057-0040-D

I-575-1 (6) CHEROKEE CO.

I-575 AND DUPREE ROAD CROSSINGS

OF NOONDAY CREEK

HYDRAULIC AND HYDROLOGICAL STUDY

LMM 7-17-78

EXAMINED AND APPROVED:

6-28-78
Date

J. T. Kratzer, P. E.
State Bridge Engineer

I-575-1 (6) CHEROKEE CO.

HYDRAULIC AND HYDROLOGICAL STUDY

The study on the above project was done by the U. S. Geological Survey and consists of two separate crossings of Noonday Creek. At the interstate crossing of Noonday Creek, dual 42 foot by 190 foot bridges are proposed. About 1500 feet upstream of the interstate crossing is a 28 foot by 60 foot existing bridge on Dupree Road that is to be replaced with a 44 foot by 144 foot bridge.

The two above-mentioned proposed bridge lengths are the shortest bridges that could be used and still maintain bank stability. The study indicates that the interstate bridge will cause a rise in floodstage of about 0.10 to 0.20 feet at the Dupree Road crossing. This is not significant due to the fact that there is no development in the upstream floodplain at Dupree Road. The study also shows two other sets of bridge lengths that are longer than the proposed bridge lengths.

Calculations indicate that no spur dikes are required.

The required calculations, USGS Report, and preliminary layout are shown on the following pages.

Prepared by: Allen Groover

SAG:ml

5-25-78

Form 9-014

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
RESTON, VA. 22092

MEMORANDUM REPORT

Flood-Flow Characteristics

Noonday Creek at State Highway 5 near Woodstock, Georgia

Project F-057, Cherokee County

Georgia District
Water Resources Division
U.S. Geological Survey
Doraville, Georgia

July 1977

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U.S. GOVERNMENT PRINTING OFFICE 889-817-1

MEMORANDUM REPORT

Flood-Flow Characteristics

Noonday Creek at State Highway 5,
near Woodstock, Georgia

Project F-057, Cherokee County

INTRODUCTION

This report has been prepared as part of a program of water-resources investigations under the provisions of a cooperative agreement between the Highway Division, Department of Transportation, State of Georgia, and the U.S. Geological Survey. The Highway Division plans construction of a bridge crossing at Noonday Creek on relocated State Highway 5 (Project F-057) near Woodstock, Georgia.

The purpose of the study is to determine the flood-flow characteristics for Noonday Creek at the proposed bridge site and at the Dupree Road crossing of Noonday Creek, about 1,500 feet upstream from the proposed bridge site, for the highest known flood and floods having a recurrence of 50 and 100 years. In addition, the study includes backwater computations, area of opening under highwater, and average velocity for both the 50- and 100-year floods at the Dupree Road crossing of Noonday Creek.

The Highway Divison provided a 2-foot contour map of the reach in the vicinity of the State Highway 5 crossing of Noonday Creek and cross sections of the channel and floodway of Noonday Creek, about 2,700 feet downstream from the proposed bridge site and at the Dupree Road crossing. All elevations used in this report are to highway datum, which is mean sea level.

Topographic features and the location of the proposed crossing site and cross sections used in routing are shown in figure 1. Noonday Creek drains an area of approximately 43 square miles at the site.

FLOOD FREQUENCY

The discharge for the 50- and 100-year floods have been estimated as 6,400 and 7,360 ft /s (cubic feet per second), respectively, based on regional relationships, $Q = 727\ A^{0.58}$ and $Q = 862\ A^{0.57}$ based on a flood-frequency study now in progress for Georgia streams. The effect of urbanization at this site is small, probably less than 10 percent, and has not been considered in the flood-frequency computations.

ELEVATION-DISCHARGE RELATION

The elevation-discharge relation for the 50- and 100-year floods have been determined at the proposed bridge site and at the Dupree Road crossing from flood routing studies made for a reach beginning 2,700 feet downstream from the proposed bridge site to the Dupree Road crossing, about 1,800 feet upstream from the proposed site. The location of the cross sections used are shown in figure 1.

The elevation of the 50- and 100-year floods (6,440 and 7,360 ft /s) at the proposed bridge site have been determined to be 883.2 and 884.0 feet, respectively, at the main channel based on the flood routing studies. The elevation of the 50- and 100-year floods (6,440 and 7,360 ft /s) at the Dupree Road crossing was determined to be 884.6 and 885.4 feet, respectively, from the routing studies.

