

5. パッシング川本川ナピンダングート下流の狭さく部にゲートを設け、下流に洪水流量を流さない場合の流況
  6. マリキナ上流ダム洪水低減機能
  7. パラニャケ放水路のラグナ湖の水位低下機能  
 氾濫解析のうち内水地区については特に次のことを調べる
    1. 既設ポンプ場の配置は各排水区でポンプが効率的に働くようポンプ合数が設置されているか
    2. 排水路網の系統は効率的であるか
    3. パッシング川ならびにサンファン川の堤防高は相対的にポンプ場の機能と均り合いがとれているか
    4. ポンプ運転時に各排水区へはゲート等の不足により本川ならびに他の排水区からどの程度の流入量があるか
- (4) フィージビリティ調査はマスタープラン調査の中で洪水による被害が著しい地域を選び、2000年まで実施可能な構造物計画及び非構造物対応計画を立てる。
- 調査実施にあたってはDPWHのJICA専門家と協議し、調査の円滑な実施とCOUNTERPARTSへのTECHNOLOGY TRANSFERに努めること。

## 6-2 対象地域及び範囲

本格調査の対象地域は、4市13自治体から成るマニラ首都圏域(636 km<sup>2</sup>)とし、対象地域内の洪水防御対象地区の治水計画のマスタープランを立案するとともに、その中の重要地区についてフィージビリティ調査を行う。

なお、流出解析等の対象となる流域は、マリキ川上流域、ラグナ湖流域等を含み、約4,750 km<sup>2</sup>である。

## 6-3 調査項目及び内容

本格調査は、マスタープラン調査とフィージビリティ調査から成る。

### (1) マスタープラン調査

マニラ首都圏域を対象とし、洪水防御計画及び内水排除計画を立案するとともに、フィージビリティ調査対象地区を選定する。

#### (A) 既存資料の収集・分析

S/Wにも記載されているとおり、以下の資料を収集・分析する。

#### ① フィリピン国及びマニラ首都圏域の社会経済情勢

\*特に地区ごとの人口及び財政状況の分析が重要

#### ② 治水に関する既存の調査・計画

\*特に1952年のマスタープラン及び1984年の世銀の中間報告の内容については熟知する必要がある。

③ 地形データ・地図

\*BCGS所有の1/10,000の地形図は主要な洪水防御対象地区をカバーしている。本調査における作業の基本となる資料と考えられる。

④ 気象・水文資料

⑤ 土質・地質資料

\*パッシング川下流域では地盤沈下が考えられるが、橋梁等の箇所でボーリングデータがあれば、今後の沈下予測に使える。

⑥ 河川の現況

⑦ 既設構造物

⑧ 土地利用（現況及び将来構想）

⑨ 過去の洪水・水害

\*特に浸水実績図，最大湛水深

⑩ 都市開発計画

⑪ その他関連する資料

(B) 現地調査

① 河川縦横断測量

S/Wによりフィリピン側で実施することになっている。測量対象河川と範囲は図-2-3-3のとおりとする。

横断測量の間隔は

パッシング川	17 km	200 m
マリキナ川（サン・シドロ下流）	12.5 km	200 m
"    "    上流	17.5 km	1 km
マンガハン放水路		
サンファン川	10 km	200 m
ナピندان川	8 km	500 m
チュラハン川		200 m
パラニャケ川（支川とも）	16 km	200 m
エステロデピタス，エスラロ・デ		
ガリナ及び各エステロから海への放流水路		200 m

縦断測量は兩岸の堤防高，堤内地盤高について横断測量の測点及び変化点を測ること。

なお，1983年測量のES/BASIC保有の河川断面図等で信頼性が高いと判断

できるものは使用してもよい。

② 水理水文観測

自記雨量計の必要箇所は図 2-3-1 のとおり。このうち、3ヶ所は既設のものが使用できる見込みである。

水位計の必要箇所は図 2-3-2 のとおり、このうち、自記観測はマリキナ川、パッシング川ラグナ湖、サンファン川で必要である。その他は水位標のみでもよい。

流量観測は、図 2-3-2 の箇所で 1 シーズン数回実施する必要がある。

③ 浸水実態調査

聞き込み等により、主要浸水地区における湛水位等の状況を把握し、浸水実績図を作成するとともに被害額を算定する。

④ 排水系統調査

内水地区の排水系統を把握し、現況の排水系統図を作成する。

⑤ 水質調査

PH、水温、DO、BOD、濁度、C<sub>0</sub>-を河川の主要な地点と主要エステロで調査する。

(C) 計画目標年次の設定

前述のとおり、緊急対策及び中期計画・長期計画を立案する。目標年次は、中期計画：西暦 2000 年、長期計画：西暦 2020 年とするが、フィリピン側の意向と調整する必要がある。

(D) 土地利用状況の設定

目標年次における土地利用状況を現況トレンド及びフィリピン側の将来計画に基づき設定する。

非構造物計画としての開発規制の効果については、将来土地利用をフィードバックして設定して測定する。

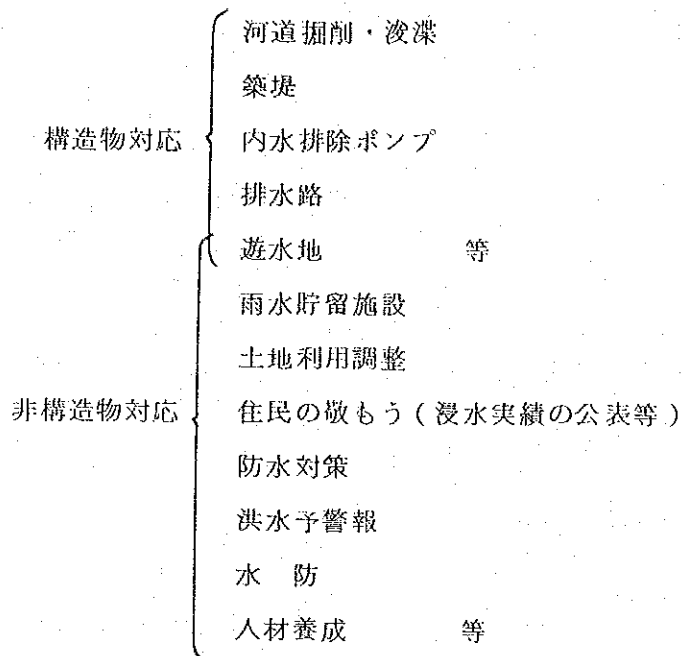
(E) 地盤沈下調査及び将来沈下量の設定

潮位記録、地質資料、地下水汲上量から地盤沈下の実態（地盤沈下区域及び程度）を把握するとともに将来沈下量を推定する。

(F) 構造物計画及び非構造物計画

本調査区域における構造物対応及び非構造物対応の洪水対策のメニューを挙げるとともにその適用性について検討する。

検討メニューには、次のものを含み、さらに現地の実状に応じ必要と判断されるものを追加する。



(G) 財務分析

経済情勢及び財政の現状を分析し、目標年次までの投資額を設定するとともに、財源調達方法について検討する。

(H) 降雨解析

収集した過去の雨量資料をもとに、時間雨量、日雨量・2日雨量について統計解析を行い、流域平均確率雨量を算定する。

(I) 流出・氾濫過析モデルの作成

(1) 流出モデルの作成

河川毎に流出モデルを作成する。

マリキナ・パッシング川ーラグナ湖水系についてはハイドログラフの得られる手法が必要である。チュラハジ川、パラニャケ川等の中小河川については合理式等で十分である。

(2) 氾濫モデル

内水域を含む洪水氾濫区域について、洪水氾濫、内水湛水状況を計算できる氾濫モデルを作成する。

内水域のブロック分割は特に内水排除施設及び排水系統の評価ができるようにする。

(J) 流出・氾濫解析

流出・氾濫解析を行い、想定被害額を算定する。計算条件は、現況の安全度、既存プロジェクト等を勘案して確率規模別に数ケース想定するものとする。

(K) 洪水処理計画代替案の検討

河道改修・マリキナ上流ダム、マンガハン放水路、ナピンダン水路、タヒグ川、パラニャケ放水路等の水理効果を組合せた洪水処理代替案を設定し、その効果を検討する。

下流端水位条件は潮位記録から既往最高潮位，年最高潮位，洪水時最高潮位，朔望平均満潮位等を勘案して決定する。

この際，次の点に点に配慮する。

- (1) パッシング川本川のナピンゲンゲート直下流狭さく部の流下能力
  - (2) マンガハン放水路建設前のナピンゲン水路，タヒグ川，ラグナ湖のパッシング川の洪水流量低減機能ならびに狭さく部上流での氾濫量。
  - (3) マンガハン放水路 ナピンゲン水路，タヒグ川，ラグナ湖を合せた場合のパッシング川の洪水流量低減機能ならびに狭さく上流での氾濫量。ロザリオせき全開した場合のケースも計算する。
  - (4) マンガン放水路のラグナ湖の水位低下機能
  - (5) パッシング川本川ナピンゲンゲート下流の狭さく部にゲートを設け下流に洪水流量を流さない場合の流況。
  - (6) マリキナ上流ダムの洪水低減機能
  - (7) パラニャケ放水路のラグ湖の水位低下機能
- (L) 内水排除計画代替案の検討

