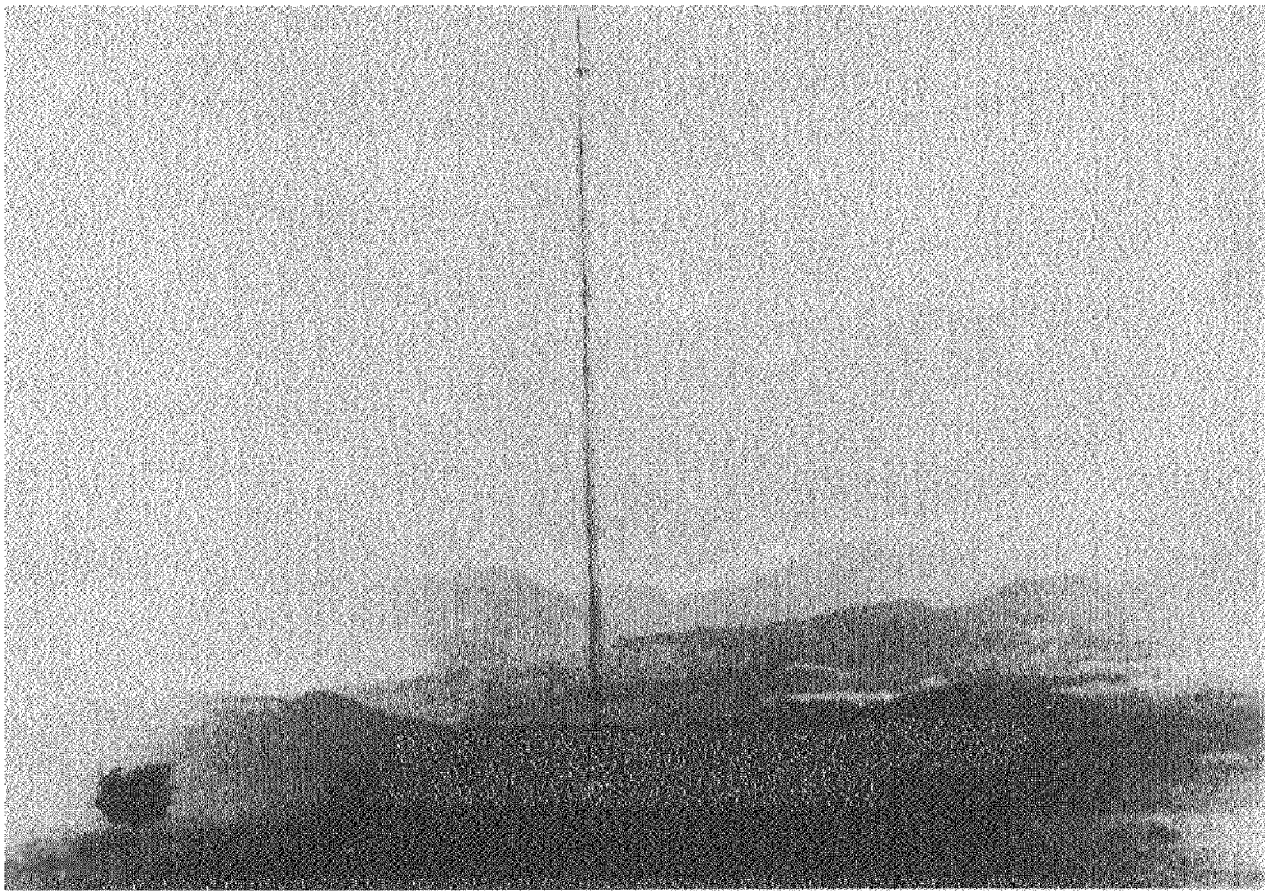


FIG. 315 B - Capel Carman repeater station

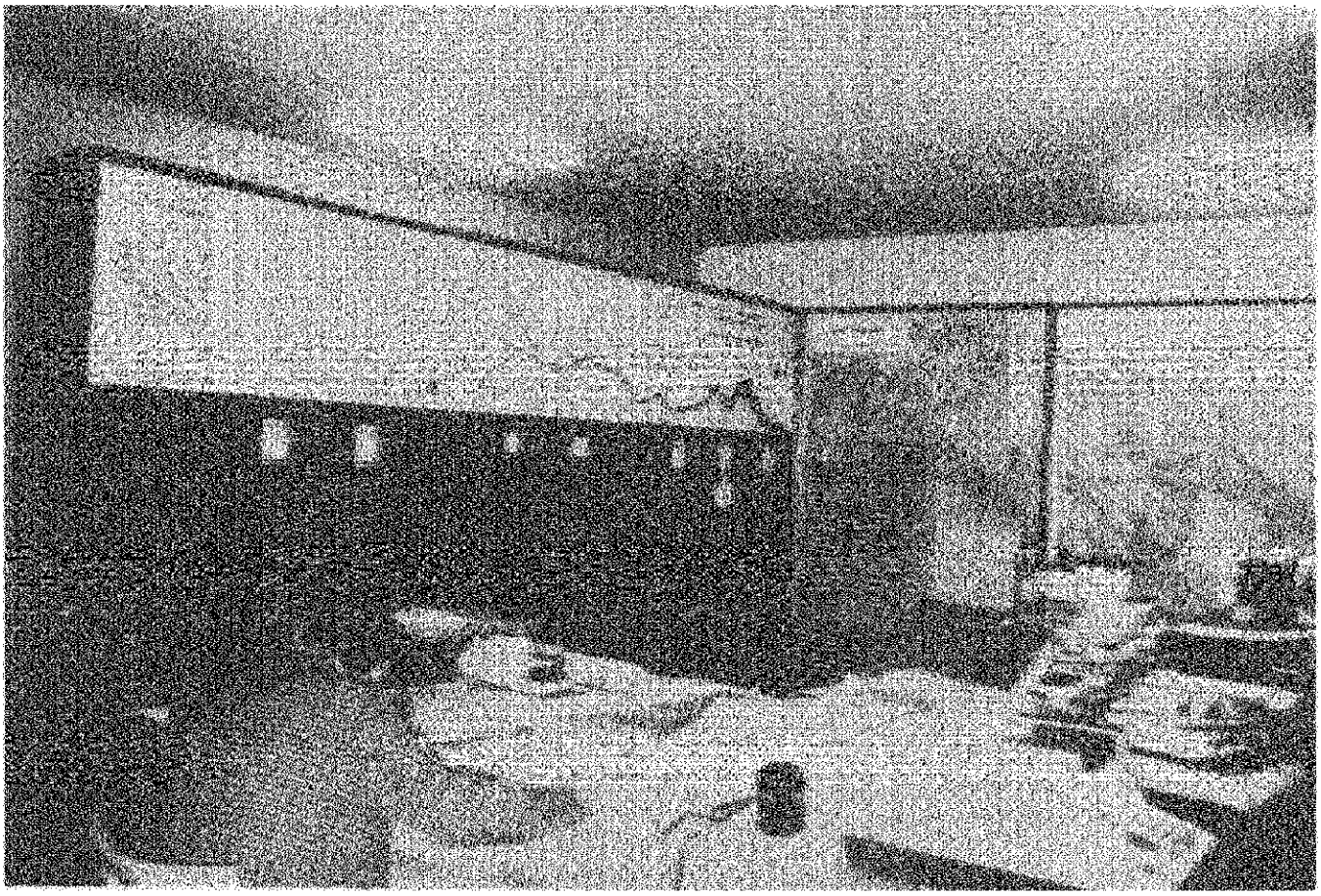


FIG. 3.15 C - Control and data receival room at Caernarvon. Displays on right with teleprinter and data logger on left.

telephone lines are very popular in river level monitoring and transmission. Quantitative values of level are given either by prerecorded voice on magnetic tape or as numbers of pulses parametrically recognized by different pitches. Commercial telegraph often results in an output of printed messages and/or punched paper tape. The former are useful for quick visual inspection by the forecast officer, the latter is suitable for archiving but is especially useful for direct computer analysis of data as they become available. Information is also displayed on television screen. On this it may be seen simply as a data set, or if the unit is linked through a special data processing and analysis unit display of predicted (and actual) flood characteristics is possible in almost any conceivable form considered suitable for immediate inspection and comprehension.