The only information available on past floods on Noonday Creek was an elevation of 884 feet, given on the plans by the Highway Division at Dupree Road.

DISTRIBUTION OF FLOW

The flow distribution across the channel and floodway for the 50- and 100-year floods at the proposed bridge site crossing on State Highway 5 are shown in figure 2. These distributions are based on channel and floodway conditions as observed on July 11, 1977. These distributions indicate that the main channel is conveying about 35 percent of the total flow. The proposed crossing at this site is skewed about 35 percent from the flood-flow alinement of the stream. The elevation of the water surface on the south (left) side was computed to be about 0.1 foot higher than that at the north side due to the skewness of the crossing.

The flow distribution across the channel and floodway for the 50- and 100-year floods at the approach to the Dupree Road crossing of Noonday Creek are shown in figure 3. The distribution indicates that the main channel conveys about 40 percent of the total flow.

BACKWATER EFFECTS

The backwater effects, area of opening under highwater and average velocity are listed for the present Dupree Road crossing in table 1. These values have been estimated based on area of flow over road, area of flow through and over bridge, and conveyances in approach section upstream. These computations indicate that there would be flow over Dupree Road frequently.

Table 1.--Backwater computation for present bridge on Noonday Creek at Dupree Road, near Woodstock, Ga.

	Elevation ft(m.s.l.)	Discharge (ft /s)	Area (ft)	Average velocity (ft/s)	Backwater (ft)
Flow through present bridge and over bridge					
50-year flood	884.6	1,800	552	3.3	0.1
100-year flood	885.4	2,000	600	3.3	0.1
Flow over roadway - west side					
50-year flood	884.6	3,000	2,470	1.2	-
100-year flood	885.4	3,400	2,840	1.2	-
Flow over roadway - east side					
50-year flood	884.6	1,640	1,470	1.1	-
100-year flood	885.4	1,960	1,710	1.1	-

