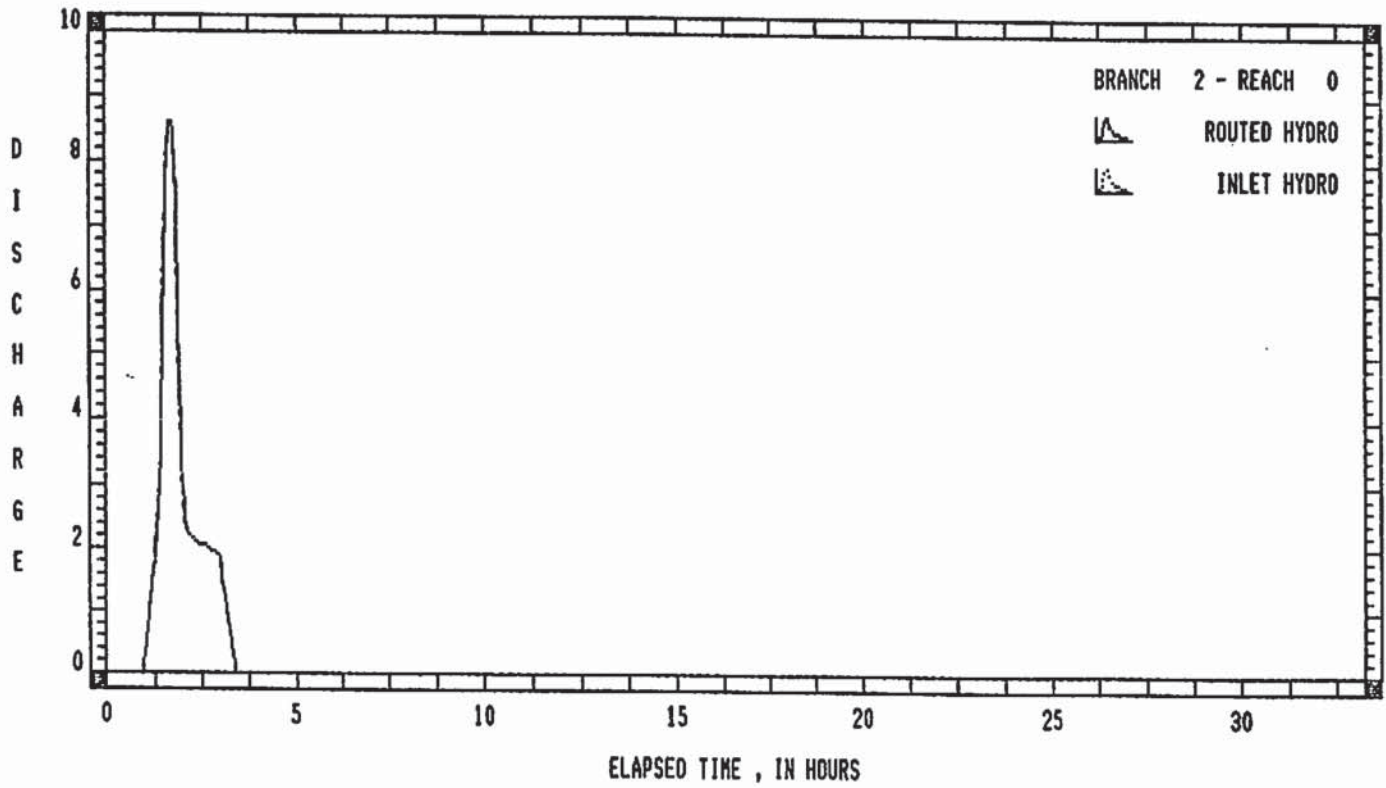
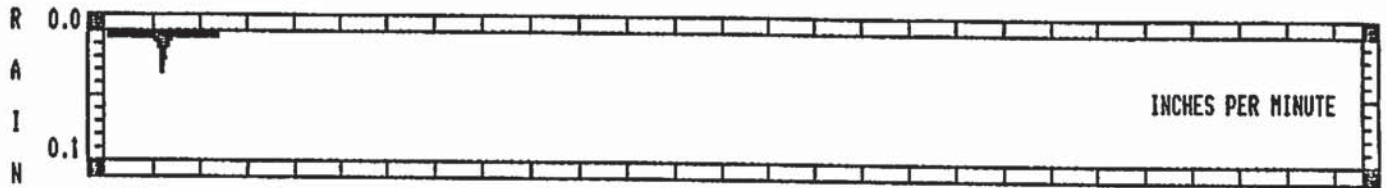
- B-R - 2 - 0 -----

