JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF SETTLEMENT & REGIONAL INFRASTRUCTURE
REPUBLIC OF INDONESIA

THE STUDY
ON
RURAL WATER SUPPLY PROJECT
IN
NUSA TENGGARA BARAT AND NUSA TENGGARA TIMUR

FINAL REPORT
VOLUME IV
SUPPORTING REPORT 2

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ABBREVIATIONS

ADB	Asian Development Bank
APBD I	Anggaran Pendapatan dan Belanja Daerah Tingkat I (Provincial Budget)
APBD II	Anggaran Pendapatan dan Belanja Daerah Tingkat II (District Budget)
APBN	Anggaran Pendapatan dan Belanja National (National Budget)
ARI	Acute Respiratory Infections
AusAID	Australian Agency for International Development
BAPPEDA	Badan Perencanaan Pembangunan Daerah Tingkat-I and Tingkat-II (Development Planning Board for Provincial and District Level)
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Board)
BDD	Bidan di Desa (Village midwife)
BHN	Basic Human Needs
BMG	Biro Meteorologi dan Geofisika (Meteorology and Geophysic Agency)
BPAM	Badan Pengelola Air Minum (Management Board for new Drinking Water Projects before being established as a PDAM)
BPD	Village Representative Council
BPL	Below Poverty Line
BPS	Biro Pusat Statistik (Central Bureau of Statistics)
BPT	Break Pressure Tank
Broncaptering	Any small structure built to 'capture' a water source
Buis beton	Traditional concrete rings used to line hand-dug wells
Bupati	Kepala Kabupaten (Head of a District; sometimes called "Regent")
Camat	Kepala Kecamatan (Head of a Sub-District)
CARE	Co-operative for Assistance and Relief Everywhere (International NGO)
CCF	Christian Children's Fund
CIDA	Canadian International Development Agency
Cipta Karya	Direktorat Jenderal Cipta Karya (Directorate General of Human Settlements DGHS)now restructured and integrated into Ministry of Settlement and Regional Infrastructure
CMR	Child Mortality Rate
DATI I	Daerah Tingkat I (Provincial Government Level)
DATI II	Daerah Tingkat II (District Government Level)
Desa	Rural village, lowest level of local Government
DG	Directorate General
Dinas	Provincial or District level governmental department
DIP	Daftar Isian Proyek (List of Development Projects)
DPU	Generic term for all departments of Public Works now included in Kimpraswil.
Dukun	Traditional birth attendant
DUPDA	Daftar Usulan Proyek Daerah (List of Proposed Yearly Development Projects at Tk.II.)
Dusun	Sub-Village/Hamlet in rural area
EC	Electric Conductivity
EIIKK	Eastern Islands IKK Water Supply and Sanitation Project (Aus AID program)

ESWS	NTB Environmental Sanitation and Water Supply Project (Aus AID program)
FGD	Focus Group Discussions
FIRR	Financial Internal Rate of Return
FLOWS	Flores Water Supply and Sanitation Reconstruction and Rural Development Project (AusAID program)
FRP	Fiber Reinforced Plastics
GIP	Galvanized Iron Pipe
GL	Ground Level
GOI	Government of Indonesia
GOJ	Government of Japan
GRDP	Gross Regional Domestic Product
GSP	Galvanized Steel Pipe
GTZ	German Technical Cooperation Agency
Hamlet	A small rural community not recognized as a Dusun
HC	House Connection (To a piped water supply system, usually metered)
HDPE	High Density Polyethylene Pipe
IBRD	International Bank for Reconstruction and Development (World Bank)
IEC	Information, Education and Communication
IGA	Income Generation Activities
IKK	Ibu Kota Kecamatan (Core Area of a Sub-District)
IMR	Infant Mortality Rate
Ir.	Insinyur (The Professional title 'Engineer')
JBIC	Japan Bank For International Cooperation
JICA	Japan International Cooperation Agency
K. Desa	Kepala Desa (Head of a Village - Lowest official level of local Government)
Kabupaten/Kab	District/Regency (Local Government level II or Tk.II)
Kampung	General term for any sub-village or hamlet, but more commonly used in urban and rural areas
Kecamatan	Sub-District
Kelompok	An unofficial committee or group of people
Kelurahan	Urban village, the lowest administrative unit in status equal to a Desa
Kepala Desa	Head of a Village (Lowest official level of local Government)
Kepala Dusun	Head of a Hamlet
Kepala Suka	Traditional Religions Leader (In Sumba)
Keputusan	Decree
KFW	German Development Bank
KHPPIA	Kelangsungan Hidup Perkembangan Perlindungan Ibu dan Anak (Development and Protection for Mother and Child)
Kimpraswil	Permukiman dan Prasarana Wilayah (Ministry of Settlement and Regional Infrastructure)
KK or K/K	Kepala Keluarga (Head of a family)
KLP	Koperasi Listrik Pedesaan
Kotamadya	City - equivalent administrative status to a Kabupaten
LBW	Low Birth Weight
LKMD	Lembaga Ketahanan Masyarakat Desa (Village self reliance organization, village development council)

LRWSS	Lombok Rural Water Supply and Sanitation Project (AusAID program)
Lb.	Labuhan (Common place name) Coastal plain behind the seashore
M.A.	Mata Air (Spring)
MOH	Ministry of Health
MOHA	Ministry of Home Affairs (Dalam Negeri)
MOU	Memorandum of Understanding
MSRI	Ministry of Settlement and Regional Infrastructure
Musbangdes	Musyawarah Pembangunan Desa (Village development planning discussion)
NGO	Non-governmental Organization
NTB	Nusa Tenggara Barat (West Nusa Tenggara)
NTT	Nusa Tenggara Timur (East Nusa Tenggara)
O&M	Operasi dan Pemeliharaan (Operation and Maintenance)
O/H	Overhead (High tension electric power line)
OECF	The former Overseas Economic Cooperation Fund of Japan (now JBIC)
P2AT	Proyek Pengembangan Air Tanah (Groundwater Development Project)
P3P	Proyek Peningkatan Prasarana Pemukiman (formerly P3AB) (Development and Management of Water Supply Construction Projects)
PAM	Perusahaan Air Minum (Water Enterprises) Generic term used for PDAM and BPAMs
PDAM	Perusahaan Daerah Air Minum (Regional Drinking Water Enterprise)
PEMDA	Pemerintah Daerah. Local government at any level, usually MOHA
PERPAMSI	Persatuan Perusahaan Air Minum Seluruh Indonesia (Indonesian Water Supply Association)
Peraturan	Regulation
PH	Public Hydrant
PKK	Pembinaan Kesejahteraan Keluarga (Local Women's Welfare Organization)
PLN	Perusahaan Listrik Negara (National Electricity Enterprise)
PMD	Department of Community Empowerment
POKMAIR	Kelompok Pemakai Air (WUG)
Polindes	Poliklinik Desa (Village health sub-clinic)
Propinsi	Province (First level of local government Tk.I.)
Puskesmas	Pusat Kesehatan Masyarakat (Village Health Center)
PVC	Unplasticized Polyvinyl Chloride (Pipe)
PVP	Photovoltaic System
Rakorbang	Rapat Koordinasi Pembangunan (Project/Budget selection discussion at Tk.II) (Coordination Meeting for Development Budget Planning)
RC	RC (Reinforced Concrete)
RDWS	GOI Rural Water Supply Development Program
RESV	Reservoir
RK	Rukun Kampung (Hamlet in a rural area)
RRA	Rapid Rural Appraisal
RT/RW	Rukun Tetangga (Neighborhood)/Rukun Warga (Hamlet in an urban area)
RWSS	Rural Water Supply and Sanitation Project (ADB program)
Sawah	An area of irrigated land used for growing paddy
SC	Specific Capacity
Sekretaris	Secretary, as in Sekretaris Desa

SISKES	GOI Health Services Improvement Program
SSF	Slow Sand Filter (Water Treatment Plant))
SWL	Static Water Level
T	Temperature
TB	Tuberculosis
TBA	Traditional Birth Attendant
TNI	Tentara Nasional Indonesia. The Indonesian armed force
TP-PKK	Women's Movement Organization
Tk.I	Tingkat I. The first level of local government. I.e. Province
Tk.II	Tingkat II. The second level of local government. I.e. District
U5MR	Under 5 Mortality Rate
UDKP	Usulan Kecamatan (List of Development Planning Proposals)
UFW	Unaccounted-for-Water
UNDP	United Nations Development Program
UNICEF	United Nation Children's Fund
UU	Undang Undang (Law)
VAP	Village Action Plan
VES	Vertical Electric Sounding
WSS	Water Supply and Sanitation
WSSLIC	Water Supply and Sanitation Project for Low Income Communities (World Bank program)
WTP	Water Treatment Plant
WUA	Water Users' Association
WUG	Water Users' Group

UNITS

Length

mm	=	millimeter
cm	=	centimeter
m	=	meter
km	=	kilometer

Area

cm^2	=	square centimeter
m^2	=	square meter
km^2	=	square kilometer
Ha/ha	=	hectare

Volume

cm^3	=	cubic centimeter
m^3	=	cubic meter
L	=	liter
MCM	=	million cubic meter

Weight

mg	=	milligram
g	=	gram
kg	=	kilogram

Time as denominator

/sec.	=	per second
/min.	=	per minute
/hr.	=	per hour
/day	=	per day
/month	=	per month
/yr.	=	per year

Electric Measurement

V	=	Volt
A	=	Ampere
Hz	=	Hertz
W	=	Watt
kW	=	Kilowatt
MW	=	Megawatt

Others

%	=	percent
HP	=	horsepower
°C	=	Celsius degree

Derived Measures

L/c/day	=	liter per capita per day
kWh	=	kilowatt-hour
MWh	=	megawatt-hour
kVA	=	kilovolt ampere
mg/L	=	milligram per liter
μ g/L	=	microgram per liter
meq/L	=	milliequivalent per liter
mS/m	=	millisiemens per meter

Abbreviation

m.bgl	=	meter below ground level
m.agl	=	meter above ground level
m.asl	=	meter above mean sea level
m.bsl	=	meter below mean sea level

Appendix 8

QUESTIONNAIRES ON EXISTING WATER SUPPLY SYSTEMS

Appendix 8
QUESTIONNAIRES ON EXISTING WATER SUPPLY SYSTEMS

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NTB # 1

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Kuranji	**Date of survey:**	March 29, 2001
Kecamatan:	Labu Api	**Total Desa Area:**	600 ha.
Kabupaten:	Lombok Barat	**Total Desa Population:**	5,100

Topography:
The village is spread out in eight separate Dusun all located on the coastal plain. Predominantly a flat low-lying irrigated farming area with narrow roads adjacent to the seashore. Relatively prosperous as a 'feeder area' for Mataram. There is a significant isolated limestone outcrop opposite the Kantor Desa.