884.1
885.5
1.6

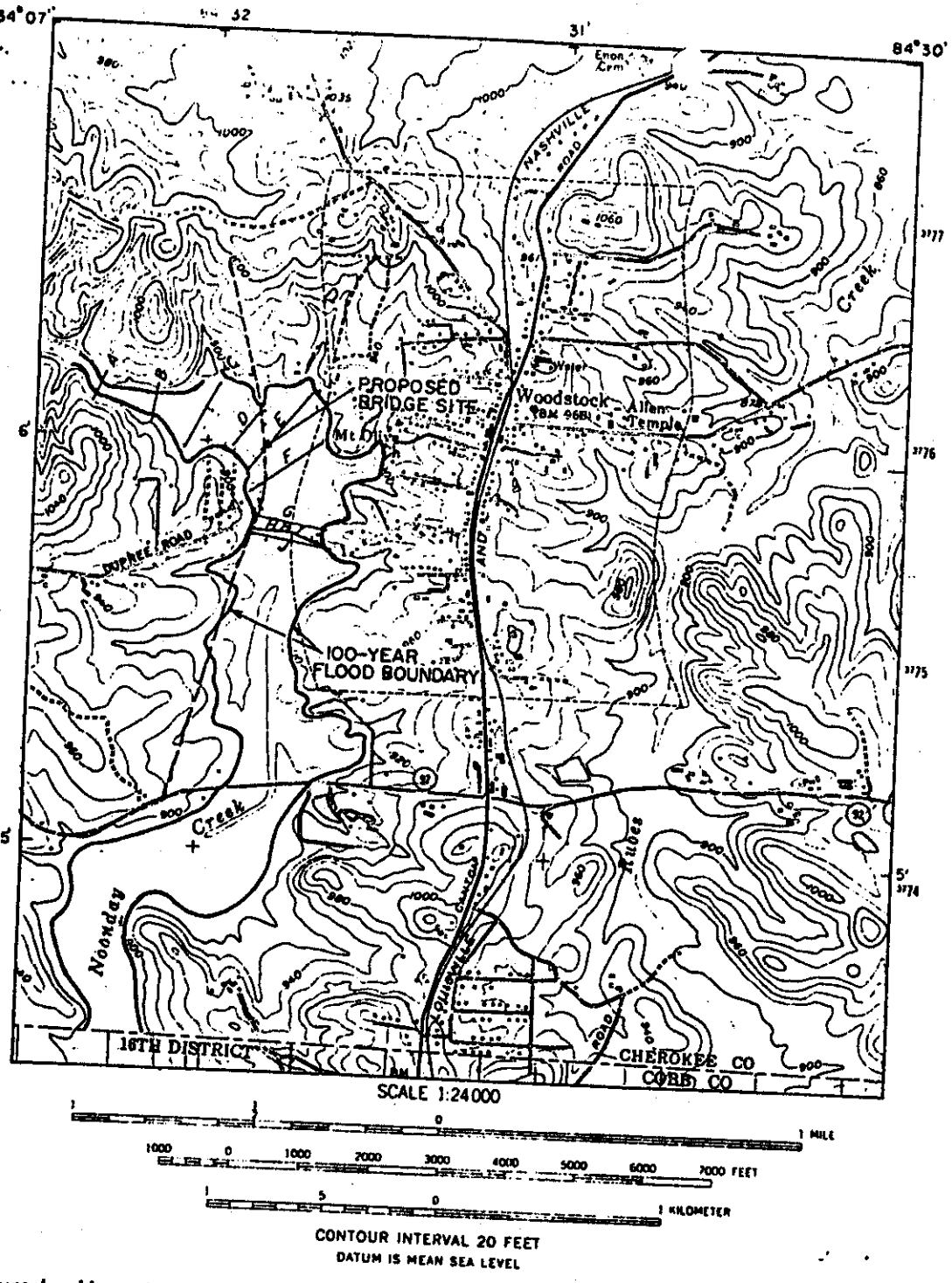

Figure 1.—Map showing location of proposed bridge crossing, cross-sections used in flood routing, and 100-year flood boundary for Noonday Creek near Woodstock, Georgia.

I-575-1 (6) CHEROKEE COUNTY

I-575 MAINLINE, I-575 RAMP AND DUPREE ROAD BRIDGES OVER NOONDAY CREEK

SUPPLEMENTAL HYDRAULIC AND HYDROLOGICAL STUDY

EXAMINED AND APPROVED:

5-23-79
(Date)

J. T. Kvatzer, P. E.
State Bridge Engineer

SAG/kg

5-21-79

I-525-1 (6) CHEROKEE COUNTY

SUPPLEMENTAL HYDRAULIC AND HYDROLOGICAL STUDY

The USGS has previously performed two hydraulic studies on the above project over Noonday Creek. These studies are dated June 28, 1978 and November 8, 1978 and the information contained within them is still considered valid.

The attached USGS Hydraulic Study combines the first two studies and adds a third alternate which consist of a ramp bridge located downstream of the I-575 mainline bridges.

The required USGS study and preliminary layouts are shown on the following pages.

Prepared By: Allen Groover

SAG/kg

5-21-79

Form 9-014

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
RESTON, VA. 22092

MEMORANDUM REPORT

Flood-Flow Characteristics

Noonday Creek at Interstate Highway 575 near Woodstock, Georgia

Project I-575-1, Cherokee County

Georgia District
Water Resources Division
U.S. Geological Survey
Doraville, Georgia

May 1979

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MEMORANDUM REPORT

Flood-Flow Characteristics

Noonday Creek at Interstate Highway 575,

near Woodstock, Georgia

Project I-575-1 - Cherokee County

INTRODUCTION

This report has been prepared as part of a program of water-resources investigations under the provisions of a cooperative agreement between the Highway Division, Department of Transportation, State of Georgia, and the U.S. Geological Survey. The Highway Division plans construction of bridges crossing Noonday Creek on Interstate Highway 575 and Dupree Road (Project I-575) near Woodstock, Georgia.

The purpose of the study is to determine the flood-flow characteristics for Noonday Creek at the proposed bridge crossings at Interstate Highway 575 and Dupree Road, for the highest known flood, and for floods having a recurrence interval of 50 and 100 years for three alternate conditions. The conditions are:

1. existing conditions at both sites;
2. bridge crossing Interstate Highway 575 from highway centerline stations 571+90 to 574+00 and bridge crossing Dupree Road from highway centerline stations 88+56 to 90+00; and
3. same as alternate 2 with additional 210-foot ramp bridge 450 feet downstream from the proposed Interstate Highway 575 bridge. The south abutment is continuous from the main Interstate Highway 575 bridge to the ramp bridge.

The second and third alternates include the encroachment of the fill placed in the flood plain from the relocation of West Mill Street. In addition, the study includes backwater computations, area of opening under highwater conditions, and average velocity for both the 50- and 100-year floods at the Interstate Highway 575 main bridge, ramp bridge, and Dupree Road.

