

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
NATIONAL DEVELOPMENT PLANNING AGENCY (BAPPENAS)  
PROVINCIAL GOVERNMENT OF NANGGROE ACEH DARUSSALAM

THE STUDY  
ON  
THE URGENT REHABILITATION AND RECONSTRUCTION  
SUPPORT PROGRAM  
FOR  
ACEH PROVINCE AND AFFECTED AREAS  
IN NORTH SUMATRA  
  
(URGENT REHABILITATION AND RECONSTRUCTION PLAN  
FOR BANDA ACEH CITY)  
  
IN THE REPUBLIC OF INDONESIA  
  
FINAL REPORT (2)  
VOLUME II : MAIN REPORT

MARCH 2006

NIPPON KOEI CO., LTD.  
YACHIYO ENGINEERING CO., LTD.  
PASCO CORPORATION

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## LIST OF REPORTS

VOLUME I : EXECUTIVE SUMMARY  
VOLUME II : MAIN REPORT  
VOLUME III : APPENDICES

## **PREFACE**

In response to a request from the Government of Indonesia, the Government of Japan decided to conduct a “Study on the Urgent Rehabilitation and Reconstruction Plan for Banda Aceh City in the Republic of Indonesia” and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Akira Takahashi of Nippon Koei Co., Ltd. in association with Yachiyo Engineering Co., Ltd., and Pasco Corporation, to Indonesia from March 2005 to March 2006.

The team held discussions with the officials concerned of the Government of Indonesia and conducted field surveys at the study area. Upon returning to Japan, the team prepared this final report.

I hope this report will contribute to the reconstruction and development of Banda Aceh City and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Indonesia for their close cooperation extended to the study.

March 2006

Kazuhisa Matsuoka  
Vice President  
Japan International Cooperation Agency

Mr. Kazuhisa Matsuoka  
Vice President  
Japan International Cooperation Agency  
Tokyo, Japan

**Subject: Letter of Transmittal**

Dear Sir,

We are pleased to submit herewith the Final Report (2) of the “Study on the Urgent Rehabilitation and Reconstruction Plan for Banda Aceh City in the Republic of Indonesia”. This Study was conducted by Nippon Koei Co., Ltd., in association with Yachiyo Engineering Co., Ltd., and Pasco Corporation, under a contract to JICA, during the period from March 2005 to March 2006. The report consists of Volume I: Executive Summary, Volume II: Main Report and Volume III: Appendices.

The report presents outputs and recommendations for Quick Impact Projects (QIPs), GIS for Aceh Rehabilitation and Reconstruction Information System (ARRIS) and Community Empowerment Program (CEP).

We would like to take this opportunity to express our sincere gratitude to your Agency, and the Ministry of Foreign Affairs. We are also most grateful for the cooperation and assistance from the officials concerned in the Republic of Indonesia, the JICA Indonesia office, and the Embassy of Japan in Jakarta. The Final Report is a fruit of excellent collaboration of all participants in this Study.

Yours Faithfully

Akira Takahashi  
Team Leader, JICA Study Team  
The Study on the Urgent Rehabilitation and Reconstruction Plan  
for Banda Aceh City  
in the Republic of Indonesia



**Location Map of Banda Aceh City**

PHOTOGRAPHS (1/ 2)



Collapsed Building



Collapsed Building



Devastated Village



Devastated Houses and Ship



Inundation in Coastal Area



Collapsed River Dike (Doy River)



## PHOTOGRAPHS (2/2)



Damaged Human Septage Treatment Plant



Cleaning of Debris



Temporary Housing for Internally Dislocated  
People (IDP)



Emergency Restoration



Construction of Permanent Houses



Public Consultation for Reconstruction Plan



## **CONCLUSIONS AND RECOMMENDATIONS**

### **BACKGROUND**

- (1) The Nanggroe Aceh Darussalam (NAD) and North Sumatra Provinces were struck by a powerful earthquake with magnitude of 9.0 and a huge tsunami after 15 minutes of the earthquake on December 26, 2004. This calamity caused casualties of more than 200,000 people and various damages amounting to approximately US\$ 4,450 million.
- (2) The Government of Indonesia has moved promptly and the President issued a Presidential Decree on December 27, 2004 declaring that the earthquake and tsunami wave are the natural disaster and directed the government agencies and organizations concerned to act immediately and comprehensively in the emergency response handling of the natural disaster through issuing 12 directives.
- (3) BAPPENAS was appointed to prepare “The Master Plan for Rehabilitation and Reconstruction for Aceh Region and Nias” (called “Blueprint”) for the people of Aceh and North Sumatra within three (3) months in coordination among the government line agencies, donors, local governments and NGOs. BAPPENAS published “Blueprint” in March 2005. The Blueprint indeed covers various aspects necessary for rehabilitation and reconstruction of the affected areas, and sets to implement the established plan in integrated approach in three (3) stages: Emergency Relief Stage (initial 3 months), Rehabilitation Stage (after 3 months to 2006), and Reconstruction Stage (2007 to 2009).
- (4) The Japanese Government decided to render various support and assistance to the damaged area. The Japan International Cooperation Agency (JICA) dispatched its Project Formulation Mission in January 2005 to Indonesia in accordance with the request of the GOJ. As a result, JICA decided to implement “The Study on the Urgent Rehabilitation and Reconstruction Plan for Banda Aceh City” (The Study) under the agreement with BAPPENAS.

### **THE STUDY**

- (5) The objectives of the Study are: (i) Formulation of Urgent Rehabilitation and Reconstruction Plan (URRP) for Banda Aceh City with a target year 2009, including Community Empowerment Program (CEP), (ii) Designing, Cost Estimation and Monitoring of Quick Impact Projects, and (iii) Establishment of Aceh Rehabilitation and Reconstruction Information System (ARRIS).
- (6) The study was commenced from March 2005 and completed in March 2006. Formulation of the URRP was completed in August 2005, and the results and some progress of CEP and ARRIS were presented in the Final Report (1).

- (7) This Report presents the rest of the original Study such as Quick Impact Projects (QIPs), GIS for Aceh Rehabilitation and Reconstruction Information System (ARRIS) and Community Empowerment Program (CEP) as Final Report (2).

## **THE STUDY AREA**

- (8) The Study Area covers the entire administrative area of Banda Aceh City (approximately 61 km<sup>2</sup>) and its surroundings. The Banda Aceh City is the capital of NAD and is also center of commerce, education and culture of the province. The city comprises 9 kecamatan (districts): Meuraxa, Baiturrahman, Kuta Alam, Ulee Kareng, Jaya Baru, Banda Raya, Leung Bata, Syiah Kuala, and Kuta Raja.
- (9) The city faces to the Strait of Malacca on its north. Its topography is characterized by very flat with average elevation around two (2) meters above sea level.
- (10) The city had population of 263,668 in December 2004, of which nearly 73,400 or 28 % were resided in Meuraxa, Jaya Baru and Kuta Raja kecamatan, most affected areas within the city. These 3 kecamatan are located on the coast. The average population growth rate before disaster was 2.1 % per annum during the period from 1998 and 2004.
- (11) Most predominant land use before disaster was presumed to be residential/commercial area, more than 30 % of the entire city area, followed by swamp/open water, most of which was used to be fish ponds, one of main economic activities.
- (12) GRDP per capita of Banda Aceh City was US \$ 350 approximately in 2002, being about a half of the national average (US\$ 710). Main economic activities are commerce and fish cultivation, but the latter was almost completely destroyed by tsunami.

## **QUICK IMPACT PROJECT (QIP) BY JICA FUND (SEPTAGE TREATMENT PLANT)**

- (13) The purpose of the project is to rehabilitate septage treatment plant (*Instalasi Pengelolaan Lumpur Tinja*, IPLT) which was built in 1995 and was destroyed completely by the Tsunami. It is a matter of importance to implement and complete the project as earlier as possible to preserve the public hygiene.
- (14) Municipal Government of Banda Aceh City through the Government of Indonesia (GOI) requested to the JICA assistance for implementation of the project “Rehabilitation of Septage Treatment Plant” (the Project) in April 12<sup>th</sup>, 2005. In response to the request, JICA decided to provide technical and financial assistance as Quick Impact Project (QIP).
- (15) The Project aims at rehabilitating IPLT with a daily treatment capacity of 50 m<sup>3</sup> in terms of septage in Banda Aceh City and access road for a length of 2 km.
- (16) Tender documents were prepared in May 2005 and tendering was conducted in June 2005. PT. Tenaga Inti Makmu Beusare, Acehnese contractor was selected in tendering.

- (17) Construction works was started on July 5 and completed on December 20, 2005. Hand-over ceremony was undertaken in the same day. The works were successfully completed within the originally planed schedule (one (1) week ahead the schedule) and technical specifications.

#### **QUICK IMPACT PROJECTS (QIPs) UNDER JAPAN'S NON-PROJECT TYPE GRANT AID**

- (18) Besides JICA URRP study, GOJ pledged GOI to provide financial assistance of JPY 14.6 billion for rehabilitation and reconstruction works on the disaster affected areas, utilizing Non-project Type Grant Aid Scheme.
- (19) Through the discussions with the related agencies of the Government of Indonesia and JICS, five (5) projects were identified as Quick Impact Projects (QIPs), which require technical assistance on studies/surveys, detailed design and preparation of draft tender documents. The works were conducted from mid. April to early September, 2005.

#### **QIP for Recovery of Water Supply System in Banda Aceh City**

- (20) There are two (2) sources of public water supply for Banda Aceh City: one is Lambaro Water Treatment Plant and the other is Siron Water Treatment Plant. Pipe water supply system in Banda Aceh City had a daily water supply capacity of 40,000 m<sup>3</sup> before the 2004 disaster and had individual connection of 24,411 and public tap of 100. However, distribution pipelines were destroyed in many locations, especially in the areas along the coast (Kecamatan Meraxa, Kuta Raja, Jaya Baru and Syiah Kuala) where the houses and infrastructure were completely destroyed and/or heavily damaged.
- (21) The Project aims at restoring water distribution network in Banda Aceh City.
- (22) The water demand is forecasted for the respective desa with a target year 2009. The average daily gross water demand including the amount of the un-accounted for water is forecasted at 44,062 m<sup>3</sup> in 2009.
- (23) The proposed distribution network is almost identical to the ones existed before the 2004 disaster. But it is more effective and efficient in terms of water distribution and control and stronger against possible disaster. In total 55 drawings were prepared as technical documents.

