

Fig.VII.5.2
Plan of Proposed River Improvement (2/2)

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Legend

- Right Bank
- Left Bank
- Lowest River Bed
- Average River Bed
- (R) Right Bank Side
- (L) Left Bank Side

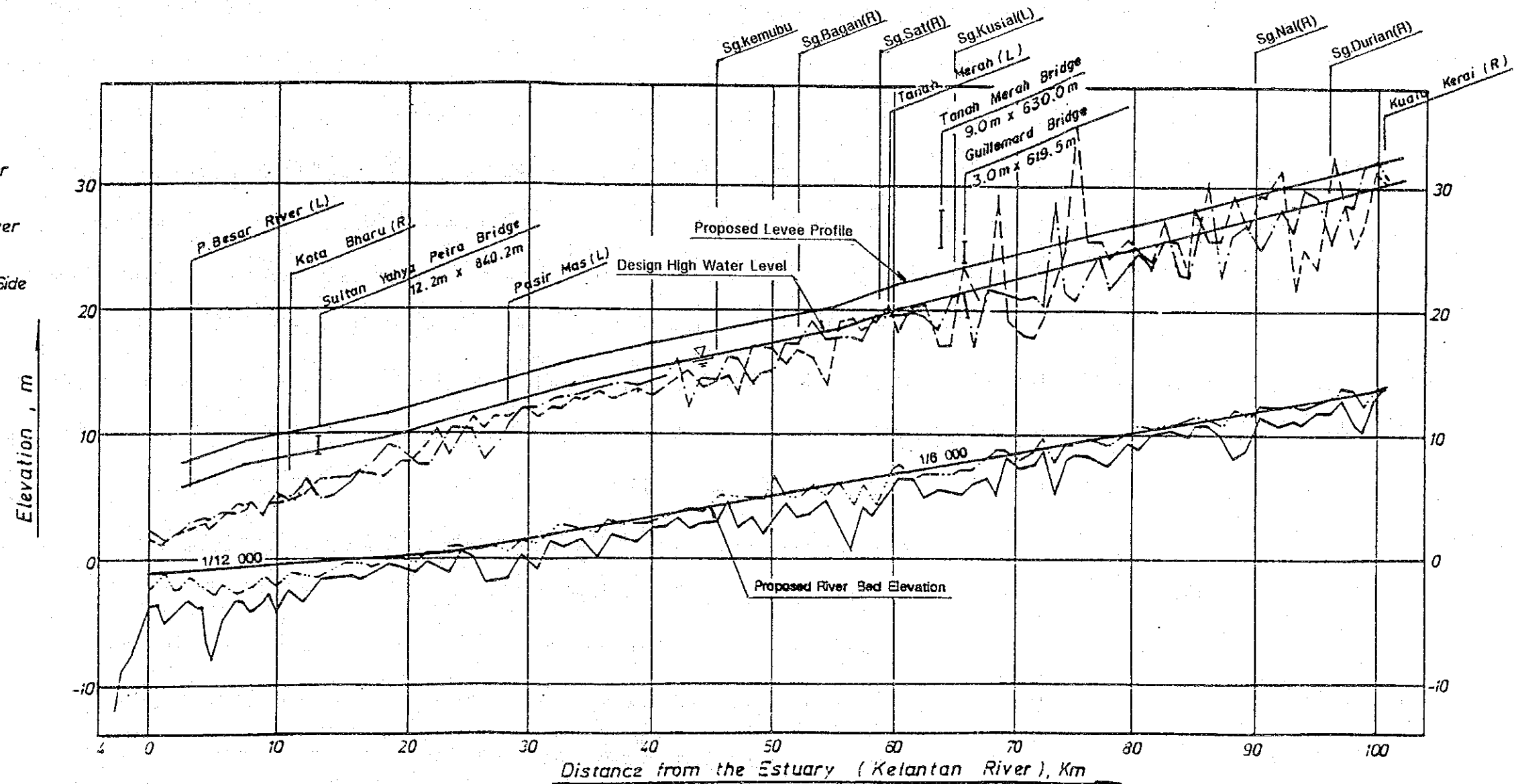


Fig.VII.5.3

Longitudinal Profile of Proposed River Channel

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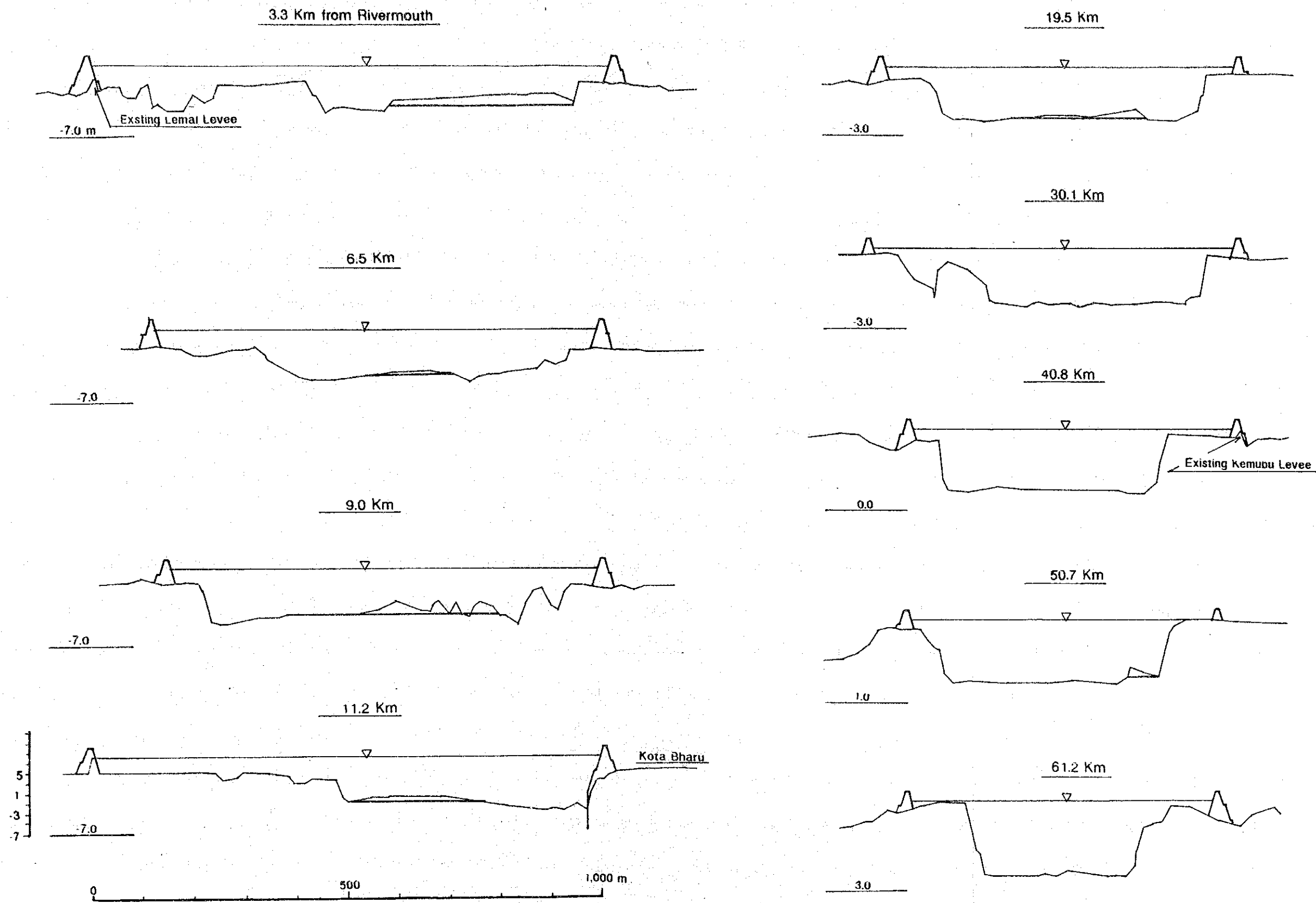