The Highway Division furnished roadway and bridge plans for both the existing and proposed crossings of Noonday Creek at Interstate Highway 575 and Dupree Road. They also provided a 2-foot contour map of the reach from Dupree Road to a point about 2,700 feet below the proposed Interstate Highway 575 bridge.

The U.S. Geological Survey furnished a report describing the flood-flow characteristics at these sites in July 1977 that included the elevations and flow distributions of the 50- and 100-year floods. In May 1978, the U.S. Geological Survey also furnished a report including flood elevations, area of opening under highwater conditions, average velocity, and backwater effects for three alternate proposed widths for Interstate Highway 575.

All elevations used in this report are to highway datum, which is National Geodetic Vertical Datum of 1929.

Topographic features and the location of the proposed crossing sites and cross sections used in routing are shown in figure 1. Noonday Creek drains an area of approximately 43 square miles at the site.

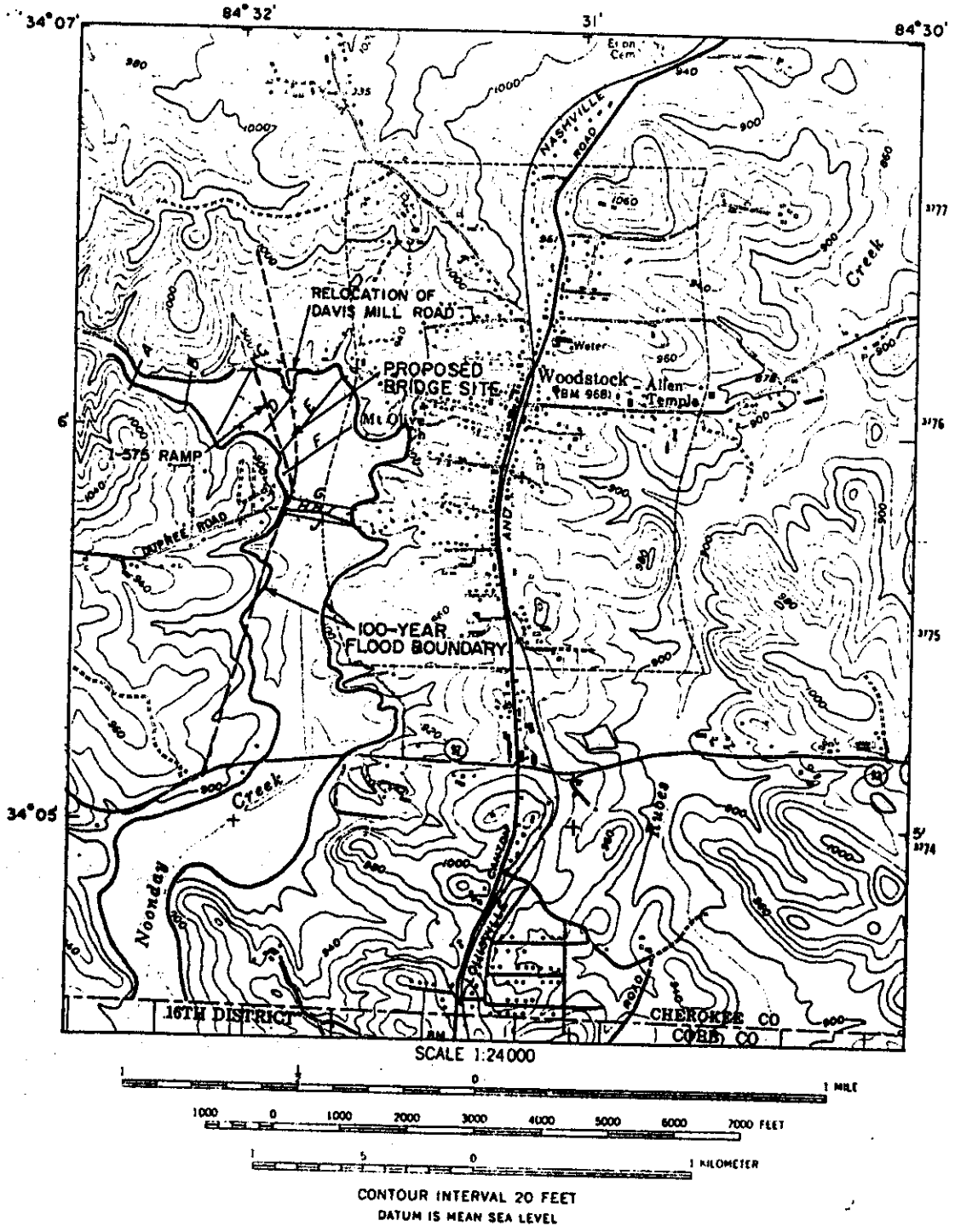

Figure 1.—Map showing location of proposed bridge crossing, cross-sections used in flood routing, and 100-year flood boundary for Noonday Creek near Woodstock, Georgia.