LOCAL AREA : CPA = 0.00 SPA = 0.00 CGA = 9.18
UPSTREAM AREA : CPA = 0.00 SPA = 0.00 CGA = 9.18
RAINFALL FACTOR = 1.000 BASE FLOW = 0.00 CFS SOIL TYPE = 4
REACH : LENGTH = 520 FT SLOPE = 14.00 % ROUGH = 0.0000
GRASS FLOW : LEN = 1300 FT SLP = 38.100 % ENTRY = 24.79 MIN
PEAKS(CFS) : INLET = 8.708 DESIGN = 8.708 OUTLET = 8.622
VOLS : ROUTED = 25711 GROSS = 25711 %PAVED = 0.00

----- DESIGN CHARACTERISTICS -----
PIPE : DIAMETER = 15 INCHES ROUGHNESS = 0.0220
DESIGN : CAP = 14.273 CFS VEL = 11.631 FPS TRV = 0.710 MIN

ROUTED DESIGN HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.343	0.793	1.253	1.712	2.385	3.202	5.856	7.839
8.622	8.538	7.764	5.146	3.213	2.447	2.251	2.194	2.150	2.105
2.062	2.056	2.056	2.018	1.974	1.929	1.885	1.524	1.148	0.778
0.407	0.050								



----- BEGIN BRANCH 1 - REACH 3 -----

PAVED AREA HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.874	0.874	0.874	0.874	0.874
0.874	0.874	0.939	0.939	0.939	0.939	1.327	2.071	5.243	3.592
1.845	1.068	0.939	0.939	0.939	0.939	0.874	0.874	0.874	0.874
0.874	0.874	0.874	0.809	0.809	0.809	0.809			

GRASSED AREA HYDROGRAPH

0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.055	0.218	0.381	0.664	1.138	2.681	3.581
3.667	2.882	1.562	0.846	0.626	0.598	0.575	0.552	0.529	0.514
0.514	0.514	0.514	0.491	0.468	0.445	0.431	0.312	0.193	0.074

UPSTREAM ROUTED PLUS SURFACE HYDROGRAPH

0.0	0.0	0.0	0.0	0.0	6.2	11.1	12.6	12.9	12.9
12.9	12.9	16.2	20.9	26.0	31.4	41.7	63.3	136.0	182.9
187.1	174.9	162.3	149.3	136.1	113.3	87.3	68.2	58.6	54.9
53.6	52.9	52.3	51.0	49.8	48.8	48.0	37.9	28.0	20.8
15.2	10.3	6.1	2.3	0.6	0.1				

