3.3.2 Operation Plan

The following considerations on making operation plan of the Project have been summarized after detailed site survey conducted by the Basic Design Study Team, several discussions with relevant agencies and review of overall reconstruction/rehabilitation plan made by the Task Force:

1. Main objective of the Project is to secure the transportation method such as road and bridges so as to assure fundamental living of the people and distribution of goods.

2. As small scale eruption is still on-going, full investigation cannot be made and, therefore, full scale of damages cannot be grasped. Further damage may be occur from future lahar, and mudflow, etc.

3. Therefore, it is required to promptly restore and rehabilitate the presently damaged facilities, to minimize off-traffic period as much as possible, and to prepare for future damage.

4. The main areas to be restored and rehabilitated are almost same with those planned by the Task Force.

The areas to be restored and rehabilitated are shown in Figure 3.3-1 and Table 3.3-3 for 9 (nine) river systems radiating from Mt. Pinatubo and with type of disaster.

Through the above considerations and technical views, rehabilitation works suitable to the condition of each river system, as shown in Table 3.3-4, are proposed in line with type of disasters. The detailed scheme of each rehabilitation work is also presented in Figure 3.3-2 (1/6)-(6/6).

Subservient number of equipment necessary to implement rehabilitation projects in the damaged areas presented in Figure 3.3-1 can be estimated as listed in Table 3.3-5, based on individual site conditions reconnoitered.

Table 3.3-3 TYPE OF DAMAGE FOR RIVER SYSTEM

Damage \ River	O'Donnel	Bamban	Abacan	Pasig-Potrero	Gumain-Porlac	Sto. Tomas	Maloma	Capangan	Bucao
(A1) Accumulation of Ash Fall on Road Surface									
Urban Roads		0		0	0				
Rural Roads		0				0			
(A2) Accumulation of Ash Fall inside Drainage System									
Urban Roads		0		0	0				
Rural Roads		0		0	0	0			
(R1) Mud Flow on Road					0	0	0		
(R2) Road Cut due to Overflow				0			0		
(R3) Scouring of Embankment			0						
(W1/W3) Scouring of Riverbed / Cut of River Bank									
B1: Tilting of Substructure			0						
B2: Collapse of Bridge			0						
B3: Scouring / Cut of Bridge Approach									
(W2/W3) Sediment of Riverbed / Cut of River Bank									
B1: Flooded to Superstructure	0	0		0	0	0	0	0	0
B3: Scouring / Cut of Bridge Approach		0		0					
(W1/W2/W3) Partial Scouring / Sediment of Riverbed / Cut of River Bank									
B1: Tilting of Superstructure / Flooded to Superstructure			0						
B2: Collapse of Bridge			0						
B3: Scouring / Cut of Bridge Approach									

Table 3.3-4 RELATION BETWEEN TYPE OF DAMAGE AND REHABILITATION METHOD

Type of Damage	Rehabilitation Method
A1: Accumulation of Ash Fall on Road Surface	Clearing / Rehabilitation of Urban Roads
	Clearing Rehabilitation of Rural Roads
A2: Accumulation of Ash Fall inside Drainage System	Drainage Clearing / Rehabilitation of Urban Roads
	Drainage Clearing / Rehabilitation of Rural Roads
W1/W3: Scouring of Riverbed / Cut of River Bank	Riverbed Consolidation by Gabion
	Slope Protection by Gabion
W2/W3: Sediment of Riverbed / Cut of River Bank	Protection by Sheet Pile
W1/W2/W3: Partial Scouring / Sediment of Riverbed / Cut of River Bank	Temporary Bridge
	Riverbed Excavation around Bridge [Case 1]
R1: Mud Flow on Road	Riverbed Excavation around Bridge [Case 2]
R2: Road Cut due to Overflow	Protection against Overflow
R3: Scouring of Embankment (Mud Flow: Vertical on Road)	Protection against Scouring by Gabion
	Riverbed Widening
R3: Scouring of Embankment (Mud Flow: Parallel with Road)	Spur Dike

Table 3.3-5 REQUESTED EQUIPMENT BY SITE

River	O'Donnel	Bamban	Abacan	Pasig-Potrero	Gumain-Porlac	Sto. Tomas	Maloma	Capangan	Bucao	Total
1.Earth Moving Equipment Bulldozer	19	26	26	26	26	21	16	16	26	202
Swamp Bulldozer	1	2	2	2	2	1	1	1	1	13
Towed Scraper	3	3	3	3	3	3	3	-	3	24
2.Earth Excavator										
Wheel Loader	-	1	1	1	1	-	-	-	-	4
Hydraulic Excavator	2	8	8	8	8	7	7	6	7	61
3.Material/Equipment Transportation										
Truck Mounted Crane	1	1	2	2	2	1	1	1	1	12
4. Other										
Gabion Fabrication Machine	Necessary	Necessary	Necessary	Necessary	Necessary	Necessary	Necessary	Necessary	Necessary	Necessary
Jack Hammer	-	1	1	1	1	-	-	-	-	4
Deasel Hammer	-	1	1	1	1	-	-	-	-	4
Mighty Mite	1	1	2	2	2	1	1	1	1	12
Sewer Vacuum	-	1	1	1	1	-	-	-	-	4
Vibro Roller	4	4	4	4	4	-	-	-	-	20
Dump Truck	10	38	38	38	38	35	30	30	30	287
TOTAL	41	87	89	89	89	69	56	58	69	648

3.3.3 Outline of Equipment

Table 3.3-6 shows the type and number of proposed equipment, listed in the Minutes of Discussions signed on October 7, 1991.

Table 3.3-6 LIST OF PROPOSED EQUIPMENT (TENTATIVE)

TYPE OF EQUIPMENT	SPECIFICATION	QUANTITY
1. Earth Moving Equipment		
1.1 Crawler Tractor (Bulldozer)	210 HP	10
1.2 Crawler Tractor (Swamp Bulldozer)	210 HP	9
1.3 Towed Scraper	9.1 cu.m.	10
2. Earth Excavator		
2.1 Hydraulic Excavator	120 HP Cap. 0.7 cu.m. Ground Pressure/ Track Length 0.3 kg/ cm^2/4,400 mm	10
3. Material/Equipment Transportation		
3.1 Truck Mounted Crane	Cap. 25 tons	8
4. Other		
4.1 Gabion Fabrication Machine	With Wire	1
4.2 Jack Hammer	Self Contained	4
4.3 Diesel Hammer	2.9 t	4
4.4 Mighty Mite (Equiv.) Multi Purpose Maint.	3.5 t	7
4.5 Sewer Vacuum	Airflow 18 cu.m./min.	2
5. Spare Parts		15%
Total Number of Equipment		65

3.3.4 Management Plan

(1) Method of Equipment Management

As mentioned in Section 3.3.1, Government of the Philippines will provide engineers and facilities for management and maintenance of the equipment. Presently, DPWH asks most of maintenance work to the private enterprises except daily maintenance work. When the proposed equipment in the Project is provided, it is necessary to improve effectively efficiency of management and maintenance of the equipment as much as possible in order to promote urgent rehabilitation work smoothly. For this purpose, technical guidance and advice by expert who will confirm total work flow and observe the key points mentioned below in management and maintenance.

Construction equipment management is divided into equipment operation management and equipment maintenance management. The method (key point) of each management is briefly summarized below.

i) Principle of equipment management
The points of equipment management to carry out the rational construction are;

- To arrange only the necessary equipment to the construction site.
- To increase the equipment work hour and the equipment efficiency.
- To conduct the equipment management by functional system.
- To operate the equipment in its proper operating condition.
- To secure the skilled operators and foremans through intentional training.
- To develop mechanized construction practice.

ii) Operation management
It is necessary to review the following items to improve the equipment work hour and its efficiency.

- To establish the efficient equipment operation plan.

- To prevent the equipment problems by planned maintenance and proper repair.
- To secure the skilled operators.
- To select the proper equipment suitable for scope of work and site conditions.
- To conduct the proper operation and construction practice.

iii) Maintenance and management

It is necessary to observe the following items, including the inspection and oil supply, during operation to keep the equipment in proper operational condition.

- Daily inspection:
  The inspection before and after daily work by operator.
- Weekly and monthly inspection:
  The periodical inspection at equipment regular running hours by export.
- Overhaul:
  The regular periodic examination by expert.

(2) Guidance for Equipment Operation and Maintenance

Recent construction equipment have been incorporating hydraulic and electro-mechanic operating devices. The technical guidance for use of these equipment will be required.

(3) Equipment Operation and Maintenance Costs

Rough operation and maintenance costs of proposed equipment can be estimated as shown below:

	(per year)
Rough operation cost	10.9 million Pesos
Rough maintenance cost	11.9 million Pesos
Total	22.8 million Pesos

Above cost is estimated in standard use and standard life of the equipment (3-8 years depend on the type). Appendix-12 shows breakdown of the cost.

The management and maintenance cost for the equipment to be provided in the Project will be covered in the budget (1,568.64

M.P.) of the Region II construction office. Cost for the management and maintenance is roughly estimated 22.8 M.P., which falls to 1.5 % of the total budget.

3.4 TECHNICAL GUIDANCE

As described in Clause 3.2.5, the dispatch of equipment based construction expert and mechanical engineer, who will give the advice and guidance to the responsible persons in charge of this Project from the Government of the Philippines, is considered to be indispensable to execute the Project effectively and obtain the fruitful results.

The restore and rehabilitation program by the Task Force is divided into nine (9) areas, all of which are required to implement promptly. For this purpose, equipment based construction expert and mechanical engineer are required for giving technical guidance on urgent rehabilitation program, actual operation, and equipment distribution and operation plan in consideration of feature of machine, contents of construction, scale of construction and other conditions.

The technical guidance includes;

Guidance for rehabilitation program

- Confirmation of area to be rehabilitated
- Priority by urgency of area to be rehabilitated
- Planning of urgent rehabilitation method
- Formulation of construction plan for urgent rehabilitation
- Planning of effective equipment placement and operation as well as procurement method of materials, in conformity with rehabilitation method.
- Formulation of equipment management and maintenance plan

Guidance rehabilitation work

1. Implementation of urgent rehabilitation work
2. Proper placement and effective use of the equipment
3. Proper operation of the equipment
4. Effective management and maintenance of the equipment

CHAPTER 4

BASIC DESIGN

CHAPTER 4

BASIC DESIGN

4.1 DESIGN PRINCIPLES

In preparing this project, selection of optimal road constructing machinery and rational calculation of the necessary units of such machinery are the vital requirements. Based on this viewpoint, the following principles are to be observed as basic guidelines for the purpose:

- Selection of the equipment suitable for construction work purposes and conditions.
- Selection of the equipment that meets the role of DPWH and necessary functions/effects.
- Selection of the equipment in conformity with the implementation schedule.

4.2 STUDY OF DESIGN CONDITIONS

The final choice of the optimal models from among the optimal machinery group was implemented through consultations with the Philippine officials concerned.

- Models that allow smooth parts replacement and that are readily available.
- Models with composite functions that are applicable to diversified purposes.
- The machinery considered to be in shortage even when considering the machinery owned by local private enterprises.

The main machinery items of the models finally selected are shown in Section 4.3.2. The method of indicating these items is in accordance with that adopted in the Japan Construction machinery Guide (edited and published by the Japan Construction machinery Association, 1989).

4.3 BASIC PLAN

4.3.1 Selection of Models

Selection of equipment model was decided in view of field investigation, desires of each concerned construction offices of DPWH and consultation with DPWH, reviewing each schedule of urgent rehabilitation work. The selected models are as follows;

1.	Earth Moving Equipment	
1.1	Crawler Tractor (Bulldozer)	210 HP
1.2	Crawler Tractor (Swamp Bulldozer)	210 HP
1.3	Towed Scraper	9.1 CuM
2.	Earth Excavator	
2.1	Hydraulic Excavator(long track)	120 HP
3.	Material/Equipment Transportation	
3.1	Truck Mounted Cranes	25 TONS
4.	Others	
4.1	Gabion Fabrication Machine	With Wire
4.2	Jack Hammer	Self Contained
4.3	Diesel Hammer	2.9 t
4.4	Mighty Mite (Equiv.) Multi Purpose Maint.	3.5 t
4.5	Sewer Vacuum	1.8 cu.m./min.

4.3.2 Work Flow

In addition to the confirmation and evaluation of objective, contents, budget, organization, etc. of the project as main study item, it is important in the technical field, to decide selection of equipment type and proper number of each unit, in the basic design.

The study flow to select proper type and number of equipment of other main study items is as follows;

Work 1 : Confirmation of the rehabilitation method Selection of equipment type.

Work 2 : Confirmation of number of operationable equipment in the Philippines Decision of necessary number of equipment.

Work 3 : Confirmation of number of necessary equipment for rehabilitation work and study of necessity and urgency of each unit.

4.3.3 Confirmation of the Rehabilitation Work

- Selection of equipment type

For the selection of suitable type of the equipment, details of the rehabilitation work is studied and confirmed, and the purpose of utilization and specification shall be confirmed. So, a study on the following items were conducted;

- Damage condition
- Type of damage
- Work item and detail of rehabilitation method
- Work item and detail of rehabilitation work
- Technical specification of the equipment

4.3.4 Decision of Necessary Number of the Equipment

In order to decide the number of equipment, volume of rehabilitation work has to be confirmed. However, it is difficult to seize exact total volume as the eruption is still on-going. Accordingly, the Study Team has conducted a field investigation and decided, in consultation with DPWH, necessary number for rehabilitation to cover area presently damaged. Then, the number of operational equipment owned by the Philippines is reducted and the remained equipment is analyzed one by one in view of necessity and urgency. The necessity and urgency of the equipment are evaluated on such items as number of shortage, necessity in rehabilitation method, possibility of charter from private and so on.

The results of above evaluation, in consideration of scale of the Project on Japan side, of each equipment are summarized in Table 4.3-1.

Table 4.3-1 TYPE AND NUMBER OF REQUIRED EQUIPMENT

Type of Equipment	Usable Equipment	Estimated Equipment	Shortage Equipment	Requested Equipment	Necessity	Proposed Equipment	Description
1. Earth Moving Equipment							
Bulldozer	180	206	-26	20	◎	10	Necessary but insufficient.
Swamp Bulldozer	3	13	-10	5	◎	9	Greater demand estimated but insufficient.
Towed Scraper					◎	10	Not requested but judged necessary after survey.
Motor Grader	11	13	-2	14	△		Adaptable by usable equipment.
Wheel Bulldozer	0	1	-1		×		Substituted.
2. Earth Excavator							
Hydraulic Excavator	19	39	-20	10	◎	10	Necessary but insufficient.
Wheel Loader	43	51	-8	10	○		Estimated less demand.
Back Hoe on Barge	1	1	0		×		
Predger Machine(8"s.p.)	8	8	0		×		
Amphi Dredge	1	1	0		×		
3. Material/Equipment Transportation							
Truck Mounted Crane	0	8	-8	2	○	8	Greater demand estimated but insufficient.
Crane on Barge	4	4	0		×		
4. Other							
Gabion Fabrication Machine						1	Not requested but judged necessary after survey.
Jack Hammer	0	11	-11	15	◎	4	Necessary but insufficient.
Deasel Hammer	0	17	-17	12	◎	4	Necessary but insufficient.
Mighty Mite	0	15	-15	20	◎	7	Necessary but insufficient.
Sewer Vacuum	0	2	-2	2	◎	2	Necessary but insufficient.
Water Jet Cleaning Tank	0	7	-7	8	○		Substituted by Sewer Vacuum.
Street Sweeper	0	7	-7	7	×		Unusable for ash clearing.
Water Tank(5000 liters)	0	2	-2	10	○		Procurable locally.
Vibro Roller	0	16	-16	15	○		Insufficient but used in short term. Procurable locally.
Mobile Shop	2	7	-5		○		Repairable in local service shops.
Fork Lift	6	8	-2		△		Substituted by usable procurement.
Dump Truck	130	130	0	20	○		Procurable locally.
Stake Truck	0	51	-51	5	○		Insufficient but procurable locally.
Truck Tracker with Trailer	3	6	-3		○		Procurable locally.
Service Vehicle	4	62	-58		×		Insufficient but procurable locally.
Total	415	686	-271	175		65	

4.3.5 Specifications of Proposed Equipment

The types and standard specifications for the equipment were proposed based on the study results reported in Section 4.1 and 4.2 and through discussions by the JICA Study Team and the representatives from DPWH.