Fig.VII.5.4

Typical Cross Section of Proposed River Channel

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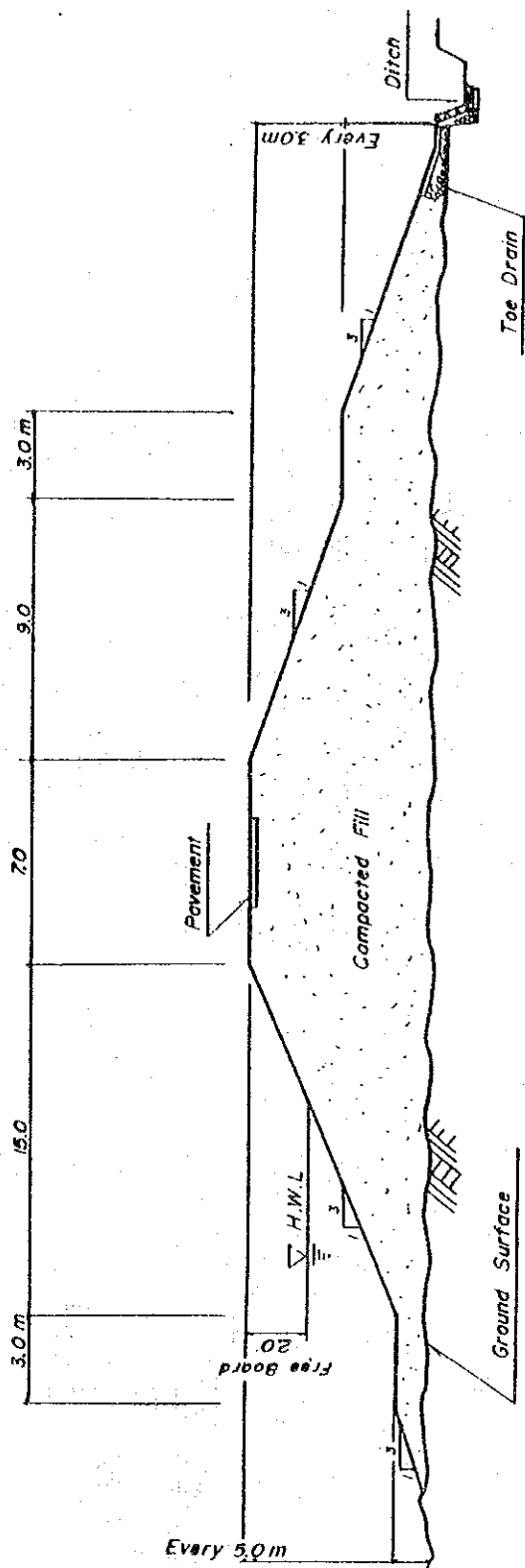


Fig.VII.5.5
 Typical Cross Section of Earth Levee

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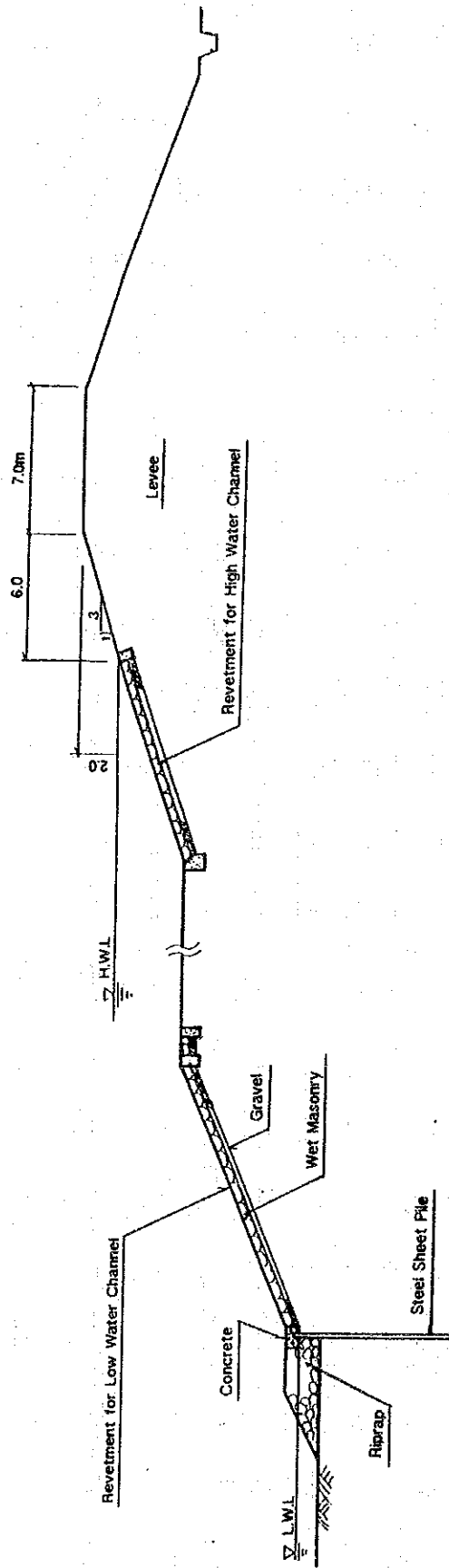