PARTICIPANTS

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Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada	Sekretaris Desa	PDAM Lombok Barat
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	339
Diameter	+/- 1.0 m
Depth	3.0 - 5.0 m
Lining	Buis beton
Construction by:	Villagers themselves

1.2 Hand-bored wells

Number	10
Diameter	+/- 100 m
Depth	8.0 - 10.0 m
Lining	None
Constructed by:	Villagers themselves

1.3 Machine-bored deep wells — None

1.4 Pumps
All hand bored wells are equipped with small electric pumps feeding individual houses/ toilets.

1.5 Ownership — Wells in open areas are considered to be 'communal'. Wells in house compounds are considered to be 'private'.

1.6 Annual cycle
Some wells dry up in the dry seasons; all water levels are lowered but not critically.

1.7 Water quality
Checked once by DPU, result not known. See Team Hydrogeologist's report.

1.8 Distance to collect water
Less than 200 m. One area in Dusun Mapakdasan has two pumped wells and five open shallow wells within a 30 m radius.

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs — There are two of significance in the Desa.

2.1 M.A. Kelongkong
The existing broncaptering in Dusun Kelongkong is a concrete tank (8.0 m x 1.5 m x 3.0 m) constructed by PEMDA Tk.II which feeds two communal bathing areas (Male/Female). The tank is an inconvenient source for household water but some is taken by bucket. The aquifer is probably contaminated by standing sullage run-off. Water quantity and quality unknown. See Team Hydrogeologist's report. The elevation is level with the adjacent Dusun.

2.2 M.A. Mapakdasan
The existing broncaptering South of Dusun Mapakdasan is used solely for communal

bathing and clothes washing. It discharges wastewater directly to the river. The quantity is very large, quality unknown. See Team Hydrogeologist's report. The location is below adjacent Dusun - 5.0 m. Construction was by the villagers themselves.

3. Deep ground water investigations None carried out

4. PDAM supplies Available but not in use at present.

5. Treatment/Storage/Distrib. systems None

B. MISCELLANEOUS ITEMS

1. Water Users' Association Already exists.

2. Stone, aggregate and sand
Available from the local limestone outcrop, for payment.
Beware sand is not taken from the adjacent beach which would be salty.

3. Local labor Available and willing to participate for payment.

4. Land acquisition
No problem for pipeline routes, but there may be some discussion re. compensation for larger areas.

5. Electric power Standard PLN O/H line 11,000/440V

.

6. Public phone Not available

C. AVAILABLE WATER SOURCES

1. Local
The major spring in Dusun Mapakdasan is a viable source, subject to water quantity and quality analysis. Would need pumping and possibly some storage capacity.

2. PDAM
The village is identified on PDAM Mataram's System Sketch as an immediate target for development when a source of construction funding is identified. The PDAM already has a 200 mm transmission main running along the main E <-> W road to the north of the village. It has confirmed in writing that there is sufficient capacity to supply Desa Kuranji and has submitted its preliminary distribution proposals to the Team for consideration.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
After much discussion Kepala Desa agreed that the two contiguous Dusun at the North of the Desa (Mapakbelatung and Mapakdasan) constitute a viable concentration of population.

2. Population to be served 2,480 **3. Area to be served** 40 ha.

4. Source
The PDAM pipeline is only 500 m from the target area on the same level and is pressurized. No storage, elevated or break-pressure tank would be required. The major spring at Mapakdasan is slightly closer but would need pumping and storage facilities. The PDAM source is preferred, leaving the spring available to continue serving the Dusun in its present role.

5. Components
A 100/150 mm. PVC pipeline from the PDAM transmission main to the center of the target area feeding standard Cipta Karya design metered PH, possibly 20, distributed throughout the two Dusun on sites selected by the Team working in conjunction with the Village WUA. HC should also be offered, for discussion with Kepala Desa and the WUA.

NTB # 2

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Bajur	**Date of survey:**	March 29, 2001
Kecamatan:	Labu Api	**Total Desa Area:**	320 ha.
Kabupaten:	Lombok Barat	**Total Desa Population:**	7,104

Topography:
The village is spread out in six separate Dusun, predominantly on flat low-lying irrigated farming area with narrow roads.

PARTICIPANTS

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Mr. T. Wada	Sekretaris Desa	PDAM Lombok Barat
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1	Hand-dug wells	Number	732
		Diameter	+/- 1.0 m
		Depth	2.0 - 4.0 m
		Lining	Buis beton
		Construction by:	Villagers themselves
1.2	Hand-bored wells	Number	62
		Diameter	+/- 100 mm.
		Depth	5.0 - 6.0 m.
		Lining	None
		Constructed by:	Villagers themselves
1.3	Machine-bored deep wells		None

1.4 Pumps
Four of the hand-bored wells in Dusun Pohdodol were fitted with hand pumps by UNICEF in 1989/90. Three are inoperative and the fourth is in poor condition.

1.5	Ownership	Wells in open areas are considered to be 'communal'. Wells in house compounds are considered to be 'private'.
1.6	Annual cycle	Wells do not dry up in the dry seasons. No water supply problem.
1.7	Water quality	No record. Said to be high in iron. (Ferrous and Ferric) See Team Hydrogeologist's report.
1.8	Distance to collect water	Less than 200 m.
1.9	Cost/Tariff structure	None, all water is free of charge

2. Springs
Kepala Desa said there are none, only some minor seepage areas inside the Desa. However there is a major spring in Dusun Muhajirim, which is now in the neighbouring Desa following a recent reorganization. It may well be available following negotiations at Kacamatan level. See Team Hydrogeologisyt's report.

3. Deep ground water investigations None carried out.

4. PDAM supplies Available but not in use at present

5. Treatment/Storage/Distrib. systems None

B. MISCELLANEOUS ITEMS

1. Water Users' Association
Already exists, but will be reformed if they get a water supply system.

2. Stone, aggregate and sand
Not available, all purchased from outside the village.

3. Local labor Available and willing to participate for payment.

4. Land acquisition No problem, no compensation.

5. Electric power Standard PLN O/H line 11,000/440V.

6. Public phone Not available

C. AVAILABLE WATER SOURCES

1. Local None, unless the Dusun Muhajirim source is available.

2. PDAM
The village is identified on PDAM Mataram's System Sketch as an immediate target for development when a source of constriction funding is identified. The PDAM has a 250 mm transmission main running East --> West across the top of the Desa and a 200 mm pipeline running along the N <--> S road through the center of the Desa. It has confirmed that there is sufficient capacity to supply the Desa and has submitted preliminary distribution plans to the Team for consideration.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The Kepala Desa identified the main Dusun Bajur and Dusun Pohdodol as the centers of population.

2. Source
The PDAM pipeline, which passes through Dusun Pohdodol, is approx. 1.0 km. from Dusun Bajur on the same level and is pressurized. No storage, elevated or break-pressure tank would be required.

3. Population to be served 3,000 **4. Area to be served** 25 ha.

5. Components
A 100/150 mm PVC pipeline from the PDAM transmission main to Dusun Bajur supplying standard Cipta Karya design metered PH, possibly 30, distributed throughout the two Dusun on sites selected by the Team working in conjunction with the WUA. HC should also be offered, for discussion with Kepala Desa and the WUA.

NTB # 3

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Sembung	**Date of survey**:	March 30, 2001
Kecamatan:	Narmada	**Total Desa Area**:	164 ha.
Kabupaten:	Lombok Barat	**Total Desa Population:**	2,874

Topography:
There are six Dusun, quite closely integrated. Predominantly a gently rolling low-lying irrigated farming area. Apparently a relatively prosperous area.

PARTICIPANTS

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Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	75
Diameter	+/- 1.0 m
Depth	5.0 - 10.0 m.
Lining	Buis beton
Construction by:	Villagers themselves

1.2 Hand-bored wells — None

1.3 Machine- bored deep wells — None

1.4 Pumps
Five shallow wells are equipped with small electric pumps feeding individual houses/ toilets.

1.5 Ownership — All shallow wells are considered to be 'private'.

1.6 Annual cycle — Some lowering of levels in the dry seasons, but not critical.

1.7 Water quality
Checked about a month ago by a Japanese team but result not known.

1.8 Distance to collect water — Less than 300 m.

1.9 Cost/Tariff structure — All spring and well sources are free of charge.
PDAM HC are metered and charged at standard tariff rates.

2. Springs — Kepala Desa says there are nine in the Desa, furthest only 500 m.
We visited the three largest, all located in the village center.

2.1 M.A. Prabe
A major spring behind the Masjid, broncaptured in a large sealed concrete tank (6.0 m x 2.5 m x 3.0 m) which supplies two communal bathing and clothes washing areas (Male/Female). Household water could be taken by bucket, but ground level shallow wells are the preferred source to avoid the uphill climb and distance from the spring. The quantity is large and quality appears good, but see Team Hydrogeologist's report. Elevation approx - 15.0 m. below village ground level. The facility was constructed by DPU Tk.II.

2.2 M.A. Kebun Bawa
Broncaptering from infiltration gallery. Possible contamination from ground water seepage. Supplies one communal bathing and clothes washing area. Household water could be taken by bucket but ground level shallow wells are the preferred source to avoid the uphill climb and distance from the spring. The quantity is large, quality unknown, see Team Hydrogeologist's report. The location is below village ground level - 10.0 m. The facility was constructed by the villagers themselves.

2.3 No name given
Adjacent to the above facility, probably drawing water from the same aquifer. A similar structure constructed by the villagers themselves. Not running very actively at present. Not

in use, ample supplies elsewhere. Slightly lower location, maybe - 15.0 m below village ground level.

3. Deep groundwater investigations None carried out.

4. PDAM supplies See below.

5. Treatment/Storage/Distrib. systems
PDAM Mataram already has 75 mm. service lines in Dusun Sembung Jejelok and Lendangre and to the Masjid. There are 10 metered private HC. No PH.

B. MISCELLANEOUS ITEMS

1. Water Users' Association Does not exist but they have two informal kelompok.

2. Stone, aggregate and sand Available locally, for payment.

3. Local labor Available and willing to participate for payment.

4. Land acquisition No problem, no compensation required.

5. Electric power Standard PLN O/H line 11,000/440V.

6. Public phone Not available

C. AVAILABLE WATER SOURCES

1. Local
The major springs offer a viable source, well located but at low level. All would need pumping and possibly some storage capacity.