The standard specifications for the finally proposed equipment are listed in Table 4.3-2. The specifications were applied from JAPAN'S CONSTRUCTION EQUIPMENT SPECIFICATION BOOK 1989, Japan Mechanized Construction Association.

Table 4.3-2 STANDARD SPECIFICATIONS FOR PROPOSED GRANT AID EQUIPMENT (1/2)

1. EARTH MOVING EQUIPMENT									2. EARTH EXCAVATOR			3. MATERIAL/EQUIPMENT TRANSPORTATION		
1.1 CRAWLER TRACTOR (BULLDOZER) 210 HP			1.2 CRAWLER TRACTOR (SWAMP BULLDOZER) 210 HP			1.3 TOWED SCRAPER 9.1M^3			2.1 Earth Excavator 120 HP 0.7m^3 G/P=0.3kg/cm^2 T/L=4400mm			3.1 TRUCK MOUNTED CRANE 25 ton		
FLYWHEEL HORSE POWER	HP	Not less than 210	FLYWHEEL HORSE POWER	HP	Not less than 210	OPERATING WEIGHT	kg	More than 8,200	FLYWHEEL HORSE POWER	HP	Not less than 118	FLYWHEEL HORSE POWER	HP	More than 280
OPERATING WEIGHT	kg	Not less than 23,000	OPERATING WEIGHT	kg	Not less than 25,000	BOWL CAPACITY ·Struck volume	m^3	More than 6.6	OPERATING WEIGHT	kg	Not less than 19,000	OPERATING WEIGHT	kg	More than 27,500
PERFORMANCE ·Travel speed ··Forward	km/h	(1st) Not less than 3.7 (3rd) Not less than 11.7	PERFORMANCE ·Travel speed ··Forward	km/h	(1st) Not less than 3.4 (3rd) Not less than 10.5	·Heaped volume	m^3	More than 9.1	BUCKET CAPACITY	m^3	Not less than 0.8	Crane Spec. ·Max.lifting capacity	kg	More than 25,000
··Reverse	km/h	(1st) Not less than 4.8 (3rd) Not less than 14.3	··Reverse	km/h	(1st) Not less than 4.6 (3rd) Not less than 13.2	DIMENSIONS ·Overall length	mm	Less than 9,300	PERFORMANCE ·Swing speed	rpm	Not less than 10.0	·Max.boom length	mm	More than 31,500
BULLDOZER EQUIPMENT ·Blade capacity (SAE)	m^3	Not less than 4.6	BULLDOZER EQUIPMENT ·Blade capacity (SAE)	m^3	Not less than 5.8	·Overall width	mm	Less than 2,950	·Max. travel	km/h	Not less than 3.0	·Max.lifting height		
·Max. lift above ground	mm	Not less than 1,140	·Max. lift above ground	mm	Not less than 1,160	·Overall height	mm	Less than 2,900	·Arm crowed	kg	Not less than 8,300	··With main boom	mm	More than 31,500
·Max. drop below ground	mm	Not less than 520	·Max. drop below ground	mm	Not less than 535	·Ground clearance	mm	More than 420	·Bucked digging force	kg	Not less than 10,000	··With jib	mm	More than 45,000
DIMENSIONS ·Overall length	mm	Not less than 5,500	DIMENSIONS ·Over length	mm	Not less than 5,800	·Over hang ··Front	mm	More than 2,350	WORKING RANGE ·Max. digging height	mm	Not less than 9,000	DIMENSIONS ·Overall length	mm	Less than 12,600
·Overall width (less blade and trunnion)	mm	Not more than 2,680	·Over width (less blade and trunnion)	mm	Not more than 3,150	··Rear	mm	More than 1,500	·Max. dumping height	mm	Not less than 6,450	·Overall width	mm	Less than 2,500
·Overall height	mm	Not more than 3,500	·Over height	mm	Not more than 3,530	·Wheel base	mm	More than 5,300	·Max. vertical wall digging depth	mm	Not less than 5,900	·Overall height	mm	Less than 3,400
·Ground clearance	mm	Not more than 400	·Ground clearance	mm	Not less than 480	·Dolly tire tread	mm	More than 1,600	·Max. digging reach at ground level	mm	Not less than 9,850	·Outriggers use ··Front	mm	More than 6,100
·Track gauge	mm	Not less than 1,980	·Track gauge	mm	Not less than 2,230	·Rear tire tread	mm	More than 1,500				··Rear	mm	More than 6,100
·Length of track on ground	mm	Not less than 2,840	·Length of track on ground	mm	Not less than 3,180	MAX. DEPTH OF CUT	mm	More than 300						
ENGINE ·Type		Direct injection turbocharged	ENGINE ·Type		Direct injection turbocharged	MAX. APR ON OPENING	mm	More than 1,500						
·Piston displacement	ltr	Not less than 10.0	·Piston displacement		Not less than 10.0	INSIDE BOWL DIMENSIONS ·Over height	mm	More than 1,300	DIMENSIONS ·Overall length	mm	Not less than 9,300			
POWER TRAIN ·Torque converter, Damper of Main clutch ·Transmission ·Brake ·Final drive		Single stage T/C Planetary Wet Spur gear or planetary gear	·Torque converter, Damper of Main clutch ·Transmission ·Brake ·Final drive		Single stage T/C Planetary Wet Spur gear or planetary gear	·Over length	mm	More than 1,200	·Overall width	mm	Not more than 3,200			
						·Over width	mm	More than 2,400	·Overall height	mm	Not more than 3,000			
									·Ground clearance	mm	Not less than 430			
									·Tail swing radius	mm	Not more than 2,750			
									·Track length	mm	Not less than 4,350			
									·Track gauge	mm	Not less than 2,350			
									ENGINE ·Type		Direct injection turbo-charged			
									·Piston displacement	ltr	Not less than 4.8			
UNDERCARRIAGE ·No. of rollers (carrier / track)		0/7 - 2/7	·No. of rollers (carrier / track)		0/7 - 2/8				HYDRAULIC SYSTEM ·Hydraulic pump		Variable capacity pump x 2			
·Ground pressure	kg/cm^2	Not more than 0.8	·Ground pressure	kg/cm^2	Not more than 0.45				·Max flow (excl.sub-pump)		Not less than 350			
·Max. width shoes	mm	Not less than 660	·Max. width shoes	mm	Not less than 910									
·Track seals		Sealed track or Lubricated track	·Track seals		Sealed track or Lubricated track				TRACK SHOES ·Type		Triple-grouser			
									·Shoes width	mm	Not less than 800			
									·Ground pressure	kg/cm^2	Not more than 3.5			
SPEC. CONDITIONS		·Straight-tiltdozer ·Steel canopy ·Rigid drawbar ·Possibility towed scraper	SPEC. CONDITIONS		·Straight-tiltdozer ·Steel canopy ·Rigid drawbar ·Possibility towed scraper				SPEC. CONDITIONS		·Triple-grouser shoes ·Light duty bucket ·Less than 1,800 mm arm			

Table 4.3- 2 STANDARD SPECIFICATIONS FOR GRANT AID EQUIPMENT (2/2)

4. OTHER

4.1 GABION FABRICATION MACHINE

Item	Unit	Specification
1. Automatic Diagonal Wire Net Fabrication Machine		
·Wire net size	mm	1000 - 8000
·Diameter of wire	mm	3.2 - 5
·Mesh size	mm	75 - 150
·Revolutions per minute	rpm	130 - 530
·Motor	kw x No.	5.5 x 1 0.4 x 1 0.75 x 1 0.06 x 1
·Machine size	mm	2320 x 10930 x 1720
·Weight	kg	6500
·Capacity		340 m^2/hr
2. Automatic Ring Fabrication Machine		
·Motor	kw	0.75 x 1
·Size	mm	1800 x 750 x 1000
3. Wire Net Roll Machine (for Cylindrical Gabion)		
·Motor	kw	0.75 x 1
·Size	mm	1100 x 1000 x 1070
4. Semi-Auto Diagonal Wire Net Fabrication Machine		
·Motor	kw	2.2 x 1 0.06 x 1
·Size	mm	1300 x 850 x 1300
5. Automatic Mat Frame Fabrication Machine		
·Size	mm	1300 x 850 x 1300
6. Frame Joint Machine		
·Size	mm	1300 x 850 x 1300
7. Wire Net Roll Machine (for Mat Gabion)		
·Size	mm	1100 x 1000 x 1070
8. Wire Cutting Machine		
·Motor	kw	1.5 x 1
·Size	mm	1440 x 950 x 1550
9. Wire Expanding Machine		
·Motor	km	5.5 x 1
·Size	mm	1500 x 700 x 1600

4.2 JACK HAMMER

Item	Unit	Specification
Operating Weight	kg	More than 25
Overall Length	mm	More than 4,600
Digging Depth	mm	More than 10,000
Dorring Angre	deg	360
Model of Shank	mm	22 x 83:L
Digging Speed	mm/min	More than 450
Engine ·Cycle		2
·Piston displacement	ltr	More than 280
·Ignition system		Flywheel-magnet
·Starting system		Recoil start
Attachment		Rad ___m Bit ___m

4.3 DIESEL HAMMER 2.9 ton

Item	Unit	Specification
Operating Weight	kg	More than 5,200
Dimensions ·Overall length	mm	More than 4,600
·Overall width	mm	More than 600
·Overall interior	mm	More than 800
Raw Weight	kg	More than 2,500
Number of Blows	blow/min	39 - 60
Max.Energy at one Blow	tfn	More than 7.5
Fuel Consumption	ltr/h	Less than 1.4
Oil Consumption	ltr/h	Less than 1.5
Colling Style		Water cooled

4.4 MIGHTY MITE (Equire) MULTI PURPOSE MAINT

Item	Unit	Specification
Flywheel Horse Power	HP	More than 4.0
Performance ·Travel speed		
··Forward	km/h	3.5 - 12.0
··Reverse	km/h	4.7 - 14.5
·Min. turning radius	mm	Less than 7,000
Dimensions ·Wheelbase	mm	Less than 2,200
·Tread ··Front	mm	Less than 1,400
··Rear	mm	Less than 1,400
·Ground clearance	mm	More than 190
·As LOADER ··Overall length	mm	Less than 5,100
··Overall width	mm	Less than 1,700
··Overall height	mm	Less than 2,450
··Bucket capacity	m^3	Less than 0.3
·As ROLLER ··Overall length	mm	Less than 4,800
··Overall width	mm	Less than 1,700
··Overall height	mm	Less than 2,450
··Roll size (width x dia)	mm	More than 1,220 x 760
·As DUMP TRUCK ··Dump vessel length	mm	More than 1,200
··Dump vessel width	mm	More than 1,500
··Dump vessel depth	mm	More than 550
··Dumping angle	deg	50
·As DOZER ··Overall length	mm	Less than 5,000
··Overall width	mm	Less than 1,700
··Overall height	mm	Less than 2,450
··Blade (width x height)	mm	1,500 More than 1,650 x 505
Power Line Brake System		4-wheel drive
·Service brake	mm	Hydraulic expanding she type
·Parking brake	mm	Hydraulic expanding she type
Attachment		Lodder, Roller Dump, Dozer

4.5 SEWER VACUUM 18 m^3/min

Item	Unit	Specification
Operating Weight	kg	More than 5,100
Flywheel Horse Power	HP	More than 55
Dimensions ·Overall length	mm	Less than 6,800
·Overall width	mm	Less than 2,250
·Overall height	mm	Less than 2,700
Suction Type		Screw Blower
·Air flow	m^3/min	Less than 35
·Vacuum pressure setting	mmHg	More than -700

4.4 WORK IMPLEMENTATION PLAN

4.4.1 Work Implementation Principles

This project will be implemented as one of Japan's grant cooperation projects. As such, the executing agency of this project is the Philippine Government.

"Notes of Exchanges" will be concluded in this regard between the governments of the two countries, and the grant cooperation by Japan will be executed with the basic points of agreement observed.

The executing agency on the side of the Philippine Government is DPWH. The details of the executing agency and the maintenance and management setup are as described in Section 4.3.

In the enforcement of this project, the Japanese side shall bear the cost for the manufacture of the disaster-restoration equipment, its marine transportation to the import port in the Philippines, and related consultant services.

The Philippine side shall bear the cost for the surface transport of the disaster-restoration equipment from the port of import to the center that supervises the disaster-restoration work. It shall also be responsible for the subsequent operation, maintenance, and management of the equipment.

4.4.2 Construction Work Supervisory Plan

In supervising the construction work for this project, appropriate and effective supervision will be enforced in accordance with adequate consultations with the Philippine side. Primary precautions in the supervisory process are as shown below:

(1) Prior to the delivery of equipment and materials, their suppliers will be asked to submit an execution plan. Its contents will be sufficiently studied, and the propriety of the schedule, the procurement plan, and the equipment and material specifications will be judged on that basis.

(2) Before the shipment of the equipment, a study will be made in Japan as to whether or not their specifications, contents, volume, etc., meet the design requirements.

(3) Concerning the delivery and handing over of the equipment, confirmation will be made as to whether or not the suppliers appropriately conduct operational guidance and whether or not they provide proper guidance regarding the operation, maintenance, and management of the equipment.

(4) In order to smoothly enforce the construction work, close contacts will be maintained with the Philippine side, consultants, and the suppliers, and sufficient consultations will be carried out with them.

(5) For effective utilization of equipment, technical guidance on management and maintenance, utilization method by rehabilitation methods and project site effective placement and so on will be made.

4.4.3 Procurement Plan

The disaster-restoration equipment shall be procured in Japan, because of the unavailability of such equipment in the Philippines and in consideration with the reliability in equipment manufacture, the easiness in future repair and maintenance services, and the time schedule for this case of grant cooperation.

4.4.4 Implementation Schedule

Implementation of the Project is divided into three stages ie., detailed design, procurement (tendering, manufacturing and transportation) and technical guidance. With regard to the procurement, manufacturing period is different depend on the type of equipment. Therefore, shipment of the equipment will be made three time.

The period required for detailed design, procurement and technical guidance on equipment operation are estimated as five (5) months, seven (7) months and eight (8) months, respectively. The proposed implementation schedule is shown in Table 4.4-1.

Table 4.4-1 PROJECT IMPLEMENTATION SCHEDULE

	1	2	3	4	5	6	7	8	9	10	11	12	13
Detailed Design	(5 months)												
Equipment Procurement and Supervisory	Manufacture of Equipment (7 months)						Export						
						Training on Equipment Operation/Maintenance (8 months)							

(1) Detailed Design

After signing of the Exchange of Notes between the Government of Japan and the Government of the Republic of the Philippines, the detailed design related to providing equipment shall be executed by a Japanese consulting firm. The detailed design works include the followings;

- Preparation of equipment specifications.
- Cost estimation.
- Preparation of tender and contract documents.
- Preparation of operation manual.
- Preparation of management and maintenance manual.
- Guidance for formulation of operation plan by area and rehabilitation method.
- Guidance for formulation of equipment placement plan by area and rehabilitation method.
- Guidance for formulation of a plan for rehabilitation method in view of effective utilization of the equipment.
- Guidance for formulation of management and maintenance plan.

(2) Procurement

(a) Tendering

Consultant shall execute the following services relevant to the tendering for the Republic of the Philippines.

- Tender Notice
- Prequalification of Tenderers
- Tendering
- Tender Evaluation

(b) Manufacture of equipment

After the supply contract is concluded, the contract is verified by the Government or Japan. Then, the equipment will be manufactured.

(c) Transportation of equipment

The Japanese supplier will ship by ocean the equipment to Manila port in the Philippines, and the Government of the Philippines is responsible for transportation from the port to Equipment Service of the Task Force (Equipment Service, Region III construction office).

(3) Technical Guidance

Japanese Equipment based Construction experts and mechanical engineers will guide and advise on the equipment operation, management and maintenance, effective use, effective placement and so on.

4.4.5 Scope of Work

Based on the Minutes of Discussions, the scope of work for the project covers the responsibilities of the Governments of Japan and Philippines as follows:

(1) The Government of Japan is responsible for the following.

(a) Construction equipment manufacture and supply for the project.

These construction equipment consist of:

1. Earth moving equipment
2. Earth excavator
3. Material/equipment transportation
4. Others

(b) Delivery of construction equipment from Japan to designated port (Manila port) of entry in the Philippines.

(c) The dispatch of Japanese equipment based construction experts and mechanical engineers in order to guide/advise for inspection, operation and maintenance of the supplied equipment, as well as for the planning and management of effective utilization of equipment on each project.