地形状況及び現況内水排除系統及び放流先河川の状況等を勘案して内水処理区を分割し，内水排除施設規模との組合せによる代替案を設定し，その効果について検討する。

この際，次の事項を特に調べる。

- (1) 既設ポンプ場の配置は各排水区でポンプが効率的に働くようポンプ台数が設置されているか。
  - (2) 排水路網の系統は効率的であるか
  - (3) パッシング川ならびにサンファン川の堤防高は相対的にポンプ場の機能と均り合いがとれているか。
  - (4) ポンプ運転時は各排水区へはゲート等の不足により本川ならびに他の排水区からどの程度の流入量があるか。
  - (5) 丘陵地からの流出量を直接海へバイパスして放流することが可能か。
  - (6) 従来のような大規模容量ポンプと小規模容量ポンプの比較を行いポンプ型式を検討すること。
- (M) 事業費，維持管理費の算定

洪水処理・内水排除計画の代替案について事業員及び維持管理費を算定する。

- (N) 経済分析（費用，便益分析）

洪水処理計画，内水排除計画の代替案について治水経済調査の手法で経済効果の分析（費用－便益分析）を行うとともに，内部収益等の算定を行う。

(O) 洪水処理・内水排除計画の立案

計画目標年次までの可能投資額，費用・便益分析結果，洪水氾濫・内水区域の社会的状況等を総合的に勘案して目標年次に対応した段階的施工計画（緊急，中期，長期）を立案する。

(P) 水質分析

立案した洪水処理・内水排除計画に対して河川・エステロ等の水質解析を行う。

(Q) 非構造物計画

前述の非構造物計画のメニューにもとづき，現地の状況を踏まえて緊急対応，中期計画，長期計画の各ランクで実施計画を立案する。

この際フィリピン側の関連行政機関で構成されるステアリングコミッティを通じ，各部門の理解・協力を得ることが重要である。

(R) 組織・人員計画

構造物・非構造物計画それぞれについて実施のための組織・人員計画を検討する。

(S) 社会・経済影響調査

この計画を実施することによるフィリピン国及びマニラ首都圏地域の社会・経済に及ぼす効果を水質等の環境に及ぼす影響を検討する。

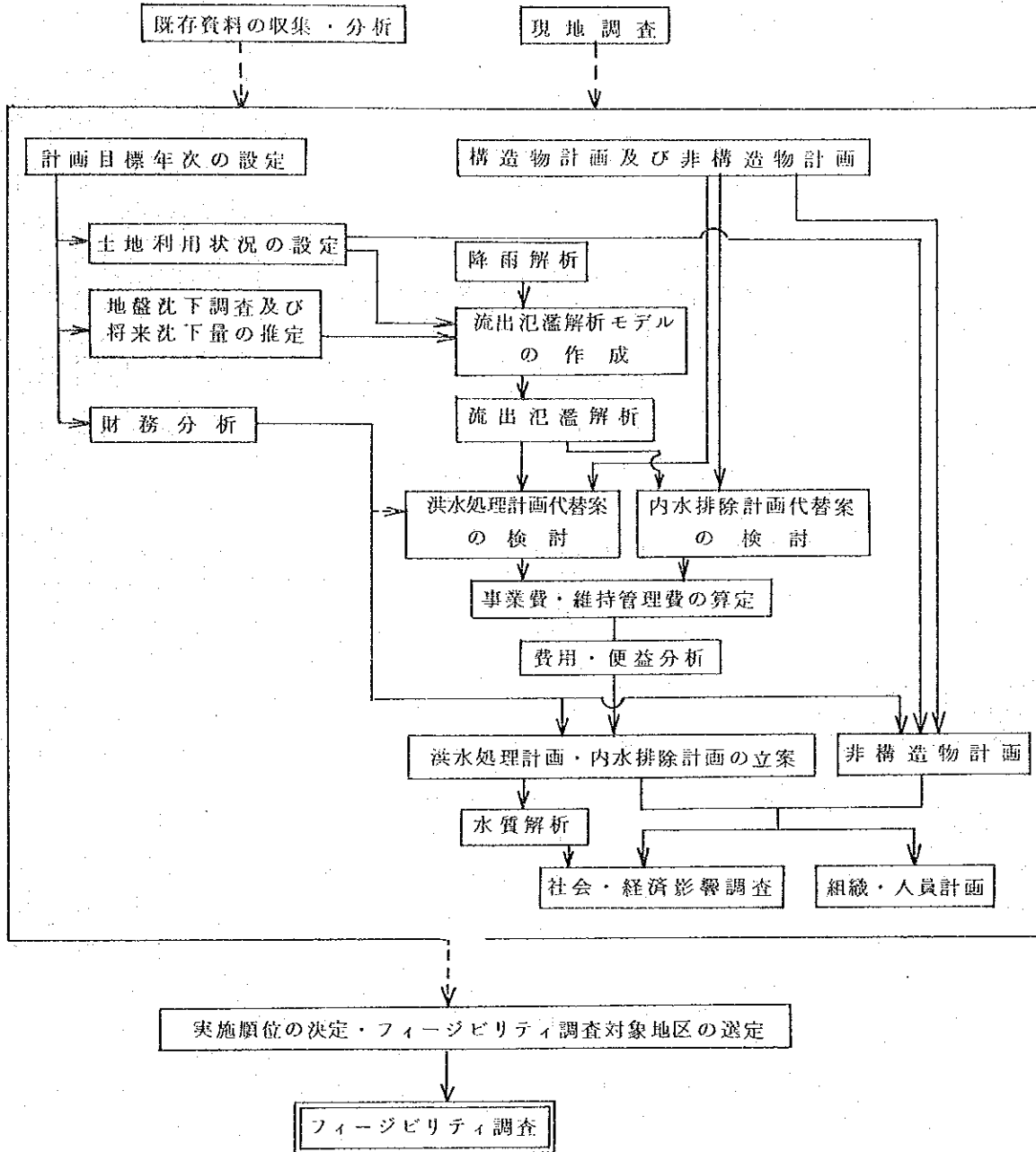
(T) 実施順位とフィージビリティ調査対策地区の選定

調査結果を総合的に判断して実施順位を決定するとともに，優先度の高い地区の中からフィージビリティ調査の対象地区を選定する。

(2) フィージビリティ調査

マスタープラン調査の中で選定された地区について，さらに詳細かつ具体的な実施計画を検討する。

調査フロー図



#### 6-4 調査工程

調査は、フィリピン国内での現地調査と日本国内で行われる解析作業とで構成される。

現地調査は、約8ヶ月間を予定し、平行して国内での作業を含め、ファイナルレポートの提出まで、合計24ヶ月間の工程を予定している。

調査工程(案)は下表のとおりである。

TENTATIVE SCHEDULE

ITEM MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
STUDY IN PHILIPPINE																									
STUDY IN JAPAN																									
REPORT	▲ IC/R				▲ P/R(1)						▲ IT/R						▲ P/R(2)				▲ DF/R	◎		▲ F/R	

(REMARKS) IC/R: Inception Report P/R(1),(2) : Progress Report (1),(2)  
 IT/R: Interim Report DF/R : Draft Final Report  
 ◎ : Comment F/R : Final Report