2. PDAM
The village is identified on PDAM Mataram's System Sketch as an immediate target for further development when a source of construction funding is identified. The existing 400 mm transmission main running along the main road through the village has sufficient capacity and pressure. No storage, elevated or break-pressure tank would be required. The PDAM is anxious to extend its service and has submitted its proposed distribution layout for consideration by the Team.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The obvious target area for a new/extended system is the contiguous Dusun and sub-Dusun along the main road through the village, including Jejelok, which already has a small piped service.

2. Population to be served 1,860

3. Area to be served 60 ha.

4. Source
The PDAM source is preferred for household connections and for public drinking water supplies provided through PH. This would leave the major springs in the village available for their present use as bathing and clothes washing facilities.

5. Components
Additional 75 mm PDAM service lines installed to supply more HC and a series of standard Cipta Karya design metered PH, possibly 15, distributed throughout the Desa on sites selected by the Team working in conjunction with the Village WUA.

NTB # 4

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Duman	**Date of survey:**	April17, 2001
Kecamatan:	Narmada	**Total Desa Area:**	1,400 ha.
Kabupaten:	Lombok Barat	**Total Desa Population:**	5,244

Topography:

A long thin Desa stretching 15 km N <--> S from the low lying Mataram plain up into the foothills of Mt. Rinjani. There have been a number of recent border changes and two new neighboring Desa have been created. The higher areas of Desa Duman are still heavily forested and difficult to access by vehicle. The lower Dusun are feeder communities for Mataram, both in terms of labor and foodstuffs. The Desa comprises nine hamlets organized into seven Dusun, but not on an adjoining or contiguous basis.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada		PDAM Lombok Barat
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	Approx. 100
Diameter	+/- 1.0 m
Depth	9.0 m
Lining	Buis beton
Construction by:	Villagers themselves

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

1.4 Pumps

None, apart from one tiny electric pump and a hydraulic ram feeding the two Masjid. (See below).

1.5 Ownership

All wells seem to be considered ‘communal‘ and the piped supplies to the higher level Dusun are certainly treated as ‘communal’.

1.6 Annual cycle

The main source feeding the higher Dusun is not affected by seasonal changes but water levels fall seriously in the shallow wells at lower levels in the dry seasons. Some dry up completely.

1.7 Water quality

We were told that Dinas Kesehatan tested the water in both the high level source and some shallow wells “once”. Dinas Kesehatan supplies calcium hypochlorite to all households to treat their own wells and the tanks along the high level piped system, free of charge, twice a year. See Team Hydrogeologist’s report.

1.8 Distance to collect water — 200 m up to 400 m in the dry season

1.9 Cost/Tariff structure

None, all water is free of charge. K. Desa prefers that we select a gravity system to avoid pumping costs in future.

2. Springs

2.1 M.A. Trawasan

The broncaptering of this major source located 2 km North of the farthest and highest Dusun in the Desa was constructed in 1985 by CARE Australia. It supplies the top 4 Dusun, (5 hamlets) by gravity and is some 300 m above the main Dusun Dumandesa. The surface water, which contained a white precipitate, testified as rainwater runoff from the previous

day's heavy storm. In the dry season the water runs clear at the same velocity, indicating that there is an underlying ground water source. The quantity is very large. See Team Hydrogeologist's report.

2.2 M.A. Duman
There is a small multi-source spring in the bank just across the river to the immediate South of the Desa office. The broncaptering feeds a hydraulic ram which pumps water across the road bridge to supply one Masjid and the tank at the Desa office. (Also the K. Desa's house.) A second supply is drawn through an underwater pipe by a tiny electric pump to a small elevated tank that supplies for bathing on the river bank and another Masjid.

3. Deep ground water investigations None carried out.

4. PDAM supplies Available but not in use at present.

5. Treatment/Storage/Disturb. systems
The original supply from the M.A. Trawasan source was taken in a 2 inch PVC pipe to the top 3 hamlets, supplying 7 PH, no HC. Over the years the system has been misused and abused to the point where there is a secondary network of small diameter pipes, steel, PVC and flexible plastic hoses, (down to 5 mm dia.) some buried, some surface laid, supplying individual houses, toilets and many improvised tanks. Many joints are not sealed, most are leaking and none have any stop cocks, valves or taps - they just run to waste. Whilst agreeing that the inadequate supply is partially due to the original 2 inch pipe being too small, it is equally true that the wastage and leakage in the system is a major factor. The system needs a major overhaul or complete reconstruction.

B. MISCELLANEOUS ITEMS

1. Water Users' Association
A kelompok exists. It plays a minor role in collecting money for the tiny electric costs incurred in supplying water to the Masjid in Dusun Dumandesa.

2. Stone, aggregate and sand Available locally, for payment.

3. Local labor Available and willing to participate for payment.

4. Land acquisition No problem, no compensation required.

5. Electric power
Standard PLN 11,000/440V O/H line in Dusun Dumandesa, but only 440V/3Ph. at higher levels and none in the top Dusun.

6. Public phone Not available

C. AVAILABLE WATER SOURCES

1. M.A. Trawasan
The source is probably sufficient to supply the entire Desa by gravity but the pipeline lengths would be long and access conditions for pipe laying are poor. The source itself also needs further investigation. See Team Hydrogeologist's report.

2. M.A. Duman
Not considered suitable for any major distribution system. Would require pumping, even to Dusun Dumandesa.

3. M.A. Embungpas
The Desa has recently opened negotiations with the adjoining Desa Langko to take water from M.A. Embungpas to supply Dusun Dumandesa only. The source is only 1.0 km East of the target area and may be high enough to supply by gravity. The capacity was reported to be 3.0 L/sec. We were not able to visit without making a formal presentation to K. Desa Langko that might well have led to a demand for a project in his Desa. A follow-up visit by the Team Hydrogeologist found the quality to be acceptable but the quantity only 1.6 L/sec., which is insufficient.

4. PDAM
The PDAM Rep. accompanying the team in the field identified the location of PDAM Mataram's transmission mains just 1.5 km south of Desa Dumandesa. He stated that there

were three pipes running E <--> W from M.A. Sarasuta and M.A. Sarasaka into Mataram and that we could take supplies from the 6 inch line. In fact the PDAM's own System Sketch shows four mains in this area, all bigger than 6 inches dia. This situation needs clarification. The pipes lie at about the same elevation as Dusun Dumandesa so, depending on the available pressure, would require pumping to supply any of the higher Dusun. Desa Duman is also identified as an immediate target for development when a source of construction funding is identified.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area

Depending almost entirely on the location of the selected source(s) and noting the K. Desa's insistence on minimal pumping costs, projects must be designed which supply as many Dusun as possible by gravity. If the M.A. Trawasan source is acceptable it may be possible to supply all the Dusun. It is also important to supply all the smaller hamlets en route, to avoid pipeline invasion problems.

2. Population to be served 3,300 **3. Area to be served** 50 ha.

4. Source

The rehabilitation and extension of the M.A. Trawasan system is preferred, subject to water quality analyses. The PDAM pipelines should be considered as alternative sources for Dusun Dumandesa to reduce pipeline lengths. These recommendations are in line with the K. Desa's expressed wishes.

5. Components

Cannot be finalized, but will likely include about 10.0 km of new distribution mains from M.A. Trawasan and between the Dusun, supplying new standard Cipta Karya design metered PH, possibly 10. The lower level project would require a 2.0 km transmission main from the PDAM pipeline supplying a further 15 new PH and HC in Dusun Dumandesa and Duman Dasan only.

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NTB # 5

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Peresak	**Date of survey:**	April 2, 2001
Kecamatan:	Narmada	**Total Desa Area:**	670 ha.
Kabupaten:	Lombok Barat	**Total Desa Population:**	10,000

Topography:
A large Desa comprising 10 Dusun astride the main road from Mataram to Lb. Lombok just to the East of Narmada. The Western area, predominantly to the South of the road, is well developed and densely populated. The larger and drier area to the East is a collection of loosely connected smaller hamlets. A hilly agricultural area, well irrigated and relatively prosperous.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada	Sekretaris Desa	PDAM Lombok Barat
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	349
Diameter	+/- 1.0 m
Depth	+/- 5.0 m
Lining	Buis beton
Construction by:	Villagers themselves

1.2 Hand-bored wells

Number	1
Diameter	100 mm
Depth	15.0 m
Lining	None
Constructed by:	Contractor

1.3 Machine- bored wells — None

1.4 Pumps
The bored well has a small surface pump serving the owner's house and toilet only. Some of the shallow wells have similar private installations.

1.5 Ownership
Wells in open areas are considered to be 'communal' as are the PH served by the two small village systems described below. Wells and services in compounds or provided to houses are considered to be 'private'.

1.6 Annual cycle
The springs in the Western section are not affected. Levels in the East fall in the dry season and some actually dry up. There is always river water available. No real water supply problem.

1.7 Water quality — Never tested.

1.8 Distance to collect water — Less than 300 m.

1.9 Cost/Tariff structure
Public supplies are free of charge. HC supplied from the local systems are charged Rp.1,000/house/month in one Dusun (no pumping costs) and Rp.3,000/house/ month in the other. The few PDAM connections in Golong and adjoining hamlets are metered and charged at Rp.150/cu.m.

2. Springs
There are five in the Desa, two of which supply small pumped systems. We visited two and nearly reached a third.

2.1 M.A. Pancor Godang
Just above the road bridge at the extreme West of the Desa. Fitted with a hydraulic ram supplying water across the main road and up the hill to Dusun Tanak Tepong Utara. The ram is presently broken. The overflow is used for adjacent male/female washing and toilet facilities. The location is very low, would require pumping and storage. Flow does not vary annually. There is a similar very small village pumped system supplying a few houses from M.A. Taman Armada.

2.2 M.A. Tebao
Located in an agricultural area to the north of the Desa. Flow seems adequate and there are piped supplies leading down to adjacent Dusun. (Said to be inoperative at present.) The overlying land is very low paddy field. There is likely to be percolation of fertilizers. (Sodium Phosphate.) Location is above main village level but probably not sufficient for gravity distribution. Flow reduces in the dry season but does not dry up.

3. Deep ground water investigations None carried out.

4. PDAM supplies
There is a small PDAM system feeding direct from M.A. Orong Petong to supply the small eastern hamlet of Golong and, more importantly, the adjacent golf course. Several main transmission mains are available to the north of the Desa.

5. Treatment/Storage/Distrib. systems

5.1 PDAM
The Golong system has just a few HC and there is no more capacity available. Not really relevant for the Desa as a whole.

5.2 Dusun Tanak Tepong Utara
The pumped system from M.A. Pancor Godang, which is owned and operated by the village, supplies a 5.0 cu.m concrete tank which in turn feeds 35 HC of which only 22 are currently operative. There are also a number of isolated standpipes.