(2) The Government of the Philippines is responsible for the following.

(a) The land transportation from Manila port to the Base Shop of DPWH Regional Equipment Services Region III, and operation, maintenance and management of the supplied equipment after receiving the equipment from Japan.

(b) Construction of gabion factory whose layout is proposed in Figure 4.4-1.

The cost to be shouldered by the Philippines is roughly estimated as follows:

- Total Maintenance/Management Cost:	76,541 Thousand Pesos
- Total Operation Cost:	67,131 Thousand Pesos
- Inland Transportation:	4,494 Thousand Pesos
- Assembly:	418 Thousand Pesos
- Factory Construction:	1,944 Thousand Pesos
Total	150,528 Thousand Pesos

The breakdown of above estimate is shown in Appendix 11.

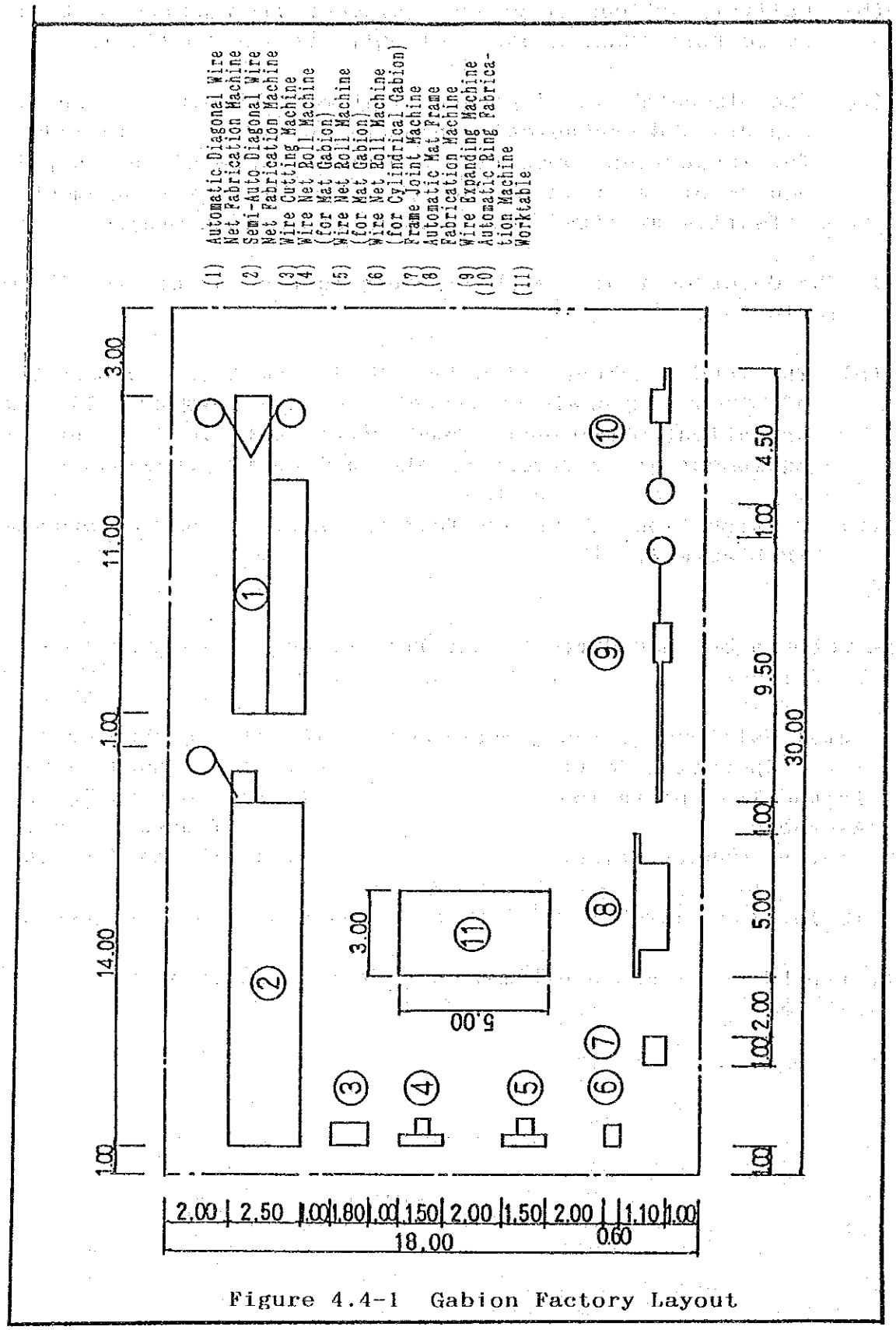


Figure 4.4-1 Gabion Factory Layout

CHAPTER 5

PROJECT EVALUATION AND CONCLUSION

CHAPTER 5

PROJECT EVALUATION AND CONCLUSION

After 611 years of dormancy, Mt. Pinatubo manifested signs of imminent eruption on April 2, 1991. About nine weeks thereafter, on 12-17 June, 1991, the volcano unleashed a series of eruptions resulting in the ejection of massive volcanic debris. A great volume of pyroclastic flow, ash, sand and other volcanic materials have been ejected. Heavy resins that poured the Mt. Pinatubo area on June 12 triggered mudflows which rolled down series and deposited huge sand along the lower reaches of the rivers, and have buried population area and farmlands. Infrastructures including roads and bridges have been seriously damaged.

The Government of the Philippines has responded to the calamity and established the three-phased program; 1) rescue and relief, 2) rehabilitation and recovery, and 3) reconstruction and development. In line with the Government's strategy, the Department of Public Works and Highways, realizing the magnitude of the rehabilitation and reconstruction activities of the damaged facilities, has formulated the immediate action plan and mobilized all available equipment.

However, the damages to the infrastructures, particularly road, bridge and river system should require additional substantial equipment support, otherwise the lengthy project duration will be consumed before the total recovery.

Under these circumstances, the effect and impact by implementing the Project are evaluated to be significant and summarized as follows.

1. The project will facilitate relief and rehabilitation works of infrastructures, particularly roads, bridges and river systems, which contribute to improvement of people's basic life.

2. The working capacity of equipment is evaluated to be upgraded to some extents, thus the rehabilitation works will be facilitated proportionally to the improved equipment capacity.

3. The organization, budget and maintenance system for the Project deem appropriate. Therefore, the equipment provided by the Project will be effectively utilized.

4. The beneficiaries are residents in the affected areas of 4 provinces and 2 cities. The rehabilitation of infrastructure will recover fundamental living environment and revitalized socio-economic activities.

5. The socio-economic activities as well as agricultural and industrial productivities in the affected area will be revitalized.

Considering the effect to facilitate relief and rehabilitation works and to improve the living standard of residents in the area, the implementation of the Project is evaluated as appropriate for the Japan's Grant Aid Program.

The effect and extent of improving present situation by implementing the Project are summarized in Table 5-1.

Table 5-1. EFFECT AND EXTENT OF IMPROVING PRESENT SITUATION BY IMPLEMENTING THE PROJECT

Present Condition and Problem	Proposed Measures	Effect and Improvement Level by the Project
1. Infrastructures, particularly roads and bridges, were seriously damaged. Due to low activities in food supply medical care and education system by traffic blockade, People's fundamental life has been disturbed.	- To provide equipment to facilitate relief and rehabilitation works.	- With absolute shortage of equipment, long term period may be required to complete the rehabilitation works. - With equipment provided by the Project, the capacity will be raised. - Feelings of uneasiness and isolation will be soften.
2. Living standard in the affected area has become worsen. The socio-economic activities as well as agricultural and industrial productivities have been hampered.	- To provide safety and reliable transportation facilities.	- Socio-economic activities will be accelerated.
3. The relief and rehabilitation works will require expertised technology and sophisticated utilization of equipment.	- To advise and provide technical guidance for effective utilization of equipment as well as operation and maintenance.	- Effective implementation of the rehabilitation project by effective utilization of the equipment.

APPENDIX 1

MEMBER LIST OF THE BASIC DESIGN STUDY TEAM

1. MEMBER OF THE BASIC DESIGN STUDY TEAM FOR FIELD SURVEY

2. MEMBER OF THE BASIC DESIGN STUDY TEAM FOR EXPLANATION OF THE DRAFT FINAL REPORT

1. NAME OF BASIC DESIGN STUDY TEAM FOR FIELD SURVEY

MEMBERS OF THE FIELD SURVEY TEAM

Koichi MIYOSHI	Leader Second Basic Design Study Division Grant Aid Study & Design Department Japan International Cooperation Agency (JICA)
Hiroshi OHTA	Cooperation Planner Supervising Engineer Engineering Affairs Management Section Minister's Secretariat Ministry of Construction
Minoru MIURA	Equipment Management Planner Executive Director Katahira & Engineers International
Shigenobu SUZUKI	Construction Machine Specialist (I) Deputy Director Engineering Department Katahira & Engineers International
Yoshio NAGAMI	Construction Machine Specialist (II) Director Engineering Department Katahira & Engineers International

2. MEMBER OF THE BASIC DESIGN STUDY TEAM FOR EXPLANATION OF THE DRAFT FINAL REPORT

Hiroshi OHTA	Leader Supervising Engineer Engineering Affairs Management Section Minister's Secretariat Ministry of Construction
Eiji IWASAKI	Second Basic Design Study Division Grant Aid Study & Design Department Japan International Cooperation Agency (JICA)
Minoru MIURA	Equipment Management Planner Executive Director Katahira & Engineers International
Shigenobu SUZUKI	Construction Machine Specialist (I) Deputy Director Engineering Department Katahira & Engineers International

APPENDIX 2

SURVEY SCHEDULE

1. ITINERARY OF THE BASIC DESIGN STUDY TEAM

2. ITINERARY OF MISSION FOR EXPLANATION OF DRAFT FINAL REPORT

1. Itinerary of the Basic Design Study Team

Survey schedule of the Study Team from September 29th, 1991 to October 18th, 1991 is below.

No.	Date	Activities	
1.	Sep. 29, 1991 (Sun.)	Koichi Miyoshi, Hiroshi Ohta, Minoru Miura, Shigenobu Suzuki, Yoshio Nagami Arrival to Manila	
2.	Sep. 30, 1991 (Mon.)	· Meeting at JICA · Courtesy Call to DPWH · Courtesy Call to DEDA	
3.	Oct. 1, 1991 (Tue.)	· Meeting at DPWH Bureau of Equipment and Bureau of Maintenance · Explanation of Inception report, and Survey schedule · Discussion on the questionnaire · Exchange opinion with ADB · Meeting at Embassy of Japan	
4.	Oct. 2, 1991 (Wed.)	· Meeting with Task Force of Mt. Pinatubo Rehabilitation Program · Meeting with Bulacan District Engineering Office and Collection of Data · Meeting with Pampanga 1st District Engineering Office and Collection of Data · Inspection of Pampanga Area Equipment Services	Site investigation . Bacolor . Sta.Barbara Br. . Capaya Br.
5.	Oct. 3, 1991 (Thu.)	· Meeting with Tarlac District Engineering Office and Collection of Data · Inspection of Tarlac Area Equipment Services · Meeting With Task Force of Mt. Pinatubo Rehabilitation Program and Collection of Data · Inspection of Base Shop Region III Equipment Services	Site Investigation . Aquino Br. . Bamban Br./Area . Abacan Br./Area . Lubao Area . Sta. Cruz/Br.

No.	Date	Activities	
5.	Oct. 3, 1991	· Meeting with Pampanga 2nd District Engineering Office and Collection of Data · Courtesy Call to Olongapo City Office	
6.	Oct. 4, 1991 (Fri.)	· Meeting Olongapo City Engineering Office and Collection of Data · Inspection of Olongapo City Equipment Services · Meeting with Zambales District Engineering Office and Collection of Data · Inspection of Zambales Area Equipment Services	Site Investigation . Olongapo City . Alusiis Area . Sto. Tomas Br. . Maloma Br. . Cabangan Br. . Up stream of Bancao River . Bucao Br. . Sta. Fe Area
7.	Oct. 5, 1991 (Sat.)	· Meeting with Bataan District Engineering Office and Collection of Data · Inspection of Bataan Area Equipment Services	Site Investigation . Orani Area . Almacen Area . Carmecito Area
8.	Oct. 6, 1991 (Sun.)	· Review/analysis of collected data · Discussion about draft of minutes	
9.	Oct. 7, 1991 (Man.)	· Meeting at DPWH · Discussion about draft of minutes · Minutes signed · Meeting at Embassy of Japan, JICA	
10.	Oct. 8, 1991 (Tue.)	Koichi Miyoshi Hiroshi Ohta Returned to Japan · Review/analysis of collected data	
11.	Oct. 9, 1991 (Wed.)	· Review/analysis of collected data	
12.	Oct. 10, 1991 (Thu.)	· Review/analysis of collected data	
13.	Oct. 11, 1991 (Fri.)	· Discussion with Bureau of Equipment · Specification of Equipments · Review/analysis of collected data	
14.	Oct. 12, 1991 (Sat.)	· Review/analysis of collected data	

No.	Date	Activities
15.	Oct. 13, 1991 (Sun.)	· Review/analysis of collected data
16.	Oct. 14, 1991 (Mon.)	· Discussion with Mt. Iwakiri (JICA Expert) · Specification and utilization of Gabion Machine 1st · Review/analysis of collected data
17.	Oct. 15, 1991 (Tue)	· Inspection of private maintenance shop · Review/analysis of collected data
18.	Oct. 16, 1991 (Wed.)	· Inspection of private maintenance shop
19.	Oct. 17, 1991 (Thu.)	· · Meeting at B.O.E. · Discussion about machine specification
20.	Oct. 18, 1991 (Fri.)	Minoru Miura Shigenobu Suzuki Yoshio Nagami Return to Japan

2. Itinerary of Mission for explanation of Draft Final Report
The mission schedule from December 8th, 1991, to December 15th, 1991 is bellow.

No.	Date	Activities
1.	Dec. 8, 1991 (Sun.)	Eiji Iwasaki Minoru Miura Shigenobu Suzuki Arrival to Manila
2.	Dec. 9, 1991 (Wed.)	· Meeting at JICA · Courtesy Call to DPWH · Courtesy Call to NEDA
3.	Dec. 10, 1991 (Tue.)	Hiroshi Ohta Arrival to Manila · Meeting at DPWH Bureau of Equipment · Explanation and Discussion on Draft Final Report · Meeting at Embassy of Japan, JICA
4.	Dec. 11, 1991 (Wed.)	· Meeting at DPWH Agno River Control Office Site investigation · Clark, Angeles
5.	Dec. 12, 1991 (Thu.)	· Meeting with staff of DPWH Bureau of Design · Discussion about Minutes of Document · Minutes signed · Meeting at JICA, Embassy of Japan
6.	Dec. 13, 1991 (Fri.)	· Meeting in Mission members · Analysis of collected data
7.	Dec. 14, 1991 (Sat.)	· Hiroshi Ohta Return to Japan · Analysis of collected data
8.	Dec. 15, 1991 (Sun.)	Eiji Iwasaki Minoru Miura Shigenobu Suzuki Return to Japan

APPENDIX 3

LIST OF PERSONS MET

1. BASIC DESIGN STUDY

2. EXPLANATION AND DISCUSSION FOR THE DRAFT FINAL REPORT

I. BASIC DESIGN STUDY

1. List of Persons Met

Name and Organization	Position
Department of Public Works and Highways	
MR. Jose P. De Jesus	Secretary
MR. Teodoro T. Encarnacion	Undersecretary
• Planning Service	
MR. Trino G. Meris	Director III
MS. Linda M. Templo	Engineer V
MR. Nick Cacatian	Engineer V
MR. Tetsuaki Iwakiri	JICA Expert for Rivers
MR. Ryoji Hagiwara	JICA Expert for Highways
• Task Forece of Mt. Pinatubo Rehabilitation Program	
MR. Vincente B. Lopez	Chairman
• Bureau of Equipment	
MR. Cresenciano N. De Leon	Director
MR. Lucas T. Marivilla	Assistant Director
MR. Hector Santos	Engineer V
MR. Armando D. Clavio	Engineer IV
MR. Margarito E. Tinio	Engineer IV
MR. Danilo G. Pancho	Engineer III
MR. Laing V. Vuiaoit	Engineer II
• Bureau of Maintenance	
MR. Leonardo A. Nunez	Director
MR. Victor T. Tisbe	Engineer V
MR. Manuel C. Llamoso	Engineer V