#### 6-5 報告書

以下の報告書を作成し、比側に提出のうえ説明、協議等を行う。

- (1) インセプション・レポート  
 英文40部(内比側提出分30部)  
 現地調査開始時に提出。
- (2) プロGRESS・レポート(1)  
 英文40部(内比側提出分30部)  
 調査開始後5ヶ月以内に提出。
- (3) インテリム・レポート  
 英文40部(内比側提出分30部)  
 調査開始後11ヶ月以内に提出。
- (4) プロGRESS・レポート(2)  
 英文40部(内比側提出分30部)  
 調査開始後17ヶ月以内に提出。



(5) ドラフト・ファイナル・レポート

英文（メインレポート）	40部（比側提出分30部）
＃（サポーティングレポート）	30部（＃ 20部）
＃（ベーシックデータ）	4部（＃ 2部）
和文（メインレポート要約）	10部

調査開始後21ヶ月以内に提出。

上記ドラフトファイナルレポートに対する比側のコメントは、同レポートの提出後1ヶ月以内にJICAに通知される。

(6) ファイナル・レポート

英文（メインレポート）	80部（比側提出分50部）
＃（サポーティングレポート）	60部（＃ 30部）
＃（ベーシックデータ）	4部（＃ 2部）
和文（本報告書）	30部

上記レポートは、ドラフト・ファイナル・レポートに対する比側のコメントを得てから2ヶ月以内にコメントを吟味、検討の上提出する。

## 6-6 要員計画（担当分野）

- ① 総括
- ② 総合評価、提示（プレゼンテーション）担当
- ③ 測量・地質調査
- ④ 水理・水文及び水質観測・調査
- ⑤ 水理・水文解析
- ⑥ 水質解析
- ⑦ 都市計画
- ⑧ 地盤沈下の調査・解析
- ⑨ 施設計画（堤防，ゲート，ポンプ，水路改修）
- ⑩ 電気・機械
- ⑪ 工法，資材，維持管理
- ⑫ 洪水管理（施設のオペレーション，組織・体制）
- ⑬ 治水経済調査・経済分析
- ⑭ 資金調達・財政計画
- ⑮ 非構造物対応（Non-structural Measures）調査・計画
- ⑯ 段階的実施計画の立案（構造・非構造対応を含む。）

⑩ 組織・人員計画

(上記について、項目を重複して担当しても良い。項目②、④～⑩に関しては、行政的経験等を有する担当が望ましい。)

6-7 調査実施の為の必要機材

	使用目的	機材	備考
1) 基礎的機材	① 現地での調査団の移動	四輪駆動車	1台
2) 測量用機材	① 河川縦横断測量等	トランシット	2台
		レベル	4台
		平板(アリダード付)	2台
		箱尺	8本
		スチールテープ	2本
		ナイロンテープ	6本
		超音波測深器	2台
3) 水文流出 観測用機材	① 雨量観測	転倒マス式自記雨量計	6ヶ所
	② 主要河川の水位観測	自記水位計	5ヶ所
	③ その他河川の水位観測	水位標	12ヶ所
	④ 流量観測	浮子	
4) 航空写真 解析用機材	① 航空写真立体視	携帯用実体鏡	2台
		机上型実体鏡	1台

## 添 付 資 料

1. 比政府要請書
2. 第一次調査議事録
3. 第二次調査議事録及び Scope of Work
4. 基礎資料の賦存状況
5. 面談者リスト



1. 比政府要請書 ( T / R )

TERMS OF REFERENCE  
FOR THE  
PASIG-LAGUNA BAY RIVER BASIN FLOOD CONTROL  
MASTER PLAN STUDY

1. BACKGROUND

I.1 General

In June 1985, a series of depressions and typhoons came one after another in rapid succession culminated by Typhoon Daling in June 27 and 28 accompanied by heavy monsoon rains. Almost all esteros, creeks, and rivers including the Pasig-Marikina River swelled and overflowed low portions of their banks. Flood damage spread out over the Metro Manila area, property losses were huge and socio-economic chaos lasted for a long time.

Notwithstanding continuous efforts and quite big investments on flood control works in the Metro Manila area, flood damage still take place in every rainy season. Moreover, several development projects and the rapid urbanization achieved in the past years have worsened flooding conditions; increased assets brought tremendous losses once inundated, and urbanization/transportation developments made it more difficult to improve flood/drainage conditions.

The flood control plan of the Pasig-Marikina River including the Metro Manila area was firstly formulated with the Marikina River Multipurpose Project, which was executed in 1954 by the Marikina Project Coordinating Committee, National Economic Council, Government of the Republic of the Philippines. Following this study, several studies on flood control of the Pasig-Marikina-Laguna Lake Basin were carried out; a floodway to divert flood discharge into the Laguna Lake was proposed in 1970; a feasibility study on the Mangahan Floodway and the Parañaque Spillway was conducted in 1975. Resultingly, the construction of Mangahan Floodway was commenced in May 1980 and is still underway but expected to be claimed

to be completed in 1987 . Furthermore, there are many studies related to flood control although their implementation has not been started yet.

With- regard to the urban drainage of the Metro Manila area, BPW prepared a drainage master plan in 1952, and the program for constructing 10 pumping stations was accomplished. However, they are not adequate to totally mitigate flood damage especially in the low-lying areas. To update the drainage plan in Metro Manila area, a master plan study was commenced in 1983, but the study remains suspended until now. The interim results submitted are compiled in the Preliminary Alternative Master Plan Strategy Report.

As enumerated above, many studies were executed and a few of the results/recommendations were implemented; but these were only made rather separately and/or independently. Since the flood control of river and the drainage system of the underlying lowlands cannot be separately undertaken, it is imperative for an efficient and complete flood mitigation to integrate all the plans of both flood control and drainage. It is mentioned, in this connection, that the basic scheme of flood control in the Pasig-Laguna Lake Basin has neither been reviewed nor updated since 1954 despite the fact that urban development has been widely achieved thereat.

## 1.2 Study Area

The study area covers Metro Manila, the Pasig-Marikina river basin and the eastern shore areas of Laguna Lake. It is within the Pasig-Marikina-Laguna Lake Basin which lies between 14°10' and 14°55' north latitude and 120°50' east longitude.

The Pasig River, which flows from east to west through the center of Metro Manila, extends about 17.0 km from the confluence of the Marikina River and the Napindan Channel to the Manila Bay. It has a fairly direct course,

except for its double-loop meander at the Punta-Santa Ana area. One of its principal tributaries is the San Juan River, which enters the Pasig River at the lower river meander about 6.0 km upstream of the river mouth.

Upstream from the junction with the Napindan Channel, the Pasig River is named the Marikina River which originates in the western side of the Sierra Madre Mountain about 35.0 km northeast of Manila. At the town of Montalban, the river emerges from the foothills of the mountain range, turning and flowing southward through the Marikina Valley until it becomes the Pasig River. The catchment areas of Pasig, Marikina and San Juan rivers are 130 km<sup>2</sup>, 50 km<sup>2</sup> and 90 km<sup>2</sup>, respectively.

This study area includes small foreshore tributary areas in Malabon, Navotas and Valenzuela (MANABA). Immediately inland from the Manila Metropolitan area, the Laguna Lake exists as a shallow lake with the catchment of approximately 3,200 km<sup>2</sup>. The lake's only outlet is via the Napindan Channel and the Pasig River. The Napindan Channel normally flows from the Laguna Lake to the Pasig, but it can and does flow in either direction, depending upon river and lake levels.

Manila, the national capital of the Republic of the Philippines, is the center of economic, political, social and cultural activities of the nation. Located in Central Luzon, it spreads along the eastern shore of Manila Bay from the mouth of the Pasig River. Manila is bisected by the river and has been popularly referred to as the Greater Manila Area.

The Greater Manila Area has expanded to encompass four (4) cities and thirteen (13) municipalities. Now known as the Metropolitan Manila Area comprising the National Capital Region, it has an area of 636 square kilometers and its population already exceeded 6.0 million in 1980. Metropolitan Manila (Metro Manila) is still developing rapidly towards the north, the east and the south where

the country's largest lake, the Laguna Lake, is restraining its southward expansion.