5.3 Dusun Peresak Utara
There is a similar partially operative supply to the Masjid and 15 HC from M.A. Taman Armada.

B. MISCELLANEOUS ITEMS

1. Water Users' Association
Already exists, but the two existing systems are managed by informal Kelompok.

2. Stone, aggregate and sand
Sand is available but aggregate and stone are brought in from outside the village.

3. Local labor Available and willing to participate for payment.

4. Land acquisition No problem, no compensation.

5. Electric power Standard PLN O/H line 11,000/440V.

6. Public phone Available in one Dusun only.

C. AVAILABLE WATER SOURCES

1. Springs within the Desa
Five local springs are available subject to water quality and quantity analyses by the Team Hydrogeologist.

2. Springs in Desa Suranadi
There are several. Subject to availability and satisfactory water quality and quantity analyses. (Note: Desa Suranadi is newly created and does not appear on the maps we are using.)

2.1 M.A. Pura Petong
This spring is only 1.0 km from the center of Desa Peresak. It is at higher level than Peresak, but access for construction is across a paddy field area.

2.2 M.A. Pura Pucuk
A further 500 m nearer to Peresak, a low lying source with two old broncapterings which used to be the source for Narmada. (Now supplied by PDAM Mataram.) The springs are unused and available but would require minor pumping over local high ground.

2.3 M.A. Pura Suranadi
This is a major source situated in a traditional Hindu Pura. The quality is apparently good and the quantity more than sufficient. However supplies are already piped to Desa Mentong. This system is owned and managed by Desa Suranadi. (See "Follow-up" Report)

2.4 M.A. Mounting
This 25.0 L/sec source is owned and operated by PDAM Mataram, feeding into its system through the Mounting reservoir.

3. PDAM Mataram
The village is identified on PDAM Mataram's System Sketch as an immediate target for development when a source of construction funding is identified. The PDAM already has a number of main transmission mains in the area in addition to the small Golong system. The 300 mm main from M.A. Mentong to Kota Narmada passes just 1.0 km North of Peresak along the Suranadi <--> Selat road.

The 450 mm high pressure steel main from the huge (1,200 L/sec) M.A. Ranget follows a similar route further north but the PDAM Rep. was not able to locate it on the topographical map of the area. Pressure in this pipeline might be too high for a direct tapping. Further discussions with PDAM are required to clarify the situation.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
Depends to a large extent on the location and capacity of the selected source. The K. Desa nominated seven Dusun in both the Eastern and Western part of the Desa in the hopes that we would provide a service to as many as could be supplied by the selected source. In fact the high-density population areas are Tanak Tepong Selatan, Tanak Tepong Utara and Peresak Utara, which collectively have a population of 2,872. But these are the areas that already have piped supplies from their own Desa operated systems. Any of the springs in Desa Suranadi or the PDAM pipelines could conveniently be utilized to serve more of the widely spread hamlets in the east of the Desa, some of which already have a metered PDAM supply.

2. Population to be served 6,000 **3. Area to be served** 58 ha.

4. Source
For the western part of the Desa, two existing spring sources are preferable, considering the reconstruction and extension of the existing piped systems. For the eastern part of the Desa, several springs in Desa Suranadi or PDAM source is proposed although further investigation is requied.

5. Components
The principal project should be the development of a source from Desa Suranadi to serve the eastern portion of the Desa. This would require a 1.0 km transmission main supplying standard Cipta Karya design metered PH, possibly 30, distributed throughout the hamlets on sites selected by the Team working in conjunction with the village WUA. HC should also be offered.

Secondary projects should be considered to reconstruct and increase the service areas of the two existing systems in the western region, taking additional supplies from the present sources to supply maybe 20 additional PH. HC should also be offered in this area.

DESA PERESAK **NTB # 5**

FOLLOW-UP MEETING WITH DESA SURANADI

PARTICIPANTS		**Date of meeting:**	May 5, 2001
JICA Study Team	**Desa Suranadi**	**Representatives of:-**	
Mr. G Woollatt	Sekretaris Desa	P3P NTB Tk.I	
Ir. Bernadi Situmpul	Kepala Desa (Later)		

A. PURPOSE OF MEETING

The meeting was not pre-arranged but the JICA Team members were well received by the staff of the newly formed Desa. The intent of the meeting was to determine procedures for negotiating water rights for Desa Peresak from sources now located in Desa Suranadi.

B. FINDINGS

1. M.A. Pura Suranadi

Water supplies taken from the large source inside the Hindu Pura Suranadi are controlled by two informal organizations (Kelompok) one for potable water supplies and the other for irrigation. Meetings would have to be convened in advance. Water is already supplied by pipeline to Mentong and to local irrigation users but more is probably available by negotiation. No charge is made for water but an initial "abstraction right" charge is made by the 'Kelompok'.

2. Other Sources

The JICA Team members were escorted to M.A. Pura Petong some 500 m directly South of the Desa office across a lot of paddy fields. It is a viable source arising in a gravel bed beside a small shrine. It would be necessary to screen off several irrigation supplies passing nearby, but this is not technically difficult. The land is privately owned, but negotiations with the owner are not expected to be any problem providing we left sufficient water for local irrigation users.

The Team members were also taken to M.A. Pura Pucuk a further 500 m nearer the Peresak border where two old broncaptering are still operating. This area was once the source for Narmada but is now unused and available. It is thought to be controlled by the same Pura Kelompok as controls M.A. Pura Suranadi.

A 12-inch PDAM pipeline was observed alongside the main road from Suranadi to Narmada.

3. General Points

Subject to water quality and quantity analyses, all the sources in Desa Suranadi are at higher elevation, suitable and available to supply Peresak, although in some cases there may be a need for some initial pumping over local high ground.

Note that the creation of Desa Suranadi has led to many border changes in the area and it is possible that a pipeline route from Desa Suranadi to Desa Peresak might cross a third Desa although the distance is less than 1.0 km.

Kepala Desa Suranadi and his staff all agreed that there was no problem taking water from Suranadi to supply Peresak. All the sources of interest are at a lower level than the main areas of habitation in the Desa and they already have adequate supplies from higher levels.

C. CONCLUSION

All these sources should be investigated and considered as potential sources for supply to the eastern portions of Desa Peresak.

NTB # 6

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Jelantik	**Date of survey:**	March 23, 2001
Kecamatan:	Jonggat	**Total Desa Area:**	776 ha.
Kabupaten:	Lombok Tengah	**Total Desa Population:**	8,100

Topography:
The village is scattered in several Dusun spread out along both sides of the main Mataram <-> Praya road in an undulating location. Apparently rich farming land, mostly irrigated. Land slopes steeply from North --> South and is cut by many small rivers.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Sekretaris Desa	DPU Tk.II
Mr. T. Wada		PDAM Lb. Tengah
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	459
Diameter	+/- 1.0 m
Depth	5.0 - 7.0
Lining	Buis beton
Construction by:	Villagers themselves

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells
There is one private deep well in an industrial area. Said to have been bored to 40 m but uses a surface pump and has a water level only 0.8 m below GL. It does not contribute to the village water supply situation.

1.4 Pumps
Some of the private shallow wells are equipped with small electric pumps feeding individual houses/toilets.

1.5 Ownership — Wells in open areas are considered to be 'communal'
Wells in house compounds are considered to be 'private'

1.6 Annual cycle
Some wells dry up in the dry seasons, all water levels are lowered but the situation does not become critical.

1.7 Water quality — Never checked. See Team Hydrogeologist's report.

1.8 Distance to collect water
Less than 200 m. in the wet season, up to 300 m. in dry seasons.

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs
Sekretaris Desa listed eight by name, but on inspection we only found one and that was insignificant. Just enough for a few local inhabitants to wash.

3. Deep ground water investigations — None carried out

4. PDAM supplies — Planned, but not yet available

5. Treatment/Storage/Distrib. systems — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — Already exists.

2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard PLN O/H line 11,000/440V.
6.	**Public phone**	Not available.

C. AVAILABLE WATER SOURCES

1. Local None.

2. PDAM
PDAM Lombok Tengah has two major schemes to bring potable water from large perennial springs on the lower slopes of Mt. Rinjani into the Western side of the Kabupaten by gravity. Both schemes have been designed and costed, but only partially constructed. The system that is intended to supply Jelantik has reached Pringgarata, 9.0 km away. The other scheme has reached Puyung, which is only 3.0 km away but at a lower level and would require a pumping facility that is not in the PDAM design. (This system was not intended to supply Jelantik.) Both have sufficient capacity and the PDAM is anxious to continue the planned construction of these two schemes when a source of funding can be identified.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The central area on both sides of the road is an awkward but logical choice.

2. Population to be served 2,500 **3. Area to be served** 40 ha.

4. Source
More information is required on the design and cost of the extensions to the PDAM systems. Meanwhile the availability of potable ground water in the village area should be investigated.

5. Components
Two or three boreholes in the village area feeding by gravity if possible to standard Cipta Karya design metered PH, possibly 20, distributed throughout the village, both sides of the road, on sites selected by the Team working in conjunction with the Village WUA. If the wells have to be sited at lower elevations pumping up to a high level storage tank might prove necessary, but this should be avoided if at all possible.

NTB # 7

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Labulia	**Date of survey:**	March 22, 2001
Kecamatan:	Jonggat	**Total Desa Area:**	1,060 ha.
Kabupaten:	Lombok Tengah	**Total Desa Population:**	8,860

Topography:
The village is spread out along both sides of the road in an entirely flat agricultural area. A small river in a very deep (60.0 m.) ravine borders the Desa on the North. There is some hilly ground to the Southwest. An intense irrigated paddy field area.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada		PDAM Lb. Tengah
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	More than 700
Diameter	+/- 1.0 m
Depth	5.0 - 7.0
Lining	Buis beton
Construction by:	Villagers themselves

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

1.4 Pumps
Some of the private shallow wells are equipped with small electric pumps supplying individual houses/toilets.

1.5 Ownership — Wells in open areas are considered to be 'communal'.
Wells in house compounds are considered to be 'private'.

1.6 Annual cycle
Most wells dry up in the dry seasons, all water levels are lowered and the situation does become critical.

1.7 Water quality — Never checked. See Team Hydrogeologist's report.

1.8 Distance to collect water
Less than 200 m. in the wet season, up to 500 m. in dry seasons.

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs — None in the Desa area.

