

FLOOD OF SEPTEMBER 16, 1975 IN THE GUÁNICA AREA, PUERTO RICO

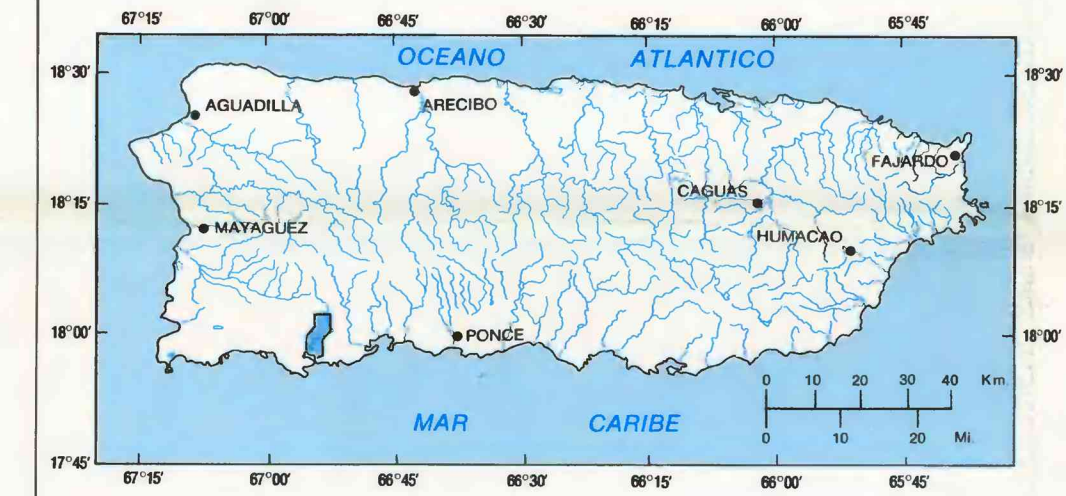
By

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DEPARTMENT OF
THE INTERIOR

UNITED STATES
GEOLOGICAL SURVEY

WATER RESOURCES
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INTRODUCTION

This report provides hydrologic and hydraulic data in the Guánica area for the flood of September 16, 1975. The data provide a technical basis on which to make land-use decisions leading to the development of the Guánica Valley flood plain.

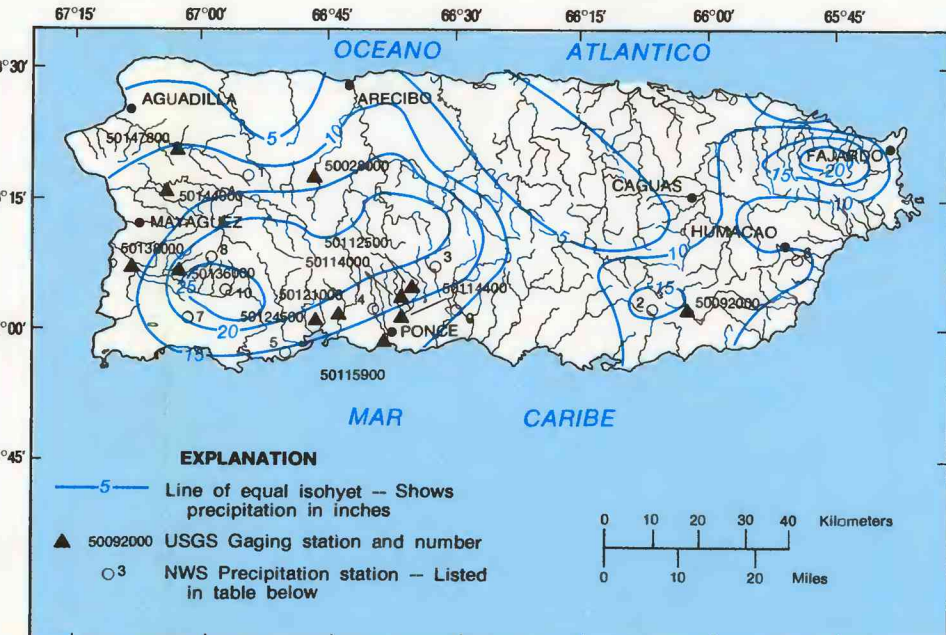
The study area is located in southwestern Puerto Rico about 31 km west of Ponce. The Rio Loco valley is mainly used for the cultivation of sugarcane. The Central Guánica sugar mill, located about 2 km west of Guánica, is the main industry in the valley.