#### **QIP for Emergency Repair Works of Aceh River and Floodway**

- (24) The Project aims at repairing the damaged dykes to their original situation urgently in order to protect the city area from flooding and high tide. With implementation of the Project the present inundation areas will be secured and contribute to return of affected people and other development activities.
- (25) The project component was determined in due consideration of the request of the Indonesian counterpart agency, urgency, condition prevailing at the site and damaged

structures, foreseen rehabilitation works and its volume, required construction period, etc.

- (26) The Project is proposed to be realized in five (5) separate contract packages in order to expedite and complete the construction works in a period shortest as possible in view of urgency. Rehabilitation of dykes and revetments, normalization, and dredging are the major works.

**QIP for Rehabilitation of Lampulo Fish Market**

- (27) The Lampulo Fish Market, which is located close to the mouth of the Aceh River (approximately 1 km), suffered major damage in the earthquake and tsunami. Most of the market facilities were destroyed and/or are in a dangerous situation.
- (28) The project component is rehabilitation on building for ice-making machines, freezers and generators, which will be procured separately by the Non-project Type Grant Aid Scheme.

**QIP for Rehabilitation of Orphanages (JROH NAGUNA and NIRMALA)**

- (29) Jroh Naguna and Nirmala orphanages, located approximately 3 km east of central Banda Aceh City were severely damaged as a result of earthquake and tsunami.
- (30) The goals of the project are to restore their normal function, improve the poor facility environment, employ disaster countermeasures, and expand the capacity of the facilities to meet the increased number of orphans and facility-related personnel.
- (31) The project component is restoration works on building facilities where damaged and new construction works where damages are judged severe resulting that the structural safety cannot be guaranteed.

**QIP for RRI (Building), and for RRI and TVRI (Equipment)**

- (32) Radio Republic Indonesia (RRI) and Television Republic Indonesia (TVRI), the state-owned broadcast in Indonesia, has suffered from the tremendous damage by the earthquake and tsunami, and has been forced to shorten their broadcasting time.
- (33) The project components for RRI (building) are repair works for some buildings, new construction works for gatehouse (16m<sup>2</sup>) and drainage works in RRI compound.
- (34) The project component for RRI and TVRI is provision of necessary equipment.
- (35) As for design drawings of RRI (equipment), schematic diagram of signal flow, block diagram of radio OB Van, and other systems, new layout plan, etc. were prepared. As for design drawings of TVRI (equipment), composition of field recording system, outline of systems, block diagram of various systems, etc. were prepared.

**Monitoring for above Five (5) QIPs**

- (36) The technical reports on the above five (5) QIPs were prepared in September 2005 and finalized by respective implementing agencies. Subsequently, tendering was held, and rehabilitation works have been commenced from late January to early February 2006 by respective implementing agencies.

## **GIS FOR ARRIS (ACEH REHABILITATION AND RECONSTRUCTION INFORMATION SYSTEM) AND DIGITAL TOPOGRAPHIC MAPS**

- (37) The objectives of ARRIS are to build a geographic information system and to prepare relevant topographic maps and data. These maps and data were used efficiently for rehabilitation and reconstruction planning of Banda Aceh City.
- (38) So called ARRIS was established and utilized for various purposes in planning and shared by various groups who were concerned with the activities of rehabilitation and reconstruction of Banda Aceh City.
- (39) Digital topographic maps and related data were prepared and used as base maps with a geographical information system (GIS). The basic GIS data was prepared at a nominal scale of 1:2,000.
- (40) Three (3) governmental institutions are considered to be the most important organizations in formulating the schemes of operation and maintenance of ARRIS, i.e., BAKOSURTANAL, BAPPENAS and BRR.
- (41) BAKOSURTANAL shall be the most important institution as the coordination of the national spatial data infrastructure (NSDI) including ARRIS data (the topographic maps of Banda Aceh City with a nominal scale of 1:2,000 and the thematic GIS layers), the (data) production house, the technical supporter for the central and local governmental institutions, and an ARRIS hub in Jakarta.
- (42) BAPPENAS shall be another important ARRIS hub in Jakarta, especially for the central government institutions (the line ministries).
- (43) BRR shall be the ARRIS hub in Aceh, and the main governmental organization for formulating and executing the operation and maintenance of ARRIS.

## **COMMUNITY EMPOWERMENT PROGRAM (CEP)**

- (44) The program is implemented for 12 project areas, not only for affected areas in Banda Aceh City but also for those in the Province of Aceh and Nias. The program intends to revitalize people's lives and community activities through enhancement of livelihood and welfare, and to directly benefit to the local people/communities and IDPs at the grassroots/village level through collaboration with local/national NGOs.
- (45) The program employs three (3) main approaches, i.e., 1) Support on Livelihood, 2) Support on community-based trauma/PTSD healing, and 3) Support on rehabilitation of communal water supply/sanitation.
- (46) Special attention was paid to the four (4) issues in the Program, such as 1) Reviving livelihood as a core of the program, 2) Respect on religion and culture, 3) Regional balance of project areas, and 4) Gender Issues.



- (47) Role of the JICA Study Team is to advice and give guidance to local/national NGOs who have contract for implementation of 12 CEP with JICA Indonesia office.
- (48) All 12 CEP is scheduled to be completed successfully at the end of February or March 2006.
- (49) In general, activities carried out under livelihood approach were successful for the target groups to re-start their individual economic activities, but had small impact on cooperative works. Cooperative works such as marketing and/or joint procurement of materials can be facilitated in the future. For sustainability of the project, strengthening on micro-finance organizations is recommended. Furthermore assistance by local/national NGOs on these activities is preferable.
- (50) As a result of psychological activities in the program, women appeared to be strengthened. Outputs for targeted children in Projects No. 10 and 11, also had positive impact on psychological aspect of children since they become more cheerful and creative than before.
- (51) Water / Sanitation and Environment Approach basically consists of 3 phases, namely 1) Facility construction, 2) Establishment of community organization for operation and maintenance (O&M), and 3) Sanitation and environment education. Facility construction as well as establishment of community organizations for O&M was successfully undertaken. However, the establishment of O&M system is sill on the early stage. Further improvement is necessary.

**FINAL REPORT (2)**  
**VOLUME II: MAIN REPORT**  
**FOR**  
**THE STUDY**  
**ON**  
**THE URGENT REHABILITATION AND RECONSTRUCTION PLAN**  
**FOR**  
**BANDA ACEH CITY**

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## ABBREVIATIONS

ADB	Asian Development Bank
AIPRD	Australia-Indonesia Partnership for Reconstruction and Development
AMDAL	Environmental Impact Assessment <i>Analisis Mengenai Dampak Lingkungan</i>
ANDAL	Environmental Impact Statement <i>Dokumen Analisis Dampak Lingkungan</i>
ARF	Aceh Recovery Forum
ARI	Acute Respiratory Infection
ARRIS	Aceh Rehabilitation and Reconstruction Information System
AusAID	The Australian Agency for International Development
BAC	Banda Aceh City
BAPEL	Rehabilitation and Reconstruction Executing Agency <i>Badan Pelaksana Rehabilitasi dan Rekonstruksi</i>
BAPPENAS	National Development Planning Agency <i>Badan Perencanaan dan Pembangunan Nasional</i>
BAPPEDA	Regional Development Planning Agency <i>Badan Perencanaan Pembangunan Daerah</i>
BAPEDALDA	Regional Environmental Impact Management Agency <i>Badan Pengendalian Dampak Lingkungan Daerah</i>
BPOM	Drug and Food Control Center <i>Badan Pengawasan Obat dan Makanan</i>
BCPR	Bureau for Crisis Prevention and Recovery
BPN	National Land Agency <i>Badan Pertanahan Nasional</i>
BPS	National Statistics Bureau <i>Badan Pusat Statistik</i>
BRR	Rehabilitation and Reconstruction Agency for Aceh and Nias <i>Badan Rehabilitasi dan Rekonstruksi NAD-Nias</i>
CBD	Central Business District
CEIC	Center for the Study of Education in an International Context
CEP	Community Empowerment Program
CHO	City Health Office
CGI	Consultative Group on Indonesia
Desa	Village
DFID	The United Kingdom Department for International Development
DKP	Department of Sanitary and Park <i>Dinas Kebersihan dan Pertamanan</i>
DOTS	Direct Observation and Treatment, Short Term
DPU	Department of Public Works <i>Dinas Pekerjaan Umum</i>
DTM	Digital Topographic Map
EDB	Education Department of Banda Aceh City
EDNP	Education Department of NAD Province
EIA	Environmental Impact Assessment (AMDAL)
EIS	Environmental Impact Statement (ANDAL)

EOJ	Embassy of Japan
EPI	Expanded Immunization Program
ERTR	Emergency Response and Transitional Recovery
ETESP	Earthquake and Tsunami Emergency Support Project
GIS	Geographical Information System
GNI	Gross National Income
GOI	Government of Indonesia
GOJ	Government of Japan
GTZ	German Technical Cooperation Agency <i>Deutsche Gesellschaft für Technische Zusammenarbeit</i>
GRDP	Gross Regional Domestic Product
HIC	UN Human Information Centre
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
IATPI	Indonesian Society of Sanitary and Environmental Engineers <i>Ikatan Ahli Teknik Penyehatan dan Teknik Lingkungan Indonesia</i>
IDPs	Internal Displaced Peoples
IDPC	Internal Displaced Peoples' Camps
IFRC	International Federation of Red Cross and Red Crescent Societies
INGO	International Non Governmental Organization
ILO	International Labor Organization
IMR	Infant Mortality Rate
IPLT	Human Excrement Treatment Plant
IOM	International Organization for Migration
IRD	International Relief and Development
JICA	Japan International Cooperation Agency
JICS	Japan International Cooperation System
Kabupaten	District
Kecamatan	Sub-district
Kota	City/ Municipality
LGSP	Local Government Support Project
LGU	Local Government Unit
LPMP	Quality Assurance in Education Institution <i>Lembaga Penjamin Mutu Pendidikan</i>
LSM	Non Governmental Organization <i>Lembaga Swadaya Masyarakat</i>
MA	Islamic Senior High School <i>Madrasah Aliyah</i>
MOC	Ministry of Communication
MCK	Communal toilet/ bath facility <i>Mandi Cuci Kakus</i>
MDGs	Millennium Development Goals
MI	Islamic elementary school <i>Madrasah Ibtidaiyah</i>
MMR	Maternal Mortality Rate
MOH	Ministry of Health
MONE	Ministry of National Education
MORA	Ministry of Religion Affairs

