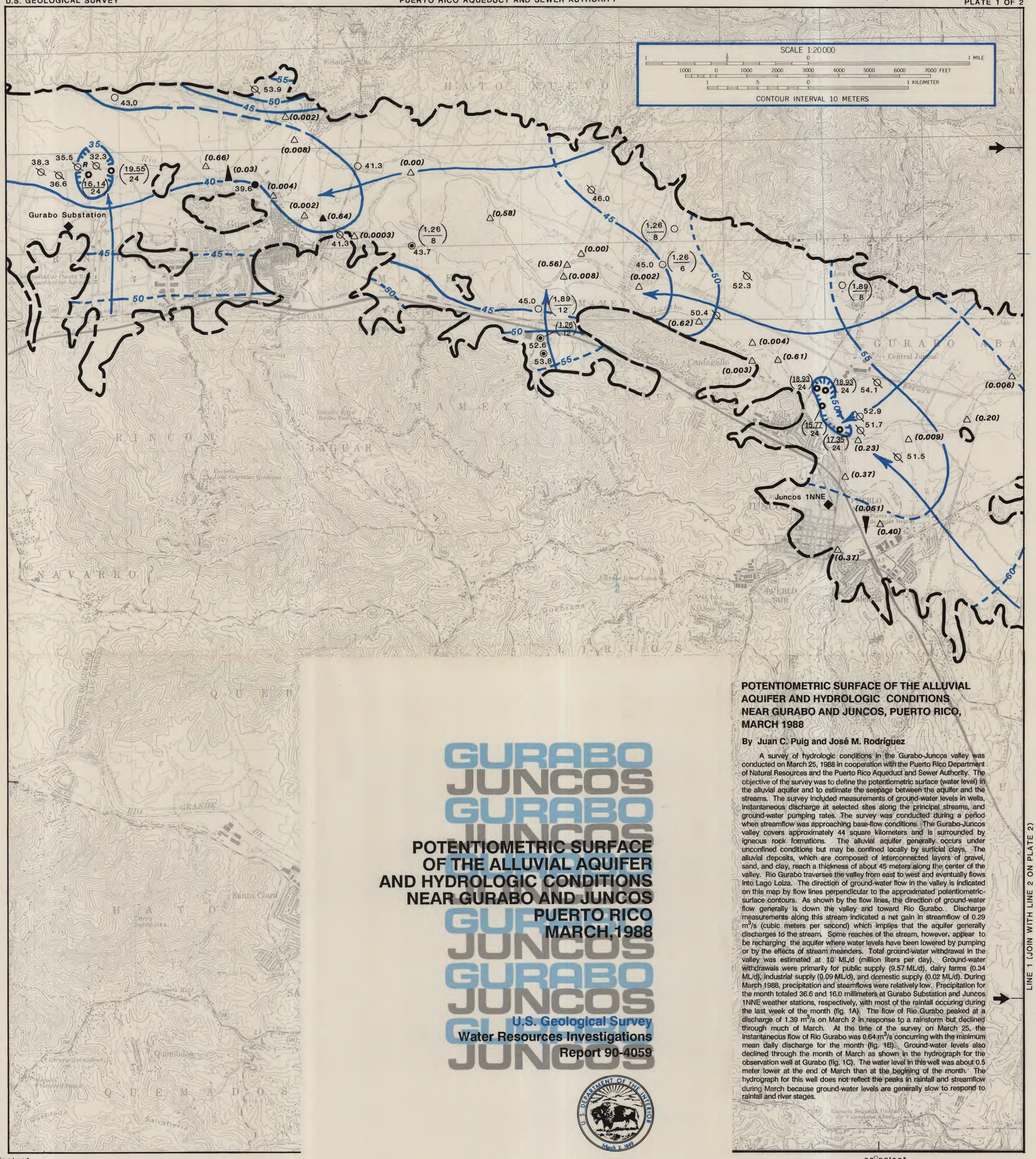
U.S.DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
PUERTO RICO DEPARTMENT OF NATURAL RESOURCES
and the
PUERTO RICO AQUEDUCT AND SEWER AUTHORITY