The climate is semiarid with a mean annual precipitation of 787 mm. The temperature ranges from 24°C in winter to 27°C in the summer.

Floods in the area generally are caused by torrential rains produced by tropical disturbances passing over or close to Puerto Rico.

Data area generally referred to in International System (SI) units. The SI units may be converted to inch-pound units by multiplying the units by the following factors:

Multiply SI units	By	To obtain inch-pound units
Length		
meter (m)	3.2808	foot (ft)
millimeter (mm)	0.03937	inch (in)
kilometer (km)	0.6214	mile (mi)
Area		
square kilometer (km ²)	0.3861	square mile (mi ²)
Discharge		
cubic meter per second (m ³ /s)	35.31	cubic foot per second (ft ³ /s)
Temperature		
degree Celsius (°C)	1.8 °C + 32	degree Fahrenheit (°F)



NUMBER ON MAP	LOCATION	PRECIPITATION OF SEPTEMBER 15-17, 1975 IN INCHES			
		SEPT 15	SEPT 16	SEPT 17	TOTAL
1	ADJUNTAS SUBSTATION	0.15	11.99	4.87	17.01
2	CARITE PLANT NO. 1	0.05	10.05	6.85	16.95
3	CERRO MARAVILLA	0.46	16.00	2.37	18.83
4	CORRAL VIEJO	0.10	7.38	8.26	15.74
5	ENSENADA	0.05	5.41	10.30	15.76
6	HUMACAO	0.40	8.02	5.22	13.64
7	LAJAS SUBSTATION	0.29	3.10	12.26	15.65
8	MARICAO 2 SSW	2.32	6.05	14.10	22.47
9	PONCE 4E	0.00	2.90	7.78	10.68
10	SABANA GRANDE 2 ENE	1.20	14.00	11.50	26.70

FIGURE 2. - Map of Puerto Rico showing isohyets for September 15-17, 1975, locations of selected precipitation and stream-gaging stations, and table showing the precipitation for the selected stations.



FIGURE 3. - Flood height (noted by arrow) at abandoned house on Highway 368 about 200 m west of intersection of road to Rio Loco Dam, Barrio Cajas (photograph A).



FIGURE 4. - Flood height (noted by arrow) at monastery, Barrio Santa Rita (photograph B).

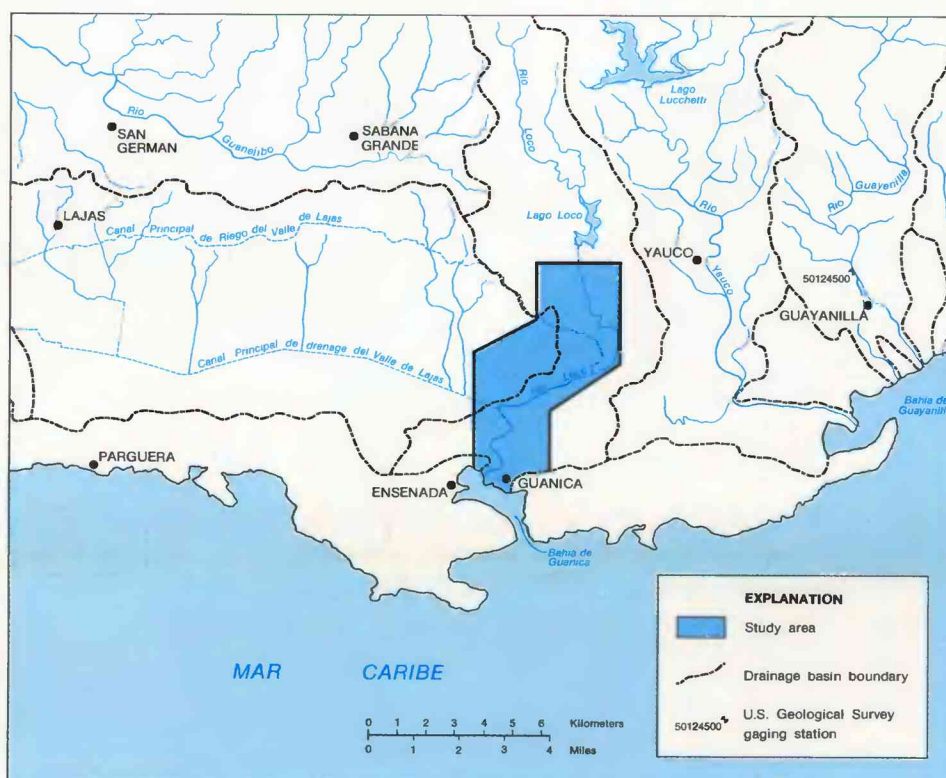


FIGURE 1. - Location of study area, and Rio Loco basin.