MOU	Memorandum of Understanding
MPU	Muslim Leader Consultative Council <i>Majelis Permusyawaratan Ulama</i>
MT	Islamic Junior High School <i>Madrasah Tsanawiyah</i>
NAD	Nanggroe Aceh Darussalam
NGO	Non Governmental Organizations (LSM)
O&M	Operation and Maintenance
PALYJA	Water Company of Jakarta City <i>PT PAM Lyonnaise Jaya</i>
PAUD	Early Age Children Education Institution <i>Pendidikan Anak Usia Dini</i>
PDAM	Water Supply Authority <i>Perusahaan Daerah Air Minum</i>
PEQIP	Primary Education Quality Improvement Project
PHO	Provincial Health Office
PKBI	Indonesia Planned Parenthood Association (NGO) <i>Perkumpulan Keluarga Berencana Indonesia</i>
PKBM	Community Learning Center <i>Pusat Kegiatan Belajar Masyarakat</i>
PMI	Red Cross Indonesia <i>Palang Merah Indonesia</i>
Propinsi	Province
Posyandu	Integrated Health Service Post <i>Pos Pelayanan Terpadu</i>
PSDAK	Road and Water Resources Department, Banda Aceh City <i>Dinas Prasarana Jalan dan Sumber Daya Air Kota Banda Aceh</i>
PTSD	Post Traumatic Stress Disorder
PU	Ministry of Public Works <i>Departemen Pekerjaan Umum</i>
PVC	Polyvinyl chloride
QIP	Quick Impact Project
RA	Islamic kindergarten <i>Raudatul Athfal</i>
RDB	Religion Department of Banda Aceh City
RDNP	Religion Department of NAD Province
REDIP	Regional Education Development and Improvement Program
RRI	The State Radio of Indonesia <i>Radio Republik Indonesia</i>
RTRW	Revised Plan of Regional Space Layout <i>Rencana Tata Ruang dan Wilayah</i>
R3MAS	Rehabilitation and Reconstruction Plan for the People of Aceh & North Sumatra <i>Rencana Rehabilitasi dan Rekonstruksi Masyarakat Aceh &amp; Sumatra Utara</i>
SD	Elementary school <i>Sekolah Menengah</i>
SDC	Swiss Agency for Development and Cooperation
SETNEG	National Secretariat <i>Sekretariat Negara</i>

SMA	Senior High School <i>Sekolah Menengah Atas</i>
SMK	Senior Vocational High School <i>Sekolah Menengah Kejuruan</i>
SMP	Junior High School <i>Sekolah Menengah Pertama</i>
SPK	District Nursing School <i>Sekolah Perawat Kesehatan</i>
STI	Sexually Transmitted Infections
THW	German Federal Agency for Technical Relief <i>Technisches Hilfswerk</i>
TK	Kindergarten <i>Taman Kanak-kanak</i>
TLC	Temporary Location Center
TOR	Terms of Reference
TOT	Training of Trainers
TPA	Reading Al Qur'an Institution <i>Taman Pengaiaan Al-Qur'an</i>
TVRI	National Broadcast of Indonesia <i>Televisi Republik Indonesia</i>
UFW	Unaccounted for Water
UKL	Environmental Management Plan <i>Upaya Pengelolaan Lingkungan</i>
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UPL	Environmental Monitoring Plan <i>Upaya Pemantauan Lingkungan</i>
USACE	The United States Army Corps of Engineers
USAID	The US Agency for International Development
URRP	Urgent Rehabilitation and Reconstruction Plan
VCT	Volunteer Testing and Counseling
WB	World Bank
WHO	World Health Organization
WTP	Water Treatment Plant
YAB	(Acehnese NGO) <i>Yayasan Anak Bangsa</i>
YADESA	(NGO) <i>Yayasan Desa</i>
YASINDO	(NGO) <i>Yayasan Sinar Desa Indonesia</i>
YCDI	(Acehnese NGO) <i>Yayasan Citra Desa Indonesia</i>
YIPD	(Acehnese NGO) <i>Yayasan Inovasi Pemerintahan Daerah</i>
YNDN	(Acehnese NGO) <i>Yayasan Nandra Dian Nusantara</i>

# CHAPTER 1 BACKGROUND

## 1.1 BACKGROUND OF THE STUDY

Large earthquake, with the magnitude of 9.0 on the Richter scale, occurred at 250 km south from Banda Aceh City on 26 December 2004 (Figure 1.1.1). Huge Tsunami was triggered by the earthquake and avalanched to Nanggroe Aceh Darussalam (NAD) and North Sumatra Provinces after 30 minutes of the earthquake. The earthquake and succeeding Tsunami brought about a number of casualties of more than 200,000 and direct damage of Indonesian Rupiah (Rp.) 40 trillion equivalent to US\$ 4,450 million.

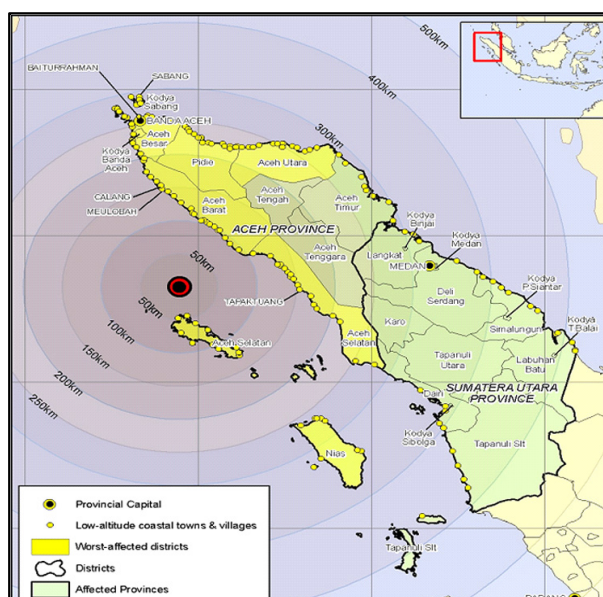
The Government of Indonesia (GOI) assigned National Development Planning Agency (BAPPENAS) as an executing government agency to establish the Rehabilitation and Reconstruction Plan for the people of Aceh and North Sumatra within three (3) months in coordination among the government line agencies, donors, local government and NGOs.

The Banda Aceh City with an area of 61 km<sup>2</sup> is located at the coast line of northern end of the Sumatra Island. The City had a population of 263,668 (54,751 households) in December 2004. The Tsunami with a height of over 10 m destroyed the city area entirely. Almost all buildings within a 4 km radius from the coast line were swept away.

Immediately after the incident, the Government of Japan (GOJ) decided to render support for rehabilitation and reconstruction and provide assistance to the damaged areas. Japan International Cooperation Agency (JICA) dispatched the Project Formulation Mission to recognize the damages, assess the needs and determine on the urgent measures to be undertaken. As a result of discussions with the JICA Project Formulation Mission, the Government of Indonesia (GOI) requested the GOJ to conduct an urgent study for the following objectives:

- (1) Formulation of Urgent Rehabilitation and Reconstruction Plan in the affected areas,
- (2) Designing/cost estimation and monitoring of Quick Impact Projects.

In response to the request from the GOI, JICA decided to implement a Study on Urgent Rehabilitation and Reconstruction Plan for Banda Aceh City (The Study).



Source : United Nations OCHA

Figure 1.1.1 Epicenter of Earthquake (26 Dec. 2004)



## **1.2 THE STUDY**

### **1.2.1 Objectives of the Study**

The objectives of the Study are:

- (1) Formulation of Urgent Rehabilitation and Reconstruction Plan  
To formulate an Urgent Rehabilitation and Reconstruction Plan (the Plan) for Banda Aceh City with a target year of 2009.
- (2) Carry out Designing, Cost Estimation and Monitoring of Quick Impact Projects (QIPs)  
To provide a technical assistance including designing, cost estimation and monitoring of Quick Impact Projects (QIPs) which will be brought into realization by the Government of Indonesia.
- (3) Establishment of Aceh Rehabilitation & Reconstruction Information System (ARRIS)  
To prepare Digital Topographic Maps (DTM) with a scale of 1/2,000, necessary for formulation of an Urgent Rehabilitation and Reconstruction Plan (the Plan) for Banda Aceh City, and to establish an information system for rehabilitation and reconstruction of Banda Aceh City, which can be shared among stakeholders.

### **1.2.2 Study Area**

The Study Area covers the Banda Aceh City with an area of 61 km<sup>2</sup> (See figure at frontispiece of the report) and its vicinity.

### **1.2.3 Scope of the Study**

The Urgent Rehabilitation and Reconstruction Plan (URRP) aims to reconstruct the city to the pre-disaster condition, which is to be achieved in five (5) years from the incident of the disaster, and will be formulated urgently with an initiative of the people of Aceh.

For the URRP, it is important to incorporate a concept of “Disaster Mitigation”, that is, urban spatial plan and strengthening of institutional arrangement to mitigate potential damages in the future.

Aside from the reconstruction of infrastructure, the integration of Community Empowerment Program (CEP) is prerequisite for the accommodation of the Internal Displaced People (IDP).

In addition to the formulation of the URRP, the scope of the Study also covers technical and financial assistance for the implementation of Quick Impact Project for septage treatment plant financed by JICA and technical assistance for other five (5) Quick Impact Projects (QIPs) financed under the Non-project Type Grant Aid Scheme, which includes confirmation of the scope of work, designing, cost estimate and monitoring of project implementation during the Study period.

The scope of the Study also includes establishment of Aceh Rehabilitation & Reconstruction Information System (ARRIS), including preparation of digital topographic maps (1/2,000), which will be required for formulation of the URRP and the information system that can be shared among the stakeholders.

**1.2.4 Overall Work Schedule**

Overall work schedule for the Study is shown below.

Year-month Work Item	2005											2006		
	3	4	5	6	7	8	9	10	11	12	1	2	3	
<b>URRP</b>														
•Formulation of URRP														
•Community Empowerment Program (CEP)														
<b>ARRIS</b>														
•ARRIS (Basic version)														
•Preparation of Digital Map														
•ARRIS (Complete version)														
<b>QIP</b>														
•Plan-Design-Cost Estimation														
•Project Monitoring														

Figure 1.2.1 Overall Work Schedule

**1.2.5 Submission of Final Report (1)**

Of the scope of work abovementioned, formulation of the URRP was completed in August 2005, and the results and some progress of CEP and ARRIS were presented in the Final Report (1).