Fig.VII.5.6

Typical Cross Section of Revetment

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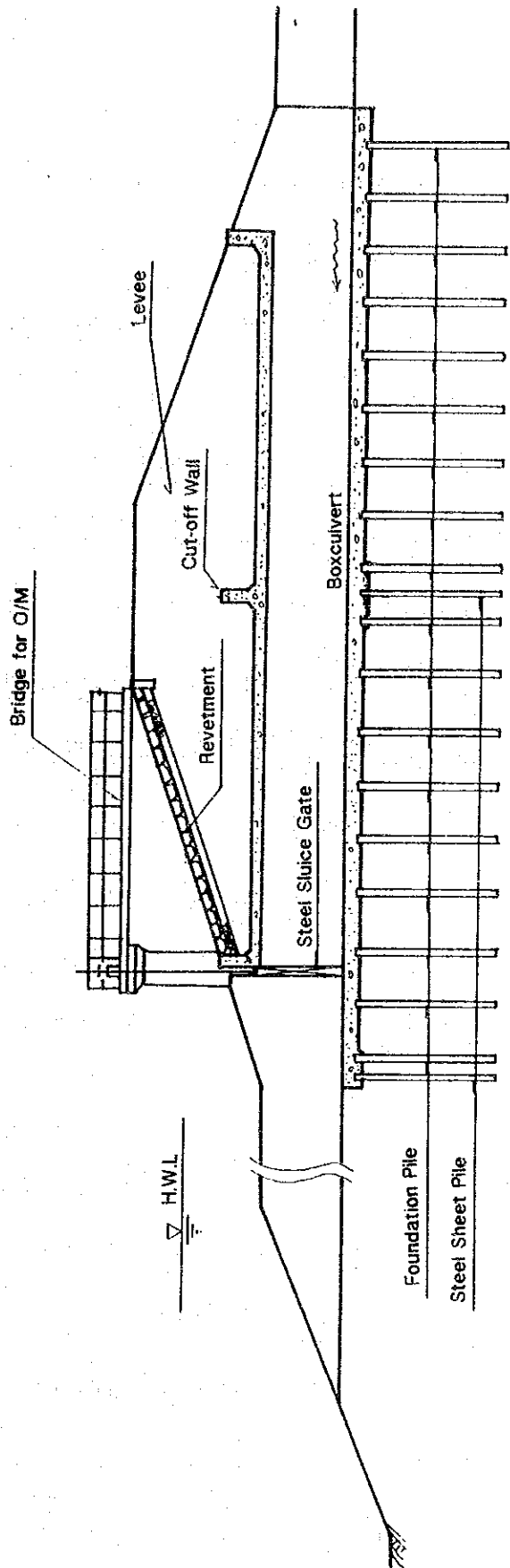


Fig.VII.5.7

Typical Cross Section of Box Culvert

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TECHNICAL SPECIFICATION

ON

RIVER MOUTH INVESTIGATION

1. GENERAL

The main purpose of river mouth investigation for the Kelantan River is to get information which is useful for forecasting the chronological change of the river mouth and the confirmation of river improvement proposed in the Pre-feasibility Study.

The required data and their purpose to be used are enumerated below:

(1) Wave observation

To get the characteristics of wave height and its direction in the vicinity of the river mouth on the basis of the statistics of the data.

(2) Tide observation

To estimate the design high tide level.

(3) Tidal current observation

To know the present condition of tidal current and drift sand and to forecast the trend of tidal current after construction of structures at river mouth.

(4) Wind observation

To interpolate the wave height and its direction on the basis of the wind data.

(5) Investigation on grain size distribution of coastal bed material

To grasp the process of the development of sand dune and to estimate the amount of sediment load.

(6) Water quality test

To know the present condition of the intrusion of salinity water.

(7) Discharge measurement at river mouth

To know the adverse effect due to the sand dune at the river mouth.

(8) Topographic survey at river mouth and seashore

To know the general information of topographic condition at the vicinity of river mouth.

The above data should be observed for a long time period and also required for the detailed design of the treatment of river mouth. However, the priority of the above data is enumerated below taking staff and maintenance cost into considerations:

(A) The data to be collected prior to the commencement of substantial coastal investigation;

- Wave height and its direction
- Tidal data
- Water level at river mouth
- Longitudinal profile and cross section of the river
- Sounding around seashore
- Survey at shoreline
- Longitudinal profile and cross section at sand dune
- Topographic survey in the vicinity of river mouth

(B) The data to be collected at the time of coastal investigations;

- Tidal current data
- Grain size distribution of coastal bed material
- Water quality data
- Discharge data at river mouth.

2. TECHNICAL SPECIFICATION

Technical specifications for the required investigation are described hereinafter. The specification is prepared on the basis of the map with a scale of 1 to 25,000. If there is a chronological change of topographic condition, these should be adjusted in accordance with the change of actual conditions.

2.1 Wave Height and Direction

2.1.1 Wave height

(1) Location

The wave gauge shall be installed at the place of more than 10 m deep, where reflection waves from land do not affect. The location is referred to Fig.A.1.

(2) Equipment : Wave gauge (refer to Fig.A.2)

(3) Period of observation : throughout a year

2.1.2 Wave direction

(1) Location : The same as 2.1.1

(2) Equipment : transit

(3) Measurement

Observation is carried out at the place (or tower) of 10 m above mean sea level. Observation is made twice a day at 10:00 and 16:00.