SEPTEMBER 16, 1975, FLOOD

The passage of hurricane Eloise near the north coast of Puerto Rico caused torrential rains on September 15, 16, and 17, 1975, which produced destructive floods mainly in the southwestern part of the island. Precipitation at 10 stations during the storm and the distribution of this precipitation throughout Puerto Rico are shown in figure 2.

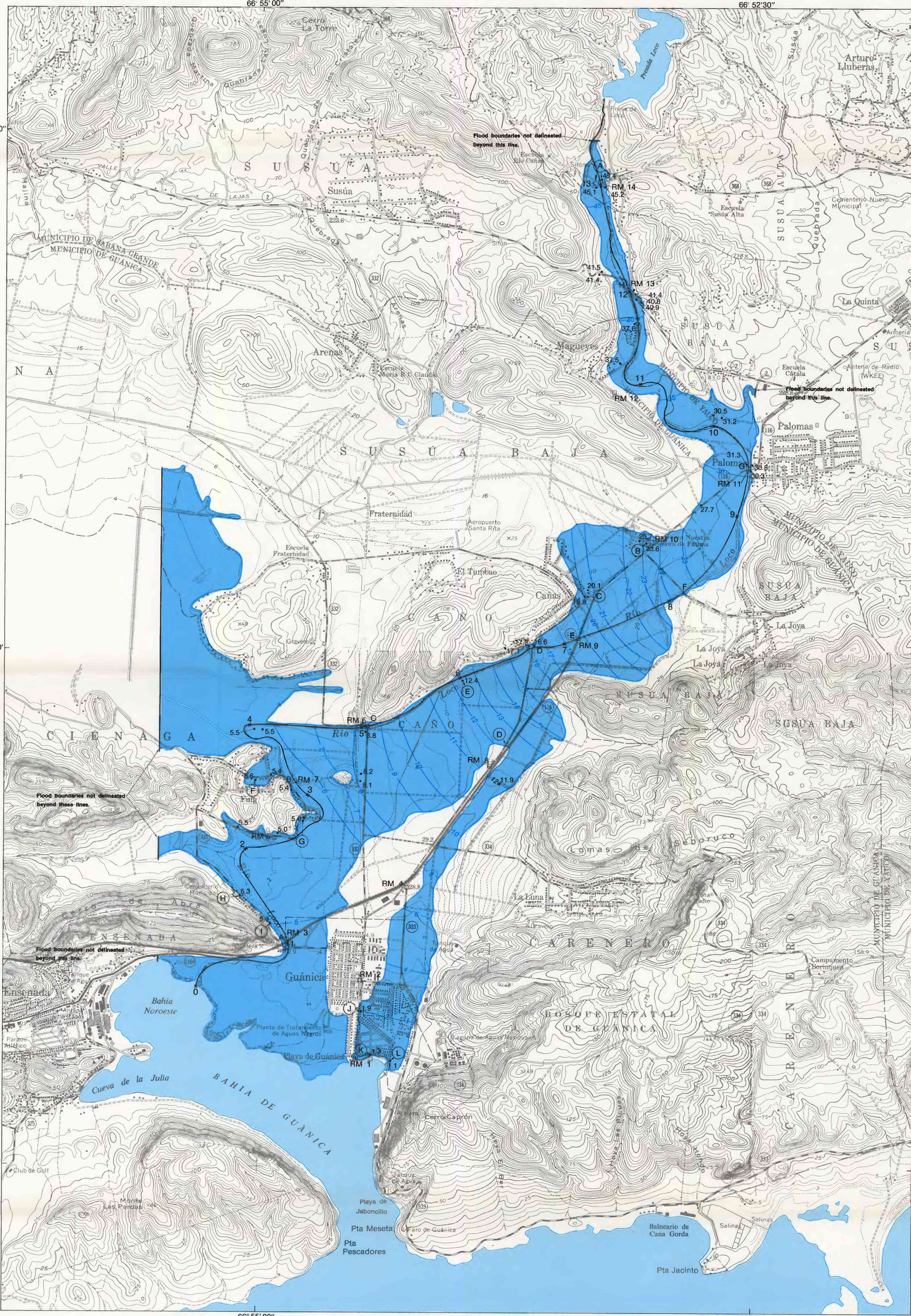
Sugarcane crops were damaged extensively and two bridges over the Rio Loco were destroyed by the floodwaters—those on Highway 116 and Highway 368.