On August 13, 2005, meeting on the Final Report (1) (Draft) was held at Banda Aceh City among BAPPENAS, PU Jakarta, BRR, BAPPEDA Province, BAPPEDA City, Dinas Tata Kota, Mayor of Kota Banda Aceh, PU Dinas, other agencies concerned, JICA Indonesia office and the JICA Study Team. During the meeting, the URRP proposed in the above-said report was accepted by all the Indonesian organizations and agencies concerned, subject to incorporation of their comments into final report and the Final Report was submitted accordingly to BAPPENAS in September 2005.

**1.2.6 Additional Study**

During the meeting on the Final Report (1) (Draft) on August 13, 2005 at Banda Aceh City among all the Indonesian organizations and agencies concerned, the Mayor and BRR expressed their opinions that there is a need of elaborating a long-term vision, a definite spatial plan and a sector development plan of Kota Banda Aceh with more community-oriented strategies, and therefore

requested to the Japan International Cooperation Agency (JICA) to continue technical assistance to achieve the above objectives.

JICA agreed to conduct an additional study on URRP in accordance with the amendment for the Scope of Work, which took effect on the 3<sup>rd</sup> of March.

The report for the Additional Study on URRP was prepared and submitted separately in March 2006.

### **1.2.7 Final Report (2)**

Final Report (2) covers the rest of the scope of works for the original Study excluding those of Final Report (1), such as Quick Impact Projects (QIPs), GIS for Aceh Rehabilitation and Reconstruction Information System (ARRIS) and Community Empowerment Program (CEP).

## CHAPTER 2 QUICK IMPACT PROJECTS (QIPs)

### 2.1 QUICK IMPACT PROJECT (QIP) BY JICA FUND (SEPTAGE TREATMENT PLANT)

#### 2.1.1 Design Works and Cost Estimate

##### (1) Background of the Project

The purpose of the project is to rehabilitate septage treatment plant (*Instalasi Pengelolaan Lumpur Tinja*, IPLT) which was built in 1995 and was destroyed completely by the Tsunami. It is a matter of importance to implement and complete the project as earlier as possible to preserve the public hygiene. After the Tsunami, the septage which are regularly collected from septic tanks of houses and buildings in BAC, are disposed of to the sea directly without any treatment, resulting in environmental problems. Under the above situation, the Municipal Government of Banda Aceh City through the Government of Indonesia (GOI) requested to the JICA assistance for implementation of the project “Rehabilitation of Septage Treatment Plant” (the Project) in April 12<sup>th</sup>, 2005. In response to the request, JICA decided to provide technical and financial assistance as Quick Impact Project (QIP).

##### (2) Situation before Disaster

In BAC there is no centralized sewerage system including sewage treatment plant, and septic tank is the most common means of sewage treatment in BAC. Sanitation and Park Department of the City Municipality (DKP) is serving the collection, treatment and disposal of septage and has an IPLT which still exists nearby river-mouth of the Ache River. It comprises two lines of Imhoff tank, anaerobic tank, facultative tank and maturation tank as show in Table 2.1.1 and Figure 2.1.1.

Table 2.1.1 Features of Main Components of IPLT

Components		Dimension (m)			Storage capacity (m <sup>3</sup> )
1	Imhoff Tank	Bottom Length	Bottom Width	Depth	
2	Anaerobic Tank	10.8	3.0	3.5	392
3	Facultative Tank	48.0	13.9	1.35	1,078
4	Maturation Tank	15.8	7.0	1.35	221
5	Sludge Drying Bed	8.0	4.0	1.2	38

Source: Outline Plan of Pembuangan Air Limbah Domestic Kota Banda Ache, DPU

In addition to the above treatment facilities, the plant was provided with operation office. Before the disaster it is reported that DKP had operated three (3) vacuum cars and the private operators also had same numbers of the vacuum cars.

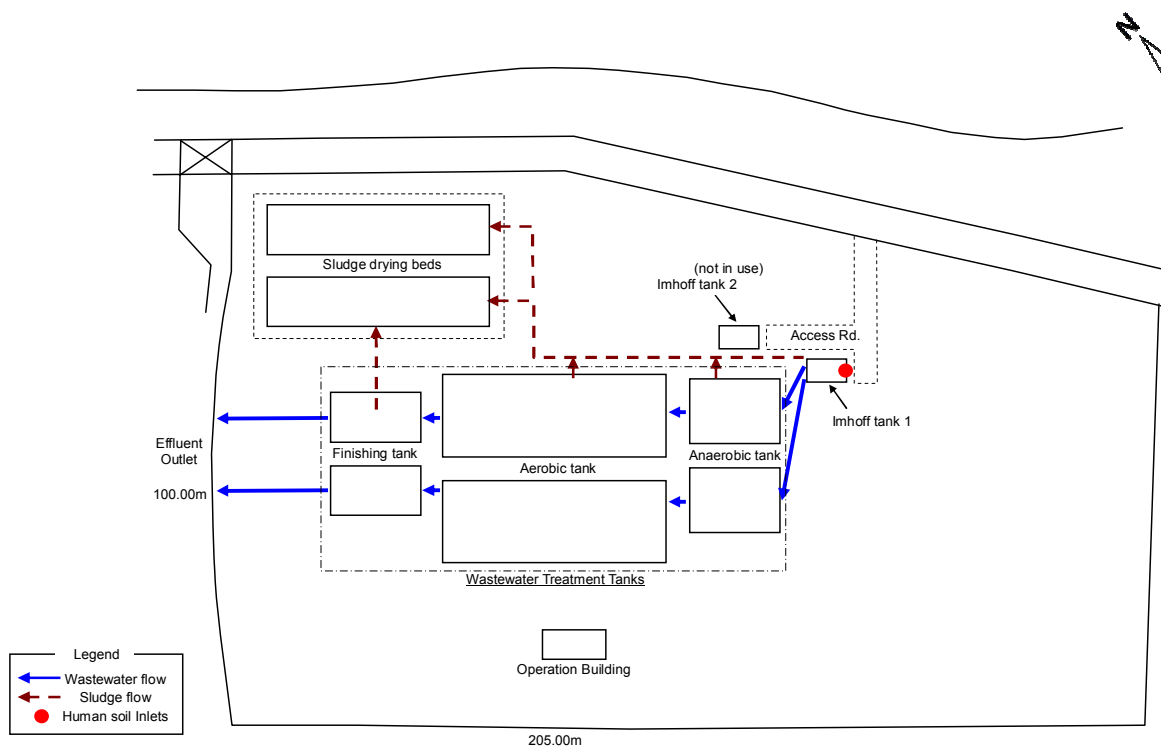


Figure 2.1.1 Schematic Layout of IPLT before Disaster

(3) Situation after Disaster

According to the investigation by DKP and the JICA Study Team, the plant is no longer usable after the disaster. The main components were completely washed away/collapsed/destroyed. For instance there are a number of cracks in the anaerobic, facultative and maturation ponds, resulting in leakage of wastewater, and sludge drying bed is no longer in place. In addition DKP's three (3) vacuum cars were washed away.

The septage collected is directly disposed to the sea near the mouth of the Aceh River. There is therefore urgent need of rehabilitation or construction of the septage treatment plant.

(4) Design Concept

In accordance with the principles of the request made by GOI, the IPLT is to be rehabilitated under the following concepts:

- ✓ The existing IPLT is required to be rehabilitated to urgently secure urban and natural environment
- ✓ Rehabilitation shall be directed to restore the existing IPLT at least with the same functions before the disaster damages
- ✓ Rehabilitation also aims at improving operation and maintenance aspects.
- ✓ Provides construction equipment and material as much as possible in Aceh state
- ✓ It is intended that construction works results in increasing job opportunity.

It is also planned not only rehabilitating the existing IPLT but also improving existing access road and providing drainage and traffic safety facilities. Design criteria for IPLT and access road were set (Details are shown in Appendix).

#### (5) Rehabilitation Design

Prior to commencement of the rehabilitation design, the JICA Study Team made technical discussion with DKP to define the rehabilitation requirements and to find better operation practice than before the disaster. The rehabilitation design presented herein is therefore joint output of the DKP and the JICA Study Team.

As the same as the existing facilities, the whole treatment process shall be achieved by gravity flow, and no mechanical equipment will be used for any part of treatment process, excepting for lighting and deep well pump for a control house. Problems of the components before the disaster were identified with DKP and measures for rehabilitation were determined as follows:

##### 1) Imhoff Tanks

- ① Both the tanks will be modified only for a separation of septage and solid waste. The septage will be led to the anaerobic tanks through open ditch.
- ② In order to facilitate the removal of solid waste and soils, imhoff tank shall be provided with screen at its inlet and bottom outlet at its bottom. The bottom of the tank shall have sloped bottom for both longitudinal and cross-sectional directions.
- ③ The solid waste and sediment which passing through the screen shall be flushed out through the bottom outlet by using a head between the inlet and the bottom outlet. Such solid waste and sediments shall be conveyed to sludge drying bed.
- ④ Approach road shall be constructed to the tanks in order to allow discharge of septage by collection vehicle into inlet of the tank.

##### 2) Anaerobic, Aerobic and Finishing Ponds

- ① The locations and dimensions of tanks shall be the same as existing tanks in principle.
- ② Existing concrete lining shall be removed entirely and bottom and slopes of new tanks shall be lined with a reinforced concrete with a thickness of 0.15 m.
- ③ Inflow into and outflow from the tank shall be controlled by overflow weir which shall be installed at inlet and outlet of the tank.

### 3) Interconnection Conduits

All the ponds from anaerobic down to finishing ponds are interconnected by a gravity flow conduits. In view of maintenance, open conduit with pre-cast concrete cover is adopted. The dimension of the conduits is 30 cm in height and bottom wide.

### 4) Sludge Drying Beds

All debris of damaged structure is removed and new sludge drying bed is determined to be constructed at the same location. Removal of debris and land grading are indispensable to start construction works. The new drying bed is designed with asphalt pavement on its surface which has a gentle slope towards edge of the bed to accelerate the process. The bed is connected to the anaerobic ponds by conduits to convey drain water for treatment.