(3) Period of observation : every day

2.2 Tidal Observation

(1) Location

Tidal observation station should be newly established at the jetty at Tumpat (refer to Fig.A.3).

(2) Equipment : tidal gauge

(3) Period of observation : throughout a year

2.3 Tidal Current Observation

(1) Location

Current observation is carried out the two points with a

distance of 500m and 1 km from seashore. The measurement points are shown on Fig.A.1.

(2) Equipment : Current meter

(3) Period of observation

The observation for 15 days is carried out twice a year (March and September).

2.4 Surface Wind Observation

(1) Location

Existing observation station at the airport in Kota Bharu

(2) Period of observation

All the recorded data are required. The data should be obtained under the approval of MMS.

2.5 Investigation on Grain Size Distribution of Coarstal Bed Material

(1) Location

Sampling points are shown on Fig.A.4. The investigation should be carried out at 3 survey lines in the sea, 5 survey lines in the river channel and 6 survey lines in the sand dune. The number of samplings is 10 samples along survey line in the sea and 3 samples in the river channel and sand dune.

(2) Equipment : Bed material sampler

(3) Observation : Twice a year (March and September)

2.6 Water Quality

(1) Location

Water sampling should be made at a point in the sea and for the river stretch of 33 km long from the river mouth up to Salor pump house at Pasir Mas at an interval of 1 km (34 points). Sampling should be made at two vertical position of a sampling point along the centre of river flow. One is collected at 0.2 of the depth below the surface and the other at 0.8.

(2) Equipment : Water sampler, temperature and salinity loggers

(3) Observation

The observation should be carried out twice a year (March and September) at a high tide of low flow discharge.

2.7 Water Level and Flow Velocity at River Mouth

2.7.1 Water level at river mouth

(1) Location

The observation station is installed at jetty which is now under construction by JKR as shown on Fig.A.3.

(2) Equipment : Automatic water level recorder

(3) Period of observation : throughout a year

2.7.2 Flow velocity at river mouth

(1) Location

The location should be set in accordance with the sections (C.S.1.0 and C.S. B1.0 for main channel and C.S A9.0 for tributary) where cross sectional survey was carried out as shown on Fig.A.5. The interval between any two verticals should be set 1/10 of the total river width and the velocity observation is made at each vertical at 0.2 and 0.8 of the depth below the surface.

(2) Equipment : Current meter

(3) Period of observation : Twice a year (March and December)

2.8 Topographic Survey

2.8.1 Longitudinal and cross sectional surveys of the River

(1) Range

Topographic surveys should be carried out for the river channel from the river mouth to 5 km upstream. (refer to Fig.A.6)

(2) Interval : at an interval of 200 m

(3) Period : twice a year (March and September)

2.8.2 Sounding around seashore

(1) Range

Survey should be carried out for 2 km in east and west directions along shoreline; namely, 5.5 km in total

including the width of river mouth as shown on Fig.A.7.

(2) Interval

Survey line at a right angle with seashore line should be set at an interval of 100 m. The survey is carried out along the survey line from seashore to the point where the water depth is 20 m deep. A depth contour at an interval of 1 m is required.

(3) Period : once a year (March)

2.8.3 Survey on shoreline

(1) Range

Survey should be carried out for 2 km in east and west directions along shoreline as shown on Fig.A.8; namely, 4.0 km in total length excluding the width of river mouth.

(2) Interval : at an interval of 100 m.

(3) Period : Once a year (March)

2.8.4 Longitudinal and cross sectional surveys in the vicinity of sand dune

(1) Location

River channel and sand dune in the vicinity of sand dune as shown on Fig.A.9.

(2) Interval : at an interval of 50 m

(3) Period : twice a year (March and September)

2.8.5 Topographic survey around river mouth

(1) Location

10.5 km² in total area as shown on Fig.A.10

(2) Scale

Topographical map with a scale of 1 to 1,000 is required. The contour at an interval of 0.5 m should be drawn.