Direct radio link is a particularly useful method where distance or topographical barriers make land lines impractical. Large distances can be transmitted by a single pair of transceivers depending on the frequency used and the power available. In circumstances where one clear line of site is not feasible, repeater stations are necessary. Data transmission for Conway valley flooding for instance is obtained by radio linkage through three repeater stations. A number of illustrations show some of the features of transmission used (Figure 3.15).

Satellites have already been mentioned in connexion with data monitoring. They also provide a most useful platform for relaying large amounts of data transmitted from earth-bound instruments to centres of forecasting or data acquisition. Successful experiments using early polar satellites have encouraged the development of Geostationary Orbiting Earth Satellites (GOES). Two GOES operated by the National Oceanic and Atmospheric Administration of the U.S.A. are now permanently in position over the American continent and give round the clock surveillance and data transmission service. GOES are also planned for other regions. A GOES situated over 0° by 120° E for instance would permit the extensive tracking of tropical cyclones in the Western Pacific, Bay of Bengal and Indian Ocean and may be established in the future by co-operative effort between Japan, India and Australia.

A brief description of one telemetric system may at this stage help to emphasize a number of features already mentioned.

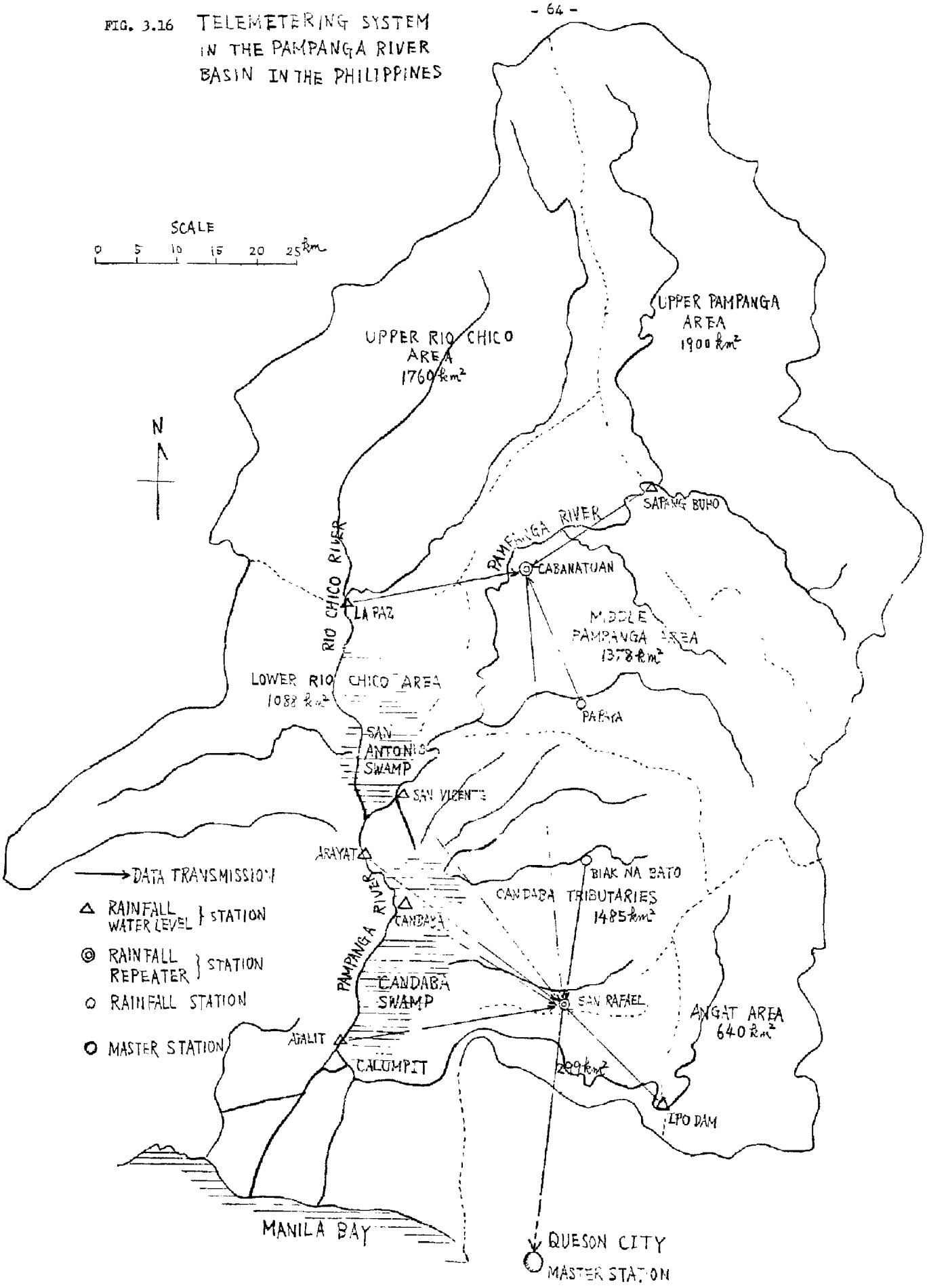
The Pampanga River Telemetric System

3.3.2.3 The Pampanga River flows through the middle of the Luzon Island and the north of Manila. It has a total catchment area of 10,540 km^2, of which 8,550 km^2 is the upper basin of Calumpit.

The main stream of the Pampanga River has its source in the Caraballo mountains and flows approximately about 260 km southwards before draining into Manila Bay (Fig. 3.16).

An embankment exists on the right bank from Arayat to Calumpit and the Candaba Swamp is extensive on the left side of the river. Downstream from Candaba, the profile of the low water levels in the channel is almost horizontal. Target areas of flood forecasting and warning include the following three areas in the river basin which have comparatively large population and properties and which suffer frequent flood damages.

FIG. 3.16 TELEMETERING SYSTEM IN THE PAMPANGA RIVER BASIN IN THE PHILIPPINES



(1) Candaba area

(2) Right bank area of the main Pampanga River below Arayat