After the flood the U.S. Geological Survey identified highwater marks on the flood plain and determined their elevations.

Photographs of selected sites in the Guánica area during the September 16, 1975 flood are shown in figures 3-14. The photograph locations are identified on the flood map by a circular symbol with an identifying letter and an arrow showing the direction in which the respective photograph was taken. A red marked in feet and a black arrow is used to point out the depth of floodwaters on each photograph.



FIGURE 5. - Flood height (noted by arrow) at front of the Soto house on Old Highway 116, Barrio Cajas (photograph C).



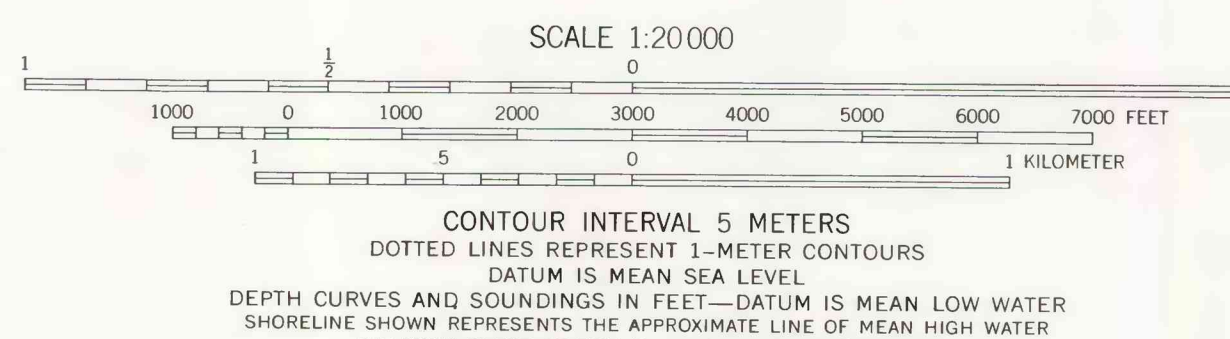
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1982

APPROXIMATE MEAN
DECLINATION, 1966



EXPLANATION

- Area Flooded, September 16, 1975
- Boundary of the 1975 flood
- Water-surface contour for the 1975 flood, in meters. Contour interval 1 meter
- Elevations of flood marks, in meters
- Bridge locations, refers to table 1 and profile
- Base line and distance from mouth of river, in kilometers
- Reference marks established by the U.S. Geological Survey refer to table 2
- Photographs showing depth of water at different sites in the valley as a result of the September 16, 1975 flood



FIGURE 8. - Flood height (noted by arrow) at front of the Lassola house, Barrio Fulg (photograph F).



FIGURE 9. - Flood height (noted by arrow) at front of the Viquez house, No. 227, Street No. 1 (photograph G).



FIGURE 10. - Flood height (noted by arrow) at front of the Chereña house on Highway 331 on left side of km 1.4 on baseline, Barrio Fulg (photograph H).



FIGURE 11. - Flood height (noted by arrow) at the Vega house at km. 1.25 on baseline of map (photograph I).



FIGURE 12. - Flood height (noted by arrow) at the Colón house on 25 de Julio Street, Guánica (photograph J).



FIGURE 13. - Flood height (noted by arrow) at east side of Waterfront Restaurant on the Guánica shoreline (photograph K).



FIGURE 14. - Flood height (noted by arrow) at front of house at Majill Street, No. 16, Guánica (photograph L).

FLOOD HISTORY

Historical records and interviews with residents in the study area show that the Guánica area has been inundated extensively at least six times since 1928. The floods in order of magnitude are September 16, 1975, September 13, 1928, August 3, 1963, November 1956, December 1960, and June 1956. Data compiled from interviews with residents in the study area (U.S. Geological Survey in Hydrologic Investigations Atlas HA-532, Floods in the eastern Lajas Valley and the lower Rio Loco basin, southwestern Puerto Rico, 1970) show that the September 16, 1975, flood was about 0.7 m higher than the September 13, 1928, flood.

The record of floods in the study area is fragmentary and not of sufficient length to determine a reliable flood-frequency relation.