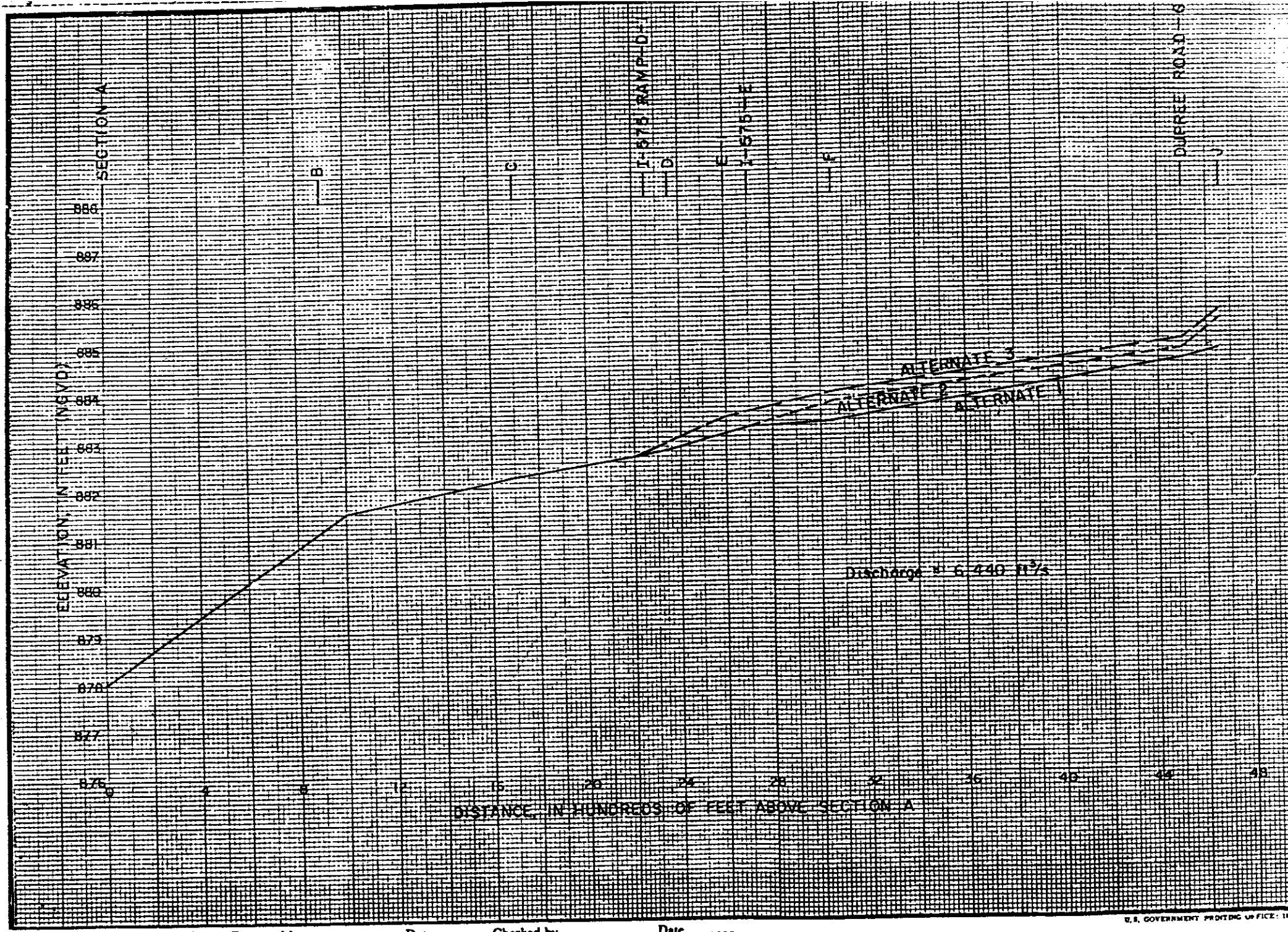

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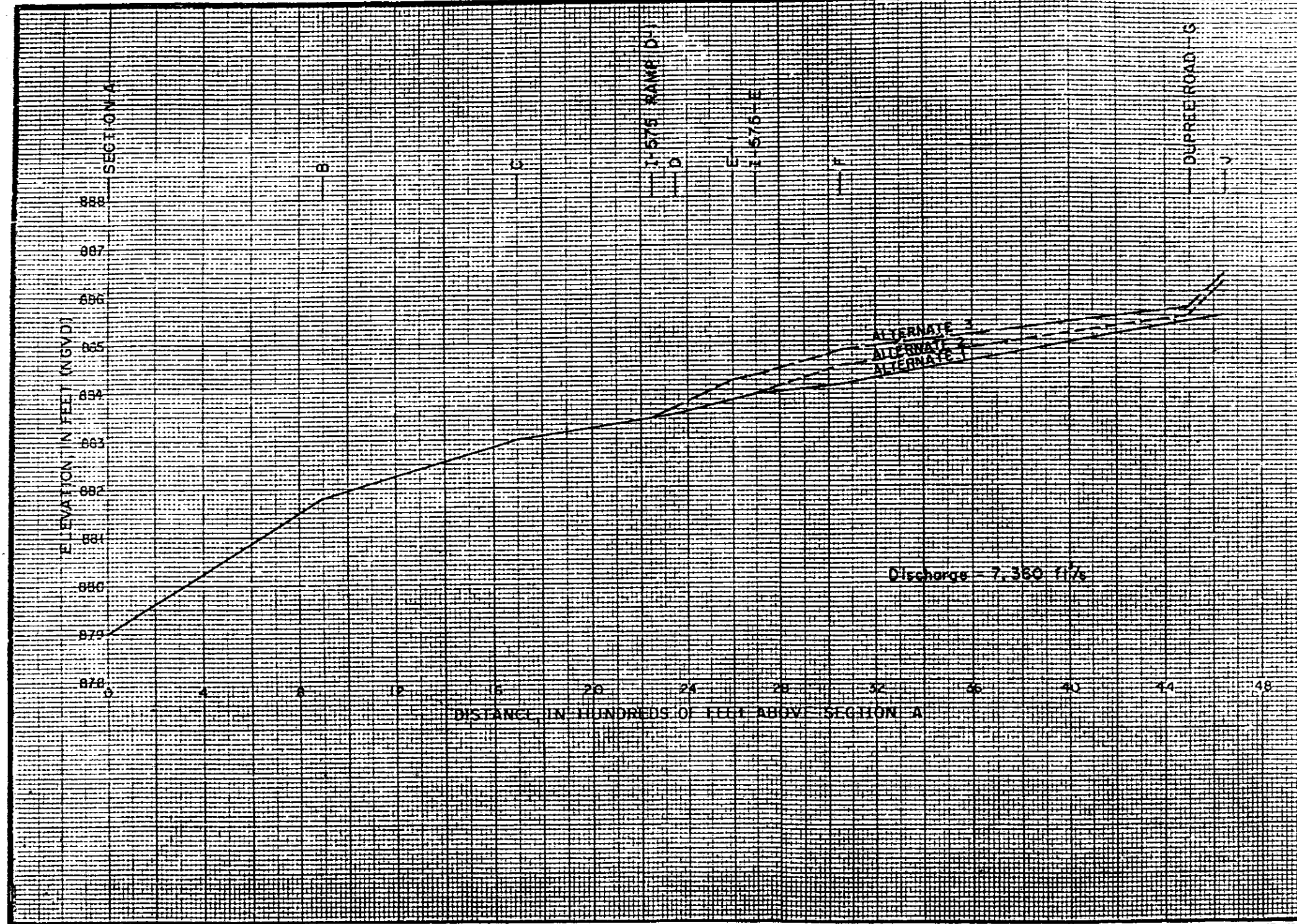
Figure 3. Flood profile for 100 year flood on Alternate 1



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FLOOD FREQUENCY

The discharges for the 50- and 100-year floods have been computed as 6,400 and 7,360 ft^3/s, respectively, using techniques described in the U.S. Geological Survey Open-File Report 76-511, "Flood-Frequency Analysis for Small Natural Streams in Georgia." The effect of urbanization at the site is small, less than 10 percent, and has not been considered in the flood-frequency computations.