Name and Organization	Position
• Regional Office RegionⅢ	
MR. Marcos R. Kabiling	Regional Director
MR. Godofredo Caritativo Jr.	Assistant Regional Director
MR. Severino V. Enriquez	Regional Project Manager
MR. Lucilo T. Honorio	Regional Equipment Engineer
• Bulacan District Engineering Office	
MR. Rogelio N. Fernando	District Engineer
MR. Marcelo C. Mendiola	Assistant District Engineer
MR. Aledo S. Estrell	Engineer Ⅳ
MR. Ernesto C. Reyes	Engineer Ⅲ
MR. Ruperto J. Cells	Engineer Ⅲ
MR. Geronimo F. Asonza	Engineer Ⅲ
MR. Jesus A. Torres	Engineer Ⅲ
MR. Dalmacio Cruz	Engineer Ⅱ
MR. Joselito A. Antonio	Engineer Ⅱ
• Pampanga 1st District Engineering Office	
MR. Rafael S. Ponio	District Engineer
MR. Emiliano C. Datu	Assistant District Engineer
MR. Olivo Ocampo	Engineer Ⅲ
MR. Abraham Sarmiento	Engineer Ⅲ
MR. Avelino Valencia	Engineer Ⅱ
MR. Conrado C. Mendiola	Engineer Ⅱ
• Pampanga 2nd District Engineering Office	
MR. Angelito Twano	District Engineer
MR. Leonardo Q. Magtoto	Assistant District Engineer
MR. Reynaldo D. Calma	Chief, Panning and Design
MR. Romeo N. Supan	Chief, Construction
MR. Bonifacio C. Cortel	Administration OfficerⅢ

Name and Organization	Position
• Olongapo City Engineering Office	
MR. Nicolas De Leon	City Engineer
MR. Ruel O. Mallari	Engineer
MR. Jaime M. Toledo	Engineer
MR. Edward G. Ramos	Engineer
MR. Rolando T. Tuya	Engineer
MR. Redentor O. Villanueva	Engineer
• Zambales District Engineering Office	
MR. Marcelo B. Rivera	District Engineer
MR. Hercules C. Manglicmot	Engineer III
MR. Godofredo T. Velasco	Engineer III
MR. A. F. Ortega	Engineer III
• Tarlac District Engineering Office	
MR. Rustico C. Navarro	District Engineer
MR. Oscar Z. Vergara	Assistant District Engineer
MR. Milagros D. Burgos	Engineer III
MR. Renato C. Laoang	Engineer III
MR. Aliwalas G. Mateo	Engineer III
MR. Abelardo G. Mati	Engineer III
MR. Benjamin G. Lopez	Engineer III
MR. Rolando M. Moson	Engineer II
MR. Jose B. Simbol	Area Equipment Engineer
MR. Alejandro Li Menses	Administration Officer III

Name and Organization	Position
• Bataan District Engineering Office	
MR. Estanislao C. Canlas	District Engineer
MR. Jose E. De Leon	Assistant District Engineer
MR. Francisco S. Galicia	Chief Maintenance Section
MR. Remigio G. Hizon	Chief Construction Section
MR. Herminio O. Estabillo	Engineer III
MR. Arsenio R. Flores	Engineer III
MR. Enrique B. Tetangco	Engineer III
MR. Jorlando E. Tigas	Engineer II
MR. Reynaldo G. Macalinao	Engineer II
MR. Regelio G. Puno	Engineer II
MR. Jose G. Macalinao	Administration Office II
NEDA	
MS. Josefina U. Esquerra	O. I. C. Assistant Director
MS. Mariles R. Navarro	Supervicing Environment Development Specialist
MR. Paulo Rodilio M. Halili	EDSI
Asian Development Bank	
MR. Benny S. Kosinda	Senior Financial Analyst
Embassy of Japan in Philippines	
MR. Takeshi Yagi	First Secretary
MR. Takuya Ikeda	First Secretary
MR. Etsuro Kashiwagi	Second Secretary
JICA Office in Philippines	
MR. Masataka Iijima	Resident Representative
MR. Kikuo Takeuchi	Deputy Resident Reresentative
MR. Kenji Matsumoto	Assistant Resident Representative

2. EXPLANATION AND DISCUSSION FOR THE DRAFT FINAL REPORT

Name and Organization	Position
Department of Public Works and Highways	
Mr. Teodoro T. Encarnacion	Undersecretary
· Planning Service	
Mr. Manuel M. Bonoan	Assistant Secretary
Ms. Linda M. Temple	Engineer V
Mr. Ryoji Hagiwara	JICA Expert
· Task Force of Mt. Pinatubo	
Mr. Vincente B. Lopez	Chairman
· Bureau of Equipment	
Mr. Hector Santos	Engineer V
Mr. Margarito E. Tinio	Engineer IV
Mr. Armando D. Clavio	Engineer IV
Mr. Jorito V. Pecache	Engineer IV
· Regional Office Region III	
Mr. Lucilo T. Honorio	Regional Equipment Engineer
· AGNO River Control Office	
Mr. Fidel D. Ginez	Project Manager I
Mr. Apolonio Ramos	Engineer IV
Mr. David B. Moreno	Engineer III
Mr. Alfredo Cayabyab	Engineer II
Mr. Romeo Martenes	Engineer II
Mr. Roman Martenes	Engineer II

Name and Organization	Position
NEDA	
Mr. Augusto Santos	Director
Department of Trade and Industry	
Mr. Tomotaka Kinoshita	Executive Consultant Construction Manpower
Embassy of Japan in Philippines	
Mr. Takuya Ikeda	First Secretary
JICA Office in Philippines	
Mr. Masataka Iijima	Resident Representative
Mr. Kikuo Takeuchi	Deputy Resident Representative
Mr. Kenji Matsumoto	Assistant Resident Representative

APPENDIX 4

MINUTES OF DISCUSSIONS

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY

ON

PROVISION OF HEAVY EQUIPMENT AND SPARE PARTS

FOR MT. PINATUBO RELIEF AND REHABILITATION OPERATION

IN THE REPUBLIC OF THE PHILIPPINES

In response to the Government of the Republic of the Philippines, the Government of Japan decided to conduct a Basic Design Study on the Project for the Provision of Heavy Equipment and Spare Parts for Mt. Pinatubo Relief and Rehabilitation Operation in the Republic of the Philippines (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team headed by Mr. Koichi Miyoshi, Director, Second Basic Design Study Division, Grant Aid Study and Design Department, JICA, and is scheduled to stay in the country from September 29 to October 18, 1991.

The Team held discussions with the officials concerned of the Government of the Philippines and conducted a field survey at the study area.

In the course of the discussions and field survey, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Philippines, October 7, 1991

KOICHI MIYOSHI
Leader
Basic Design Study Team,
JICA

JOSE P. DE JESUS
Secretary
Department of Public Works
and Highways

ATTACHMENT

1. Objectives of the Project

The objectives of the Project is to provide equipment to facilitate relief and rehabilitation works of infrastructure, emphasizing roads, bridges and adjoining river systems damaged by Mt. Pinatubo eruptions and the flow of volcanic materials, which contribute to ensure safe transportation and maintain socio-economic activities in the affected area.

2. Project Area

The Project area is located at Region III. The map of the Project area is attached as ANNEX-I.

3. Executing Organization

The executing agency in the Philippines for the implementation of the Project is the Department of Public Works and Highways. The Task Force for Mt. Pinatubo Rehabilitation Projects created in the Department shall be responsible for the operation and maintenance of the equipment provided under the Project, which shall be limited to be utilized for the relief and rehabilitation works of the devastations brought about by Mt. Pinatubo eruptions.

4. Necessary items for the realization of the Project requested by the Government of the Philippines

(1) Equipment

After the discussions on the Project, the equipment shown in ANNEX-II were judged necessary for the realization of the Project.

(2) Engineering

Engineering on the Project covers preparation of tender documents, assistance in bidding and other works necessary for the completion of the Project. Aside from those, technical guidance for effective utilization of equipment for rehabilitation measures and work methods, as well as operation and maintenance of such equipment will be included under the Project.

However, the final items of the Project may differ from the above items, if it deems necessary after further studies in Japan.

5. The Government of the Philippines shall provide the necessary budget and personnel required for the effective operation and maintenance of equipment provided under the Project.

6. Japan's Grant Aid system extended by the Government of Japan

(1) The Government of the Philippines has understood the system of Japan's Grant Aid explained by the Team.

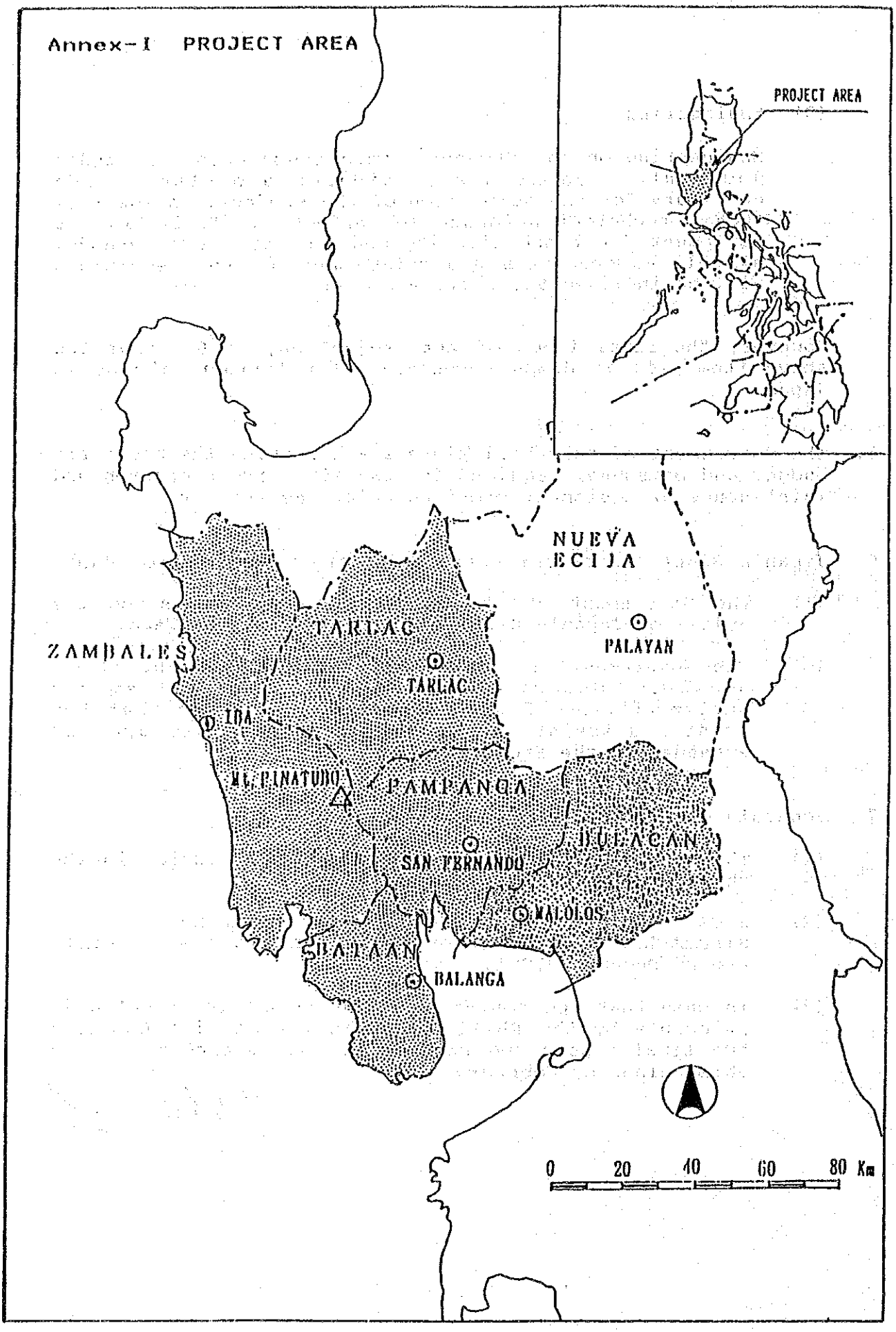
(2) The Government of the Philippines will take necessary measures described in ANNEX III for smooth implementation of the Project on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

7. Schedule of the Study

(1) The consultants will proceed to further studies in the Philippines until October 18, 1991.

(2) JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around December 1991.

(3) In case that the contents of the report is accepted in principle by the Philippines side, JICA will complete the final report and send it to the Government of the Philippines by February 1992.


Annex-I PROJECT AREA
PROJECT AREA
NUEVA ECIJA
PALAYAN
ZAMBALES
TARLAC
TARLAC
PAMPANGA
SAN FERNANDO
BULACAN
MALOLOS
BATAAN
BALANGA
0 20 40 60 80 Km

ANNEX II

LIST OF EQUIPMENT (TENTATIVE)

TYPE OF EQUIPMENT	SPECIFICATION	QUANTITY
1. Earth Moving Equipment		
1.1 Crawler Tractor (Bulldozer)	210 HP	10
1.2 Crawler Tractor (Swamp Bulldozer)	210 HP	9
1.3 Towed Scraper	9.1 cu.m.	10
2. Earth Excavator		
2.1 Hydraulic Excavator	120 HP Cap. 0.7 cu. m. Ground Pressure/ Track Length 0.3 kg/ cm^2/4,400 mm	10
3. Material/Equipment Transportation		
3.1 Truck Mounted Crane	Cap. 25 tons	8
4. Other		
4.1 Gabion Fabrication Machine	With Wire	1
4.2 Jack Hammer	Self Contained	4
4.3 Diesel Hammer	2.9 t	4
4.4 Mighty Mite (Equiv.) Multi Purpose Maint.	3.5 t	7
4.5 Sewer Vacuum	Airflow 18 cu.m./min.	2
5. Spare Parts		15%
Total Number of Equipment		65

ANNEX-III

Necessary measures to be undertaken by the Government of the Republic of the Philippines:

1. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

2. To ensure prompt unloading, tax exemption and custom clearance of the equipment at the port of disembarkation and internal transportation of such goods provided under the Grant Aid.

3. To accord Japanese nationals whose services may be required in connection with the supply of the equipment and services under the verified contract such facilities as may be necessary for their entry into the Philippines and stay therein for the performance of their work.

4. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Philippines with respect to the supply of the equipment and services under the verified contracts.

5. To operate and maintain properly and effectively the equipment provided under the Grant, for the execution of the works for the Project.

6. To bear all the expenses other than those to be borne by the Grant, necessary for operation and maintenance as well as transportation of equipment.

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY

ON

PROVISION OF HEAVY EQUIPMENT AND SPARE PARTS

FOR MT. PINATUBO RELIEF AND REHABILITATION OPERATION

IN THE REPUBLIC OF THE PHILIPPINES

(CONSULTATION ON DRAFT REPORT)

In October 1991, the Japan International Cooperation Agency (hereinafter refered to as "JICA") dispatched the Basic Design Study Team on the Project for the Provision of Heavy Equipment and Spare Parts for Mt. Pinatubo Relief and Rehabilitation Operation in the Republic of the Philippines (hereinafter referred to as "the Project"), and through series of discussions, field survey, and technical examination of the results in Japan, has designed the appropriate plan for the Project and prepared the draft report of the Basic Design Study.

In order to explain and to consult with the Government of the Philippines on the components of the draft report, JICA sent to the Philippines a study team, which is headed by Mr. Hiroshi Ohta, Supervising Engineer, Engineering Affairs Management Section, Minister's Secretariat, Ministry of Construction from December 8 to 15, 1991. As a result of the discussions, both parties confirmed the main items described on the attached sheet.

Manila, December 12, 1991

HIROSHI OHTA
Leader
Draft Report Explanation Team
JICA

TEODORO T. ENCARNACION
Undersecretary
Department of Public
Works and Highways

ATTACHMENT

1. Components of Draft Report

The Government of the Philippines has agreed and accepted in principle the components of the draft report proposed by the Team.

2. Japan's Grant Aid System

(1) The Government of the Philippines has understood the system of Japan's Grant Aid explained by the Team.

(2) The Government of the Philippines will take the necessary measures, described in Annex I, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further Schedule

The team will make the Final Report in accordance with the confirmed items, and send it to the Government of the Philippines by end of March 199X.

ANNEX-I

Necessary measures to be taken by the Government of the Republic of the Philippines in case Japan's Grant Aid is executed.

1. To secure the site and complete the construction of the building in which the gabion fabrication machine will be installed in accordance with the agreed time schedule.

2. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A).

3. To ensure prompt unloading, tax exemption and customs clearance of the equipment at the port of disembarkation and internal transportation of such goods provided under the Grant aid.

4. To accord Japanese nationals whose services may be required in connection with the supply of the equipment and services under the verified contract such facilities as may be necessary for their entry into the Philippines and stay therein for the performance of their work.

5. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Philippines with respect to the supply of the equipment and services under the verified contracts.

6. To operate and maintain properly and effectively the equipment provided under the Grant, for the execution of the work for the Project.

7. To bear all the expenses other than those to be borne by the Grant, necessary for the operation and maintenance as well as tansportation of equipment.

ANNEX II

LIST OF PARTICIPANTS

I. BASIC DESIGN STUDY TEAM

1.	Mr. HIROSHI OHTA	- Team Leader
2.	Mr. EIJI IWASAKI	- Project Coordinator
3.	Mr. MINORU MIURA	- Rehabilitation Planner
4.	Mr. SHIGENOBU SUZUKI	- Construction Machinery Planner

II. DPWH PANEL

1.	Mr. TEODORO T. ENCARNACION	- Undersecretary
2.	Mr. MANUEL M. BONOAN	- Assistant Secretary for Planning
3.	Mr. RYOJI HAGIWARA	- Highway Engineering Adviser, JICA
4.	Mr. HECTOR G. SANTOS	- OIC, Asst. Director Bureau of Equipment
5.	Mr. MARGARITO E. TINIO	- Engineer V Bureau of Equipment
6.	Ms. LINDA M. TEMPLO	- Engineer V Planning Service

APPENDIX 5

LIST OF COLLECTED DATA

DPWH CENTRAL OFFICE

- Department of Public Works and Highways Organization Diagram
- Ogranization Structure : DPWH Bureau of Equipment
- Organization Structure : DPWH Regional Equipment Services RegionⅢ
- Organization Structure : Area Equipment Services
- Organization Chart : Staff of DPWH Task Force of Mt. Pinatubo Rehabilitation Program
- Socio-Economic Condition of the Project Area
- Condition of Access Roads to the Project Area
- Initial Report on the Study on the Properties of Volcanic Ash Emitted by Mt. Pinatubo
- Report on the Lahar Warning System in the Areas of Mt. Pinatubo
  (August 1991 First Lahar Warning Team JICA)
- Reports Relevant to Extent of Devastation Due to Eruption of Mt. Pinatubo
- DPWH Status Report as of September 4, 1991
- DPWH Relief and Rehabilitation Program
- List of Equipment Presently Used in Relief and Rehabilitation Work
  (Aa of September 24, 1991)
- Revised Cost Estimate Construction Completion of Gabion Building
  (Region I PMO-AGNO Flood Control System)
- Mt. Pinatubo Rehabilitation Projects Action Program for River System
  (25 September 1991)

DPWH TASK FORCE OF MT. PINATUBO

- Action Program of DPWH-REGION III on the Damages Made by Mt. Pinatubo Eruption (As of September 24, 1991)
- Memorandum : Lease of Private Equipment
  (DPWH Secretary 09 August 1991)
- Organization, Procedures, and Guidlines for Rehabilitation of Infrastructure Damaged by Mt. Pinatubo
  (DPWH Secretary 01 July 1991)
- Equipment Rehabilitation Status Report (3rd Qgurter, 1991)
- Monthly Equipment Stantus Report (August, 1991)
- Summary of Equipment Requirement Re-Mt. Pinatubo Eruptions
- Plan of Base Overhaul Shop

DPWH PAMPANGA 1ST ENGINEERING DISTRICT

- Heavy Equipment Needed For Mt. Pinatubo Projects
- Estimated Daily Rental Charges (September 20, 1991)
- Summary of Actual Accountability Report by Municipality of Mt. Pinatubo (Week Ending September 25, 1991)
- Project Expenditure Report of Mt. Pinatubo (Week Ending September 25, 1991)

DPWH PAMPANGA 2ND ENGINEERING DISTRCIT

- Clearing & Disposal of Ashfall and Sandfall on various National, Provincial, Municipal & Barangay Roads by use of Heavy Equipments
- Progress Reports Under the Repair and Rehabilitation of Various School Builduings Affected by the Eruption of Mt. Pinautbo

DPWH BULACAN 1ST ENGINEERING DISTRICT

- Report of Damages Caused by Mt. Pinatubo Eruption and Tiphoon 'Diding'

DPWH TARLAC ENGINEERING DISTRICT

- Organizational Chart of Tarlac Engineering District
- Organizational Chart of Area Equipment Services
- Monthly Equipment Status Report (July 1991)
- Cost Estimate of Rehabilitation Program for DPWH Infrastructure damaged by Mt. Pinatubo Eruption (August 01, 1991)

DPWH BATAAN ENGINEERING DISTRICT

- List of Equipment Used and Still Needed
- Organization Chart of Bataan Engineering District
- Damaged Report Caused by the Eruption of Mt. Pinatubo

DPWH ZAMBALES ENGINEERING DISTRICT

- Damage Report for Rehabilitation of Infrastructures Damaged by Mt. Pinatubo Eruption
- Organization Chart of Zambales Engineering District
- Typical Section of Earthdyke at Sto. Tomas River System
- List of Equipments Needed
- List of DPWH Equipments Available in the District
- Monthly Equipmnet Status Report (September 1991)
- Briefing Materials for Mt. Pinatubo, Zambales and Olongapo

DPWH OLONGAPO CITY ENGINEER

- Monthly Rehabilitation Project Report (September 30, 1991)
- Monthly Equipment Status Report (September 1991)
- List of Equipment Needed for the Rehabilitation of Mt. Pinatubo Damages
- List of Equipment Used
- List of Projects Damaged by Mt. Pinatubo Eruption

NEDA

- Brief on Rehabilitation and Reconstruction Efforts
- copy of Memorandum Order No. 369, Malacanang Creating a Task Force on the Rehabilitation of Arears Affected by the Eruption of Mt. Pinatubo and Its Effects
- The Macroeconomic Implications of the Mt. Pinatubo Eruption (Aa of 26 September 1991)
- Pinatubo Aftermath ; Relief, Rehabilitation, Reconstruction and Development (27, June 1991 NEDA Secretarist)
- ODA Commitments/Pledges for Relief, Rehabilitation and Reconstruction/Development of the Mt. Pinatubo Victims (As of 26 June 1991)
- Mt. Pinatubo : Rehabilitation of Damaged Infrastructure Status As of 26 June 1991 (DPWH)
- Operation Pinatubo : General Plan of Action (DPWH)
- Progress Report Re On-Going Disaster Operation on Mt. Pinatubo As of 261200H JUNE 1991 (Chairman, NDCC)
- External Assistance for Relief, Rehabilitation and Reconstruction/Development of Mt. Pinatubo Victims (As of 20 September 1991)

APPENDIX 6

COUNTRY DATA

Table 6-1 . Main Economic Index (1/2)

General Outline of Republic of the Philippines

Capital: Metro Manila
Language: Pilipino, English
GPN per Capita: 590 dollars

Population: 5,736,000
Area: 300,000 km^2
Currency: Philippine Peso

item / unit / year	GNP	Agri-culture	Mining & Industry	Manufac-turing	GNP Deflator	Financial Balance	Against GNP	Lending Rate	Exchange Rate
	Billion Peso	Composition Rate by Economic Activity (%)			1980 = 100	Million Pesos	%	%	Peso = 1$
1970	41.5	37.1	20.8	18.6	29.2	-943.7	-2.27	10.00	5.9044
1975	114.7	28.8	126.7	24.9	58.3	-2,449.0	-2.13	6.00	7.2479
1980	264.6	23.3	27.5	24.4	100.0	1,812.0	0.68	4.54	7.5110
1984	540.5	25.8	27.2	25.4	200.3	3,714.0	0.68	12.11	16.6990
1985	609.5	26.7	26.6	24.7	235.4	4,493.0	0.74	11.50	18.6070
1986	626.7	26.1	26.3	24.7	246.1	-4,313.0	-0.69	9.63	20.3860
1987	-	-	-	-	259.4	-6,920.0	-	9.08	20.5680

Table 6-1 Main Economic Index (2/2)

item / unit / year	Exports	Imports	Current Balance	Trade Balance	Long-term Capital Balance	Balance	Total Balance	Foreign Money Reserve	Consumer Price Index
	Million US dollar								1980=100
1970	1,142	1,286	-48	-26	130	87	83	251	28.4
1975	2,294	3,776	-923	-1,196	517	-407	-12	1,359	59.2
1980	5,788	8,295	-1,928	-1,939	878	-1,050	891	3,140	100.0
1984	5,322	6,051	-1,268	-679	291	-977	-403	890	206.2
1985	4,544	5,261	-18	-482	3,068	3,050	952	1,116	253.8
1986	4,842	5,394	996	-202	1,298	2,294	1,131	2,527	255.7
1988	5,565	6,811	-539	-1,017	455	-84	-268	2,014	265.4

Source: Handbook of Overseas Economic Cooperation 1989

Table 6-3 External Assistance

(unit: million US dollars)

Item \ Year	1983	1984	1985	1986
Bilateral Aid	358.0	355.4	437.0	886.6
(Highest Country)	(JPN 147.0)	(JPN 160.1)	(JPN 240.0)	(JPN 438.0)
Multilateral Aid	71.0	41.5	49.3	69.3
(Highest Organization)	(ARAB 13.1)	(IDA 10.0)	(IDA 13.0)	(AsDB 29.9)
Total (Including Private Sector)	1,524.0	945.9	635.2	1,118.4

Table 6-4 Japan's Economic Cooperation and Trade

(unit: million US dollars)

Item \ Year		1983	1984	1985	1986	1987
Bilateral ODA (Net)	Grant	61.97	57.68	69.71	80.37	111.79
	(Technical cooperation)	(26.13)	(31.30)	(29.75)	(39.30)	(44.90)
	Loan	85.05	102.39	170.29	357.58	267.59
	Total	147.02	160.07	240.00	437.96	379.38
Others	(Net)	194.19	40.95	-126.26	24.46	-15.76
Total (Net)		341.21	201.02	113.74	462.42	363.62
Export from Japan		36.76	46.46	70.34	64.93	71.33
Import from Japan		61.42	48.93	100.09	63.05	63.47

Source: Handbook of Overseas Economic Cooperation 1989

Table 6-5 Land and Population

(1990)

Region/Province	Land (km^2)	Population (100 psns.)	Density (psns./km^2)
Metro Manila	636.0	7,929	12,467.0
CAR	18,293.6	1,146	62.6
Region 1	12,840.2	3,551	276.6
Region 2	26,837.6	2,341	87.2
Region 3	18,230.8	6,199	340.0
Region 4	46,924.2	8,266	176.2
Region 5	17,632.5	3,910	221.7
Region 6	20.223.2	5,392	266.6
Region 7	14,951.4	4,593	307.2
Region 8	21,432.7	3,055	142.5
Region 9	18,730.1	3,159	168.7
Region 10	28,327.7	3,159	168.7
Region 11	31,692.8	4,457	140.6
Region 12	23,323.2	3,171	136.0
Total	300,000.0	60,685	202.3

Source: 1990 Philippine Statistical Yearbook

Table 6-6 Persons By Industry

(1990)

Industry	Employed Persons (%)	
Agriculture, Forestry, and Fishery	10,185	(45.2)
Mining and Quarrying	133	(0.6)
Manufacturing	2,188	(9.7)
Construction	947	(4.3)
Electricity, Gas, Water and Sanitary Services	91	(0.4)
Transport, Storage and Communication	1,137	(5.0)
Trading	3,145	(14.0)
Finance	444	(2.0)
Services	4,220	(18.7)
Total	22,532	(100%)

Source: 1990 Philippine Statistical Yearbook

Table 6-7 Persons of Major Industry by Region (1989)

(unit: 1000 psns.)

Item \ Region	Region III	Region IV	
Agriculture, Forestry, and Fishery	749	1,019	9,852
Mining and Quarrying	11	10	154
Manufacturing	275	436	2,298
Electricity, Gas, Water and Sanitary Services	6	13	83
Construction	136	172	911
Trading	301	417	3,074
Transport	154	181	1,095
Finance	38	49	398
Services	405	489	3,972
Others	6	0	13
Total	2,082	2,786	21,849

Source: National Statistic Office

Table 6-8 GDP by Industry

(unit: million Pesos)

	1985	1986	1987	1988	1989
Agriculture, Forestry, and Fishery	26,252	27,110	26,834	27,793	28,986
Mining and Quarrying	1,768	1,574	1,547	1,815	1,563
Manufacturing	21,541	21,717	23,076	25,281	26,886
Construction	4,258	3,382	3,967	4,344	4,947
Electricity, Gas, Water and Sanitary Service	1,433	1,723	1,908	1,995	2,137
Transport	4,953	5,105	5,251	5,487	5,761
Trading	14,066	14,337	15,153	15,998	16,795
Finance	4,286	4,831	5,832	6,250	6,843
Service	6,094	6,039	6,106	6,445	6,767
Public	5,253	5,362	5,697	6,242	6,458
Total	89,904	91,180	95,371	101,450	107,143

Table 6-9 Principal Manufacturing Products

(unit: million Pesos)

	1985	1986	1987	1988	1989
Food Manufactures	8,646	8,738	9,368	9,995	10,427
Beverage Industries	796	733	808	844	937
Tobacco Manufactures	970	713	631	717	703
Textile Manufactures	734	891	990	1,001	1,005
Footwear, Wearing Apparel	1,213	1,378	1,412	1,557	1,837
Wood and Cork Products	536	388	416	458	487
Furniture and Fixtures	109	120	138	155	164
Paper and Paper Products	158	172	187	232	292
Publishing and Printing	389	430	460	496	552
Leather and Leather Products	69	63	68	79	96
Rubber Products	281	290	305	346	358
Chemicals and Chemical Products	1,704	1,584	1,328	1,792	1,804
Products of Petroleum and Coal	1,153	1,156	1,230	1,369	1,409
Non-metallic Mineral Products	375	377	399	488	586
Basic Metal Industries	1,070	1,018	1,140	1,312	1,481
Metal Products	746	725	793	885	998
Machinery except Electrical	409	445	480	537	626
Electrical Machinery	1,600	1,913	2,000	2,355	2,364
Transport Equipment	136	135	162	149	267
Miscellaneous Manufactures	447	448	461	479	492
Total	21,541	21,717	23,076	25,281	26,886

Table 6-10 Principal Agricultural Products

(unit: million Pesos)

	1985	1986	1987	1988	1989
Paddy Rice	4,665	4,899	4,513	4,741	4,998
Corn	1,698	1,798	1,872	1,938	1,979
Coconuts	1,420	1,821	1,803	1,634	1,551
Sugarcane	829	775	701	799	894
Banana	931	935	678	853	887
Other Crops	681	6,847	6,607	6,579	6,710
Livestock	2,114	2,283	2,432	2,666	2,942
Poulty Farming	2,576	2,547	2,742	3,055	3,347
Aquaculture	4,422	4,551	4,638	4,834	5,046
Forest Products	706	654	648	689	632
Total	26,525	27,110	26,834	27,793	28,986

Table 6-11 Telecommunication Facilities and Broadcasting Stations

Region	Telephone		Telephone Station	Telex	Facsimile	Radio	Radio Stations
	Line	Exchange					
Metro Manila	62,918	-	21	-	-	1	18,387
Region I	27,924	21	151	5	1	8	1,824
II	4,278	8	111	3	-	1	440
III	35,564	84	109	9	-	5	1,757
IV	33,925	45	219	5	-	32	1,589
V	7,500	15	129	6	1	13	1,763
VI	32,162	16	132	7	2	1	3,107
VII	23,319	10	127	5	1	1	3,962
VIII	4,700	10	145	3	1	6	605
IX	5,737	6	87	3	1	1	1,041
X	6,946	9	111	7	1	8	2,246
XI	20.895	18	96	3	1	-	2,924
XII	1,950	6	103	6	-	-	790
Total	51,818	246	1,544	62	9	76	40,435

Table 6-12 Balance of Payments

Item	1988	1989	1990 (p)
1. Current Transactions			
A. Merchandise Trade			
Exports	7,074	7,821	8,186
Imports	8,159	10,419	12,206
B. Non-merchandise Trade			
Inflow	3,592	4,586	4,836
Outflow	3,672	4,283	4,218
C. Transfer			
Inflow	778	832	717
Outflow	3	2	3
Current Net Inflow (Total)	-390	-1,465	-2,688
2. Non-monetary Capital			
D. Long-term Capital	-519	379	392
E. Direct Investments	986	854	469
F. Short-term Capital	479	385	620
Non-monetary Capital, total	643	1,527	1,490
G. Monetization of Gold	314	288	218
H. Revaluation Adjustments	83	101	797
Total	650	451	-183