3. Deep ground water investigations — None carried out

4. PDAM supplies — Planned but not yet available

5. Treatment/Storage/Distrib. systems — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — Already exists.

2. Stone, aggregate and sand — Available locally, for payment.

3. Local labor — Available and willing to participate for payment.

4. Land acquisition — No problem, no compensation required.

5. Electric power Standard PLN O/H line 11,000/440V.

6. Public phone Not available.

C. AVAILABLE WATER SOURCES

1. Local
There are three minor springs 2.5 km away near Prajurit, but this is in Kabupaten Lombok Barat so the source would not be available without undue administrative hassle. Quantity and quality not known. See Team Hydrogeologist's report.

2. PDAM
PDAM Lombok Tengah has two major schemes to bring potable water from large perennial springs on the lower slopes of Mt. Rinjani into the Western side of the Kabupaten by gravity. Both schemes are designed and costed, but only partially constructed. The system that is intended to supply Labulia has reached Pringgarata, 15 km away. The other scheme has reached Puyung, which is only 8.0 km away but is at a lower level and would require a pumping facility that is not in the PDAM design. (This system was not intended to supply Labulia) Both have sufficient capacity and the PDAM is anxious to continue the planned construction of these two schemes when a source of funding can be identified.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
There is little choice; the main village area is spread out along both sides of the road, maybe 1.0 km x 500 m. Kepala Desa also wants a supply to a small satellite component of the same Dusun less than 500 m away to the Southeast.

2. Population to be served 3,100 **3. Area to be served** 40 ha.

4. Source
More information is required on the design and cost of the extensions to the PDAM systems. Meanwhile the availability of potable ground water in the village area should be investigated.

5. Components
Two or three boreholes supplying service lines along both sides of the village street. Distribution through standard Cipta Karya design metered PH, possibly 25, on sites selected by the Team working in conjunction with the village WUA. A secondary 150 mm PVC pipe would be required to feed another 5 PH in the satellite community. HC should be offered, for discussion with Kepala Desa and the WUA.

NTB # 8

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Setanggor	**Date of survey:**	March 22, 2001
Kecamatan:	Praya Barat	**Total Desa Area:**	1,176 ha.
Kabupaten:	Lombok Tengah	**Total Desa Population:**	4,950

Topography:
A very hilly village, almost circular in shape, clustered around the sides of a prominent isolated hill feature in the midst of more gently rolling agricultural land. Intense irrigated paddy field area. There is a very large irrigation dam and lake to the Southwest.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada	Community meeting	PDAM Lb. Tengah
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1	Hand-dug wells	Number	Over 600	(Some wells have
		Diameter	+/- 1.0 m	internal water levels
		Depth	+/- 3.0 m	above the external GL)
		Lining	Buis beton	.
		Construction by:	Villagers themselves	
1.2	Hand-bored wells		None	
1.3	Machine-bored deep wells		None	
1.4	Pumps		None	
1.5	Ownership	Wells in open areas are considered to be 'communal'. Wells in house compounds are considered to be 'private'.		
1.6	Annual cycle	Water levels fall in the dry season but do not dry up. No serious water supply problem.		
1.7	Water quality	Never checked. See Team Hydrogeologist's report.		
1.8	Distance to collect water	Less than 200 m.		
1.9	Cost/Tariff structure	None, all water is free of charge.		

2. Springs
There is a group of three small springs 3.5 km away that is used by the local inhabitants in that area for drinking, bathing and washing clothes. They are not relevant to the water supply situation in the main village area.

3.	**Deep ground water investigations**	None carried out
4.	**PDAM supplies**	None, and nothing planned
5.	**Treatment/Storage/Distrib. systems**	None

B. MISCELLANEOUS ITEMS

1.	**Water Users' Association**	Does not exist, but would be formed if they had a water supply system.
2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.

4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard PLN O/H line 11,000/440V.
6.	**Public phone**	Not available

C. AVAILABLE WATER SOURCES

1. Local

The small springs 3.5 km away are the only local source, apart from the wells in the village. Distance is far, route crosses a major irrigation dam lake, quantity is small and elevation is probably - 20 m. Would require pumping and storage facility.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area

The central village area is the obvious choice although the individual houses are widely spaced and the varying elevations +/- 15.0 m will create design problems.

2. Population to be served 3,000 **3. Area to be served** 80 ha.

4. Source

The three small springs are not recommended as a suitable source. Best choice is to find ground water in the village area. The semi-artesian effect in some of the shallow wells suggests that large diameter but relatively shallow bored wells, sited in non-contaminated locations and sealed, might prove to be a viable solution.

5. Components

Two or three wells in the village area feeding by gravity, if possible, to standard Cipta Karya design metered PH, possibly 30, distributed throughout the village on sites selected by the Team working in conjunction with the Village WUA. If the wells have to be sited at lower elevations pumping up to a high level storage tank might prove necessary, but this should be avoided if at all possible.

NTB # 9

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Rembitan	**Date of survey:**	March 24, 2001
Kecamatan:	Pujut	**Total Desa Area:**	1,475 ha.
Kabupaten:	Lombok Tengah	**Total Desa Population:**	7,500

Topography:
A long thin village stretching along the main N <-> S road from Praya to Kuta. The immediate area is predominantly flat but the surrounding land falls from West --> East (+/- 15 m.) and the road rises quite sharply at both ends of the village. A poor agricultural area supported in part by the adjacent traditional Sasak village, a tourist attraction.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada		PDAM Lb. Tengah
Mr. S. Takahashi		
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	12 communal	
Diameter	+/- 2.5 m	(Very unusual
Depth	Up to 15 m	construction)
Lining	Brick	
Construction by:	Villagers themselves	

Plus many traditional private wells

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

1.4 Pumps
A few of the private shallow wells are equipped with small electric pumps feeding individual houses/toilets.

1.5 Ownership
The 12 wide diameter brick lined wells are all located in public areas and are considered 'communal'. The smaller concrete lined wells in individual compounds are considered to be 'private'.

1.6 Annual cycle
Most wells dry up in dry seasons. Much dependence on rain water collection. Water shortage is acute in the dry season.

1.7 Water quality — Never checked. See Team Hydro-geologist's report.

1.8 Distances to collect water — Around 200 m. in the rainy seasons. Much further in the dry season.

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs
There is a group of springs (three, plus some seepage) on both sides of the road half way up a quite steep incline 2.5 km south of the village. These are used for drinking, bathing and clothes washing by the very few people who live in the surrounding forest area. Not really relevant to the water supply situation in Rembitan at present.

3. Deep ground water investigations — One recent test borehole found nothing.

4. PDAM supplies — Available but not in use at present.

5. Treatment/Storage/Distrib. systems — None

B. MISCELLANEOUS ITEMS

1.	**Water Users' Association**	Already exists, but is male dominated!
2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard PLN O/H line 11,000/440V.
6.	**Public phone**	Not available

C. AVAILABLE WATER SOURCES

1. Local

The group of springs 2.5 km to the South is not great. Quantity is small and quality questionable due to difficulty in collection without pollution. At present they are collected downstream in a P2AT irrigation dam. The source elevation is a few meters above village level, probably insufficient to maintain gravity flow. A collection and pumping installation would be required

2. PDAM

PDAM Lombok Tengah has a 400 mm transmission main running along the main N <-> S road through the village. It has plans and costed designs to supply the village through a high level break pressure tank to the North. Source capacity is more than sufficient (WTP Praya) but the pressure locally is questionable.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area

The obvious target area is the two contiguous Dusun spread out along the main road, Rembitan I and Rembitan II. This is clearly the main center of population.

2. Population to be served 1,560 **3. Area to be served** 50 ha.

4. Source

The PDAM source is the only possibility.

5. Components

Subject to technical review, implementation of the PDAM design for a break-pressure tank and secondary transmission pipeline to the village. Supply through standard Cipta Karya design metered PH, possibly 15, distributed throughout the two Dusun on sites selected by the Team working in conjunction with the Village WUA. HC are probably beyond the people's ability to pay.

NTB # 10

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Bagik Papan	**Date of survey:**	March 28, 2001
Kecamatan:	Pringgabaya	**Total Desa Area:**	900 ha.
Kabupaten:	Lombok Timur	**Total Desa Population:**	8,975

Topography:
The village is predominantly located on the North side of the Aikmel <--> Lb. Lombok main road. A hilly rural area with Dusun widely spread. A farming area falling steeply from N --> S.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Desa Sekretaris	DPU Tk.II (2)
Mr. T. Wada	Three village elders	PDAM Lb. Timur (2)
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	121
Diameter	+/- 1.0 m
Depth	Up to 30.0 m!
Lining	Buis beton
Construction by:	Villagers themselves

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

1.4 Pumps — None

1.5 Ownership — Wells in open areas are considered to be 'communal'. Wells in house compounds are considered to be 'private'.

1.6 Annual cycle
Most wells dry up in the dry seasons; all water levels are lowered seriously.

1.7 Water quality — Never checked. See Team Hydrogeologist's report.

1.8 Distance to collect water — Less than 200 m. in all Dusun.

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs — There are two major springs in the Desa.

2.1 M.A. Balas I
A high level source, some 3.0 km North of the main road. Supply was taken by a CARE project from a broncaptering for a village system to supply piped water to Dusun Desanimba, Bampak and Tontongsuit. The system is said to be inoperative but the source remains available. See Team Hydrogeologist's report for water quality and quantity analyzes.

2.2 M.A. Telaga Murni
A major PDAM broncaptering, swimming pool and irrigation source across the main road, South of all population centers. Does not provide any service or facility to the Desa.

3. Deep ground water investigations
Dinas Kesehatan carried out a test drilling a long time ago but found nothing.

4. PDAM supplies — None, apart from M.A. Telaga Murni above

5. Treatment/Storage/Distrib. systems
A 3 inch buried PVC pipe system from the M.A. Balas I source supplied 3 PH in the high level Dusun. Managed by the village.

B. MISCELLANEOUS ITEMS

1.	**Water Users' Association**	Does not exist.
2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard 11,000/440V O/H line, but supply is from Aikmel Koperasi not PLN.
6.	**Public Phone**	Not available

C. AVAILABLE WATER SOURCES

1. M.A. Balas I Available, subject to satisfactory quantity and quality analyzes.

2. M.A. Telaga Murni
This significant source was broncaptered by a major DPU project from which PDAM Lombok Timur provides piped supplies to five downstream villages and large quantities of overflow water into the irrigation system. The capacity is obviously sufficient to supply Bagik Papan and several other Desa, subject to favorable water quality analyzes. See Team Hydro-geologist's report. However the location is some 30 m below road level and even lower than the potential target Dusun. There would be significant pumping costs and possibly a requirement for storage.