TRAVEL TIME SO SMALL THAT ROUTED APPROXIMATELY = DESIGN HYDROGRAPH

ROUTING CONTINUITY CHECK ---- INFLOW VOLUME = 680900 CU FT
 ROUTING CONTINUITY CHECK ---- OUTFLOW VOLUME = 680900 CU FT

- B-R - 1 - 3 -----

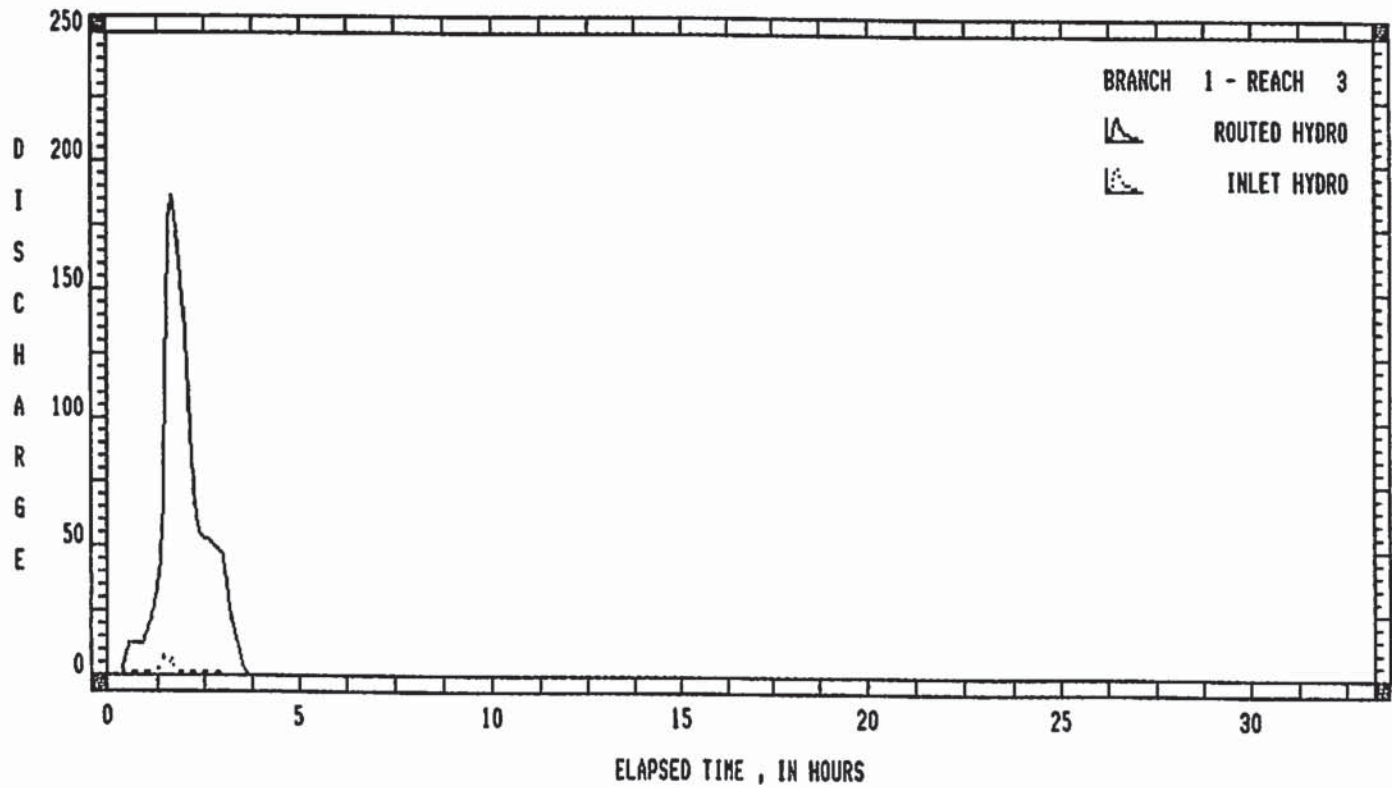
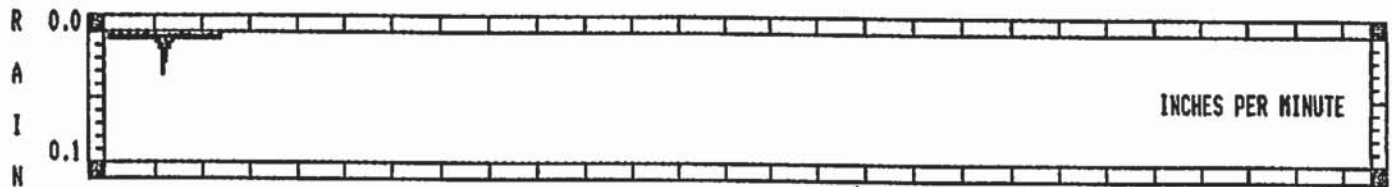
LOCAL AREA : CPA = 2.70 SPA = 1.02 CGA = 2.48
 UPSTREAM AREA : CPA = 6.96 SPA = 3.45 CGA = 28.92
 RAINFALL FACTOR = 1.000 BASE FLOW = 0.00 CFS SOIL TYPE = 3
 REACH : LENGTH = 180 FT SLOPE = 0.37 % ROUGH = 0.0000
 PAVED FLOW : LEN = 500 FT SLP = 10.000 % ENTRY = 3.04 MIN
 GRASS FLOW : LEN = 280 FT SLP = 26.800 % ENTRY = 18.13 MIN
 PEAKS(CFS) : INLET = 7.924 DESIGN = 187.128 OUTLET = 186.748
 VOLS : ROUTED = 680900 GROSS = 93410 %PAVED = 31.60

----- DESIGN CHARACTERISTICS -----

PIPE : DIAMETER = 84 INCHES ROUGHNESS = 0.0220
 DESIGN : CAP = 229.486 CFS VEL = 5.963 FPS TRV = 0.451 MIN

ROUTED DESIGN HYDROGRAPH

0.0	0.0	0.0	0.0	0.0	5.7	10.6	12.5	12.9	12.9
12.9	12.9	15.9	20.4	25.6	30.9	40.8	61.3	129.4	178.7
186.7	176.0	163.4	150.5	137.3	115.4	89.7	69.9	59.5	55.3
53.7	53.0	52.4	51.1	49.9	48.9	48.0	38.8	28.9	21.5
15.8	10.7	6.4	2.6	0.8	0.2				