(3) Period : once in 5 years

Location of a Wave Height Recorder to be installed

Locations of Tidal Current Observation

Location of Wave Direction Observation

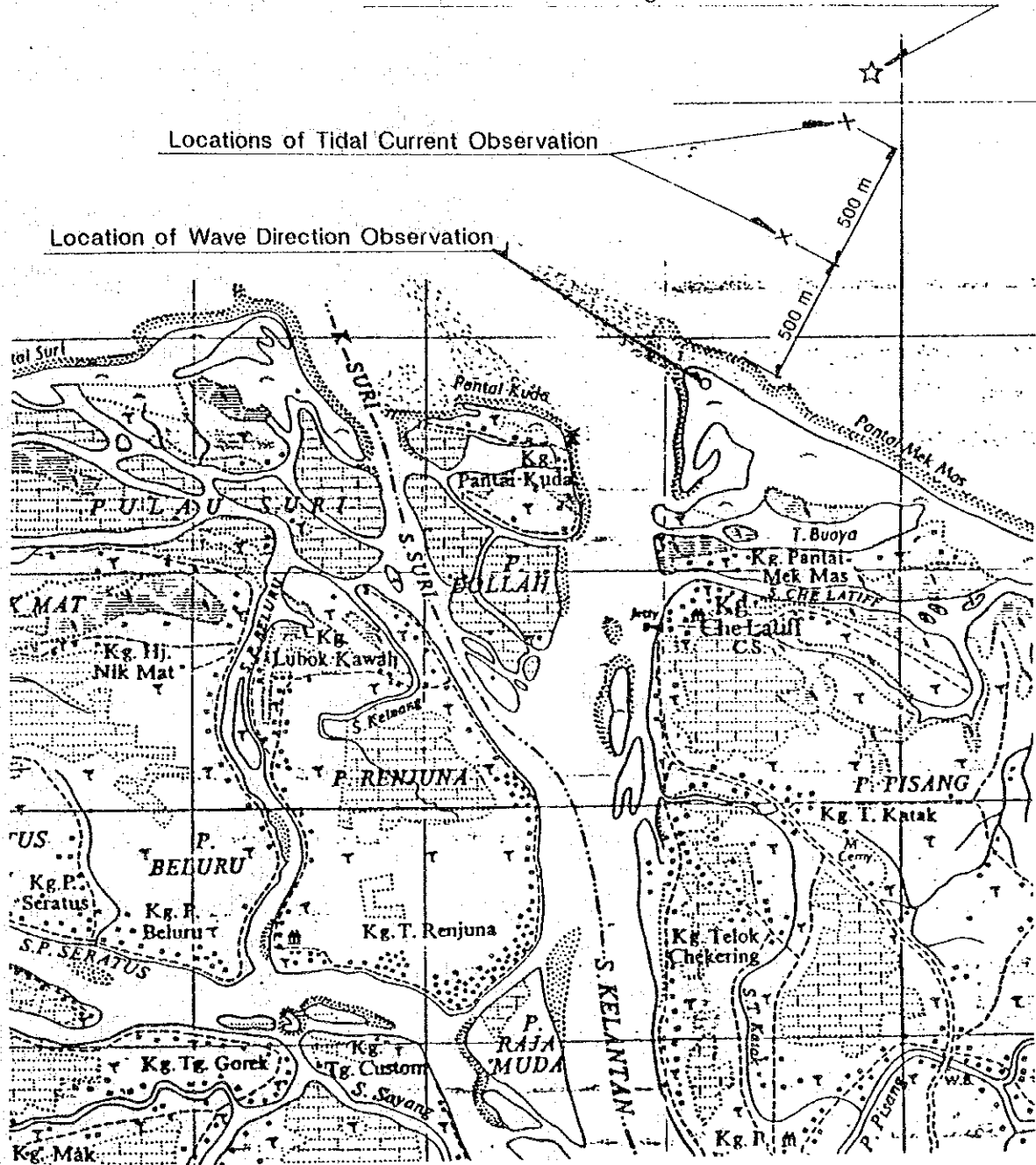
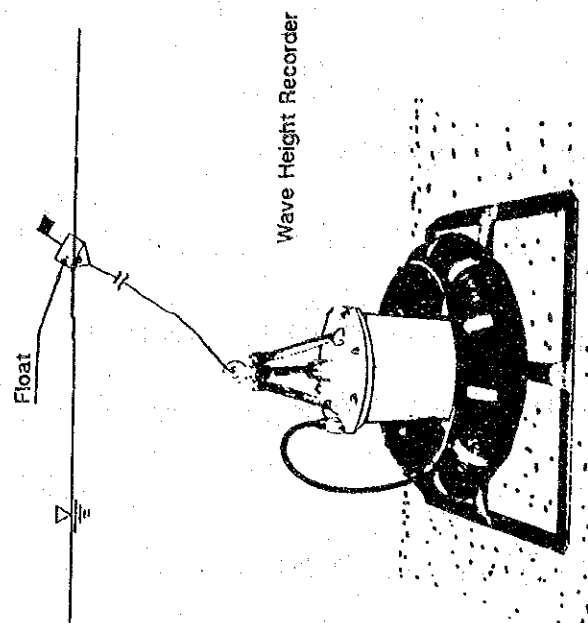


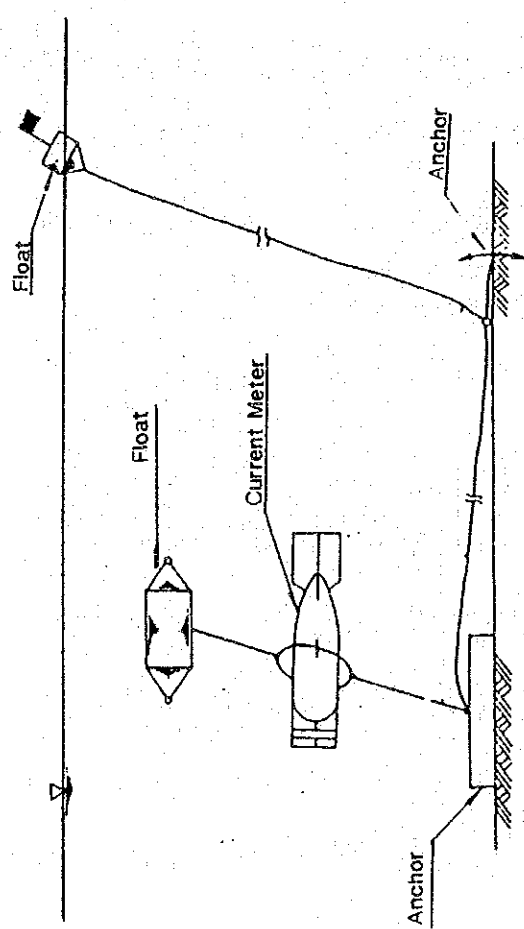
Fig.A.1

Location of Tide and Wave Observations

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INSTALLATION OF WAVE HEIGHT RECORDER