(3) Delta area below Apalit.

A VHF telemetering system is used to monitor data of rainfall and water level for flood forecasting and warning. The present network system is based on ideas that from the upstream basins of the Pampanga and the Rio Chico Rivers sufficient propagation time of floods is available, that water level to water level correlation method is suitable and that local inflow computed from rainfall data in the middle and downstream basins must be added to the discharge of the Pampanga River.

River water level of the Angat River is observed because it is an important tributary of the downstream basin. A raingauge is also situated at the site of the river level gauge. Both gauges are telemeterized.

Rainfall data to be used for flood forecasting are those collected at Sapang Buho, La Paz, San Vincente Papaya, Biak na Bato, Arayat, Candaba, Apalit, Ipo Dam and San Rafael, and water level data are those at Sapang Buho, La Paz and Ipo Dam.

Arayat, Candaba and Apalit stations are the target stations for which flood forecasts need to be issued. Observed water level data are also used for forecasting.

Water level data of the San Vincente stations are used for checking the issued forecast knowing the inflow into the Candaba Swamp through the floodway.

The inflow used for hydraulic computation of the water level of the Candaba Swamp is the sum of the discharges obtained from water levels at Sapang Buho and La Paz in upstream basins, that obtained from rainfall by runoff computations in the middle and downstream basins, and that obtained from the water level at Ipo Dam, the Angat River. Forecasts of the water level are successfully achieved giving a high degree of accuracy about one day in advance.

Data receival and operational analysis

3.3.3 Technique of data receival and subsequent analysis varies depending partly on the method of transmission used and partly on how such forecasting procedure can be converted into a convenient and simple computational form. Simple data transfer methods and forecast procedure require few special arrangements; numerical prediction is normally worked up by hand. Condensed procedure consists of tables, graphs, instructions for arithmetic operation, and forms for entering data and computation.

Each scheme encompasses a major sub-division of the area of responsibility, and represents a forecasting assignment that can be performed by a single member of the forecasting staff within allowable time limits. A time increment, generally 6, 12 or 24 hours is selected that will provide satisfactory accuracy of