### 1.3 Flood Control and Drainage Works Undertaken and the Problems to be Solved

The Mangahan Floodway is the first and major flood control works offered in the course of the flood control plan. Its construction was started in 1980 and is still going on. The floodway aims at diverting the flood discharge of 2,400 m<sup>3</sup>/s out of 3,300 m<sup>3</sup>/s corresponding to a 100-year frequency discharge from the Upper Marikina River. However, the hydraulic model test conducted in 1983 revealed that the said discharge cannot bifurcate toward the Laguna Lake without the Marikina Control Gate Structure (MCGS).

With the Mangahan Floodway, the degree of flood control capability of the Pasig-Marikina is evaluated. Compared with the design flood of 100-year return probability, the flow capacity of the whole reach of Pasig-Marikina River corresponding to a discharge of less than 2-year frequency, is very small, especially the Upper Marikina River which is quite poor for the conveyance of flood.

In line with the flood control scheme which defines the role of Mangahan Floodway, the improvement plan for the Pasig River was formulated and successfully implemented since the early 1970's. Improvement works mainly consisted of the construction of river walls and the dredging around the Pasig river mouth. Until now, the improvement works have not been completed and some portions of the wall have already been damaged resulting in a poor flow capacity of only around 500-800 m<sup>3</sup>/s.

The construction of the Napindan Hydraulic Control Structure (NHCS) was completed in 1982, to control the water stage of the Laguna Lake as well as prevent the intrusion of saline and polluted water from the Pasig River. Since the Napindan Channel is the only waterway aside from the on-going Mangahan Floodway, this structure is also given an operational function to release a part of the flood



discharge of the Pasig River to the Laguna Lake, and vice versa, to avoid the inundation of coastal/shore areas around the Lake. However, no firm operation rule is fixed, nor the flow capacity of the channel is planned to assure a certain flood mitigation effect.

Tributaries have played as drainage mains for urban storm runoff in recent years. These tributaries, however, have remained unimproved and flooding along them has worsened in proportion to the urban development in basin. Aside from the San Juan River, the other tributaries like Nangka, Ampid and Burgos that join the Upper Marikina River have been suffering from overbanking around their confluences and neither study nor plan for flood control has been conducted.

Urban storm drainage in the Metro Manila area has always been a serious matter to promote further urban development for a more comfortable and safer living environment for its increasing population. The drainage program was started in 1974 and totally, 10 pumping stations have been constructed in low-lying areas. These stations cover approximately 4,300 ha of drainage area and may drain the 10-year frequency storm runoff in 12 hours. However, a significant portion of drainage mains and laterals can carry only 10 to 30% of the runoff discharge and the full coordination of their operation with the flood control plan of the Pasig-Marikina River where the storm runoff is to be drained has to be considered.

In addition to the above works, there have been several studies to formulate a plan for flood control and drainage system in the Pasig-Marikina-Laguna Lake Basin. In 1982, the study on an effective flood control operation and telemetering system in the Basin was undertaken and its detailed design was carried out from 1985 to early 1986. The system is to materialize the effective operation of both the Rosario and the Napindan hydraulic control structures with a real time base information by means of telecommunication. The construction of the system is scheduled to commence soon and it is expected to be operational by the time the Mangahan Floodway will be available.

In 1983, a study on an urban drainage plan for Metro-Manila was commenced to review/evaluate the drainage improvement works being carried since 1974. This study will be completed with the formulation of an integrated drainage plan, but was suspended after the submittal of a proposal for the execution of an Immediate Action Plan. A design work for the Marikina Control Gate Structure and the Upper Marikina River Improvement was also carried out in 1985, but the reasons to justify the plan was not studied.

Judging from the foregoing studies, it becomes clear that there has been no comprehensive and long-ranged plan that includes aspects of the Basin.

## 2. NECESSITY OF THE STUDY

The rapid population growth and magnification of economic activities and hence urban expansion made it unavoidable for people to emigrate to the flood-prone areas. Flooding problems have been getting more serious to the maximum extent.

As described, the present flood control scheme that the greater part of flood discharge from the Upper Marikina River Basin be diverted into the Laguna Lake was firstly indicated in 1954 and finally formulated into the project in 1975. One of the main components of the scheme, the Mangahan Floodway, is now under construction.

This basic scheme has only aimed at protecting the old Metro Manila area from the overbanking flood of the Pasig River. Wider urban expansion than before has brought the effectiveness of the scheme to its limit and caused new flood problems in the tributaries basins.

A long time has passed since the basic plan of flood control was formulated. Moreover, there are remaining works which are still to be implemented, while only a preliminary study on the overall drainage system for the Metro Manila area was commenced in 1983 with world bank assistance to solve the aggravated drainage problem in the area but the Master Plan has not been pursued. In the

future, more rapid urban expansion and socio-economic development is anticipated in the Basin including the Metro Manila Area. To assure flood-free urbanization and promote development, it is indispensable that the overall flood control works be undertaken.

Since the Basin holds the national capital where various development plans have been contemplated and carried out, the flood control and drainage measures shall be formulated on the basis of long-term and wide-viewed strategic plan. A Master Plan Study should, therefore, be carried out in the earliest time.

### 3. OBJECTIVE AND APPROACH

#### 3.1 Objective

The objective of the Study is to prepare the master plan for flood control and drainage, which should cover mainly a long-term strategic program to draw a phased implementation schedule of the optimum flood control and drainage works in Metro Manila and its suburban area, concentrating in the Pasig-Marikina River Basin. The area of Metro Manila lying outside the basin as well as the coastal/shore area of Laguna Lake is also included. In succession to the formulation of the Master Plan, the Feasibility Study will be carried out for the selected area to proposed the first implementation plan.

#### 3.2 Approach

The investigation will require large amounts of detailed information some of which are inherently variable or probabilistic in nature. Much of the information needed is already available from various sources such as previous studies, maps and surveys, meteorological-hydrological records, and socio-economic statistics. However, it is anticipated that existing information/data will be partly incomplete or out of date and that new mapping, surveys and analyses will be required before the formulation of the Master Plan. Therefore, a stepwise study approach is appropriate.

The proposed study will comprise the following two (2) stages; namely, the Master Plan Study and the Feasibility Study, as summarized hereunder.

#### Master Plan Study

The Master Plan Study consists of two (2) phases: Phase I is to review/evaluate the previous plans/studies and to execute additional survey/investigations, and Phase II is to formulate the comprehensive plans for flood control and drainage.

During Phase I, all of the previous studies and plans related to the Pasig-Marikina-Laguna-Lake Basin will be reviewed evaluated to analyze the flooding problems and to propose additional survey/investigation necessary for executing the further study. In this period, a task is set to identify the area for an immediate action plan.

Through the results of the above review and survey, alternative plans on flood control will be prepared for the above entire study area in Phase II. Synthetic study and selection of alternative plans will be made to formulate the strategic plan and priority sequence for implementation. The strategic plan shall involve financial and economic consideration and, in addition, there must be a harmony between the degree of flood control and the stage of economic development of the Basin.

#### Feasibility Study

The strategic plan recommended in the Master Plan will draw up a sequential group of optimum flood control and drainage works as well as the priority area to implement such works. The study shall be executed with more extensive studies and investigations on the technical and economic aspects for specific proposal, including the analysis of problems, alternative solutions, the associated cost and benefits, the responsible authority, and the preparation of the implementation.

#### 4. INSTITUTIONAL ASPECT

The implementing agency for the study is the Department of Public Works and Highways (DPWH). Technical assistance is expected to be provided by overseas aid, counterpart support personnel and logistic support to the necessary extent shall be provided by DPWH, and coordination and cooperation with the agencies related to the study shall be arranged through the counterpart staff.

#### 5. PLAN OF OPERATION

The plan of operation hereunder is presented in a form of rather continuous scheme in which the study itself is divided into two (2) stages. The duration and classification of each study item which is involved in either the Master Plan Study Stage or the Feasibility Study Stage are given in Fig. 1, Study Schedule.

##### 5.1 Review of Relevant Plans/Studies

All the plans/studies relevant to flood control works and/or developments in the Pasig-Marikina-Laguna Lake Basin will be reviewed and evaluated to identify the flood problems, and further, to pick up the main points which require necessary investigation/survey in the succeeding study period.