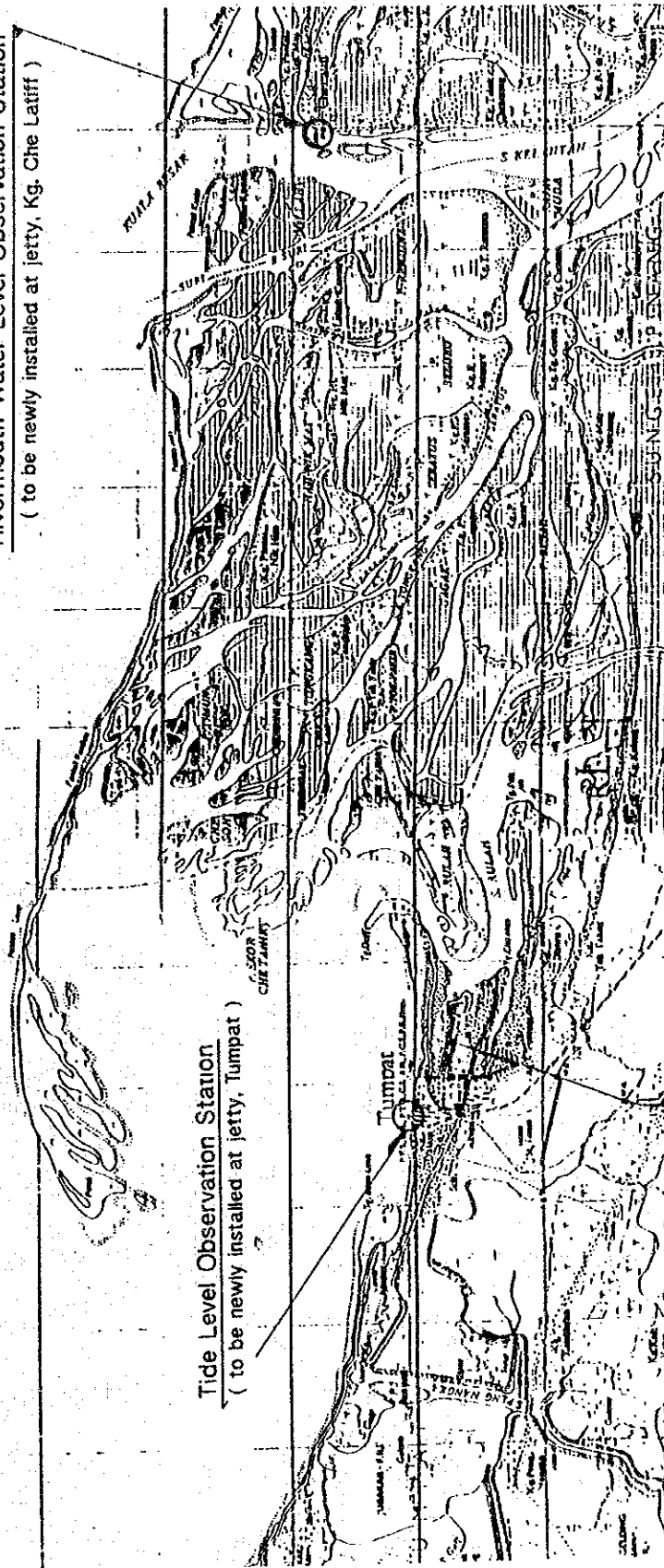


INSTALLATION OF CURRENT METER

Fig.A.2
Installation of Wave Height Recorder
and Tidal Current Meter

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Rivermouth Water Level Observation Station
(to be newly installed at jetty, Kg. Che Latiff)



Tide Level Observation Station
(to be newly installed at jetty, Tumpat)