FLOOD PROFILES

The flood-profile data for the 50- and 100-year floods for three alternate conditions are listed in table 1 and are shown in figures 2 and 3.

The profile data were computed using U.S. Geological Survey step-backwater Computer Program E431 and present channel conditions. The starting elevation at section A was obtained from slope-conveyance studies.

A field reconnaissance of the reach was made by U.S. Geological Survey personnel on July 11, 1977, and roughness values were estimated for use in routing studies.

The only information available on past floods on Noonday Creek was an elevation of 884 feet, given on the plans by the Highway Division, at Dupree Road.

As indicated by the profiles in figures 2 and 3, the maximum effect of the proposed construction would be less than 1.0 foot.

The minor encroachment of the fill placed in the flood plain from the relocation of West Mill Street at cross sections C and D has no significant effect on the flood profiles.

Table 1.--Flood-profile data for Noonday Creek near Woodstock, Georgia

Cross section (See fig. 1.)	Distance (ft)	WATER SURFACE ELEVATION, IN FEET (NGVD)					
		50-Year Flood			100-Year Flood		
		Alt. No. 1	Alt. No. 2	Alt. No. 3	Alt. No. 1	Alt. No. 2	Alt. No. 3
A	0	878.0	878.0	878.0	879.0	879.0	879.0
B	900	881.0	881.0	881.0	881.8	881.8	881.8
C	1,700	882.2	882.2	882.2	883.0	883.0	883.0
D-1 (Interstate Highway 575 Ramp)	2,250	-	-	882.6	-	-	883.4
D	2,350	882.7	882.7	-	883.5	883.5	-
E-1	2,600	-	-	883.4	-	-	884.2
E-1 (Interstate Highway 575)	2,700	883.2	883.2	883.5	883.9	883.9	884.3
F	3,050	883.3	883.7	883.9	884.1	884.5	884.8
(G) Dupree Road	4,500	884.5	884.7	884.9	885.4	885.5	885.7
(J)	4,645	884.7	885.3	885.5	885.5	886.2	886.4

BACKWATER EFFECTS

The computed flood elevations, area of opening under highwater conditions, average velocity, and backwater for the 50- and 100-year floods for the three alternate conditions requested are listed in table 2. As indicated in the table, flow over the roadway would occur frequently for existing conditions at Dupree Road.

The total backwater has been listed in table 2 rather than the backwater from each individual crossing. The maximum backwater indicated is about 0.9 foot upstream from Dupree Road. The backwater from the Interstate Highway 575 bridge was about 0.4 foot without the ramp construction and about 0.6 foot with the ramp construction.

McGlone Price

May 14, 1979

Table 2.--Noonday Creek near Woodstock, Georgia

Condition	Downstream elevation, ft (NGVD)	Discharge ft^3/s		Area ft^2	Average velocity (ft/s)	Total backwater (ft)
		Through bridge	Flow over roadway			
Interstate Highway 575 Ramp bridge						
Alternate No. 3 — 210-foot ramp						
50-year flood	882.6	6,440	0	1,210	5.3	0.3
100-year flood	883.4	7,360	0	1,310	5.6	.4
Interstate Highway 575						
Alternate No. 2 — 210-foot bridge						
50-year flood	883.2	6,440	0	1,470	4.4	0.4
100-year flood	884.0	7,360	0	1,590	4.6	.4
Alternate No. 3 — 210-foot bridge and 210-foot ramp						
50-year flood	883.4	6,440	0	1,510	4.3	.6
100-year flood	884.3	7,360	0	1,650	4.5	.7
Dupree Road						
Alternate No. 1 — Existing conditions						
50-year flood	884.5	1,800	4,640	552	3.3	0.1
100-year flood	885.4	2,000	5,360	600	3.3	.1
Alternate No. 2 — 210-foot bridge at Interstate Highway 575						
50-year flood	884.7	6,440	0	1,150	5.6	.6
100-year flood	885.5	7,360	0	1,250	5.9	.7
Alternate No. 3 — 210-foot bridge and 210-foot ramp at Interstate Highway 575						
50-year flood	884.9	6,440	0	1,170	5.5	.8
100-year flood	885.7	7,360	0	1,280	5.8	.9