##### 5.2 Execution of Necessary Survey and Investigation

This item covers the execution of survey and investigation required for the study as specified below:

- (1) Longitudinal and cross sectional survey along the rivers, their tributaries and main channels;
- (2) Aerophotogrammetry and mapping of the flood-prone area (Scale: 1/5000; Contour Interval: 2.0 m);
- (3) Topographic survey and mapping covering the sites of the major structures (Scale: 1/200); and
- (4) Geological investigation for the sites of major structures and soil investigation on rivers and riparian areas and inland areas.

### 5.3 Collection of Data and Information

This will involve the collection of available data and updating information regarding the following:

- (1) National and regional socio-economy;
- (2) Previous studies/plans related to flood control and drainage
- (3) Meteorology and hydrology;
- (4) Soil and geological conditions;
- (5) Existing structures for flood control and drainage
- (6) Data relevant to the flood inundation and damage.
- (7) Urban development plans such as housing, road, water supply, etc. and
- (8) Other related data and information, if any.

### 5.4 Study and Analysis

This will cover studies and analyses required for the formulation of the Master Plan, including the following:

- (1) Hydrological and hydraulic aspects such as flood runoff, discharge statistics, drainage and flooding;
- (2) Soil and geological conditions of dam sites, river and riparian areas, and sediments;
- (3) River improvement and storm drainage plans;
- (4) Flood regulation plan by impounding reservoirs;
- (5) Flood and storm damage with present/future land use and assets; and
- (6) Social and environmental assessments due to the project implementation.

### 5.5 Formulation of Immediate Action Plan

Through the review of the relevant plans/studies, survey/ investigation and preliminary studies, the are for an immediate action plan shall be identified. The immediate action shall be formulated for early implementation and it will involve the following works:

- (1) Survey and investigation of seriously damaged areas having flood and storm drainage;

- (2) Analysis and formulation of countermeasure/counter-action works;
- (3) Preliminary design for the works; and
- (4) Socio-economic evaluation of the works.

#### 5.6 Formulation of the Master Plan

- (1) The Master Plan of Flood Control and Drainage will be formulated on the basis of economic superiority as well as technical soundness. Due to the complexity of the river system, there will be various kinds of alternative plans, so that all the components shall be not only evaluated severally but also justified integrally. Moreover, the viewpoint of multi-purpose development shall be taken into account when the impounding reservoir will be adopted as a component of the overall flood control scheme.
- (2) A strategic and long term program shall be drawn out by this master plan, and an implementation schedule which defines the area, period, investment programs and major contents of the stepwise plans shall also be prepared.
- (3) Throughout the Master Plan Study, the first investment program to require a feasibility study will be picked up for proceeding to the next page.

#### 5.7 Execution of the Feasibility Study

In accordance with the first investment program selected by the Master Plan, the Feasibility Study will successively be undertaken. Main items to be included are as follows:

- (1) Additional study and analysis involving hydrological and hydraulic aspects, geology and soil, and socio-economic setting for flood control plan;
- (2) Preparation of definitive plan;
- (3) Preliminary design for major structures;
- (4) Construction planning and cost estimates; and
- (5) Economic evaluation as well as social impact assessment.

#### 5.8 Transfer of Knowledge

This involves the transfer of knowledge to and the training of selected government staff, including:

- (1) Technical assistance in carrying out the necessary survey and investigation through On-the-Job Training; and

- (2) Training in overseas country for the selected government staff to obtain wider knowledge on modern practices and techniques regarding the project.

## 6. EXTERNAL AND GOVERNMENT INPUTS

### 6.1 External Input

the proposed external input for the Study are as follows:

- (1) Engineering Services

This include 202 man-months of of engineering services. The list of expatriates in Table I shows the required specialty and length of service of the experts.

- (2) Overseas Training of Counterpart Staff

Ten (10) man-months will be required for special training in Japan for the counterpart staff who will be assigned in the execution of the project.

- (3) Equipment

Equipment, as shown in Table 2, will be required for the survey and study.

- (4) Aerophotographs and Maps

Aerophotographs of the flooding area on the scale of 1:20,000 and mapping on the scale of 1:10,000 will be required.

### 6.2 Government Input

The Government of the Republic of the Philippines is prepared to provide the following to support the Study Team.

- (1) Office space with a conference room and toilet, adequately equipped with office furniture and fixtures including water and electric facilities, air-conditioner, potable water, etc., necessary for the smooth execution of the services;
- (2) Data, information and all available documents relevant to the Study;
- (3) Counterpart staff with accommodation and facilities to assist the Study Team in conducting technical works;
- (4) Four (4) vehicles to carry out field work, including drivers, maintenance, fuel and lubricants;
- (5) Staff as may be required to assist the Study Team concerning administrative works; and



- (6) Exemption from tax and customs duties of materials, machinery, equipment, office supplies and commodities, and personal effects brought in for the Study.

## 7. REPORTING REQUIREMENTS

The Study Team shall prepare and submit the following reports:

- (1) Inception Report: Two (2) months after commencement of the Study in twenty-five (25) copies. This report shall identify the comments and/or any suggestion based on the review of previous reports and data, and summarize main findings and technical problems obtained through the field survey.
- (2) Progress Report: Six (6) months after commencement of the Study in twenty-five (25) copies, giving a summary of the Study Team's activities, technical problems encountered, deviations from the original work schedule and the program of the works in the next study period.
- (3) Immediate Action Plan Report: Eight (8) months after commencement of the Study in fifty (50) copies. This report will indicate the area which needs an immediate action to be made, and give the features, cost and schedule of the works.
- (4) 1st. Interim Report: Thirteen (13) months after commencement of the Study in twenty-five (25) copies, giving all the results of review, survey, investigation and analysis, as well as the first draft of the Master Plan.
- (5) Master Plan Report: Seventeen (17) months after commencement of the Study in fifty (50) copies. This report will present the final formulation of the Master Plan, and the Government's comments on the report shall be given to the Study Team within one (1) month after receipt of this report.
- (6) 2nd. Interim Report: Twenty-five (25) months after commencement of the Study in twenty-five (25) copies, giving the basic features of the project for the first implementation plan.
- (7) Draft Feasibility Study Report: The first implementation plan will be enclosed in this report in line with the basic strategy given by the Master Plan. This report shall be compiled and submitted in twenty-five (25) copies within twenty-nine (29) months after commencement of the Study. The Government's comments will be given to the Study Team within two (2) months after receipt of this draft report.
- (8) Final Report: At the completion of the Study giving all the results, in fifty (50) copies.

## 8. STUDY SCHEDULE

The study shall be carried out in thirty (30) months, as shown in Fig. 1.

Table 1. LIST OF EXPATRIATES REQUIRED

<u>NO.</u>	<u>DESIGNATION</u>	<u>MAN-MONTH</u>
1.	Team Leader	30
2.	Hydrologist	20
3.	Hydraulics Engineer	10
4.	Geomorphologist	8
5.	Geologist	5
6.	River Planning Engineer	25
7.	Drainage Engineer	20
8.	Water Resources Engineer	6
9.	Dam Engineer	10
10.	River Structures Engineer	15
11.	Structural Engineer	15
12.	Socio-Economist	10
13.	Environmental Engineer	8
14.	Construction Planner/Cost Estimator	10
15.	Survey Expert	10
16.	Other Specialist (As Required)	10
	T o t a l	202