Fig.A.3 Location of Tide Level and River Mouth Water Level Observation Stations

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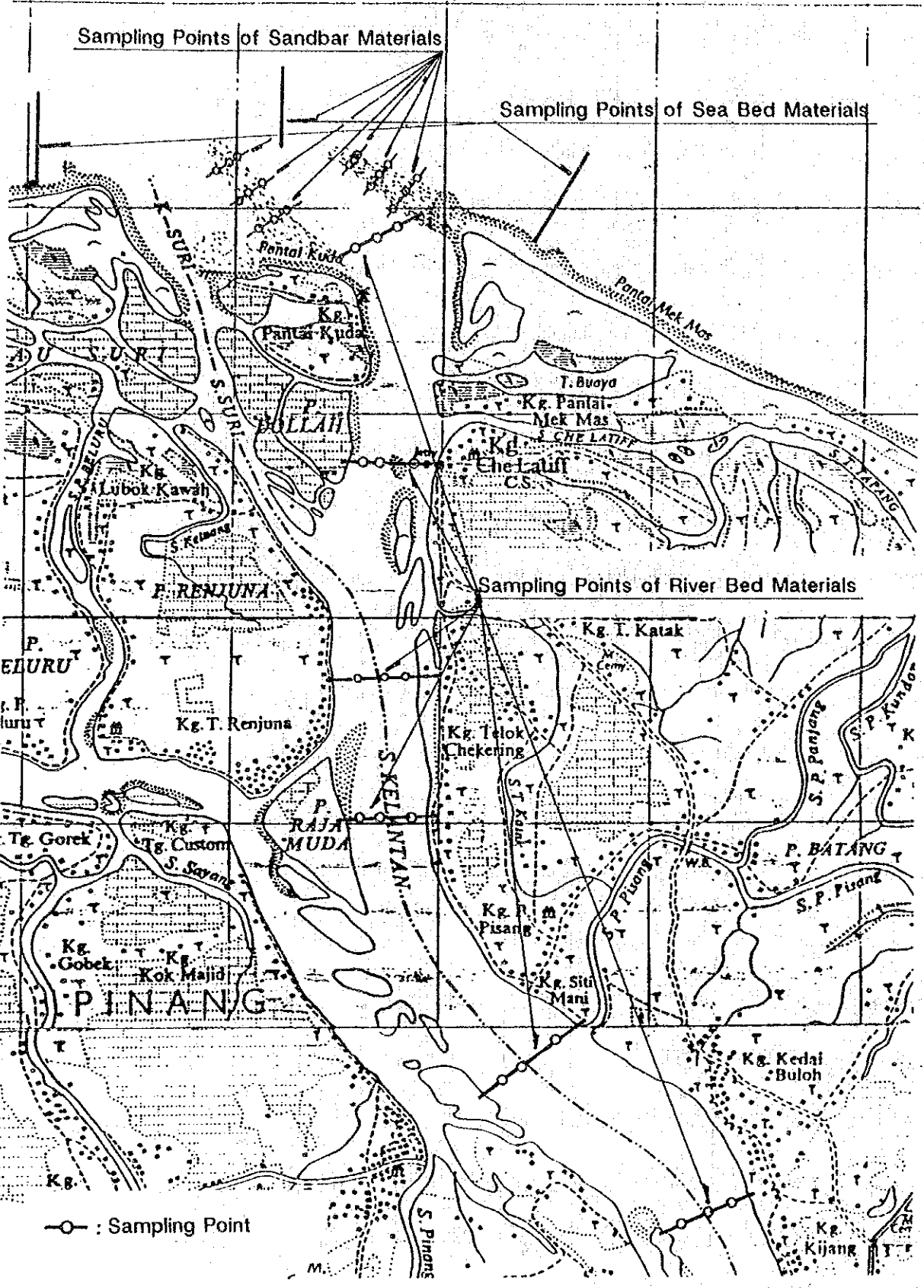
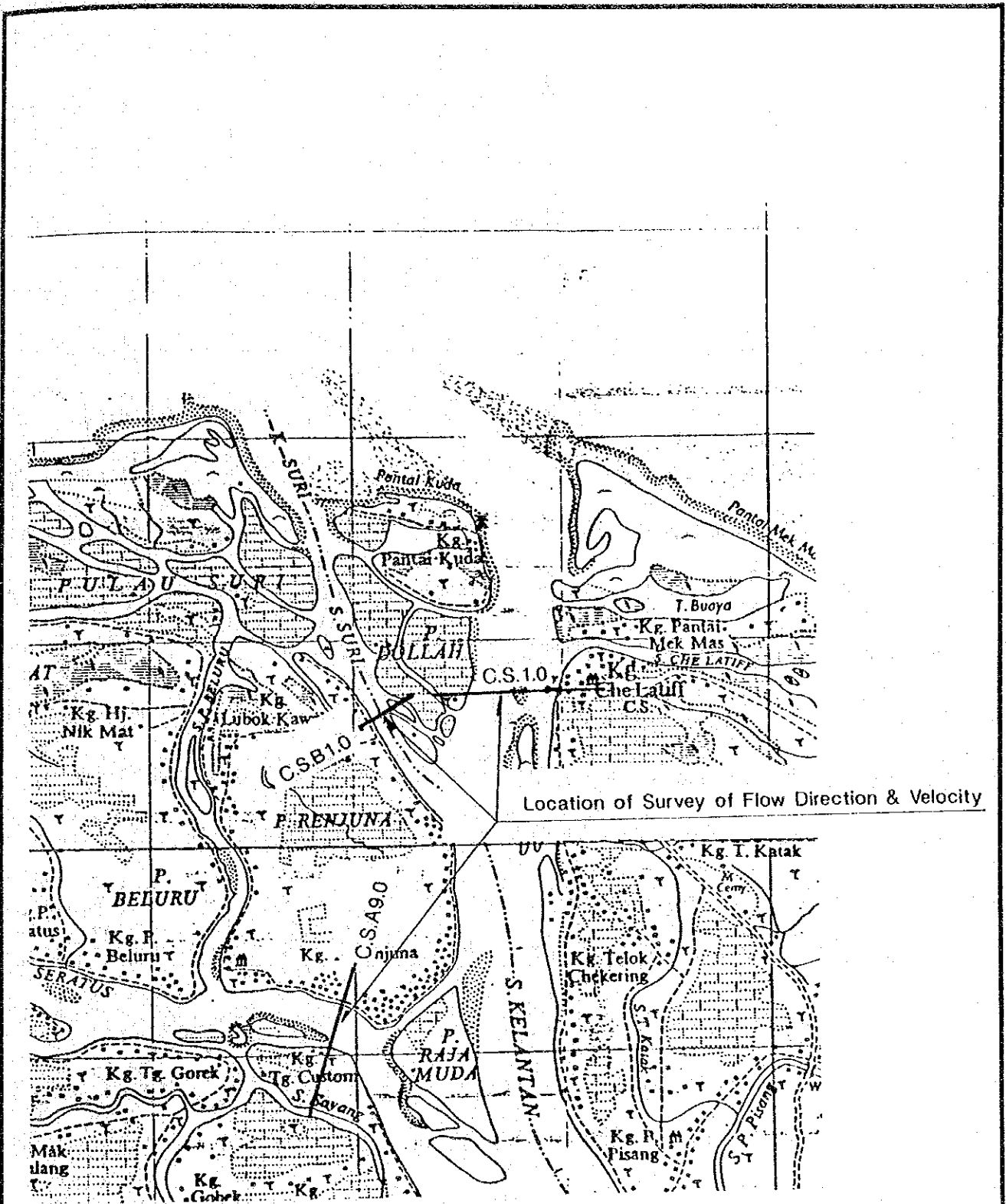


Fig.A.4
Sampling Points of Sea Bed, Sand Bar
and Riverbed Material

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Location of Survey of Flow Direction & Velocity

Fig.A.5
Location of Rivermouth Flow Direction
and Velocity

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Fig.A.6 Location of Cross Sectional and Longitudinal Survey of River Channel