3. PDAM
There are no plans to supply water to Bagik Papan but it would be technically possible to supply all Dusun by gravity from the PDAM M.A. Lemor regional system.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
In addition to rehabilitating the CARE system, the Desa wants a piped supply to Dusun Bagik Papan. This is an excellent choice. The Dusun is a compact center of population served by just 14 very deep hand dug wells that effectively dry up in summer.

2. Population to be served 1,600 **3. Area to be served** 24 ha.

4. Source
Further investigations are required but a gravity supply from M.A. Balas I would be preferred. Failing this, detailed engineering studies must be made to confirm the practicality of pumping water from the M.A. Telaga Murni facility or adding Bagik Papan to the M.A. Lemor system.

5. Components
Subject to quantity and quality analyzes the Australia system should be rehabilitated and extended to supply all Dusun north of the main road through standard Cipta Karya design PH, possibly 25. The viability of HC should also be considered through discussions with Kepala Desa and the WUA.

DESA BAGIK PAPAN **NTB # 10**

FOLLOW-UP VISIT TO M. A. BELAS I

PARTICIPANTS	**Date of visit:**	May 16, 2001
JICA Study Team	**Desa Bagik Papan**	
Mr. G Woollatt	Sekretaris Desa	
Mr. T. Wada	2 Village guides	
Ir. Bernadi Sitompul		
Ir. Tian Andrian Noor		

A. PURPOSE OF VISIT

The meeting was not pre-arranged but the JICA Team members were well received by the Desa and accompanied to the Belas area. The intent of the visit was to investigate the Belas source and the status of the old CARE Australia system supplying the higher level Dusun.

B. FINDINGS

The Belas I area is about 1.0 km above Dusun Dasanimba in Desa Ketangga. It is an area source, two bamboo pipes running full and much seepage through the gravel at the foot of the solid rock cliff. Broncaptering 8 L/sec would not be difficult. The main river that flows past the site to an irrigation dam would not be affected. There is also a Belas II source that is used solely for irrigation.

The source for the CARE project is much lower, just above the dam site. The actual intake has been covered by an earthfall but the pipe (3-inch PVC) is still running full. The pipe is deeply buried and hard the trace, but is presumably in good condition as some water still reaches at least one large concrete tank (Nov 1989) in Dusun Dasanimbu which is running to waste continuously. The terrain is good for pipe laying.

C. CONCLUSION

It is likely, but not yet confirmed, that Belas I is a sufficient gravity source for all four Dusun. Most of the Australian pipeline is probably reusable, "as is, where is", if the diameter proves to be sufficient for the demand and the hydraulic gradient.

NTB # 11

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Selaparang	**Date of survey:**	March 29, 2001
Kecamatan:	Swela	**Total Desa area:**	800 ha.
Kabupaten:	Lombok Timur	**Total Desa population:**	3,566

Topography:
The village stretches along a high narrow ridge between a small river in a ravine on the South-West and the low coastal plain on the East. The surrounding countryside is also hilly. The area appears dry, but is well irrigated and fertile. The village is neat and well managed. Moderately prosperous. The water supply situation is quite serious.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	PDAM Lombok Timur (2)
Mr. T. Wada	Camat Swela	
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells None (A most unusual situation)

1.2 Distance to collect water
The majority of the population takes all its water from the river in one way or another. Drainage channels run down the village street and many users have immersed pipes in these flows at higher levels. So distance is very small. Bathing and clothes washing is done in the river itself, approx. 300 m distant and 40 m below village GL. Channels and river levels are lower in the dry season but never dry up completely.

2.0 Springs There are two of significance.

2.1 M.A. Lemor
A substantial PDAM broncaptering and swimming pool structure outside the Desa boundary, 5 km distant and 300 m above village level. There are several break-pressure tanks along the pipeline route. Capacity supposedly over 30 L/sec., less in the dry seasons. The source supplies the irrigation and water supply needs of six Desa, including the PDAM HC and PH system in Selaparang. The PDAM allegedly tests water quality monthly but the results are not available. Water quantity and quality at the source are apparently satisfactory. See Team Hydrogeologist's report.

2.2 M.A. Sabau
A major new source, estimated at over 200 L/sec, 30.0 km above village at a differential elevation of +1,000 m. As yet not utilized. Camat Swela has a project to use this source to supply all six Desa. The PDAM appears to be compliant as the potential operators of the system should it ever be implemented. The project is being actively promoted by DPU Tk. II.

3. Deep ground water investigations
None carried out in this Desa, but water was found at -200 m. in a nearby Desa.

4. PDAM supplies Local, from Lemor source.

5. Treatment/Storage/Distrib. systems
DPU constructed a 6 inch steel and PVC pipeline regional system which is operated by PDAM Lb. Timor. Selaparang is an intermediate village on the system but receives inadequate supplies. There are only 15 active house connections remaining on the system. It is assumed that an ever increasing number of illegal tappings and pipe leakages have resulted in the virtual drying up of the system. Tariff Rp. 150/cu.m. Meters are not read regularly and no maintenance is evident. The villagers have lost confidence in the system and do not want it rehabilitated.

B. MISCELLANEOUS ITEMS

1. Water Users' Association Does not exist.

2. Stone, aggregate and sand Available locally for payment.

3.	**Local labor**	Available and offered free of charge.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard O/H line 11,000/440V, but supply is from Aikmel Koperasi not PLN.
6.	**Public phone**	Not available.

C. AVAILABLE WATER SOURCES

1. M.A. Lemor
Subject to water quality and quantity analyses, this is apparently a satisfactory source, but there are clearly technical problems with the pipeline flow and the allocation of supplies between the six Desa served by the PDAM system.

2. M.A. Sabau
A major new project, clearly desirable and for the benefit of the Kecamatan as a whole, but unnecessary for Selaparang alone if the problems with the Lemor system can be resolved.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area The selected target area is the main village, Dusun Selaparang Timur.

2. Population to be served 1,520 **3. Area to be served** 50 ha.

4. Source Rehabilitation of the Lemor system is preferred.

5. Components
Possible reconstruction of the pipeline from Lemor, maybe at a larger diameter. Promotion of more metered HC along the village street and the installation of standard Cipta Karya design metered PH, possibly 15, distributed on sites selected by the Team working in conjunction with the Village WUA.

DESA SELAPARANG **NTB # 11**

FOLLOW-UP VISIT TO M. A. LEMOR

PARTICIPANTS	**Date of visit:**	May16, 2001
JICA Study Team	**Desa Suranadi**	
Mr. G Woollatt	Sekretaris Desa	
Mr. T. Wade	Kepala Desa (Later)	
Ir. Bernadi Situmpul		
Ir. Tian Andrian Noor		

A. PURPOSE OF VISIT

The meeting was not pre-arranged but the JICA Team members were well received by the Desa and accompanied to Lemor. The intent of the visit was to investigate the reasons for the inadequate supply reaching the Desa.

B. FINDINGS

Lemor is a significant tourist site, swimming pools, bathing and washing facilities. The source is huge. The four main arisings probably total 50 – 60 L/sec. and there are several smaller springs at higher levels. The majority of the water passes though the site to the river for irrigation use. There are several intake tanks and a number of smaller pipes taking water to local communities. The main PDAM pipe is 6-inch steel feeding six Desa. (Suwele, Ketangga, Suntalangu, Selaparang, Pringgabaya and Batuyang.) The actual intake to the PDAM Regional system is not readily apparent. The break-pressure tanks along the route appear to be in good condition and there are no reports of major pipeline leakages or breakages.

There is no doubt that Lemor is a sufficient supply for the six Desa so the reason for the inadequate supply reaching Selaparang must be due to some pipeline problem.

- A 6-inch dia. pipe may provide insufficient capacity.
- The intake may be blocked or choked with debris.
- The pipe may be blocked somewhere down the line.
- Illegal tappings and other minor leakages.

A parallel pipe would be approximately 5 km long in good pipe laying terrain.
It would be feasible to add Bagik Papan to this Regional system but probably inadvisable.

C. CONCLUSION

We can assume that the Lemor source is sufficient. The requirement is for a technical investigation of the pipeline system and the possible installation of a parallel line supplying Selaparang only, but this could only be done with the close collaboration of PDAM Lb. Timor.

NTB # 12

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Batu Nampar	**Date of Survey:**	March 27, 2001
Kecamatan:	Kruwu	**Total Desa Area:**	924 ha.
Kabupaten:	Lombok Timur	**Total Desa Population:**	4,161

Topography:
The village is located in two widely separated and disparate areas. A low-lying coastal fishing and salt making area, and a small farming village, which includes the Kepala Desa office on, higher ground 2.5 km away. There are also three smaller outlying Dusun. The area is arid and saline, very poor with acute water supply problems.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Sekretaris Desa	DPU Tk.II
Mr. T. Wada		PDAM Lombok Timur
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		
Mr. Marjono (P3P)		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	Hard to define, there are few operative wells. New wells become saline quickly and are replaced regularly.
Diameter	+/- 1.0 m
Depth	8.0 - 10.0 m
Lining	Buis beton
Construction by:	Villagers themselves

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

1.4 Pumps — None

1.5 Ownership — All wells are considered to be 'communal'.

1.6 Annual cycle
All wells dry up or become saline in the dry seasons. Supply is then by tanker truck or in desperation from an irrigation dam 5.0 km away.

1.7 Water quality — Never checked. See Team Hydrogeologist's report.

1.8 Distance to collect water
Varies with the season, can be as far as 5.0 km. Usually over 500 m.

1.9 Cost/Tariff structure
None for water taken from village wells, but payment must be made for trucked supplies.

2. Springs — None

3. Deep ground water investigations — None carried out, presumably saline.

4. PDAM supplies
Available through a new gravity pipeline system. (See below.)

5. Treatment/Storage/Distrib. systems

5.1 AusAid system
Built in 1991. Took supplies from PDAM Lombok Tengah's piped system originating from WTP Praya. A 4-inch pipe supplied water to a series of concrete tanks and communal washing and toilet facilities in the coastal half of the village. A combination of illegal abstractions and the villagers' inability to pay led the PDAM to cut off supplies several years ago. The structures remain unused and inoperative.

5.2 Dept. of Fisheries system
The Dept. of Fisheries Tk.I. has constructed (maybe 95% complete) a totally new 3-inch system, designed and supervised by PDAM Lombok Timur, funded by ADB. The system, which will be connected to the PDAM regional system in June 2001, will supply only 5 metered PH, which are not constructed to Cipta Karya's standard design.

B. MISCELLANEOUS ITEMS

1.	**Water Users' Association**	Already exists.
2.	**Stone, aggregate and sand**	Stone and aggregate available for repayment. Salt-free sand NOT available.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard PLN O/H line 11,000/440V.
6.	**Public phone**	Not available.