### 5) Outlet Work

Effluent from finishing tanks shall be discharged into the sea through outlet works. The outlet consists of a discharge pipe with a diameter of 30 cm and outlet structure equipped with a flap gate. The flap gate is to protect inflow of sea water into IPLT when high tide.

### 6) Surrounding Dyke and Landscaping

IPLT shall be surrounded by earth embankment with average height of 2 m and at its entrance steel gate is provided. The embankment slopes are protected with sod facing and a number of trees are planted at the crest of the embankment and several places within IPLT compound.

### 7) Control House

New control house is built and has a floor area of approximately 90 m<sup>2</sup>. It is divided into office, laboratory, and toilet. Water supply system is installed by means of deep well with pump.

### 8) Access Road

The access road is rehabilitated for a length of approximately 2 km. It is of asphalt pavement structure and has a width of 4 m or 6 m and a wearing course thickness of 0.15 m.

In total 38 drawings are prepared as Tender Drawing. Construction cost of the restoration works is estimated at the price level of July 2005. Details are presented in Appendix.

## 2.1.2 Preparation of Tender Documents

### (1) Tender Conditions

#### 1) Outline of the Contract Works

The Project aims at rehabilitating the access road for a length of 2 km and IPLT with a daily treatment capacity of 50 m<sup>3</sup> in terms of septage in BAC. The contract works will include the supply of all labors, equipment, plants, materials and support services required for construction, inspection, testing, and commissioning of the following:

- site clearance (includes removal of debris);
- cleaning of all existing tanks;
- surrounding dykes and drainages;
- access road and compound roads
- two (2) Imhoff tanks
- two (2) anaerobic tanks;
- two (2) Aerobic tanks;
- two (2) finishing tanks;
- sludge drying bed;
- control office

#### 2) Details to Tender

JICA implements the Project in compliance to the request of the Banda Aceh City Government through GOI in accordance with the following pre-construction schedule:

<input type="checkbox"/>	Request of Banda Aceh Municipality to JICA	April 12 <sup>th</sup> , 2005
<input type="checkbox"/>	Submission of Draft Tender Documents to JICA	May 23 <sup>rd</sup> , 2005
<input type="checkbox"/>	Approval of Draft Tender Documents (JICA)	May 31 <sup>st</sup> , 2005
<input type="checkbox"/>	Distribution of Tender Documents	June 01 <sup>st</sup> , 2005
<input type="checkbox"/>	Tender Opening	June 16 <sup>th</sup> , 2005

#### 3) Eligibility of Contractor and Required Documents to be submitted with Tender

The Tender is determined to be evaluated in Point System, in which the Tender is divided into two categories: the first category is Tenderer's qualification including their financial status, construction experience and technical proposal for the contemplated contract works and the second category is tender price. Both the categories are evaluated by means of a numerical rating system respectively in addition to their formality and completeness and the first lowest tenderer is determined to be the one who gained the highest aggregate point of the both categories.

### (2) Tender Documents



The Tender Documents will comprise three (3) volumes as listed up here under:

1) VOLUME I	Section 1	Invitation for Tenders
	Section 2	Instructions to Tenderers
	Section 3	Tender Data
	Section 4	Bill of Quantities
	Section 5	Forms, Annexes and Enclosures
	Section 6	Conditions of Contract
	Part I:	General Conditions of Contract
	Part II:	Conditions of Particular Application
	Part III:	Appendix to Tender
2) VOLUME II	Section 7	Technical Specifications
3) VOLUME III	Section 8	Drawings

### 2.1.3 Tender Results

The Tender submitted was evaluated by 2 stages. Allocation of points between the Stage 1: Tenderer's Qualification and Stage 2: Tender Price was determined as follows:

		<u>Weighting</u>
Stage 1	: Tenderer's Qualification	80 Points
Stage 2	: Tender Price	20 Points
		Full mark 100 Points

It was pre-determined that the Stage 2 evaluation was conducted only for such Tenderers that gained the score 50 or more at the Stage 1 evaluation.

As a result, Tender submitted by PT. Tenaga Inti Makmu Beusare was concluded to be the lowest responsive tender among there (3) Tenders received and is therefore recommended for award of the contract. Contact cost is about US\$ 866,000.

## **2.1.4 Construction Supervision Works**

### **(1) Scope of Construction Supervision**

Scope of construction supervision works is mainly categorized into: 1) Progress Control, 2) Quality Control, 3) Cost Control and 4) Safety Control during the course of the following major activities on supervision works:

- Review and approval of construction drawings, methods, schedule and proposals submitted by the Contractor
- Modification of construction drawings, as required
- Review and approval of manufacturer's design and drawings, if necessary
- Inspection of the completed works
- Inspection and witness of final acceptance tests
- Certification of completed works
- Review and certification of statement of progress and final payments
- Preparation of monthly progress report, completion report and compilation of As-built Drawings.

(2) Organization of Construction Supervision Team

Organization of construction supervision team was set as shown in Figure 2.1.2.

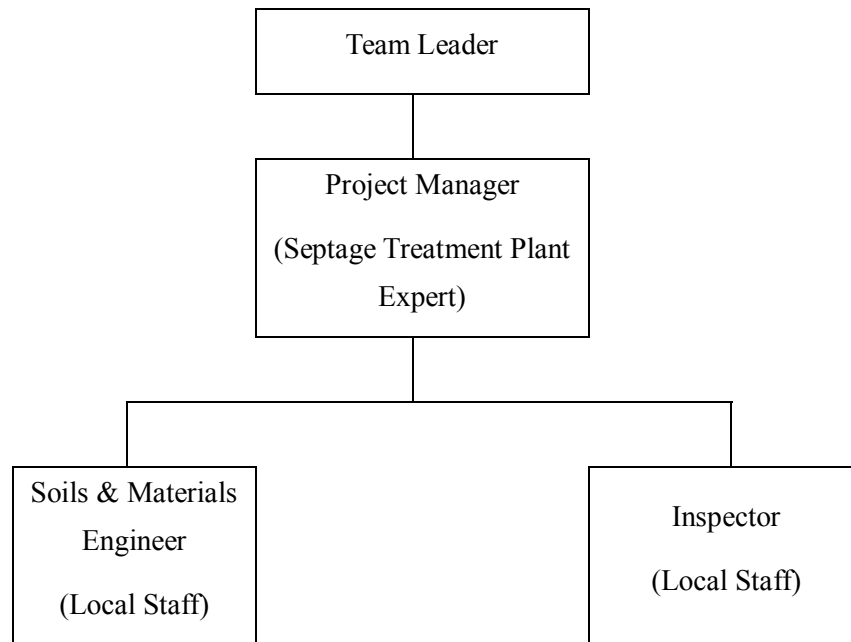


Figure 2.1.2 Organization of Construction Supervision Team

Team Leader of the JICA URRP Study Team is responsible for management of the construction supervision team.

Septage Treatment Plant Expert of the JICA URRP Study Team acted as a Project Manager who is responsible for all construction supervision works.

Soils and Materials Engineer (Local Staff) was assigned for all construction materials including borrow pits, quarries, stockpiles, concrete and asphalt production, on-site manufacturing yard and off-site supplies.

Inspector (Local Staff) was also assigned for inspection works.

(3) Construction Supervision Works

1) Progress Control

Progress control was made based on the work program. Actual progress of works was checked at the site and compared to the planned progress. Regular review of the program was made to ensure that the planned progress of each project component could be made in each month.

The comparisons of the actual and planned progress were described in the monthly report together with explanations of reasons of delay if any, and details of measures taken or to be taken to avoid further delay. Monthly meetings were held to monitor respective works.

## 2) Quality Control

### (i) Quality Control on Materials

Construction materials used for the project are divided into in-situ materials and procured materials. The in-situ materials are produced from the approved borrow pits, quarry sites, river deposits and beach areas, while procured materials are products manufactured at factories like cement, rebar, bitumen, piles, pipes, paint, hardware and road signs. All of these were confirmed as acceptable quality prior to construction.

### (ii) Quality Control on Workmanship

Quality control on workmanship was carried out on products made by the Contractor under the supervision of the Engineer in accordance with the Conditions of Contract, Specifications, Drawings and other relevant Contractual Documents. The major work items subject to quality control on workmanship are as follows:

- Excavation works
- Embankment works
- Slope protections consisting of rip-rap, gabions, masonry, etc.
- Instrumentation (for site office)
- Concrete works
- Metal works and painting

## 3) Cost Control

Each work item described in the Bill of Quantities was reviewed and adjusted as required. Cost control was made based on the measured work quantities and unit rates, lump sums and provisional sums in close cooperation with Inspector.

## 4) Safety Control

Safety is considered one of the key issues for any type of construction works. The safety control was fully taken during construction with establishment of safety control organization, meetings and monitoring.

## 5) Handover of the Project

The Project was completed with sufficient control on progress, quality, cost and safety on December 20, 2005, 8 days before the contacted completion date on December 28, 2005. Handover ceremony was conducted on the same day with the presence of Minister of Embassy of Japan, JICA Resident Representative, Mayor of Banda Aceh City, BRR and other related agencies.

Signing on handover agreement and signing on agreement on transfer of the Project were also undertaken in the ceremony.