WATER-RESOURCES INVESTIGATIONS
REPORT 90-4059
PLATE 1 OF 2



POTENTIOMETRIC SURFACE OF THE ALLUVIAL AQUIFER AND HYDROLOGIC CONDITIONS NEAR GURABO AND JUNCOS, PUERTO RICO, MARCH 1988

By Juan C. Puig and José M. Rodríguez

A survey of hydrologic conditions in the Gurabo-Juncos valley was conducted on March 25, 1988 in cooperation with the Puerto Rico Department of Natural Resources and the Puerto Rico Aqueduct and Sewer Authority. The objective of the survey was to define the potentiometric surface (water level) in the alluvial aquifer and to estimate the seepage between the aquifer and the streams. The survey included measurements of ground-water levels in wells, instantaneous discharge at selected sites along the principal streams, and ground-water pumping rates. The survey was conducted during a period when streamflow was approaching base-flow conditions. The Gurabo-Juncos valley covers approximately 44 square kilometers and is surrounded by igneous rock formations. The alluvial aquifer generally occurs under unconfined conditions but may be confined locally by surficial clays. The alluvial deposits, which are composed of interconnected layers of gravel, sand, and clay, reach a thickness of about 45 meters along the center of the valley. Rio Gurabo traverses the valley from east to west and eventually flows into Lago Loiza. The direction of ground-water flow in the valley is indicated on this map by flow lines perpendicular to the approximated potentiometric-surface contours. As shown by the flow lines, the direction of ground-water flow generally is down the valley and toward Rio Gurabo. Discharge measurements along this stream indicated a net gain in streamflow of 0.29 m^3/s (cubic meters per second) which implies that the aquifer generally discharges to the stream. Some reaches of the stream, however, appear to be recharging the aquifer where water levels have been lowered by pumping or by the effects of stream meanders. Total ground-water withdrawal in the valley was estimated at 10 ML/d (million liters per day). Ground-water withdrawals were primarily for public supply (9.57 ML/d), dairy farms (0.34 ML/d), industrial supply (0.09 ML/d), and domestic supply (0.02 ML/d). During March 1988, precipitation and steamflows were relatively low. Precipitation for the month totaled 36.6 and 16.0 millimeters at Gurabo Substation and Juncos 1NNE weather stations, respectively, with most of the rainfall occuring during the last week of the month (fig. 1A). The flow of Rio Gurabo peaked at a discharge of 1.39 m^3/s on March 2 in response to a rainstorm but declined through much of March. At the time of the survey on March 25, the instantaneous flow of Rio Gurabo was 0.64 m^3/s concurring with the minimum mean daily discharge for the month (fig. 1B). Ground-water levels also declined through the month of March as shown in the hydrograph for the observation well at Gurabo (fig. 1C). The water level in this well was about 0.5 meter lower at the end of March than at the begining of the month. The hydrograph for this well does not reflect the peaks in rainfall and streamflow during March because ground-water levels are generally slow to respond to rainfall and river stages.

GURABO JUNCOS

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U.S. Geological Survey
Water Resources Investigations
Report 90-4059

1990

Base from U.S. Geological Survey topographic quadrangles of Gurabo, Juncos and Humacao, Puerto Rico, scale 1:20,000.

For additional information write to:
U.S. Geological Survey, Water Resources Division,
P.O. Box 364424, San Juan, Puerto Rico 00936 - 4424

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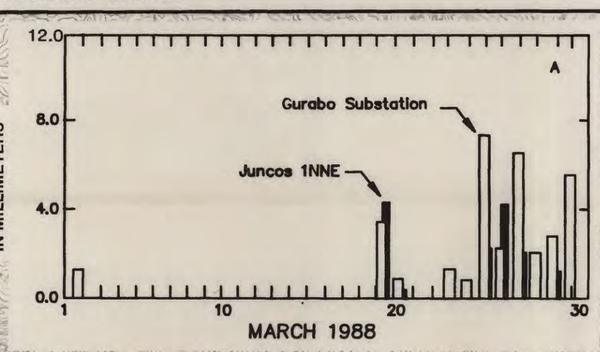
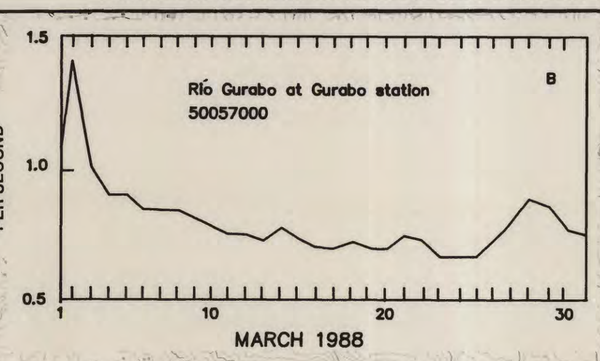