C. AVAILABLE WATER SOURCES

1. AusAid system
Presumably impossible to reactivate. The system is derelict and the administrative problems involved in getting long-term approval for a project to take treated water supplies across Kabupaten borders are probably insurmountable.

2. Dept. of Fisheries system
The project is apparently on schedule. The Dept. of Fisheries contractor is currently completing installation of a new 6-inch transmission main for the PDAM in the proposed connection area, which is 15 km from Batu Nampar.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The two parts of the village, which are located around the two existing systems, are obviously the only viable project target area.

2. Population to be served 2,000 **3. Area to be served** 36 ha.

4. Source
The only realistic source is PDAM Lb. Timor's regional system through the Dept. of Fisheries system.

5. Components
The 5 new PH should be improved to comply with Cipta Karya's standard design and more PH are certainly desirable. Maybe 15. Interconnection to the old Australian concrete tanks in the target area would significantly increase the storage capacity on the system and provide more public facilities at little cost. The possibility of providing supplies to the village of Sukaraja along the pipeline route should be investigated, to avoid local jealousies and pipeline damage.

DESA BATU NAMPAR **NTB # 12**

FOLLOW-UP MEETING WITH Dept. of FISHERIES

PARTICIPANTS		**Date of Meeting:**	May 5, 2001
JICA Study Team	**Dept. of Fisheries**	**Representatives of:-**	
Mr. G Woollatt	Kepala Dinas NTB Tk.I	P3P NTB Tk.I	
Ir. Bernadi Situmpul	Sek. Dir. Jenderal		
	Staf Proyek NTB Tk.I		

A. PURPOSE OF MEETING

The meeting was convened by P3P NTB Tk.I at the request of the JICA Study Team to determine the status of the new water supply project constructed by the Dept. of Fisheries for Desa Batu Nampar.

B. FINDINGS

It was determined that the project was designed and supervised by PDAM Lombok Timur and constructed by a contractor retained directly by the Dept. of Fisheries by competitive tender. The project is financed as a component of a much larger Fisheries Development project funded by ADB. The project is on schedule, 93% complete, due for commissioning in June 2001.

Dept. of Fisheries has a firm agreement with the PDAM for the long term O&M of the system with an assured supply of 6 L/sec. The project has been approved at TK.I level and no problems are foreseen. The extent of the project included significant rehabilitation and new construction of PDAM main supply facilities to ensure adequate supplies for Batu Nampar.

The JICA Team suggested that the number of PH provided appeared to be significantly less than is required by Cipta Karya guidelines and that the design was not to Cipta Karya standards. Dept. of Fisheries said that these were matters for the project design team, i.e. PDAM Lombok Timur.

C. CONCLUSION

We can assume that the Fisheries project constitutes an adequate water supply facility for Batu Nampar and that no JICA project is required. The possibility of adding more PH and incorporating the existing large, serviceable but unused Australian tanks into the system as additional storage capacity, might be taken up with the PDAM at a later date, as a secondary JICA project.

NTB # 13

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Labuhan Mapin	**Date of survey:**	April 12, 2001
Kecamatan:	Alas Barat	**Total Desa Area:**	2,369 ha.
Kabupaten:	Sumbawa	**Total Desa Population:**	5,021

Topography:

The main village, Dusun Bugis and Bajo, is partially on stilts in the sea and partially on the shore. Dusun Senggarahan at the crossroads on the main road from Sumbawa Besar to the Lombok ferry and the small Dusun Hijrah 2 km along the road towards Sumbawa are slightly above sea level. Dusun Glampar is significantly higher in the foothills. The activities in the area are a mixture of fishing and agriculture with quite significant areas of paddy field. Typical coastal plain topography with saline intrusion and an arid appearance, although the area is probably a little more prosperous than some we have seen. The water situation in the Dusun on the seashore is serious

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada	Sekretaris Desa	PDAM Sumbawa
Mr. G. Woollatt	Staf Kacamatan	
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

None in the coastal Dusun, all shallow water is saline.

Dusun Glampar	Number	24
	Diameter	+/1.0 m
	Depth	1.0 m
	Lining	Buis beton
	Construction by:	Villagers themselves
Dusun Senggarahan	Number	12
	Diameter	+/1.0 m
	Depth	10.0 m
	Lining	Buis beton
	Construction by:	Villagers themselves

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None in use for water supply. (See below.)

1.4 Pumps — None

1.5 Ownership — All water sources are considered to be 'communal'.

1.6 Annual cycle

Water levels in the higher Dusun fall seriously in the dry season. If the situation gets really desperate there is a small river available, about 1.0 km away.

1.7 Water quality

Never checked. See Team Hydrogeologist's report. The water supplied through the PDAM system (see below) is supposed to be checked every three months by the Puskesmas, but no records were available.

1.8 Distance to collect water — 200 m up to 400 m in the dry season

1.9 Cost/Tariff structure — Well/spring sources free of charge.
PDAM supplies PH Rp.400, HC Rp. 425/cu.m.

2. Springs None in use for water supply, except through the PDAM system

3. Deep ground water investigations

None carried out, apart from the successful drilling described below.

4. PDAM supplies
PDAM Sumbawa operates a regional gravity system which supplies six communities in four Desa including Lb. Mapin from a major source M.A. Remas, said to have a capacity of 20.0 L/sec. It is located 8 km away in another Desa, Mapinrea. (Staf Camat says "no problem") It supplies all users en route. The spring is inaccessible, said to be a 6-hour walk one way.

5. Treatment/Storage/Distrib. systems
M.A. Remas is 420 m above Labuhan Mapin so there are 6 break-pressure tanks en route. The pipeline is steel above ground and PVC where buried. The residual head for Lb. Mapin is 120 m. The system supplies 6 metered PH and 120 metered HC in the two beach Dusun. However, little water reaches the users in daytime. Many meters have been by-passed to avoid paying water charges so PDAM earns little revenue. The system is well maintained but the supply is inadequate.

B. MISCELLANEOUS ITEMS

1.	**Water Users' Association**	Does exist.
2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard PLN O/H line, 11.000/440V/3Ph. Only 440V/3Ph in Dusun Glampar
6.	**Public phone**	Not available

C. AVAILABLE WATER SOURCES

1. M.A. Remas
It was said that the main PDAM source has "moved" just 2.0 m since the initial broncaptering. There are several arisings in the same area. Clearly this must be considered the preferred source but requires further investigation, despite its remote location and difficult access. The PDAM has plans to rectify the problem but lacks the funds to implement their proposals.

2. Artesian borehole
2.5 km east along the main road from Sumbawa Besar in Dusun Hijrah we were shown a machine-drilled borehole, which provides a small artesian supply at GL (maybe 1.5 - 2.0 L/sec) used for small scale irrigation. Little is known about its age, depth or construction, but the dia. appears to be about 100 mm. Taking this supply would probably not be acceptable to the surrounding community, but it is indicative that other ground water sources may be available. See Team Hydrogeologist's report.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The target area should be the Dusun Bajo, Bugis and Senggarahan in one combined system. We asked several times for population by Dusun but the information was not available. Population to be served estimated only.

2. Population to be served 3,500 **3. Area to be served** 46 ha.

4. Source
Preferably a redevelopment of the PDAM source and pipeline, with a ground water source as an alternative.

5. Components
The repair and/or extension of the existing broncaptering to include sufficient arisings to satisfy the anticipated demand. Some extension of the existing distribution system is also desirable, providing the supply allocated to Lb. Mapin permits. Additional standard Cipta Karya design metered PH, possibly 25, should be constructed on sites selected by the Team working in conjunction with the Village WUA. Provision should also be made for more HC but an intensive social program will be needed to rebuild consumer confidence in the PDAM service.

DESA LABUHAN MAPIN **NTB # 13**

FOLLOW-UP VISIT TO PDAM REGIONAL SYSTEM

PARTICIPANTS
JICA Study Team
Mr. G Woollatt
Mr. T. Wade
Ir. Tian Andrian Noor
Ir. Bernadi Situmpul

Date of visit: May 8, 2001
PDAM Sumbawa
Local system operator
Tech. Dir. and two staff members from Sumbawa

A. PURPOSE OF MEETING

To determine the problems causing inadequate supplies reaching Labuhan Mapin and to establish the basis for a JICA project to improve the situation.

B. FINDINGS

The only problem appears to be the failure of the high level remote broncaptering, which was built as an integral part of the regional system in 1989. The source is M.A. Remas at an elevation of 420 m. asl some 8 km up in the mountains to the South of Mapinrea. It is reported that the arising is in a flat rocky area amongst some aggressive tree roots (which are obviously feeding on the source.) Over the years the tree roots have cracked the broncaptering structure but, more importantly, the main arising has moved just 2.0 m and is now outside the broncaptering. The source is rated at 20 L/sec which is more than sufficient for the four Desa served by the system.

The PDAM has a plan to replace the broncaptering which was approved by the previous managing director but has not yet been presented to the new incumbent. Basically they do not have the money to carry out even such a small job. The transmission main is in good condition (6 inch and 4 inch PVC and steel) predominantly buried. There are 6 break-pressure tanks (12 cu.m. ea.), all serviceable and operating. The local distribution system in Lb. Mapin is said to be okay and most of the fiberglass PH and fittings are visually serviceable.

The suggestion that JICA might provide a borehole at low level to supply Lb. Mapin only was rejected by the PDAM on several grounds.

- Their mandate is to supply four Desa. Isolating Lb. Mapin would not solve their problem.
- They have a fully developed system and a business in Lb. Mapin. Another agency cannot simply take over and compete or replace them.
- The present tariff is sufficient to support a gravity system but will not cover the costs of a pump attendant, fuel or electricity.
- They have extensive adverse experience with boreholes in Sumbawa. Water quality tests okay at first but after some weeks of production pumping become saline and have to be abandoned.

The PDAM wants JICA to repair/replace the existing broncaptering. This is all that is required to ensure an adequate supply to Desa Lb. Mapin.

C. CONCLUSION

This small job would be of immense value, quickly and easily restoring adequate and reliable water supplies to four large Desa in a saline coastal area. The project is urgently needed.