## **2.2 QUICK IMPACT PROJECTS (QIPS) UNDER JAPAN'S NON-PROJECT TYPE GRANT AID**

### **2.2.1 QIPs Selected**

Besides JICA URRP study, GOJ pledged GOI to provide financial assistance of JPY 14.6 billion for rehabilitation and reconstruction works on the disaster affected areas, utilizing Non-project Type Grant Aid Scheme. On this scheme, National Development Planning Agency (BAPPENAS) of GOI proposed GOJ to implement following thirteen (13) projects/programs as follows:

- (1) Emergency Relief Goods (Medicine)
- (2) Urgent Recovery of the West Coast Road between Banda Aceh and Meulaboh
- (3) Recovery of Water Supply and Sanitation System at Affected Areas in Aceh Province
- (4) Rebuild or Rehabilitate Health Centers (*Puskesmas*)
- (5) Rehabilitate, Rebuild or Expand Orphanages (*Panti Asuhan*)
- (6) Support for Universities *IAIN Ar Raniry & Univ. Syiah Kuala*)
- (7) Selected Emergency Repair Work of the floodway dyke in Aceh
- (8) Rehabilitation of Fishing Activities
- (9) Rehabilitation of Local Market Places
- (10) Support for Vocational Training
- (11) Support for Islamic School (*Madrasah / Pesantren*)
- (12) Support for Radio/TV Broadcasting Activities
- (13) Procurement of Vacuum Freeze Dry Chamber

Through the discussions with the related agencies of the Government of Indonesia and JICS, the Projects No. 3, 5, 7, 9 and 12 were identified as Quick Impact Projects (QIPs), which require technical assistance on studies/surveys, detailed design and preparation of draft tender documents. The works were undertaken from mid. of April to beginning of September, 2005. Outline of the QIPs selected are presented as follows:

Table 2.2.1 QIPs Selected under Japan's Non-Project Type Grant Aid

No.	Project Name	Outline of the Project	Assistance provided for:
1.	Recovery of water supply system in Banda Aceh city	Rehabilitation of water distribution facilities in Banda Aceh City - Installation of water distribution pipes (total 172 km), pipe bridges (4 locations), valves (61 units), house connection (5,000 units), public stand pipes (33 locations), fire hydrants (10 locations), etc.	- Technical study - Detail design - Preparation of draft tender documents
2.	Emergency repair works of Aceh River and floodway	Recovery of water supply system in Banda Aceh city	- ditto -
3.	Rehabilitation of Lampulo fish market	Rebuilding of ice factory in Lampulo fish market (1 story, total floor space 432 m <sup>2</sup> ) (Ice making machine, freezer and generator are procured separately)	- ditto -
4.	Rehabilitation of orphanages (JROH NAGUNA and NIRMALA)	Rehabilitation and rebuilding of NIRMALA and JROH NAGUNA Orphanages - Rebuilding of offices, hostels, classrooms, storages, toilets, water supply and other facilities (NIRMARA; 3 story, cumulative floor space 1,459 m <sup>2</sup> , JROH NAGUNA; 2 story, cumulative floor space 1,231 m <sup>2</sup> ) - Repair works on existing building structures (floor, wall, pillar, beam, roof, etc.) and other affiliated facilities	- ditto -
5.	Supporting for radio and TV stations	Rehabilitation of existing RRI building and provision of equipments for radio station (RRI) and TV station (TVRI) - Urgent rehabilitation of existing RRI building - Provision of broadcasting equipments for RRI and TVRI	- ditto -



Figure 2.2.1 Location Map of QIPs

## 2.2.2 QIP for Recovery of Water Supply System in Banda Aceh City

### (1) Design Condition

#### 1) Scope of Works

The scope of work comprises (1) design works and cost estimate, and (2) preparation of technical report for restoration of water distribution network in Banda Aceh City.

It should also be noted that quantity of design discharge shall be forecasted based on the water demand for the year 2009, which is the end of rehabilitation and reconstruction program of Banda Aceh City as set forth by GOI.

#### 2) Damage of Water Distribution Network

Pipe water supply system had a daily water supply capacity of 40,000 m<sup>3</sup> before the 2004 disaster and had individual connection of 24,411 and public tap of 100. The historical water supply record and layout of distribution network reveals the following:

- ① Assuming the average family member of each household was 5, total connected people were 138,984 in 2004, meaning service connection ratio of about 57%. The rest of population was deemed to be relied on groundwater and/or other water resources for its water supply.
- ② The average water consumption per capita was 136 liter per day.
- ③ Un-accounted for water was relatively high, calculated at 49%
- ④ The distribution pipelines appear to be not systematic and rational, resulting in uneven distribution of pressure and water through out the service area.
- ⑤ There was no major industry or bulk water consumer in the Project area, though there were a large number of retail shops throughout the Project area.
- ⑥ The distribution pipelines were destroyed in many locations and areas especially in the areas along the coast (Kecamatan Meraxa, Kuta Raja, Jaya Baru and Syiah Kuala) where the houses and infrastructure were completely destroyed and/or heavily damaged. It is still not possible to distribute the treated water to such Kecamatan areas.
- ⑦ As of September 2005, pipe water service is provided to the areas where distribution pipelines are not damaged and/or restored already, and those 3 Kecamatan areas are served by public taps which are regularly filled up by water tankers.



(2) Detail Design

1) Design Criteria

In July 6, 2005 there was a meeting at Meeting Room of Urban and Rural Development, Western Region, DG of Human Resettlement, MPW in Jakarta to discuss about restoration works of the distribution system among the representatives of JICA Study Team, Ciptakarya, BRR and other parties concerned and the following are mutually agreed among the attendants:

- ① Service population should be 80% of population in Banda Aceh City in 2009.
- ② Elevated tank should not be reconstructed, since it is observed that it does not function in many areas in Indonesia as wells as Banda Aceh City.
- ③ Minimum water pressure and other design criteria/condition should follow PU Guidelines.

Based on the above the following design criteria are determined to be adopted:

- Design discharge : Maximum hourly, to be 1.5 times of the average daily demand
- Required minimum pressure : 5 m
- Hydraulic analysis : EPANET-2
- Boosting capacity of Transmission pumps : 6 bars (to be same as existing at Lambaro WTP)
- Standards for pipe : BS, AWWA, JIS and their equivalent

2) Water Demand Forecast

① Population in the Project area

Population in the Project area was estimated at about 254,000 for the year 2009. According to the last census average family size is set at 5 people per household throughout the planning horizon.

② Pipe water service ratio

The pipe water service ratio is estimated at 57 % in 2004. According to PDAM medium term plan and the PU Guidelines it is planned to increase year after year and to reaches at 57 % in 2005 to 80 % in 2009.

It is also planned that the pipe water will be served through individual connection and public taps. The rates of individual and public taps connection are assumed at 90 % and 10 % respectively.

③ Unit water consumption

Water demand is classified into domestic use and non-domestic uses. It is also assumed that quantity of the non-domestic use is equivalent to 20 % of the domestic use and this rate is constant throughout the planning horizon.

Per capita water consumption in the domestic use is 150 liter per day on average and remains constant through out the planning horizon.

④ Un-accounted for water

After the disaster the un-accounted for water is estimated to amount to about 50 % of total water produced. It is assumed that the rate would gradually reduce year after year: 50 % in 2005 to 30 % in 2009.

Those basic parameters are as summarized in Table 2.2.2.

Table 2.2.2 Basic Parameters Applied for Water Demand Forecast

Description		unit	2005	2006	2007	2008	2009	PU guideline
Connection	Served population	%	58	60	65	70	80	
	Average family size		1:5					1:(5-6)
	House connection	%	90					80-90
	Public tap	%	10					10-20
Unit consumption	House connection	lpcd	150					150
	Public tap	lpcd	40					30-50
	Non-Domestic	%	20					15-30
UFW		%	50	45	40	35	30	30-50
Maximum Daily Demand Factor			1.1					1.1-1.25
Peak Hourly Demand Factor			1.5					1.5-2.0

note: PU guideline for house connection per capita consumption applied figure for the city with 100,000-500,000 population.

⑤ Water Demand Forecast

The water demand is forecasted for the respective desa annually during the period from 2005 to 2009 and for the year 2015 as reference for a long-term pipe water supply planning. Table 2.2.3 presents the net amount of the domestic and non-domestic demands in the year 2009. The average daily gross water demand including the amount of the un-accounted for water is forecasted at 29,146 m<sup>3</sup> in 2005, 30,894 m<sup>3</sup> in 2006, 34,269 m<sup>3</sup> in 2007, 37,705 m<sup>3</sup> in 2008, and 44,062 m<sup>3</sup> in 2009.

Table 2.2.3 Water Demand and Supply Capability

Description		unit	2005	2006	2007	2008	2009	2015
Population		person	200,843	212,893	225,767	239,206	254,000	360,304
Served Population	Total	person	116,489	127,736	146,749	167,444	203,200	288,243
	House Conn.	person	104,840	114,962	132,074	150,700	182,880	259,419
	Public Tap	person	11,649	12,774	14,675	16,744	20,320	28,824
Net Demand	House Conn.	m <sup>3</sup> /day	15,726	17,244	19,811	22,605	27,432	38,913
	Public Tap	m <sup>3</sup> /day	466	511	587	670	813	1,153
	Non-Domestic	m <sup>3</sup> /day	3,238	3,551	4,080	4,655	5,649	8,013
	TOTAL	m <sup>3</sup> /day	19,430	21,306	24,478	27,930	33,894	48,079
UFW	Rate		50%	45%	40%	35%	30%	30%
	Amount	m <sup>3</sup> /day	9,715	9,588	9,791	9,775	10,168	14,424
Gross Demand		m <sup>3</sup> /day	29,146	30,894	34,269	37,705	44,062	62,503
Supply Capacity	Lambaro	m <sup>3</sup> /day	37,584	37,584	37,584	37,584	37,584	37,584
	Siron	m <sup>3</sup> /day	1,728	1,728	1,728	1,728	1,728	1,728
	Total	m <sup>3</sup> /day	39,312	39,312	39,312	39,312	39,312	39,312
Balance		m <sup>3</sup> /day	10,166	8,418	5,043	1,607	-4,750	-23,191

### ⑥ Design Discharge for Distribution Network

The daily average demand by desa in 2009 is estimated. These figures are basically employed as design discharge of distribution pipelines after applying hourly peak factor.

### 3) Restoration Design of Distribution System

#### ① Basic Approach

Taking into consideration of the hydraulic characteristics and damages of the pre-disaster distribution network, the restoration works are determined to include the following principles:

- A complete new distribution network will be installed in the area of Kecamatan Jaya Baru, Muaraxa and Ulee Kareng where distribution pipelines were completely destroyed and/or severely damaged.
- Aiming at achieving rational and efficient control and flexibility in water distribution, the water service area is proposed to be divided into four (4) zones as shown in Figure 2.2.2.
- Aiming also at minimizing head loss and efficient distribution of water throughout the network, it is determined to adopt a loop system. The system will also allow changing direction of flow in case of emergency.
- New secondary pipelines will be located in the southern part of the Project area in compliance with the proposed expansion of the city structure. It is proposed to accommodate new housing and city government offices in future in such area. The new secondary pipeline will eventually contribute efficient water supply to the southern and western parts (Zones 1 and 2).

- It is proposed to replace existing pipes which are identified to be defective in terms of hydraulic design with new pipes. Such replacement mainly occurs in Zone 4.
- It is important to increase the number of water meter as many as possible in order to reduce un-accounted for water and increase collection of tariff. It is proposed to procure 5,000 sets of PDAM standard type connection unit under the Project, and their installation are determined to be executed directly by PDAM keeping pace with progress of rehabilitation and reconstruction of residential houses and commercial units in the disaster affected areas.