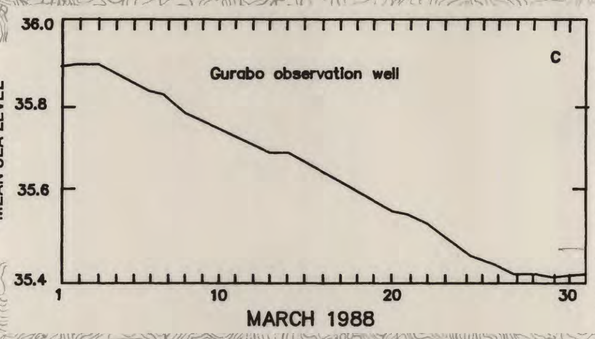


Figure 1. --Precipitation, runoff and the ground-water level fluctuations in the Gurabo-Juncos valley during March 1988: (A) daily precipitation at Gurabo Substation and Juncos 1NNE weather stations, (B) mean daily discharge at Río Gurabo at Gurabo, (C) mean daily ground-water level at Gurabo observation well.

EXPLANATION

- **POTENTIOMETRIC CONTOUR** - Shows altitude at which water level would have stood in tightly cased wells. Dashed where appoximately located. Contour interval, in meters , is variable. Datum is mean sea level.
- **GEOLOGIC CONTACT LINE** - Delineates geologic contact between alluvial material and outcrop of igneous rocks.
- **DIRECTION OF REGIONAL GROUND-WATER FLOW** - Dashed where approximately located.
- 45.0 (1.26 / 6) **WATER-LEVEL DATA CONTROL POINT** - Number is altitude of static water level, in meters above mean sea level. Upper number in parenthesis is the estimated well discharge in liters per second, lower number is the estimated daily pumping time in hours.
- **APPARENT CONE OF DEPRESSION** - Indicates area where potentiometric surface was affected by pumpage from one or more wells.
- **WELL USED FOR PUBLIC-WATER SUPPLY**
- **WELL USED FOR INDUSTRIAL- WATER SUPPLY**
- **WELL USED FOR DOMESTIC-WATER SUPPLY**
- **WELL USED FOR DAIRY FARM-WATER SUPPLY**
- **OBSERVATION WELL**
- **OBSERVATION WELL EQUIPPED WITH RECORDER**
- **GAGING STATION** - Río Gurabo at Gurabo USGS surface water station.
- (0.37) **STREAMFLOW MEASURING SITE** - Number in parenthesis is the instantaneous discharge in cubic meters per second.
- (0.03) **WASTE WATER TREATMENT PLANT EFFLUENT** - Number in parenthesis is the recorded discharge in cubic meters per second.
- **WEATHER STATION** - Gurabo Substation and Juncos 1NNE weather stations operated by the National Oceanic and Atmospheric Administration.

18°15′

12′30″

LINE 2 (JOIN WITH LINE 1 ON PLATE 1)

65°52′30″

65°50′00″

FACTORS FOR CONVERTING INTERNATIONAL SYSTEM (SI) UNITS TO INCH - POUND UNITS

multiply SI units	by	To obtain inch-pound units
	Length	
millimeter (mm)	0.03937	inch (in.)
meter (m)	3.281	foot (ft.)
	Flow	
cubic meter per second (m^3/s)	35.31	cubic foot per second (ft^3/s)
liter per second (L/s)	15.85	gallon per minute (gal/min)

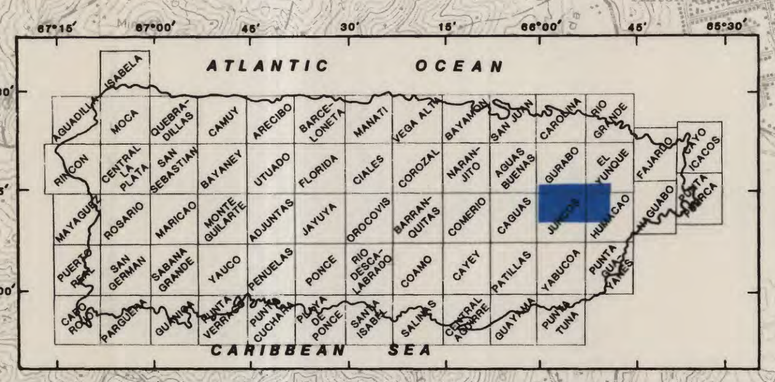
SCALE 1:20000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 METERS



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