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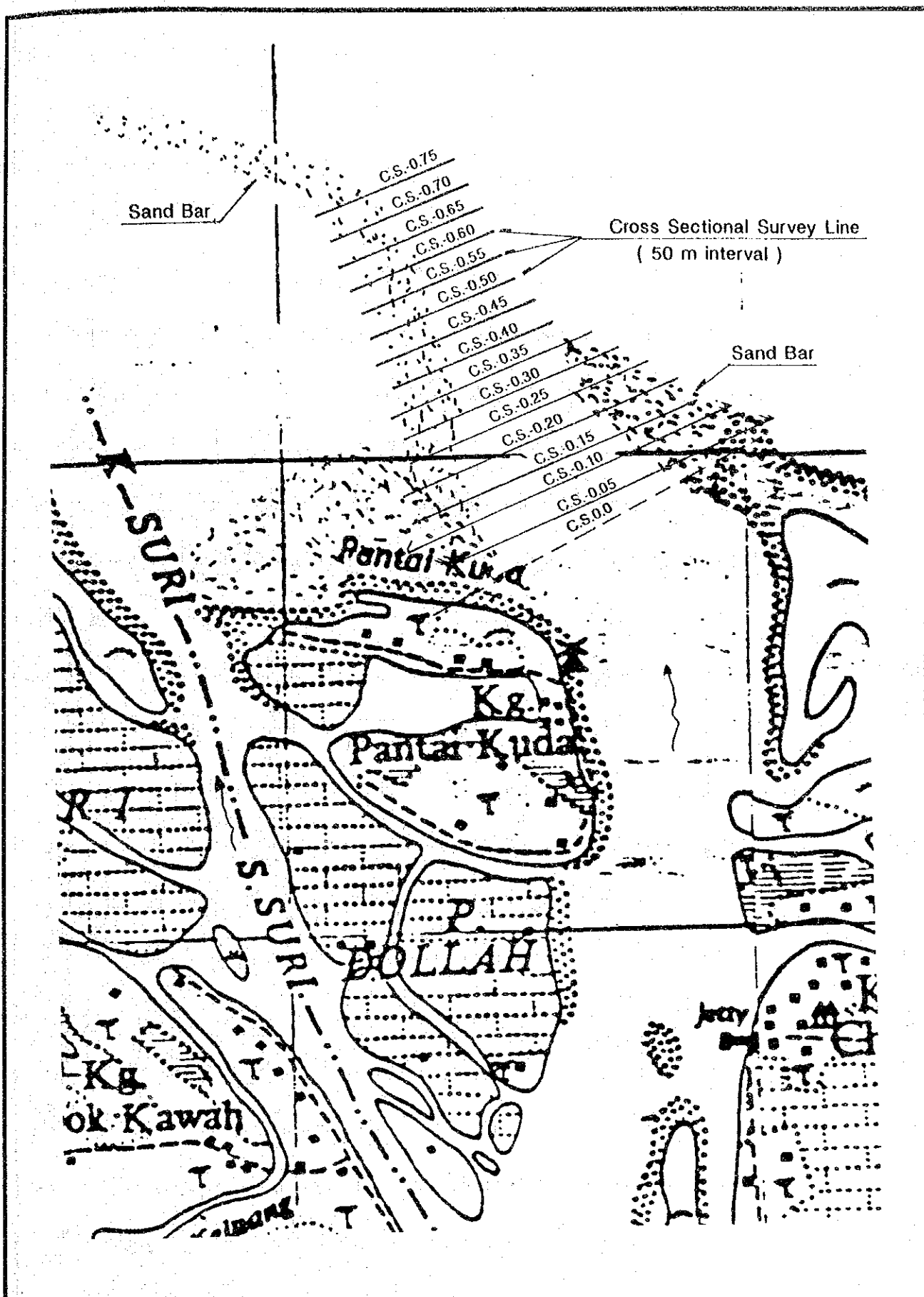


Fig.A.9 Location of Cross Sectional and Longitudinal Survey of Sand Bar and River Mouth

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Area to be mapped by topographical survey

(3 x 3.5 km = 10.5 km²)

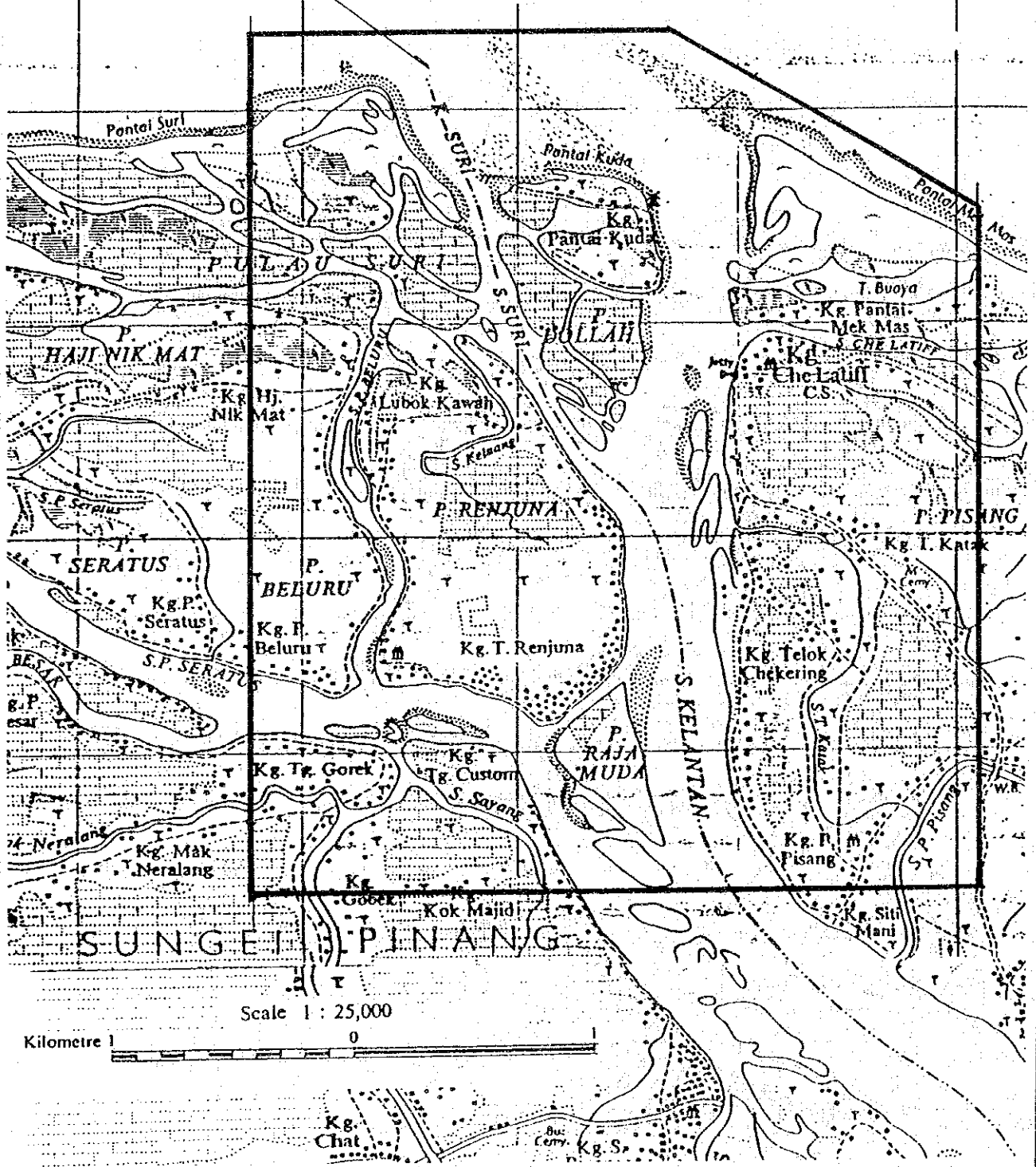


Fig.A.10 Area of Topographic Survey

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