FLOOD PROFILES

The profile in figure 15 was developed from floodmarks identified by the U.S. Geological Survey after the floodwater receded, and from interviews with residents in the study area. It represents the maximum water-surface elevation above mean sea level datum of the September 16, 1975 flood. The profile is referred to the arbitrary baseline shown on the flood map. The baseline, and therefore the profile, is not confined to the configuration of the channel but follows a smoother path along the flood plain in the general direction of the floodflow. There are nine bridges over the Rio Loco in the study area (table 1) of which two were destroyed by the September 16, 1975 floodwaters and later were rebuilt.

All elevations in the study area are referred to mean sea level datum. Permanent reference marks were established at selected points throughout the study area (table 2) and are shown on the flood map.

Table 1.—Elevation of selected bridges in the study area

Map symbol	Stationing along baseline, in kilometers	Location of bridge	Elevation above mean sea level, in meters	
			Top deck	Low beam
A	0.97	Old Highway 116, above mouth		
B	3.18	Dirt road, Barrio Fulg bridge	4.262	3.567
C	5.05	Highway 332 bridge	8.473	7.657
D	6.70	Old Highway 116 bridge at Barrio Cajas	18.284	17.217
E	7.12	New Highway 116 bridge, km 25.1	20.490	18.713
F	8.16	Highway 389 bridge	24.572	23.990
G	9.45	Old Highway 116 bridge, Barrio Palomas, Yauco	29.726	28.761
H	12.13	Highway 2 bridge	39.736	38.926
I	13.0	Highway 368 bridge	42.850	42.506

* Destroyed by September 16, 1975 flood

Table 2.—Reference marks established by the U.S. Geological Survey in the Guánica area, Puerto Rico

Reference mark no. (see map)	Elevation, above mean sea level, in meters	Description of location
RM-1	1.28	Chiseled square painted red on shoreline sidewalk in front of Waterfront Restaurant in Guánica.
RM-2	2.89	Chiseled square painted red on southeast corner of sidewalk at intersection of 25 de Julio Street and C Street, in urbanization Balla at Guánica.
RM-3	6.15	Chiseled square painted red on top of left downstream side of concrete handrail foundation at new Hwy 116 bridge, 1.0 kilometer above mouth of Rio Loco.
RM-4	8.33	Chiseled square painted red on north end of sidewalk in front of Coqui Lighter Co. on Highway 333.
RM-5	4.51	Chiseled square painted red on upstream side of culvert close to intersection of streets 1 and 2, Barrio Fulg, Guánica.
RM-6	8.43	Standard tablet on downstream side of culvert over Rio Loco at kilometer 1.6, Highway 332.
RM-7	4.22	Chiseled square painted orange on left upstream side of bridge abutment over Rio Loco at entrance road to Barrio Fulg.
RM-8	11.94	Standard tablet embedded in concrete on left upstream side of irrigation canal, 1.3 meters from outlet on Highway 116 marginal, kilometer 23.7.
RM-9	21.13	Standard tablet embedded in concrete on left upstream side of bridge over Rio Loco, at kilometer 25.15, new Highway 116.
RM-10	23.43	Chiseled square painted red on downstream side of culvert at entrance road to Santa Rita that intercepts Highway 116 at kilometer 27.
RM-11	30.55	Standard tablet embedded in concrete on left downstream side of pillar of bridge over Rio Loco, kilometer 33.8 Highway 116, Barrio Palomas.
RM-12	37.67	Standard tablet embedded in concrete on left upstream side of bridge over Rio Loco, kilometer 226.6 Highway 2.
RM-13	40.01	Standard tablet embedded in concrete on right upstream side of bridge over Rio Loco, kilometer 226.6 Highway 2.
RM-14	43.87	Chiseled square painted red on top of right downstream side of retaining wall for Rio Loco on Highway 368, Barrio Rio Cajas.

INUNDATED AREAS

The area inundated by the September 16, 1975 Flood, has been delineated on a topographic map with a 10-m contour interval, scale 1:20,000. The boundaries of the flood were delineated from the high-water profile (fig. 15), field inspections of the flood plain after the flood, and aerial photographs taken by the Puerto Rico Highway Authority on September 24, 1975.

WATER-SURFACE CONTOURS

Water-surface contours are based on the elevations of floodmarks identified in the field and the profile shown in figure 15. These contours represent equal elevation of the water surface and are approximately normal to the direction of flow. Obstruction to the flow, either natural or manmade, and variations in the valley will affect the shape of the high-water contours. The approximate depth of flooding at any point in the inundated area can be estimated by subtracting the elevation of the ground from that of the water surface.