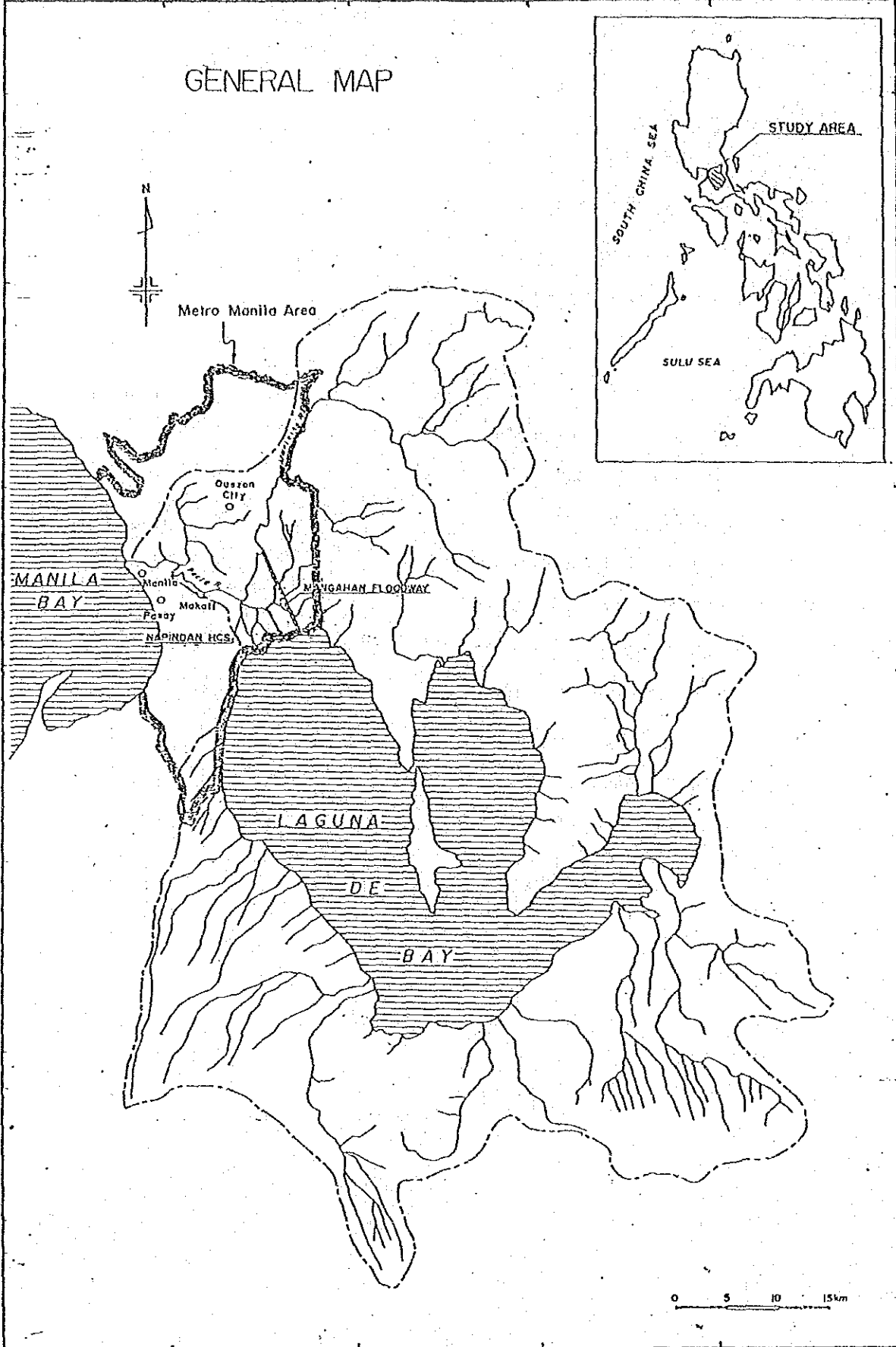
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Table 2. LIST OF EQUIPMENT REQUIRED FOR THE  
ENGINEERING SERVICES

<u>NO.</u>	<u>NAME OF EQUIPMENT</u>	<u>QUANTITY</u>
1.	Electro-Optical Distance Meter	1 unit
2.	Transit with Tripod	3 units
3.	Level with Tripod	3 units
4.	Hand Level	3 units
5.	Levelling Staff	6 units
6.	Pole	6 units
7.	Binocular	1 unit
8.	Mirror Steroscope	2 units
9.	Walkie-Talkie	2 units
10.	Current Meter	4 units
11.	Rainfall Recorder	3 units
12.	Water Level Recorder	3 units
13.	Drafting Equipment	2 sets
14.	Word Processing Device	1 unit
15.	Micro-Computer	1 unit
16.	Consummables	1 lot

180°50' 181°00' 181°10' 181°20' 181°30' 181°40'

# GENERAL MAP





2. 第一次調査議事録

MINUTES OF MEETINGS  
FOR  
THE PASIG-MARIKINA-LAGUNA LAKE BASIN COMPLEX  
FLOOD CONTROL MASTER PLAN STUDY

At the request of the Government of the Republic of the Philippines to the Government of Japan through the Japan International Cooperation Agency (JICA), JICA organized and dispatched a Preliminary Survey Mission (the Mission), which visited the Philippines from 22 March to 01 April 1987, in connection with the proposal step for the preparation of PASIG-MARIKINA-LAGUNA LAKE BASIN COMPLEX FLOOD CONTROL MASTER PLAN STUDY (the Study).

The Mission carried out field surveys of the study area and held series of discussions based on the Revised Terms of Reference submitted by the Department of Public Works and Highways (DPWH), with DPWH and other agencies concerned.

A final meeting was held on March 26, 1987 at the DPWH Office, Manila. A list of those who attended is shown in the attached sheet.

Main issues discussed are as follows:

- 1) DPWH shall be the counterpart and coordinating agency for the smooth conduct of the Study.

DPWH shall organize a counterpart team which is composed of personnel having enough technical background for technical transfer from the JICA Study Team.

- 2) DPWH stated the priority order of the area to be protected as follows:

1st - Manila and Suburbs

2nd - MANAVA Area (Malabon, Navotas and Valenzuela)

3rd - Mangahan Floodway, East Area (Taytay-Cainta)  
and West Area (Pasig-Pateros-Taytay)


4th - San Juan River Basin


5th - Upper Marikina River Basin

The criteria to determine the priority order is the number of population and the amount of flood damage.

- 3) The Mission suggested for the deletion of the MANAVA Area from the entire Study Area for the reason that said area is a separate basin and the complexity of the flooding problem would require a separate study.

However, DPWH insisted that MANAVA area should be included in the Study because this area is the 2nd priority considering the social and environmental impact of the flood control project for the area.

  
TEODORO T. ENCARNACION  
Asst. Secretary for Planning  
Department of Public Works and  
Highways (DPWH)

  
YOICHI TAKEUCHI  
Leader of the Preliminary  
Survey Mission  
Japan International Cooperation  
Agency (JICA)

26 March 1987  
DPWH, Manila, Philippines

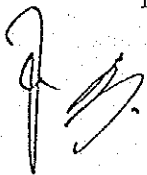
LIST OF ATTENDANCE

Philippine Side

- Teodoro T. Encarnacion - Asst. Secretary for Planning, DPWH
- Antonio A. Alpasan - Project Manager IV, PMO-Major Flood Control Projects, DPWH
- Rogelio A. Flores - Project Manager III, PMO-Major Flood Control Projects, DPWH
- Jose C. Guanzon - Chief Civil Engineer Planning Service, DPWH
- Pedro T. Razon - Chief, Flood Control & Drainage Division Bureau of Construction, DPWH
- Bienvenido C. Leuterio - Chief, Hydraulic Division Bureau of Design, DPWH
- Pedro P. Terciño - Chief, Surveys & Investigation Division Bureau of Design, DPWH
- Nonito F. Fano - Officer-in-Charge, Planning and Design Division, National Capital Region DPWH
- Gonzalo K. Banuelos - Supervising Civil Engineer II City Engineers Office, Manila

2. Japanese Side:

- Yoichi Takeuchi - Leader of the Preliminary Survey Mission, JICA
- Yukio Kikuta - Member, Cooperation Policy
- Toichiro Suzuki - Member, Urban Drainage
- Hiroyuki Kutsuna - Member, Coordination
- Yoshiaki Kimura - Member, Hydraulics & Hydrology
- Toshiki Kawakami - JICA Expert for Flood Control, DPWH
- Yuji Okazaki - Asst. Residence Representative of JICA Philippines





3. 第二次調査議事録及び Scope of Work

MINUTES OF DISCUSSION  
ON  
THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT  
IN METRO MANILA

D a t e : 4 August 1987  
P l a c e : Conference Room, DPWH Building  
Attendance : Attached Annex-I

In connection with the Implementing Arrangement of THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT IN METRO MANILA, the following major issues were discussed between JICA Survey Team and DPWH;

1. JICA Survey Team proposed that the study area covers the Metro Manila area (636 km<sup>2</sup>) and comprehensive flood mitigation measures consist of structural and non-structural ones are to be studied in the Master Plan Phase.