Table 6-13 Foreign Trade by Country

The Name of a Country	1988		1989		1990	
	Export	Import	Export	Import	Export	Import
United States of America	1,715,032	2,432,431	1,978,990	2,798,273	2,365,532	3,094,588
Japan	1,421,309	1,420,374	2,043,224	1,585,856	2,232,046	1,615,978
France	121,454	165,309	165,995	152,154	151,222	143,946
West Germany	320,334	297,886	408,287	334,855	532,132	390,373
Holland	127,634	316,051	203,112	329,224	170,221	350,531
England	161,347	327,649	170,817	328,600	247,886	350,531
Kuwait	182,166	6,702	172,272	8,937	194,495	5,507
Saudi Arabia	111,231	49,137	250,839	57,099	546,238	63,951
Indonesia	84,069	27,165	157,826	56,182	181,563	60,937
Malaysia	249,125	116,893	150,272	98,993	272,461	126,805
Singapore	335,120	223,949	492,550	220,795	486,660	239,632
Thailand	51,659	123,344	82,114	154,978	137,176	156,449
China	242,282	66,802	221,105	50,235	162,102	61,764
Australia	282,782	110,601	347,331	124,338	369,435	96,382
Hong Kong	373,863	346,368	481,130	304,784	554,578	330,470
Korea	330,899	160,548	422,859	175,246	477,993	229,504
Taiwan	510,738	200,834	701,799	210,298	805,570	209,263
Canada	80,927	107,712	158,184	127,424	167,490	122,895
Other Countries	3,109,936	574,435	1,810,115	704,811	2,151,560	529,971
Total	8,159,378	7,074,190	10,418,821	7,821,082	12,206,160	8,186,027

Source: 1991 Philippine Statistic Yearbook

APPENDIX 7

LIST OF EQUIPMENT FOR REHABILITATION OF INFRASTRUCTURE DAMAGED BY MT. PINATUBO

LIST OF EQUIPMENTS FOR REHABILITATION OF INFRASTRUCTURE DAMAGED BY MT. PINATUBO (1/3)

List of Equipments	Equipments Owned by District (DPWH) / Equipments Owned by Private Contractors / Total Equipments Needed for the Rehabilitation								
	Pampanga 1st District Office	Pampanga 2nd District Office	Bulacan District Office	Tarlac District Office	Bataan District Office	Zambales District Office	Olongapo City Engineer's Office	REGIONAL OFFICE	T O T A L
Bulldozer	- 67 76	- 28 33		- 57 67		3 25 30			3 177 206
Wheel Bulldozer				- - 1					- - 1
Low Ground Pressure Bulldozer	- - 3	- - 4		- - 3		- 3 3			- 3 13
Wheel Loader	- 26 30	- 5 7		- 2 4		- 10 10			- 43 51
Motor Groder	2 - 2	- 3 3		- - 2		2 2 4	2 - 2		6 5 13
Back Hoe	- 13 13			- - 2		- 4 4			- 17 19
Back Hoe on Barge		1 - 1							1 - 1
Crane on Barge		4 - 4							4 - 4
Truck Mounted Crane, 40 tons with clamshell	- - 1	- - 1		- - 1		- - 1			- - 4

SOURCE: DPWH REGION III OFFICE

LIST OF EQUIPMENTS FOR REHABILITATION OF INFRASTRUCTURE DAMAGED BY MT. PINATUBO (2/3)

List of Equipments	Equipments Owned by District (DPWH) Equipments Owned by Private Contractors Total Equipments Needed for the Rehabilitation Pampanga 1st District Office	Pampanga 2nd District Office	Bulacan District Office	Tarlac District Office	Bataan District Office	Zambales District Office	Olongapo City Engineer's Office	REGIONAL OFFICE	T O T A L
Hydraulic Excavator 0.743 Bucket (17 ton)	2 – 15			– – 1		– – 4			2 – 20
Vibro Roller (6-8 tons)	– – 4	– – 2		– – 3	– – 3	– – 3	– – 1		– – 16
Dredger Machine (8"S.P.)		5 2 7				1 – 1			6 2 8
Amphi Dredge	1 – 1								1 – 1
Jack Hammer (Self Contained)	– – 3	– – 3		– – 3	– – 1		– – 1		– – 11
Dump Track (11 tons)	72 72					7 48 50	– 8 8		7 128 180
Stake Truck	– – 6	– – 5		– – 8	– – 2	– – 8	– – 2	– – 20	– – 51
Mighty Mite Multi Purpose	– – 3	– – 2		– – 3	– – 4		– – 3		– – 15
Truck Tractor with Trailer								8 – 8	8 – 8
Wrecker Truck								– – 2	– – 2

SOURCE: DPWH REGION III OFFICE

LIST OF EQUIPMENTS FOR REHABILITATION OF INFRASTRUCTURE DAMAGED BY MT. PINATUBO (3/3)

List of Equipments	Pampanga 1st District Office	Pampanga 2nd District Office	Bulacan District Office	Tarlac District Office	Bataan District Office	Zambales District Office	Olongapo City Engineer's Office	REGIONAL OFFICE	T O T A L
	Equipments Owned by District (DPWH)								
	Equipments Owned by Private Contractor								
	Total Equipments Needed for the Rehabilitation								
Service Vehicle	- - 4	- - 10		- - 8	- - 6	- - 10	- - 4	4 - 20	4 - 82
Mobile Shop								2 - 7	2 - 7
Fork Lift (5-10 tons)								8 - 8	8 - 8
Water Tank (6,000 liters)	- - 1	- - 1							- - 2
Water Jet Cleaning Tank (6,000 liters)	- - 2	- - 2		- - 2			- - 1		- - 7
Street Sweeper Speed 3-15 M Sweeping Width	- - 2	- - 2		- - 1			- - 2		- - 7
Truck Sewer Vacuum (Trk. Mtd.)	- - 1						- - 1		- - 2
Diesel Hammer	- - 3	- - 4		- - 3	- - 3	- - 4			- - 17
Telescopic Crane (45 tons)								- - 1	- - 1
Telescopic Crane (35 tons)								- - 1	- - 1
T O T A L E Q U I P M E N T S	6 178 242	10 88 91		- 59 112	- - 19	18 87 132	2 8 25	15 - 65	45 870 686

SOURCE: DPWH REGION III OFFICE

APPENDIX 8

EXTERNAL ASSISTANCE FOR RELIEF, REHABILITATION AND RECONSTRUCTION OF THE MT. PINATUBO VICTIMS

External Assistance for Relief, Rehabilitation and Reconstruction of the Mt. Pinatubo Victims
(as of 20 September 1991)

(unit: 1000 Peso)

Donor	Relief/ Rescue	Rehabilitation/ Reconstruction	Description
A. Multilateral			
UNDP/UNDRO	2,095		worth of tents, blanckets, etc.
		Grant 13,890	Assistance being firmed up by NEDA
UNICEF	17,506		for purchase of health kits, rice
WFP	25,438		food acid
ILO		Grant 833	Consultancy on Lakor-Based Management.
WHO	417		worth of medicine supplies
FAO		Grant 1400	to finance services of animal production
UNHCR	1,385		Rehab. of hospital, school, building of NIPA
CKC	19,600		cash, worth of food & medical supplies
WB			being considered by PMO
ADB			DPWH's request
B. Bilateral			
V.S.A.	94,500		worth of package meals monitoring equipment and others
		Grant 2,800	Assistance for Agri. Rehab.
SINGAPORE	2,400		worth of military tents
NEW ZEALAND	900		Cash donation
SOUTH KOREA	2,800		
AUSTRALIA	2,827		cash donated thru PNRC, rice

Donor	Relief/ Rescue	Rehabilitation/ Reconstruction	Description
JAPAN	17,360 18,200		food, medicine, tents, generators, etc., monitoring equipment. dispatched Specialist, Awaiting response
GERMANY	11,130		purchases of food medicaments, etc.
DENMARK	800		Cash donation to PNRC
U.K.	7,298		for Save the Children Fund, and others.
SWEDEN	1,134		Cash donation waiting $300,000 grant
NORWAY	6,113		Cash donation
NETHERLANDS	11,500		project for relief operation
		Grant 100,000	Dutch Rural Develop. Assist. Program
SPAIN	12,374		for relief goods
ITALY	10,282		for the purchase of relief goods, etc.
CHINA	556		Cash donation
CANADA		Grant 6,925	Local Initiatives for Rehab./Recon.
	6,506		for the purchase of relief goods etc.
BELGIUM	375		worth of relief supplies
FRANCE	458		Cash donation
TAIWAN	5,600		Cash and 200 large tents
FINLAND	5,558		Cash donation
SAUDI ARABIA	140 tons food 3 mobile clinics		

Donor	Relief/ Rescue	Rehabilitation/ Reconstruction	Description
THAILAND	10,340		Cash, medical supplies, rice
MALTA	3,340 ibs. of eye wash, medical supplies		
MYANMAR	10,000 bags of rice		
INDIA	110 cartons of medical supplies		
INDONESIA	2,800		
ISRAEL			with commitment

APPENDIX 9

ORGANIZATION CHART

AND

NUMBER OF STAFF

DPWH BUREAU OF EQUIPMENT ORGANIZATION CHART

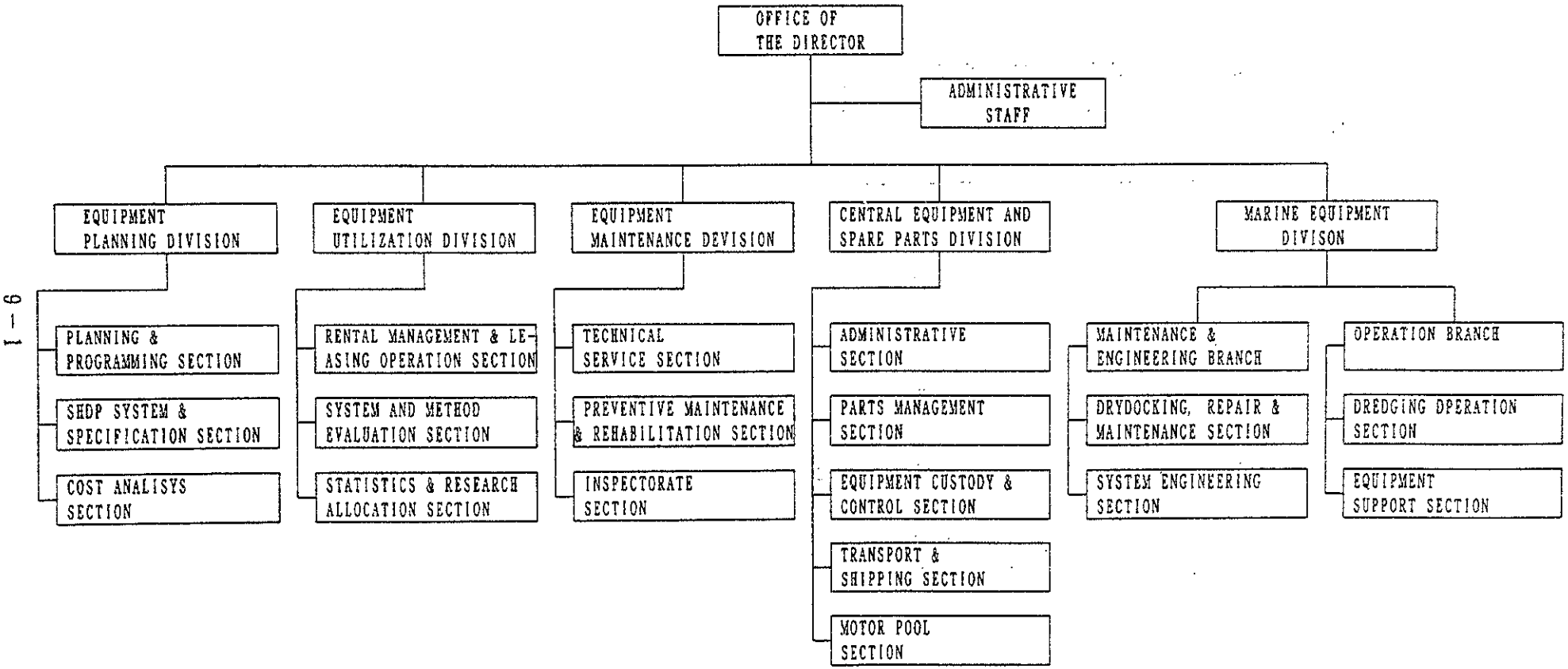
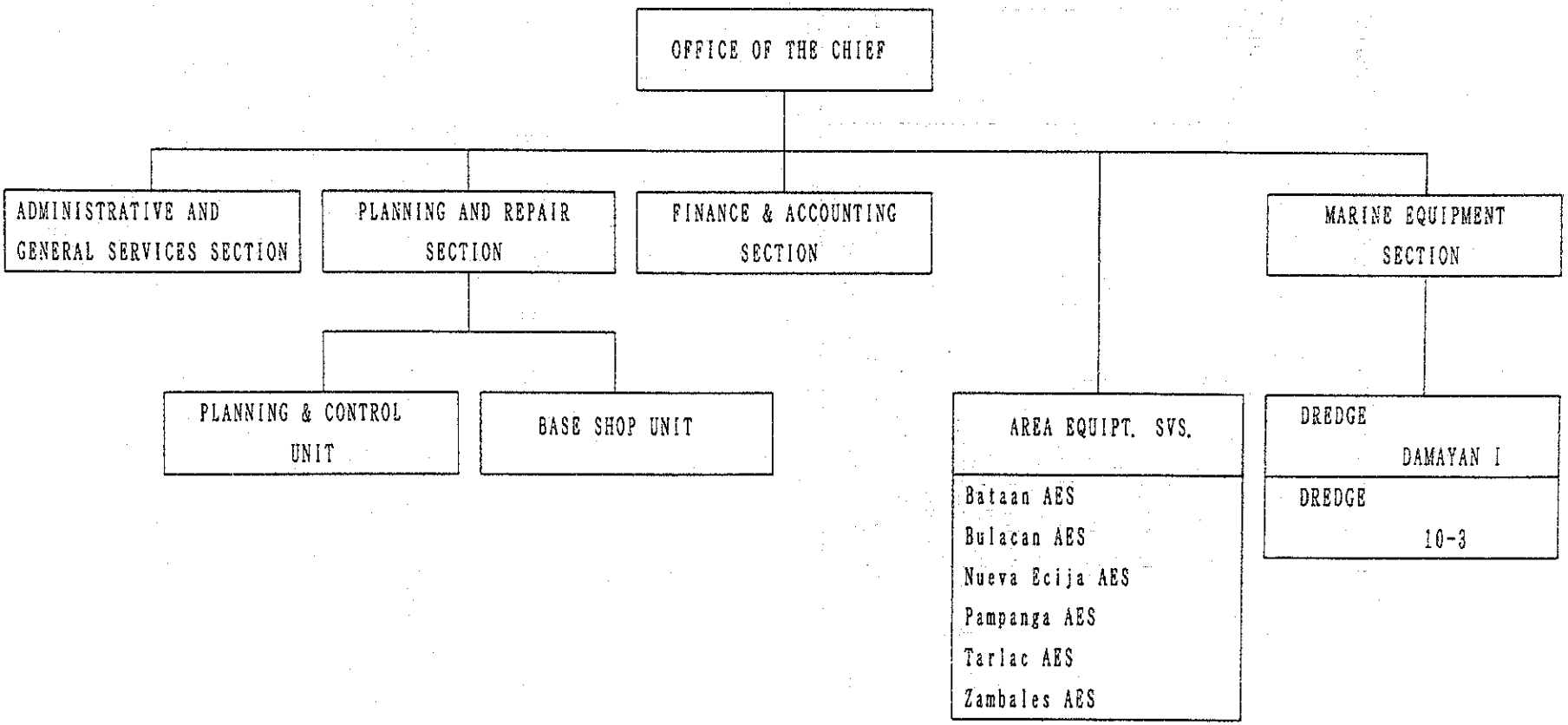