② Restoration of Distribution Network

The proposed distribution network is almost identical to the ones existed before the 2004 disaster. But it is more effective and efficient in terms of water distribution and control and stronger against possible disaster.

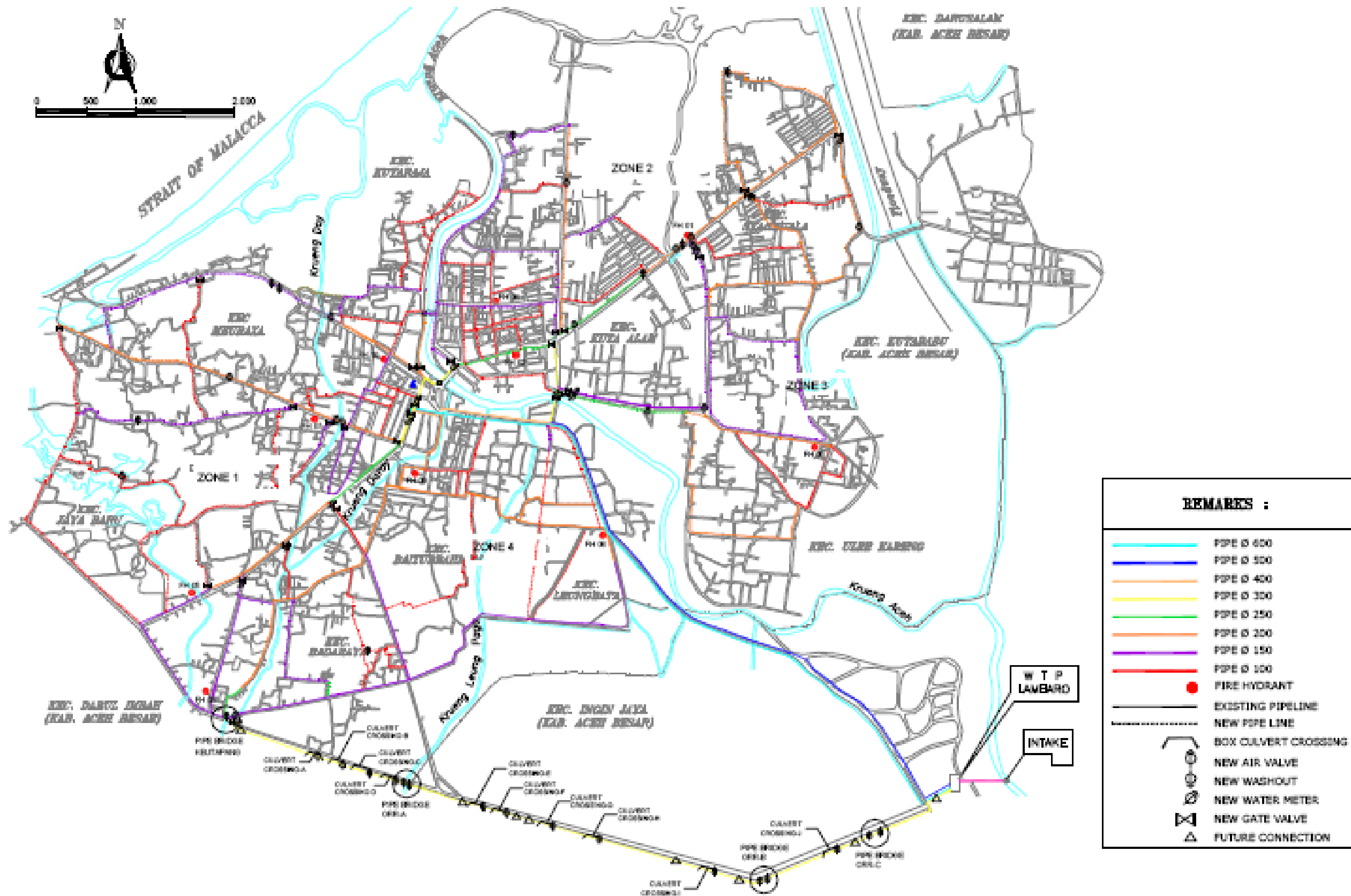


Figure 2.2.2 Water Supply Distribution Network Plan

(a) Pipe materials

Pipe materials are selected through technical discussion between the JICA Study Team, PU and PDAM and in due consideration of strength, durability and easiness in installation and transportation. It is proposed to use Ductile Iron Pipe (DIP) for pipes with a diameter of 400 and more, and High Density Polyethylene Pipe (HDPE) for the others.

(b) Fire hydrant

Ten (10) fire hydrants are proposed to be installed by the Project at the locations shown in Figure 2.2.2. The location is determined based on consultation to PDAM, Dinas PU and Department of Fire Fighting, and take into account population density, land use condition, administrative services, etc.

(c) Public stand pipe

It is proposed to install 33 public stand pipes by the Project, especially in most affected three (3) Kecamatan: Baru Jaya, Muaraxa and Ulee. A large portion of lands in these areas are still under water and no land restoration works are yet taken, though temporary housing construction has been taken place at many locations. In order to expedite return of internally displaced people from their temporary shelters, it is considered to be matter of importance to extend safe pipe water service. There are a number of villages in such areas but the public stand pipe is determined to be installed at a rate of one location per 355 inhabitants. As a result, the number and location of public stand pipe are as follows:

Table 2.2.4 Distribution of Public Stand Pipe

<b>Kecamatan</b>	<b>Desa</b>	<b>Unit</b>
1. Meraxa	except desa Punge Jurong	15 (one per desa)
2. Kuta Raja	Gumpong Jawa	4
	Gumpong Pande	1
	Peulanggahan	3
	Kedua	2
3. Jaya Baru	Lampoh Daya	1
	Lamjamee	1
	Bitai	1
	Ulee Patah	1
	Geuceu Menara	1
4. Syiah Kuala	Tibang	3
<b>TOTAL</b>		<b>33</b>

### ③ Network Analysis for Proposed Restoration

A trial and error method is carried out to identify the optimal network in terms of hydraulic behavior and restoration cost. The hydraulic calculation was conducted by using a computer software ESPANET-2. The design discharge is the same as that applied for the hydraulic analysis of the pre-disaster disaster network.

A schematic distribution network of the optimum plan is as shown in Figure 2.2.3, which also indicates the residual water pressure.

### 4) Design of Pipe Laying Works and Valve Chambers

#### ① Pipe Laying Works

Pipe laying works basically follows the PDAM design standards. In principle, the pipe is designed to be buried within the right of way of existing road, and characterized by types of backfilling of trench. Minimum coverage of backfill is determined to be 60cm above crown of the pipes.

Pipes are designed to be laid in trench and backfilled with selected material. Where there is pavement, such pavement is to be reinstated with the same materials as existing after backfilling of the trench.

Where the pipes are located within a road carriage both longitudinal and crossing directions, they are designed to be protected by surrounding concrete.

#### ② Valve Chambers

Pipelines associate with 31 air valves, 28 section valves, and 7 washouts.

##### (a) Air valves

There two (2) types of air valves: one is a single vent and the other is double vents. The air valves are designed to be installed in concrete chambers excepting pipe bridges sites.

##### (b) Section valves

The section valves are to be sited at 28 locations, and their locations are determined in conjunction with zoning of the network. All the valves are to be encased in concrete chamber.

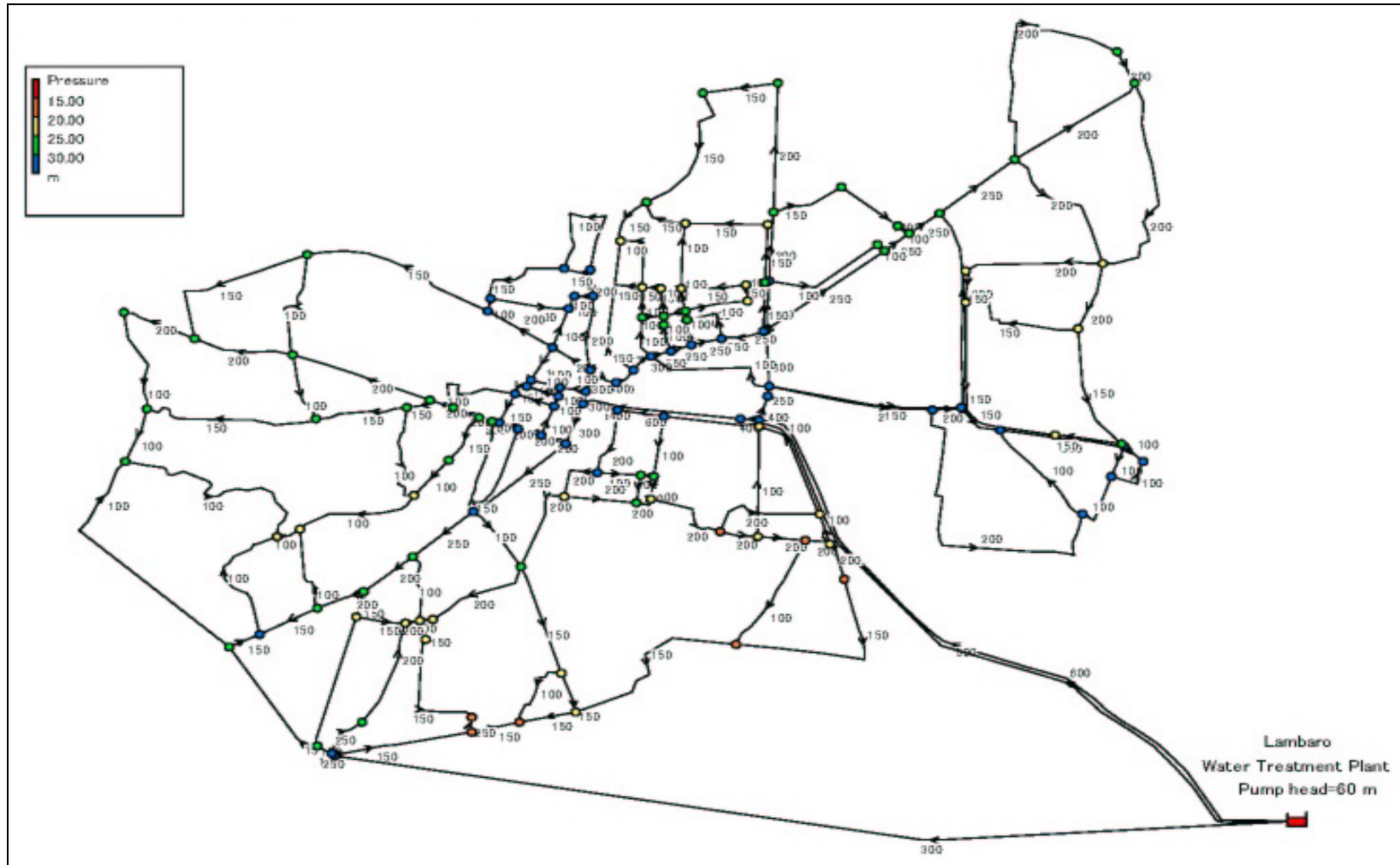


Figure 2.2.3 Result of Hydraulic Analysis, Proposed Restoration Network



(c) Wash-out

The wash-out is sited at 7 locations, and it is a set of a sluice valve on drain pipe and a gate valve on distribution pipe. The direction and length of the drain pipe is subject to drainage channel/river. The set of valves are designed to be encased in concrete chamber.