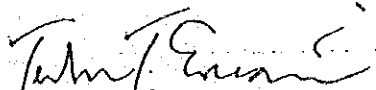
JICA Survey Team also explained that the Parañaque Spillway project and dams at upstream of the Marikina watershed shall be studied on the basis of hydrological aspect only without hydraulic designs. DPWH agreed to the JICA proposal and explanations.

2. For the hydrological observation, JICA Survey Team pointed out the necessity of establishing nine (9) stations for hourly rainfall gauge, twelve (12) stations for water level gauge and five (5) stations for flood discharge observation.

In case the existing facilities are not available, JICA will provide the hydro-meteorological equipment such as automatic rainfall gauge, water level staff gauge or automatic recorder. DPWH shall bear the necessary expenses for installations. JICA Survey Team requested flood level markings along the rivers and in flood prone areas of major floods in 1987, and hourly water level observation at the existing pumping stations.

3. JICA Survey Team requested the DPWH that the longitudinal profiles and cross-sections survey of river channels and canals in the study area will be done by DPWH before the next flood season in 1988. The extent of the survey are shown in Figure-1. DPWH agreed to undertake the said survey.
4. DPWH requested the necessary survey equipment listed in Table-1, as well as one (1) micro-computer for hydrological and hydraulic analysis.
5. For the effective implementation of appropriate measures especially of non-structure measures, JICA Survey Team pointed out the necessity of setting up the Steering Committee for coordination among the agencies concerned which covers the authorities of city planning, sewerage, housing, road construction, garbage collection and others. DPWH agreed to create the Steering Committee as soon as possible.
6. DPWH explained that at least four (4) vehicles for study shall be provided, however, additional four-wheel drive type vehicles are necessary for survey during flood periods. DPWH requested two (2) such type of vehicles to be provided by JICA.

7. Use of 1:10,000 Topographical Map which was prepared by BCGS recently will be arranged for the study by DPWH before the arrival of the Study Team.
8. JICA Survey Team requested DPWH for the provision of an adequately equipped office. DPWH agreed on the matter.
9. In reference to technology transfer, DPWH requested JICA to receive participants for technical training in Japan during the course of the study.
10. JICA Survey Team answered that all the request of DPWH will be presented to JICA and discussed for consideration.



TEODORO T. ENCARNACION  
Undersecretary  
Department of Public Works and  
Highways (DPWH)



YOICHI TAKEUCHI  
Leader of the Preliminary  
Survey Team  
Japan International Cooperation  
Agency (JICA)

05. August 1987  
DPWH, Manila, Philippines

Fig. 1 Extent of Survey

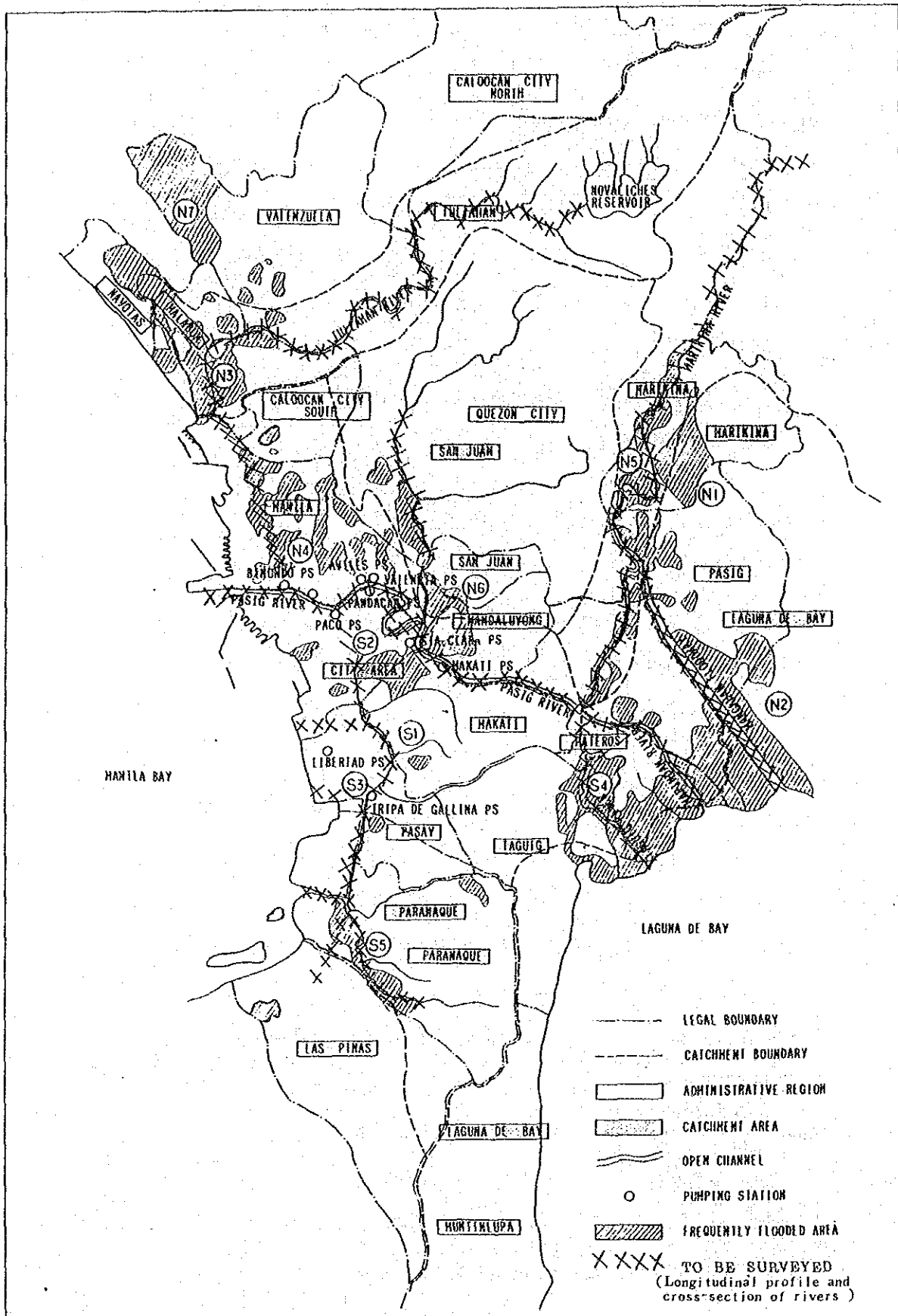


Table-1 List of Survey Equipment:

	<u>Nos.</u>
1. Transit with accessories	2
2. Automatic level with accessories	4
3. Plane Table with alidade	2
4. Echo Sounder	2
5. Current Meter with accessories	2
6. EDM Instrument, Range 2 km to 5 km. (Electronic Distance measuring complete with accessories)	2
7. Steel tapes, 50 m. and 100 m. long	4
8. Fiberglass (or nylon) tapes, 50 m. long.	6

*J*  
*S*

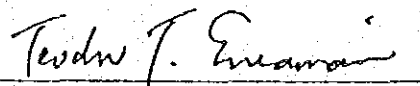
LIST OF ATTENDANCE


## I. Authorities Concerned - Philippine Side:

<u>N a m e</u>	<u>Designation</u>	<u>O f f i c e</u>
1. Teodoro T. Encarnacion	Undersecretary	DPWH
2. Manuel M. Bonoan	Asst. Secretary for Planning	DPWH
3. Antonio A. Alpasan	Project Manager IV	PMO-Major Flood Control Projects, DPWH
4. Rogelio A. Flores	Project Manager III	PMO-Major Flood Control Projects, DPWH
5. Nonito F. Fano	Chief Civil Engineer	Planning Division, NCR, DPWH
6. Jose C. Guanzon	Chief Civil Engineer	Project Evaluation Division Planning Service, DPWH
7. Pedro P. Terciño	Chief, Surveys and Investigation Div.	Bureau of Design, DPWH
8. Bienvenido C. Leuterio	Chief, Hydraulic Division	Bureau of Design, DPWH
9. Fernando Lagman	Project Manager V	Mangahan Floodway Project DPWH
10. Gonzalo Banuelos	Sup'g. Civil Engr. III	City Engineers Office Manila
11. Toshiki Kawakami	JICA Consultant	JICA/DPWH
12. Julian D. Centeno		Laguna Lake Development Authority (LLDA)
II. JICA Survey Team:		
1. Yoichi Takeuchi	Team Leader	MOC
2. Michio Kanda	Cooperation Planning	JICA
3. Dr. Katsuhide Yoshikawa	River Channel Planning	MOC
4. Naoya Matsumoto	Drainage of Inner Basin	MOC
5. Tomiaki Ito	Coordinator	JICA
III. JICA Philippines:		
1. Mr. Katsuhiko Ozawa		JICA