TABLE OF DPWH BUREAU OF EQUIPMENT

Position	Number
Director	1
Assistant Director	1
Head of Division	5
Engineer	124
Officer	8
Administer	79
Foreman	18
Operator	32
Mechanic	20
Artisan	27
Dredge Man	47
Skilled Worker	41
Driver	13
Utility Worker	31
Total	447

REGIONAL EQUIPMENT SERVICES REGION III ORGANIZATION CHART

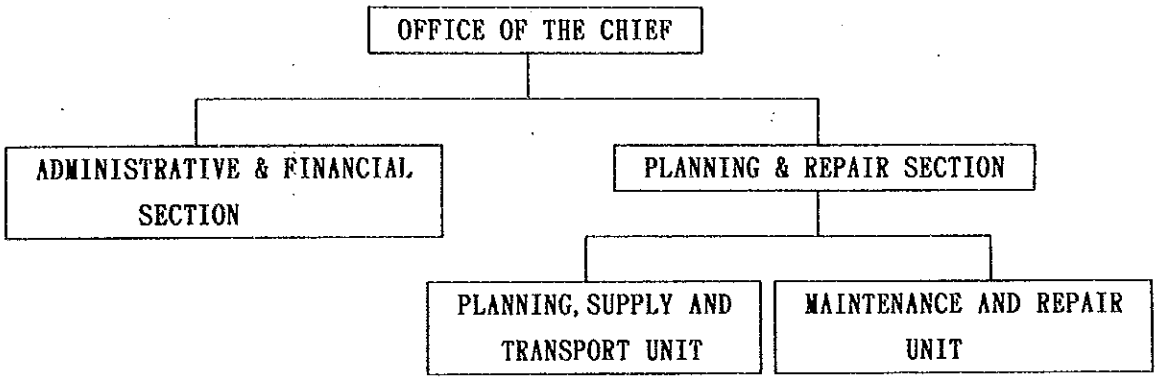


STAFF OF DPWH REGION III EQUIPMENT SERVICES

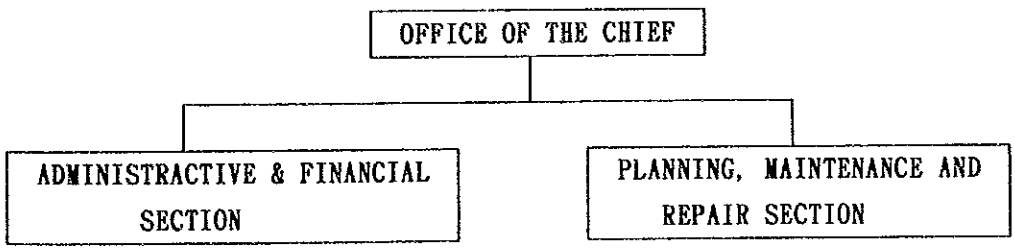
Position	Number
Chief of Office	1
Engineer	11
Officer	5
Administer	23
Foreman	4
Operator	11
Mechanic	40
Artisan	18
Dredge Man	9
Skilled Worker	8
Nurse	1
Utility Worker	8
Total	139

AREA EQUIPMENT SERVICES ORGANIZATION CHART

• Second Class Area Equipment Services Area : BULACAN
TARLAC
ZAMBALES



• Third Class Area Equipment Services Area : Pampanga
Bataan



STAFF OF AREA EQUIPMENT SERVICES

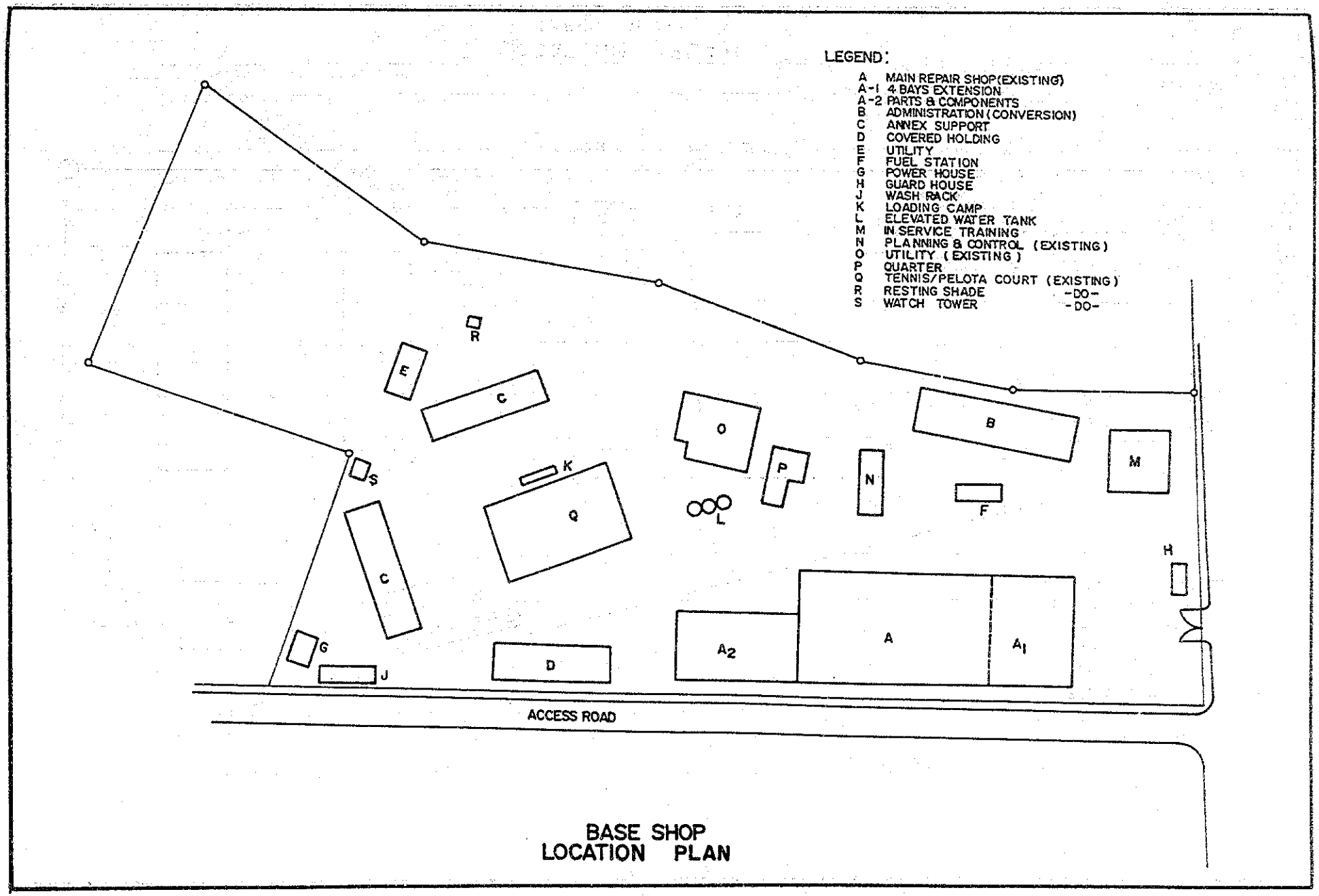
Position	Number	
	Second class	Third class
Chief of Office	1	1
Engineer	3	1
Administer	11	7
Mechanic	14	10
Operator	2	2
Skilled Worker	5	1
Utility Worker	5	2
Total	41	24

APPENDIX 10

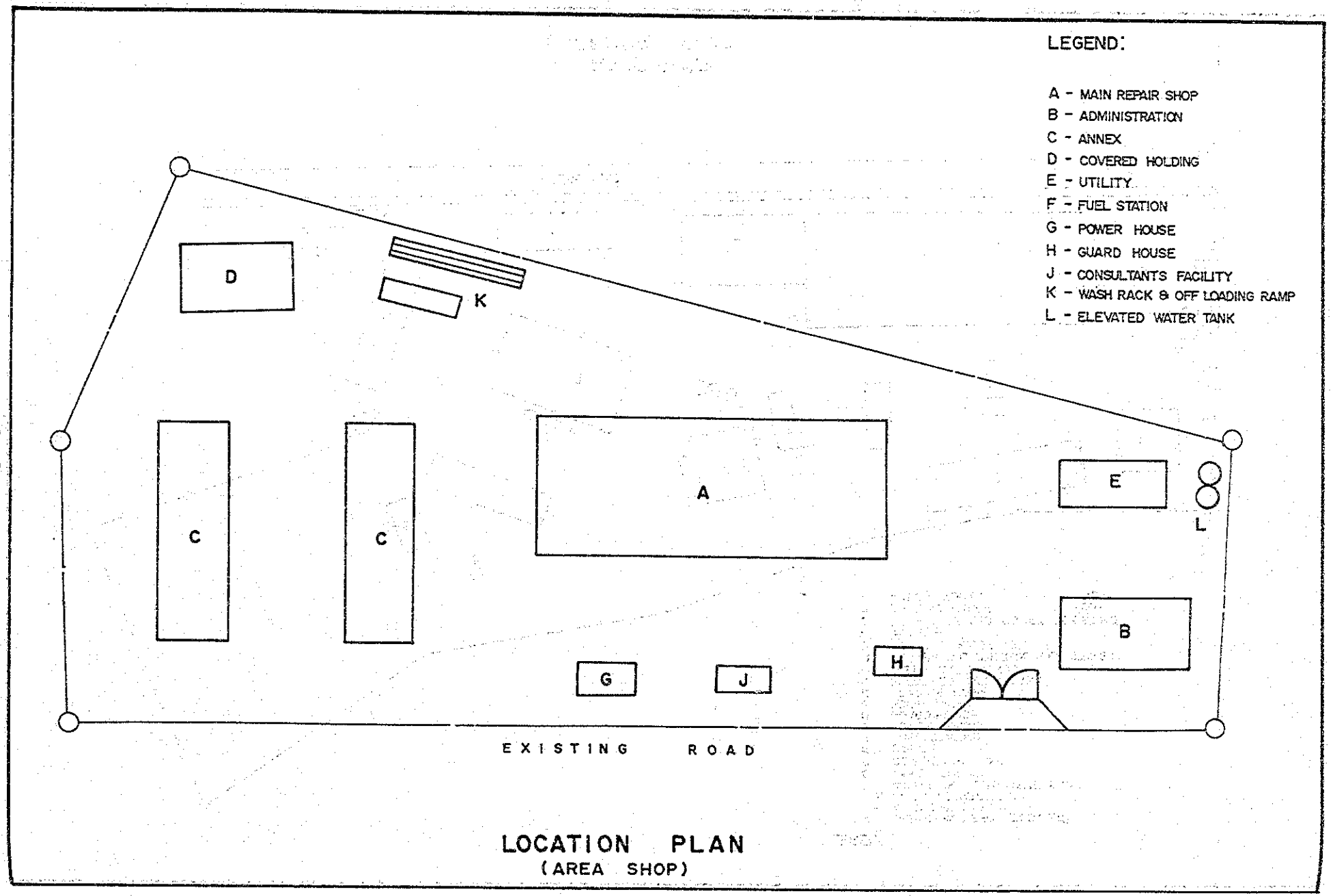
LOCATION PLAN

OF

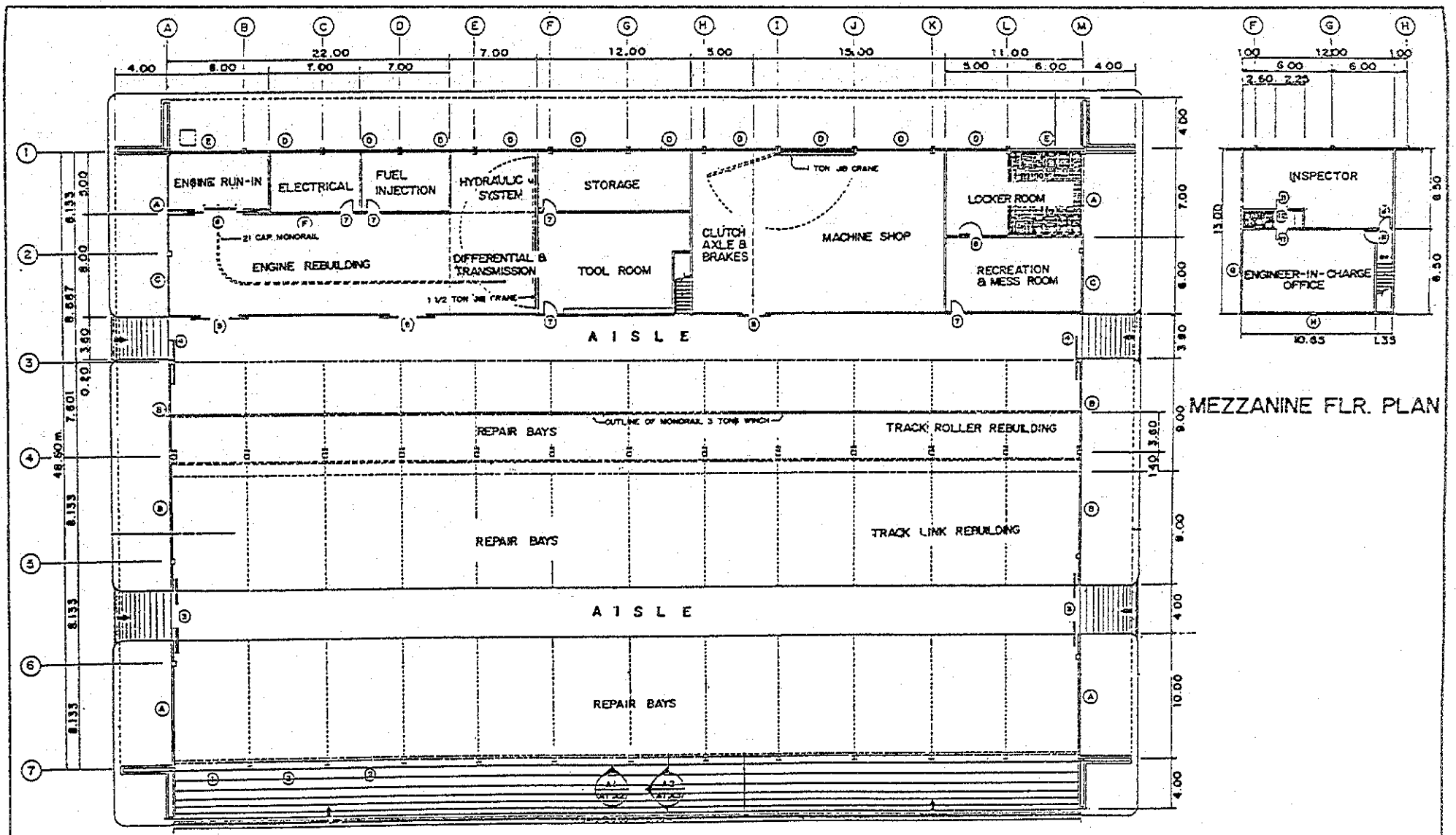
BASE SHOP



BASE SHOP
LOCATION PLAN



LOCATION PLAN
(AREA SHOP)



MEZZANINE FLR. PLAN

GROUND FLOOR PLAN

BASE OVERHAUL SHOP

APPENDIX 11

THE COST TO BE SHOULDERED BY THE PHILIPPINES

TOTAL MAINTENANCE/MANAGEMENT COST

(unit: thousand Pesos)

Type of Equipment	Life to Use (year)	Unit Cost			Number (each)	Total Cost			Description
		Maintenance	Management	Total		Maintenance	Management	Total	
Bulldozer	6	1,005	306	1,311	10	10,050	3,060	13,110	210 HP
Swamp Bulldozer	6	1,228	306	1,534	9	11,052	2,754	13,806	210 HP
Towed Scraper	8	1,642	191	1,833	10	1,620	1,910	18,330	9.1 m^3
Hydraulic Excavator	5	821	268	1,089	10	8,210	2,680	10,890	0.7 m^3
Truck Mounted Crane	8	799	485	1,284	8	6,392	3,880	10,272	25 t
Gabion Fab. Machine	8	2,463	1,071	3,534	1	2,463	1,071	3,534	
Jack Hammer	3	4	1	5	4	16	4	20	
Diesel Hammer	5	110	32	142	4	440	128	568	2.9 t
Mighty Mite	6	479	164	643	7	3,353	1,148	4,501	
Sewer Vacuum	5	587	168	755	2	1,174	336	1,510	
Total								76,541	

ANNUAL MAINTENANCE/MANAGEMENT COST

(unit: thousand Pesos)