----- BEGIN BRANCH - REACH 4 -----

PAVED AREA HYDROGRAPH

0.00	0.00	0.00	0.00	0.00	1.65	1.74	1.74	1.74	1.74
1.74	1.74	1.86	1.87	1.87	1.87	2.60	4.04	10.09	7.33
3.86	2.21	1.88	1.87	1.87	1.87	1.75	1.74	1.74	1.74
1.74	1.74	1.74	1.62	1.61	1.61	1.61	0.09		

GRASSED AREA HYDROGRAPH

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.14
0.24	0.35	0.47	0.58	0.67	0.70	0.79	1.04	1.94	2.49
2.68	2.71	2.64	2.42	1.60	1.01	0.77	0.71	0.69	0.68
0.66	0.65	0.65	0.64	0.62	0.61	0.60	0.49	0.38	0.29
0.20	0.10	0.01							

UPSTREAM ROUTED PLUS SURFACE HYDROGRAPH

0.0	0.0	0.0	0.0	0.0	7.3	12.4	14.2	14.7	14.8
14.9	15.0	18.2	22.9	28.1	33.4	44.2	66.4	141.5	188.5
193.3	180.9	167.9	154.8	140.7	118.3	92.2	72.3	61.9	57.7
56.1	55.4	54.7	53.3	52.1	51.1	50.2	39.3	29.3	21.8
15.9	10.8	6.5	2.6	0.8	0.2				

TRAVEL TIME SO SMALL THAT ROUTED APPROXIMATELY = DESIGN HYDROGRAPH

ROUTING CONTINUITY CHECK --- INFLOW VOLUME = 713039 CU FT
ROUTING CONTINUITY CHECK --- OUTFLOW VOLUME = 713039 CU FT

- B-R - 1 - 4 -----

LOCAL AREA : CPA = 5.37 SPA = 1.58 CGA = 1.85
UPSTREAM AREA : CPA = 12.33 SPA = 5.04 CGA = 30.76
RAINFALL FACTOR = 1.000 BASE FLOW = 0.00 CFS SOIL TYPE = 3