IMPLEMENTING ARRANGEMENT ON THE TECHNICAL COOPERATION  
BETWEEN THE JAPAN INTERNATIONAL COOPERATION AGENCY  
AND  
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS  
FOR  
THE STUDY ON FLOOD CONTROL AND DRAINAGE PROJECT  
IN METRO MANILA  
REPUBLIC OF THE PHILIPPINES

AGREED UPON BETWEEN  
JAPAN INTERNATIONAL COOPERATION AGENCY  
AND  
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

  
TEODORO T. ENCARNACION  
Undersecretary  
Department of Public  
Works and Highways  
(DPWH)

  
YOICHI TAKEUCHI  
Leader  
Preliminary Survey Team,  
Japan International  
Cooperation Agency (JICA)

August 5, 1987

## I. INTRODUCTION

In response to the request of the Government of the Republic of the Philippines (hereinafter referred to as "GOP"), the Government of Japan (hereinafter referred to as "GOJ") has decided to conduct the Study on Flood Control and Drainage Project in Metro Manila (hereinafter referred to as "the Study"), and exchanged the Note Verbales with GOP concerning the implementation of the Study.

The Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programmes of GOJ, will undertake the Study, in accordance with the relevant laws and regulations in force in Japan.

On the part of GOP, the Department of Public Works and Highways (hereinafter referred to as "DPWH") shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

The present document constitutes the Implementing Arrangement between JICA and DPWH under the above-mentioned Note Verbales exchanged between the two governments.

## II. OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To prepare the Flood Control and Drainage Master Plan in Metro Manila and to identify the priority areas.
2. To conduct the Feasibility Study on the Flood Control and Drainage Project in the aforementioned priority areas.



### III. STUDY AREA

1. The Study area for the Master Plan, shall cover Metro Manila which is approximately 636 km<sup>2</sup>.
2. The Project areas for the Feasibility Study will be selected from the result of the Master Plan Study.

### IV. SCOPE OF THE STUDY

In order to achieve the objectives mentioned above, the Study shall cover the following items:

1. Collection and review of existing data
  - (1) National and regional socio-economy
  - (2) Previous studies/plans related to flood control
  - (3) Topographical data and maps
  - (4) Meteorology and hydrology
  - (5) Soil and geological condition
  - (6) River condition
  - (7) Existing structures for flood control and drainage
  - (8) Present and future land use
  - (9) Past flood and their damages
  - (10) Urban development plans related to the Study
  - (11) Other related data and informations
2. Analysis
  - (1) Hydrological and hydraulic analysis
  - (2) Flood damage analysis
  - (3) Review of existing flood control plans
3. Formulation of Master Plan
  - (1) Formulation of Flood Control and Drainage Master Plan of the study area
  - (2) Identification of the priority areas
  - (3) Recommendation of urgent project

#### 4. Field Survey

- (1) Surveys on longitudinal profile and cross-section of rivers and channels
- (2) Topographic surveys and mapping covering the sites of major structures
- (3) Geological investigation for the sites of major structures

#### 5. Feasibility Study

- (1) Preliminary design
- (2) Operation and maintenance plan
- (3) Cost estimation and implementation schedule
- (4) Evaluation of the project
- (5) Social and environmental impact

#### V. THE STUDY SCHEDULE

The Study will be executed in accordance with the attached Tentative Schedule.

#### VI. REPORTS

JICA will prepare and submit the following reports in English to GOP:

##### 1. Inception Report

Thirty (30) copies at the commencement of the field survey

##### 2. Progress Report I

Thirty (30) copies within five (5) months after commencement of the Study

3. Interim Report  
Thirty (30) copies within eleven (11) months after commencement of the Study
4. Progress Report II  
Thirty (30) copies within seventeen (17) months after commencement of the Study
5. Draft Final Report  
Thirty (30) copies within twenty-one (21) months after commencement of Study.  
GOP will provide JICA with its comments within one (1) month after receipt of the Draft Final Report.
6. Final Report  
Fifty (50) copies each within two (2) months after JICA's receipt of the said comments on the Draft Final Report.

#### VII. UNDERTAKINGS OF GOP

In accordance with the Note Verbales exchanged between GOJ and GOP, GOP shall accord privileges, immunities and other benefits to the Japanese Study Team and, through the authorities concerned, take necessary measures to facilitate the smooth conduct of the Study.

1. a) GOP shall be responsible for dealing with claims which may be brought by the third parties against the members of the Japanese Study Team and shall hold them harmless in respect of claims or liabilities arising in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims or liabilities arise from gross negligence or willful misconduct of the above-mentioned members.

b) GOP shall secure the safety of the Study Team during the implementation of the Study.

2. DPWH shall, at its own expense, provide the Japanese Study Team with the following, if necessary, in cooperation with other agencies concerned:

- a) Available data and information related to the Study,
- b) Counterpart personnel and support staff necessary for the Study,
- c) Suitable office space in Metro Manila,
- d) Credentials or identification cards to the members of the Japanese Study Team,
- e) Four (4) vehicles with drivers,
- f) Hydrological observations, surveys on longitudinal profile and cross-section of rivers and channels, and topographic surveys and mapping covering the sites of major structures.

3. DPWH shall make necessary arrangements with other governmental and non-governmental organizations concerned for the following:

- a) To secure the safety of the Japanese Study Team,
- b) To permit the member of the Japanese Study Team to enter, leave and sojourn in the Philippines for the duration of their assignment therein,
- c) To exempt the members of the Japanese Study Team from taxes, duties, fees and other charges on equipment, machinery and other materials brought into the Philippines for the conduct of the Study,
- d) To exempt the members of the Japanese Study Team from income tax and charges of any kind imposed on or in connection with any emolument or allowance paid to the members of Japanese Study Team for their services in connection with the implementation of the Study,
- e) To provide necessary facilities to the Japanese Study Team for remittance as well as utilization of the funds introduced into the Philippines from Japan in connection with the implementation of the Study,
- f) To secure permission for entry into private properties or other areas for the conduct of the Study,

- g) To secure permission to take all data and documents (including aerial photographs) related to the Study out of Philippines to Japan by the Japanese Study Team,
- h) To provide medical services as needed and its expenses will be chargeable on the members of the Japanese Study Team.

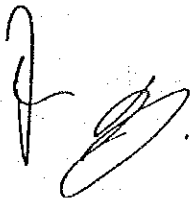
#### VIII. UNDERTAKINGS OF GOJ

In accordance with the Note Verbales exchanged between GOJ and GOP, GOJ, through JICA, shall take the following measures for the implementation of the Study.

- 1. To dispatch, at its own expense, the Study Team to the Philippines
- 2. To pursue technology transfer to the Philippine counterpart personnel in the course of the Study.

#### IX. CONSULTATION

JICA and DPWH shall consult with each other in respect of any matter that may arise from or in connection with the Study.



TENTATIVE SCHEDULE

ITEM	MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
STUDY IN PHILIPPINE	IC/R																								
	IT/R																								
STUDY IN JAPAN	IC/R																								
	IT/R																								
REPORT	IC/R																								
	IT/R																								
	P/R(1)																								
	P/R(2)																								
	DF/R																								
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(REMARKS) IC/R : Inception Report P/R(1),(2) : Progress Report (1),(2)  
 IT/R : Interim Report DF/R : Draft Final Report  
 © : Comment F/R : Final Report