Type of Equipment	Number (each)	Unit Cost			Total Annual Cost			Description
		Maintenance	Management	Total	Maintenance	Management	Total	
Bulldozer	10	167.5	51.0	218.5	1,675	510	2,185	210 HP
Swamp Bulldozer	9	204.7	51.0	255.7	1,842	459	2,301	210 HP
Towed Scraper	10	205.3	23.9	229.2	2,053	239	2,292	9.1 m^3
Hydraulic Excavator	10	164.2	53.6	217.8	1,642	536	2,178	0.7 m^3
Truck Mounted Crane	8	99.9	60.6	160.5	799	485	1,284	25 t
Gabion Fab. Machine	1	307.9	133.9	441.8	308	134	442	
Jack Hammer	4	1.2	0.3	1.5	5	1	6	
Diesel Hammer	4	22.0	6.3	28.3	88	25	113	2.9 t
Mighty Mite	7	79.8	27.3	107.1	559	191	750	
Sewer Vacuum	2	117.3	33.6	150.9	235	67	302	
Total							11,853	

OPERATION COST

(unit: thousand Pesos)

Type of Equipment	Number (each)	Annual Operation Cost		Life to Use (each)	Total Operation Cost		Description
		Unit Cost	Annual Op. Cost		Unit Cost	Total Op. Cost	
Bulldozer	10	258.8	2,588	6	1,553	15,530	
Swamp Bulldozer	9	258.8	2,329	6	1,553	13,997	
Towed Scraper	10	120.0	1,200	8	720	7,200	
Hydraulic Excavator	10	210.0	2,100	5	1,260	12,600	
Truck Mounted Crane	8	140.3	1,122	8	1,122	8,976	
Gabion Fab. Machine	1	294.8	295	8	2,358	2,358	
Jack Hammer	4	75.6	302	3	227	908	
Diesel Hammer	4	81.0	324	5	486	1,944	
Mighty Mite	7	57.6	403	6	346	2,422	
Sewer Vacuum	2	121.6	243	5	608	1,216	
Total			10,906			67,131	

INLAND TRANSPORTATION

(unit: US$)

	Quantity	Unit	Unit Price	Amount
Construction Equipment				
Bulldozer	10	Units	1,130.00	11,300.00
Swamp Bulldozer	9	Units	1,050.00	9,450.00
Towed Scraper	10	Units	1,130.00	11,300.00
Hydraulic Excavator	10	Units	1,130.00	11,300.00
Truck Mounted Crane	8	Units	1,620.00	12,960.00
Gabion Fab. Machine	1	Units	1,100.00	1,100.00
Jack Hammer	4	Units	150.00	600.00
Diesel Hammer	4	Units	575.00	2,300.00
Mighty Mite	7	Units	575.00	4,025.00
Sewer vacuum	2	Units	575.00	1,150.00
Sub-total	65	Units		65,485.00
Spare For				
Bulldozer	4.67 x 10	t	40.00	1,868.00
Swamp Bulldozer	5.00 x 9	t	40.00	1,800.00
Towed Scraper	0.60 x 10	t	40.00	240.00
Hydraulic Excavator	0.40 x 10	t	40.00	160.00
Truck Mounted Crane	0.35 x 8	t	40.00	112.00
Gabion Fab. Machine	0.59 x 1	t	40.00	23.60
Jack Hammer	0.02 x 4	t	40.00	3.20
Diesel Hammer	0.06 x 4	t	40.00	9.60
Mighty Mite	0.15 x 7	t	40.00	42.00
Sewer vacuum	0.07 x 2	t	40.00	5.60
Sub-total		t		4,264.00
Materials				
Iron for Gabion	681.89	t	4.00	27,275.60
Sub-total		t		27,275.60
		t		90,024.60
TOTAL	US$1 =	27.41		2,659,444.29
	US$1 =	137.32		13,323,418

UNLOADING COST

(unit: US$)

Type of Equipment	Quantity (F/T x Number)	Unit	Unit Price	Amount
Construction Equipment				
Bulldozer	54.15 x 10	F/T	4.00	2,166.00
Swamp Bulldozer	60.30 x 9	F/T	4.00	2,170.80
Towed Scraper	67.00 x 10	F/T	4.00	2,680.00
Hydraulic Excavator	85.00 x 10	F/T	4.00	3,400.00
Truck Mounted Crane	100.83 x 8	F/T	4.00	3,226.56
Gabion Fab. Machine	69.91 x 1	F/T	4.00	279.64
Jack Hammer	0.15 x 4	F/T	4.00	2.40
Diesel Hammer	6.13 x 4	F/T	4.00	98.08
Mighty Mite	21.40 x 7	F/T	4.00	599.20
Sewer Vacuum	22.00 x 2	F/T	4.00	176.00
Sub-total	3.699.67	F/T		14,798.68
Spare For				
Bulldozer	5.33 x 10	F/T	4.00	213.20
Swamp Bulldozer	6.00 x 9	F/T	4.00	216.00
Towed Scraper	1.80 x 10	F/T	4.00	72.00
Hydraulic Excavator	2.50 x 10	F/T	4.00	100.00
Truck Mounted Crane	0.70 x 8	F/T	4.00	22.40
Gabion Fab. Machine	3.79 x 1	F/T	4.00	15.16
Jack Hammer	0.05 x 4	F/T	4.00	0.80
Diesel Hammer	0.25 x 4	F/T	4.00	4.00
Mighty Mite	1.50 x 7	F/T	4.00	42.00
Sewer Vacuum	0.80 x 2	F/T	4.00	6.40
Sub-total	172.99	F/T		691.96
Materials				
Iron for Gabion	681.89	F/T	4.00	2,727.56
Sub-total	681.89	F/T		2,727.56
TOTAL	4,554.55	F/T		18,218.20
	US$1 = 27.41			499,360.86
	US$1 = 137.32			2,501,723

PORT CHARGE

(unit: US$)

Type of Equipment	Quantity (F/T x Number)	Unit	Unit Price	Amount
Construction Equipment				
Bulldozer	54.15 x 10	F/T	11.00	5,956.50
Swamp Bulldozer	60.30 x 9	F/T	11.00	5,969.70
Towed Scraper	67.00 x 10	F/T	11.00	7,370.00
Hydraulic Excavator	85.00 x 10	F/T	11.00	9,350.00
Truck Mounted Crane	100.93 x 8	F/T	11.00	8,873.04
Gabion Fab. Machine	69.91 x 1	F/T	11.00	769.01
Jack Hammer	0.15 x 4	F/T	4.00	2.40
Diesel Hammer	6.13 x 4	F/T	4.00	98.08
Mighty Mite	21.40 x 7	F/T	11.00	1,647.80
Sewer Vacuum	22.00 x 2	F/T	11.00	484.00
Sub-total	3.699.67	F/T		40,520.53
Spare For				
Bulldozer	5.33 x 10	F/T	4.00	213.20
Swamp Bulldozer	6.00 x 9	F/T	4.00	216.00
Towed Scraper	1.80 x 10	F/T	4.00	72.00
Hydraulic Excavator	2.50 x 10	F/T	4.00	100.00
Truck Mounted Crane	0.70 x 8	F/T	4.00	22.40
Gabion Fab. Machine	3.79 x 1	F/T	4.00	15.16
Jack Hammer	0.05 x 4	F/T	4.00	0.80
Diesel Hammer	0.25 x 4	F/T	4.00	4.00
Mighty Mite	1.50 x 7	F/T	4.00	42.00
Sewer Vacuum	0.80 x 2	F/T	4.00	6.40
Sub-total	172.99	F/T		691.96
Materials				
Iron for Gabion	681.89	F/T	11.00	7,500.79
Sub-total	681.89	F/T		7,500.79
TOTAL	4,554.55	F/T		48,713.28
	US$1 = 27.41			1,335,231.00
	US$1 = 137.32			6,690,308

ASSEMBLY COST

(unit: US$)

	Quantity	Unit	Unit Price	Amount
Construction Equipment				
Bulldozer	10	Units	14,400.00	144,000.00
Swamp Bulldozer	9	Units	14,400.00	129,600.00
Towed Scraper	10	Units	-	-
Hydraulic Excavator	10	Units	14,454.00	144,540.00
Truck Mounted Crane	8	Units	-	-
Jack Hammer	4	Units	-	-
Diesel Hammer	4	Units	-	-
Mighty Mite	7	Units	-	-
Sewer vacuum	2	Units	-	-
Sub-total	64	Units		418,140.00
Assembly				
Gabion Fab. Machine	1	Unit	-	-
Sub-total	1	Unit		-
Factory Construction				
Gabion Factory	1	Set	1,944,000.0	1,944,000.00
Sub-total	1	Set		1,944,000.00
TOTAL	65	Units		2,362,140.00
	US$1 = 5.01			11,834,321

APPENDIX 12

PHOTOGRAPHS (DAMAGE AREA)

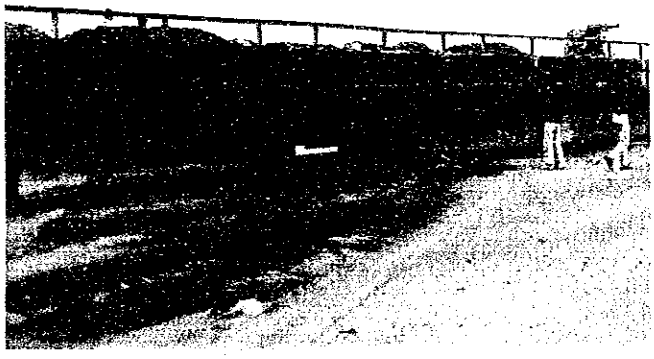
Aqino Bridge:Sediment of Riverbed

Bambam Bridge:Buried under Sediment

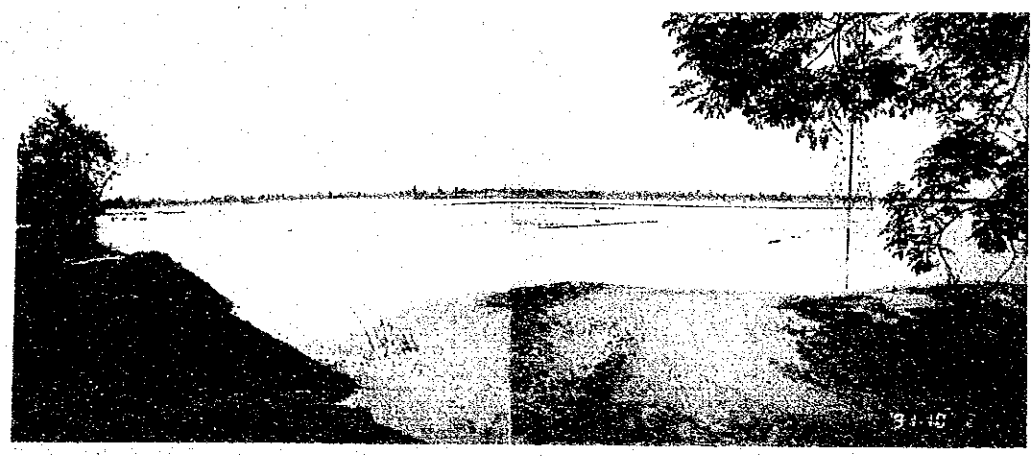
Abacan Bridge:Scouring upstream

Abacan Bridge:Collapse

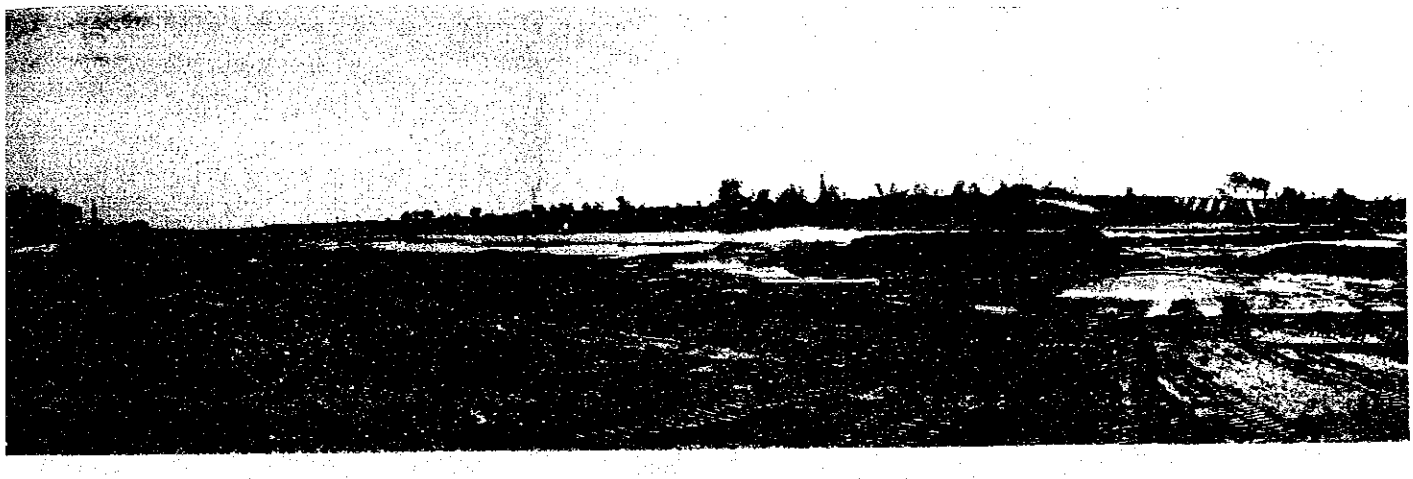
Capaya Bridge:Bridge Approach Washout



Capaya Bridge:Sediment of Riverbed



Pasig-Potreo River :Mudflow

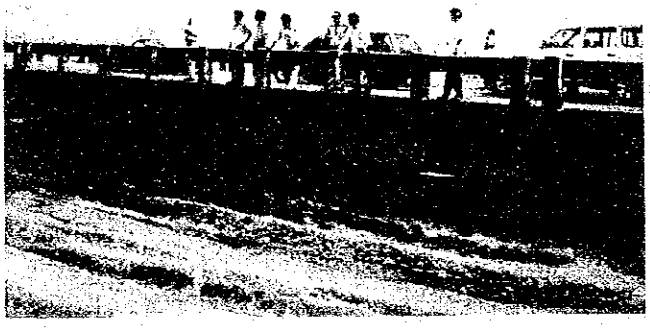


Pasig-Potreo River :Up-stream of Sta.Barbara Bridge

Gumain-Porlac River:Overflow on Road

Gumain-Porlac River:Mudflow at Lubao Area

Sto. Tomas River:Mudflow at Sta. Fe Area



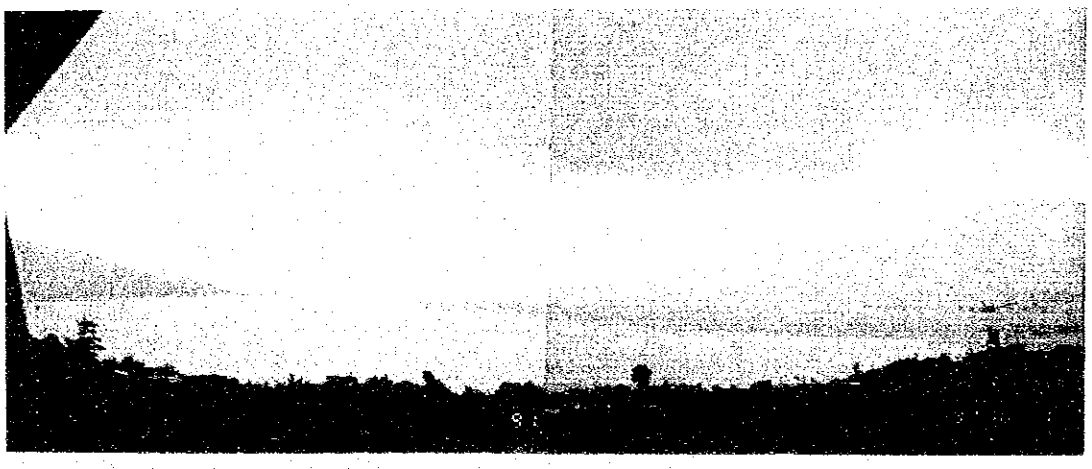
Maculcul Bridge:Sediment of Riverbed

Sto. Tomas River:Sediment by Overflow

Maloma River:Cut of Riverbank

Cabangan River:Downstream of Cabangan Bridge

Cabangan River:Overflow at Upstream



Bucao River:Lahar in upstream

Bucao River:Flooded Road by Overflow