(d) Fire Hydrant

The fire hydrants are decided to be installed at 10 locations. The hydrants are supported by concrete blocks with K 250.

(e) Standpipes

Typical drawing of stand pipe is as shown in Appendix.

(f) Pipe Bridges

New secondary pipeline passing through Zones 1 and 4 crosses small river/drainage channel at four (4) locations. For such crossing points, it is necessary to construct either pipe bridge or under-crossing structure. It is proposed that such structure be realized on a basis of design-built method by the contractor to be procured, and accordingly the bid documents sets forth such items in the bill of quantities.

5) Design Drawings

In total 55 drawings are prepared as Technical Documents as shown in Table 2.2.5.

Table 2.2.5 List of Design Drawings

PLATE No.	DWG No.	DWG Title
<b>A. GENERAL</b>		
001	GN 010	PROJECT LOCATION MAP
002	GN 020	WATER SUPPLY DISTRIBUTION NETWORK PLAN
<b>B. WATER SUPPLY DISTRIBUTION PIPELINE</b>		
003	DP 010	KEY MAP
004	DP 020	PIPE ID TABLE
005	DP 030	DISTRIBUTION PIPELINE PLAN (01)
006	DP 040	DISTRIBUTION PIPELINE PLAN (02)
007	DP 050	DISTRIBUTION PIPELINE PLAN (03)
008	DP 060	DISTRIBUTION PIPELINE PLAN (04)
009	DP 070	DISTRIBUTION PIPELINE PLAN (05)
010	DP 080	DISTRIBUTION PIPELINE PLAN (06)
011	DP 090	DISTRIBUTION PIPELINE PLAN (07)
012	DP 100	DISTRIBUTION PIPELINE PLAN (08)
013	DP 110	DISTRIBUTION PIPELINE PLAN (09)
014	DP 120	DISTRIBUTION PIPELINE PLAN (10)
015	DP 130	DISTRIBUTION PIPELINE PLAN (11)
016	DP 140	DISTRIBUTION PIPELINE PLAN (12)
017	DP 150	DISTRIBUTION PIPELINE PLAN (13)
018	DP 160	DISTRIBUTION PIPELINE PLAN (14)
019	DP 170	DISTRIBUTION PIPELINE PLAN (15)
020	DP 180	DISTRIBUTION PIPELINE PLAN (16)
021	DP 190	DISTRIBUTION PIPELINE PLAN (17)
022	DP 200	DISTRIBUTION PIPELINE PLAN (18)
023	DP 210	DISTRIBUTION PIPELINE PLAN (19)
024	DP 220	DISTRIBUTION PIPELINE PLAN (20)
025	DP 230	DISTRIBUTION PIPELINE PLAN (21)
026	DP 240	DISTRIBUTION PIPELINE PLAN (22)
027	DP 250	DISTRIBUTION PIPELINE PLAN (23)
028	DP 260	DISTRIBUTION PIPELINE PLAN (24)
029	DP 270	DISTRIBUTION PIPELINE PLAN (25)
030	DP 280	DISTRIBUTION PIPELINE PLAN (26)
031	DP 290	DISTRIBUTION PIPELINE PLAN (27)
032	DP 300	DISTRIBUTION PIPELINE PLAN (28)
033	DP 310	DISTRIBUTION PIPELINE PLAN (29)
034	DP 320	DISTRIBUTION PIPELINE PLAN (30)
035	DP 330	DISTRIBUTION PIPELINE PLAN (31)
036	DP 340	DISTRIBUTION PIPELINE PLAN (32)
037	DP 350	DISTRIBUTION PIPELINE PLAN (33)
038	DP 360	DISTRIBUTION PIPELINE PLAN (34)
039	DP 370	DISTRIBUTION PIPELINE PLAN (35)
040	DP 380	DISTRIBUTION PIPELINE PLAN (36)
041	DP 390	DISTRIBUTION PIPELINE PLAN (37)
042	DP 400	DISTRIBUTION PIPELINE PLAN (38)
043	DP 410	DISTRIBUTION PIPELINE PLAN (39)
044	DP 420	DISTRIBUTION PIPELINE PLAN (40)
045	DP 430	DISTRIBUTION PIPELINE PLAN (41)
<b>C. ASSOCIATED STRUCTURES</b>		
046	AS 010	PIPE LAYING
047	AS 020	THRUST BLOCK FOR TEE, REDUCER AND END CUP
048	AS 030	THRUST BLOCK FOR BEND AND FUTURE CONNECTION
049	AS 040	TYPICAL BOX CULVERT CROSSING
050	AS 050	AIR VALVE CHAMBER
051	AS 060	WASHOUT VALVE CHAMBER
052	AS 070	GATE VALVE AND WATER METER CHAMBER
053	AS 080	FIRE HYDRANT AND PIPE MARKING POST
054	AS 090	HOUSE CONNECTION AND FUTURE CONNECTION
055	AS 100	PUBLIC STAND PIPE

6) Cost Estimate

Direct construction cost of the restoration works is estimated at the price level of July 2005 as given in Table 2.2.6. It should be noted that the cost does not include general expenses such as cost for performance and bid securities, insurance, mobilization and demobilization, etc.

Table 2.2.6 Estimated Construction Cost (Rp)

Items	Description	Amount
<b>A</b>	<b>PREPARATORY WORKS</b>	<b>340,500,000</b>
A.1	Mobilization	25,000,000
A.2	Demobilization	25,000,000
A.3	Preparation and submission of monthly reports including photos	3,500,000
A.4	Preparation and submission of Video Record	10,000,000
A.5	Pipe factory inspection by PDAM staff (4 person)	36,000,000
A.6	Provision, operation and maintenance of the Engineers office, fully furnished as per specification	24,000,000
A.7	Preparation and submission of working drawings and as-built drawings	15,000,000
A.8	Provision of temporary works	30,000,000
A.9	Provision and removal of safety equipment, light and first aid kit	12,000,000
A.10	Exploratory Boring	160,000,000
<b>B</b>	<b>CONSTRUCTION OF DISTRIBUTION PIPELINES FOR ZONE-1</b>	<b>13,207,633,400</b>
B.1	Supply of Pipe Materials	9,605,605,000
B.2	Installation of Pipelines	1,632,395,000
B.3	Supply and Installation of Valves, Water Meters and Fire Hydrants	525,940,600
B.4	Supply and Installation of Pipe Marks	7,692,800
B.5	Construction of Pipe Bridges	1,436,000,000
<b>C</b>	<b>CONSTRUCTION OF DISTRIBUTION PIPELINES FOR ZONE-2</b>	<b>10,864,160,900</b>
C.1	Supply of Pipe Materials	5,761,394,000
C.2	Installation of Pipelines	2,511,698,000
C.3	Supply and Installation of Valves, Water Meter, Fire Hydrants, Public Stand Pipes and House Connections	2,574,240,900
C.4	Supply and Installation of Pipe Marks	16,828,000
<b>D</b>	<b>CONSTRUCTION OF DISTRIBUTION PIPELINES FOR ZONE-3</b>	<b>12,125,834,500</b>
D.1	Supply of Pipe Materials	7,610,053,000
D.2	Installation of Pipelines	3,650,058,000
D.3	Supply and Installation of Valves, Water Meter, Fire Hydrants, Public Stand Pipes and House Connections	839,039,100
D.4	Supply and Installation of Pipe Marks	26,684,400
<b>E</b>	<b>CONSTRUCTION OF DISTRIBUTION PIPELINES FOR ZONE-4</b>	<b>8,012,109,800</b>
E.1	Supply of Pipe Materials	5,367,498,000
E.2	Installation of Pipelines	1,948,392,000
E.3	Supply and Installation of Valves, Water Meter, Fire Hydrants and House Connections	682,997,800
E.4	Supply and Installation of Pipe Marks	13,222,000
	<b>TOTAL</b>	<b>44,550,238,600</b>

### (3) Preparation of Technical Report

#### 1) Source of Funds

The Government of Indonesia has received from the Government of Japan a Grant Aid amounting to Fourteen Billion Six Hundred Million Japanese Yen (Yen 14,600,000,000) as per Exchanged Note dated on January 17, 2005, for the purchase of products and services necessary for the execution of Program by the Government of Indonesia for Efforts to cope with the Damages caused by the Great Earthquake of the Coast of Sumatra, and by the Indian Ocean Tsunami Disaster which includes the Project.

Under this program, the Japan International Cooperation System (JICS) acts as an implementing agency for and on behalf of the Government of Indonesia in accordance with the Exchange of Notes.

#### 2) Mode of Tender

The Contractor for construction will be procured through international competitive bidding which will be executed by JICS.

The contract is presumed to be a unit price contract with bill of quantities.

#### 3) Technical Report

The tender documents will comprise three (3) volumes as listed up hereunder:

- VOLUME I	Section 1	Invitation for Bids
	Section 2	Instructions to Bidders
	Section 3	Bid Data
	Section 4	Bill of Quantities
	Section 5	Forms, Annexes and Enclosures
	Section 6	Conditions of Contract
- VOLUME II	Part I:	General Conditions of Contract
	Part II:	Conditions of Particular Application
	Part III:	Appendix to Bid
- VOLUME III	Section 7	Technical Specifications
	Section 8	Drawings

Volume I is due to be prepared by JICS and the JICA Study Team has produced Volumes II and III as Technical Report.