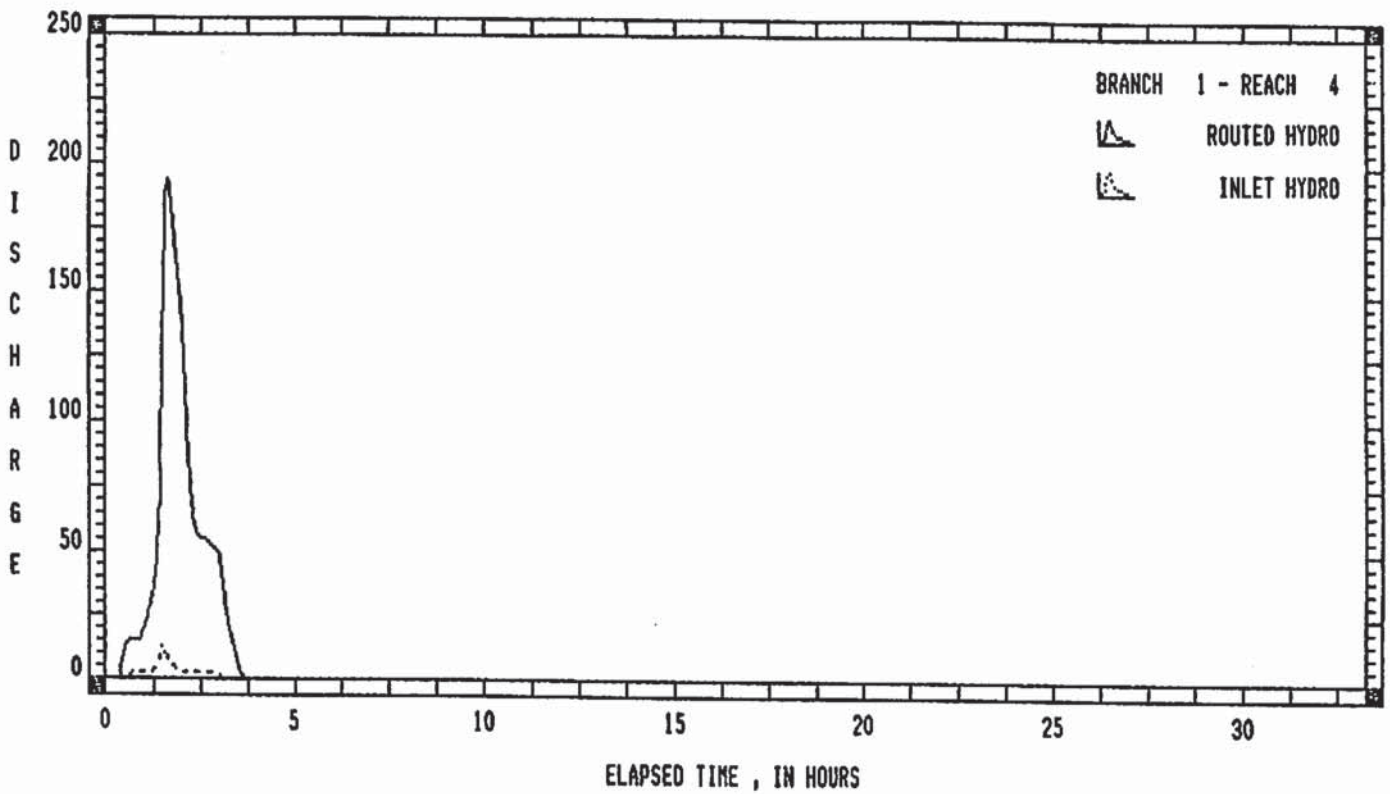
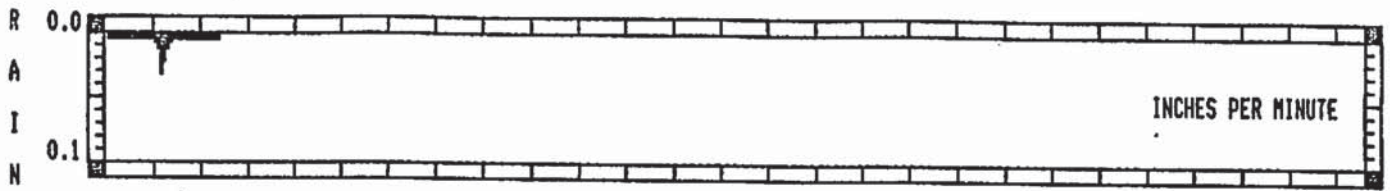
REACH : LENGTH = 4 FT SLOPE = 1.11 % ROUGH = 0.0000
PAVED FLOW : LEN = 1200 FT SLP = 5.800 % ENTRY = 5.29 MIN
GRASS FLOW : LEN = 200 FT SLP = 3.800 % ENTRY = 30.55 MIN

PEAKS(CFS) : INLET = 12.035 DESIGN = 193.291 OUTLET = 193.285
VOLS : ROUTED = 713039 GROSS = 125549 %PAVED = 41.64

----- DESIGN CHARACTERISTICS -----
PIPE : DIAMETER = 84 INCHES ROUGHNESS = 0.0220
DESIGN : CAP = 397.481 CFS VEL = 10.328 FPS TRV = 0.006 MIN

ROUTED DESIGN HYDROGRAPH

0.0	0.0	0.0	0.0	0.0	7.3	12.4	14.2	14.7	14.8
14.9	15.0	18.2	22.9	28.1	33.4	44.1	66.4	141.4	188.4
193.3	181.0	167.9	154.8	140.7	118.3	92.2	72.4	61.9	57.7
56.1	55.4	54.7	53.3	52.1	51.1	50.2	39.4	29.3	21.8
16.0	10.8	6.5	2.6	0.8	0.2				



OUTFALL HYDROGRAPH IN CFS RUNOFF VOLUME IN CU FT = 713039

0.0	0.0	0.0	0.0	0.0	7.3	12.4	14.2	14.7	14.8
14.9	15.0	18.2	22.9	28.1	33.4	44.1	66.4	141.4	188.4
193.3	181.0	167.9	154.8	140.7	118.3	92.2	72.4	61.9	57.7
56.1	55.4	54.7	53.3	52.1	51.1	50.2	39.4	29.3	21.8
16.0	10.8	6.5	2.6	0.8	0.2				

THE JOB IS FINISHED