COOPERATION AND ACKNOWLEDGMENTS

This report was prepared under a cooperative agreement between the Puerto Rico Department of Natural Resources and the U.S. Geological Survey. Aerial photographs were furnished by the Puerto Rico Highway Authority; estimate of damages by the Puerto Rico Department of Civil Defense, and precipitation data by the National Weather Service.

ADDITIONAL INFORMATION

Additional information related to this report can be obtained from from the U.S. Geological Survey, San Juan District office, G.P.O. Box 4424, San Juan, Puerto 00926.

SELECTED REFERENCES

Johnson, Karl G., 1974, Floods in eastern Lajas Valley and the lower Rio Loco basin, southwestern Puerto Rico: U.S. Geological Survey Hydrologic Investigations Atlas HA-532.

Picó, Rafael, 1950, The geographic regions of Puerto Rico: University of Puerto Rico Press, Rio Piedras, Puerto Rico, 256 p.

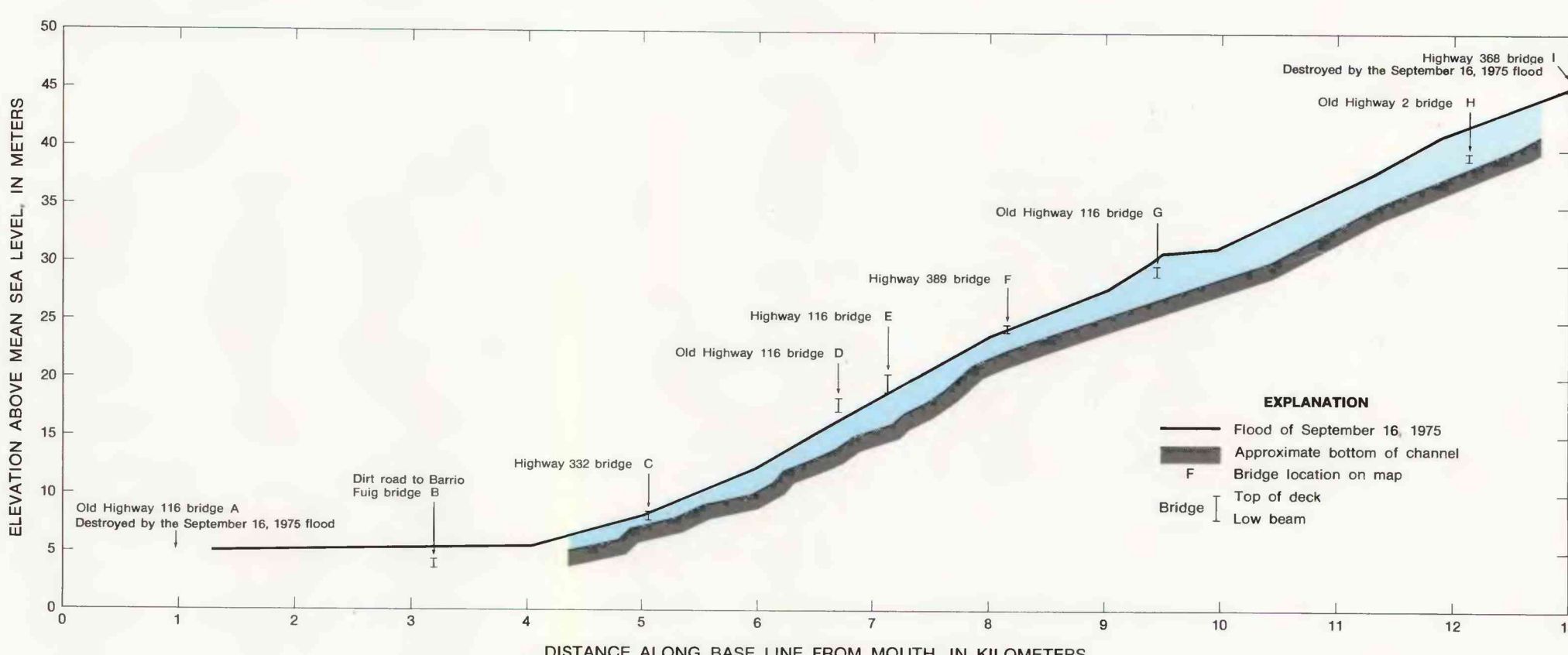


FIGURE 15. - Profile of the Rio Loco during the flood of September 16, 1975.