NTB # 14

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Labuhan Lalar	**Date of survey:**	April 12, 2001
Kecamatan:	Taliwang	**Total Desa Area:**	3,079 ha.
Kabupaten:	Sumbawa	**Total Desa Population:**	3,656

Topography:
A flat coastal hollow set amongst hilly countryside and tidal lakes. The main center of population is in two contiguous Dusun on the seashore. The two smaller inland Dusun are still at low level. Activities are a combination of fishing and agriculture. There is a significant area of paddy field around the inland Dusun but the countryside is predominantly salt flats and scrubland vegetation.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada	Sekretaris Desa	
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	60	(All said to be saline for
Diameter	+/- 1.0 m	washing/bathing only.)
Depth	2.0 m	
Lining	Brick	
Construction by:	Villagers themselves	

Surface samples taken from these wells were not all saline. (See Team Hydrogeologist's report.) Kepala Desa claims there is only one well suitable for drinking, called Sumur Nunok. It is a well with "a spring in the bottom", which probably means that the level does not change in the dry seasons or when a lot of water is taken. This is a wider (1.5 m) concrete lined well 3.5 m deep, about 1.0 km from the village in the foothills. However it appears not to be in regular use, there is no trodden access path, the surrounding area was totally dry and the bucket and string were inadequate. I cannot accept that this is the only regular supply of drinking water for some 2,500 people.
The two inland Dusun Liang and Lalar have no problem, several good shallow wells and small springs.

1.2	Hand-bored wells	None
1.3	Machine-bored deep wells	None
1.4	Pumps	None
1.5	Ownership	Wells in open areas are considered to be 'communal'. Wells in house compounds are considered to be 'private'.
1.6	Annual cycle	No appreciable effect reported.
1.7	Water quality	Never checked. See Team Hydrogeologist's report.
1.8	Distance to collect water	200 m or 1.0 km?
1.9	Cost/Tariff structure	None, all water is free of charge.
2.	**Springs**	None in use
3.	**Deep ground water investigations**	None carried out.
4.	**PDAM supplies**	None, and nothing planned
5.	**Treatment/Storage/Distrib. systems**	None

B. MISCELLANEOUS ITEMS

1.	**Water Users' Association**	Does not exist.
2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard PLN O/H line, 11.000/440V/3Ph. Only 440V/3Ph in Dusun Liang and Lalar.
6.	**Public phone**	Not available

C. AVAILABLE WATER SOURCES There are two springs:

1. M.A. Buin Tangal
Located about 500 m beyond Dusun Lalar, but at no significant altitude. Just a dirty seepage pond, already in use to supply a small irrigation dam. See Team Hydrogeologist's report.

2. M.A. Perpas
Located about 2.0 km above Dusun Lalar, at a similar altitude. Said to be even smaller than M.A. Buin Tangal.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The target area should be the two beach Dusun Lb. Lalar I and Lb. Lalar II.

2. Population to be served 2,280 **3. Area to be served** 27 ha.

4. Source A new ground water source must be located.

5. Components
Two or three boreholes in the village area which will require pumping. Supplying standard Cipta Karya design metered PH, possibly 15, distributed throughout the village on sites selected by the Team working in conjunction with the Village WUA. HC should be offered to the K. Desa and the WUC for consideration.

NTB # 15

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Poto	**Date of survey:**	April 5, 2001
Kecamatan:	Moyo Hilir	**Total Desa Area:**	1,367 ha.
Kabupaten:	Sumbawa	**Total Desa Population:**	2,332

Topography:
Very hilly countryside, little irrigation, poor dry land farming (mostly semi-wild green beans). Four quite compact small Dusun strung out down the N <--> S road with one outlying Dusun 1.5 km to the West.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada	(Temporary stand-in)	PDAM Sumbawa
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	86
Diameter	+/- 1.0 m
Depth	10.0 m
Lining	Buis beton
Construction by:	Villagers themselves

(Two of the hand-dug wells are 1.5 m dia brick lined.)

1.2 Hand-bored wells

Number	2
Diameter	150 m
Depth	12.0 m
Lining	None
Construction by:	Villages themselves

1.3 Machine-bored deep wells — None

1.4 Pumps
The two bored wells have hand pumps and one of the hand-dug wells has a small electric pump feeding five houses. Three hand pumps draw from the same hand-dug well, all pumps feed individual houses and toilets.

1.5 Ownership — Wells in open areas are considered to be 'communal'.
Wells in house compounds are considered to be 'private'.

1.6 Annual cycle
Water levels fall seriously in the dry season, many wells dry up but there are two, which provide water year round.

1.7 Water quality — Never checked. See Team Hydro-geologist's report.

1.8 Distance to collect water — 300 m up to 700 m in the dry season

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs — None in use

3. Deep ground water investigations — None carried out

4. PDAM supplies — None

5. Treatment/Storage/Distrib. systems — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — Does not exist.

2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	PLN O/H line, but only 440V/3Ph.
6.	**Public phone**	Not available

C. AVAILABLE WATER SOURCES

1. Local
There is a spring called M.A. Ai Selalu beyond the outlying Dusun Samri, but it is not a suitable source.

2. PDAM
PDAM Sumbawa has an ongoing construction project to develop a new Regional system in a group of neighboring Desa, but the first phase of this project does not include Poto and does not have the capacity to do so.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The target area should be the 4 or 5 small Dusun/hamlets strung out along the N <--> S road but it depends to some extent on the location and capacity of the selected source(s).

2. Population to be served 1,500 **3. Area to be served** 83 ha.

4. Source
A new ground water source is required, preferably on higher ground.

5. Components
Two or three boreholes in the village area feeding by gravity, if possible, to standard Cipta Karya design metered PH, possibly 15, distributed throughout the hamlets on sites selected by the Team working in conjunction with the WUA. If the wells have to be sited at lower elevations pumping up to a high level storage tank might prove necessary, but this should be avoided if at all possible.

NTB # 16

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Piong	**Date of survey:**	April 8, 2001
Kecamatan:	Sanggar	**Total Desa Area:**	36,600 ha.
Kabupaten:	Bima	**Total Desa Population:**	1,708

Topography:
A low-lying coastal hollow set amongst quite hilly terrain, dry scrub vegetation. Probably dependent on sea fishing, fish farming and salt manufacture. Gives the impression of being very poor, with serious water supply problems, but may not be quite as desperate as they make out.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada	(In his house, Sunday)	PDAM Bima (2)
Mr. G. Woollatt	Sekretaris Desa and others	
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	20
Diameter	+/- 1.0 m
Depth	9.0 m
Lining	None
Construction by:	Villagers themselves

1.2 Hand-bored wells

Private

Number	20 (All said to have collapsed)
Diameter	1.25 inches
Depth	6.0 - 9.0 m
Lining	None
Construction by:	Villagers themselves

Communal

Number	2
Diameter	100 mm
Depth	9.0 m
Lining	None
Construction by:	Villagers themselves

1.3 Machine-bored deep wells None
(But there are six successfully drilled by P2AT Sumbawa in the Kamp Transmigrasi 1.5 km away. For irrigation and farming use.)

1.4 Pumps
K. Desa said all the hand-dug wells originally had hand pumps but all are broken. The two larger communal hand-bored wells are still operating, with hand pumps. Presumably the 20 narrow hand-bored wells originally had hand pumps, but K. Desa says the boreholes have collapsed.

1.5 Ownership
All wells were said to be considered 'private', but this is not possible as other users are allowed access.

1.6 Annual cycle
Water levels fall seriously in the dry season but do not dry up.

1.7 Water quality
Well water never checked but is NOT saline, despite low level coastal location.
See Team Hydrogeologist's report. TNI did check water quality before constructing the system described below.

1.8 Distance to collect water 200 m up to 400 m in the dry season

1.9 Cost/Tariff structure
All water is free of charge. Kepala Desa refuses to pay pumping charges for water.

2. Springs None in use at present

3. Deep ground water investigations
None carried out, apart from the successful drillings in the Kamp Transmigrasi.

4. PDAM supplies None, and nothing planned

5. Treatment/Storage/Distrib. systems
TNI constructed a gravity system in 1997 from an infiltration well and tank, called M.A. Oincama, in the streambed some 2.0 km South of the village. A 4-inch PVC buried pipe supplied five PH (Standard fiberglass and concrete tanks with faucets) but no HC. Illegal connections and broken pipe rendered the system inoperative long ago. Tanks may still be reusable.

B. MISCELLANEOUS ITEMS

1. Water Users' Association Does not exist.

2. Stone, aggregate and sand Available locally, for payment.

3. Local labor Available and willing to participate for payment.

4. Land acquisition No problem, no compensation required.

5. Electric power PLN O/H line, but /440V/3Ph. only

6. Public phone Not available

C. AVAILABLE WATER SOURCES

1. Springs
There are several, far away and low lying, outside the Desa. All were described as having less capacity than the TNI source.

2. TNI System
This system could certainly be reconstructed and extended, subject to satisfactory water quality and quantity analyzes, but would require an intensive public acceptance campaign.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The target area must be the two contiguous Dusun Segolo and Karama, which have a combined population around 1,750. I.e. all the Desa is concentrated in one location.

2. Population to be served 1,750 **3. Area to be served** 34 ha.

4. Sources
Probably a new ground water source(s) sited just outside the village on high ground. (K. Desa refuses to pay for electric pumping.) The old TNI source remains an option and is preferred by the Desa.

5. Components
Three or four boreholes just outside the village area feeding by gravity, if possible, to standard Cipta Karya design metered PH, possibly 20 (reusing some of the old tanks), distributed throughout the village on sites selected by the Team working in conjunction with the Village WUA. If this is not practicable, the reconstruction of the TNI system should be investigated. 1.0 Km buried pipe, possibly steel to prevent vandalism.

NTB # 17

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Labuhan Kenanga	**Date of survey:**	April 9, 2001
Kecamatan:	Tambora	**Total Desa Area:**	2,383 ha.
Kabupaten:	Bima	**Total Desa Population:**	1,700

Topography:

A village on the beach, with two remote Dusun high up in the hills. The occupation is forestry and the export of sawn lumber. The two contiguous coastal Dusun Sarae and Madaoi is now the seat of the new Kacamatan Tambora. The two Dusun in the forest, which are inaccessible by road at present, Sori Bura (Pop. 300 families) and Tambora (Pop. 175 families) have applied to secede into a new Desa. This has been approved and they will no longer be part of Desa Labuhan Kenanga in a few months.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa (In his house)	DPU Tk.II
Mr. T. Wada	Local TNI Commander (Cpl)	PDAM Bima (2)
Mr. G. Woollatt		
Ir. Bernadi Sitompul		
Ir. Tian Andrian Noor		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Lower Dusun

Number	250 (Every family has its own well.)
Diameter	+/- 1.0 m
Depth	5.0 m
Lining	Buis beton
Construction by:	Villagers themselves

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

1.4 Pumps — None

1.5 Ownership — Supplies in open areas are considered to be 'communal'. Wells in house compounds are considered to be 'private'.

1.6 Annual cycle

Water levels fall slightly in the dry season but no serious problem.

1.7 Water quality

Well water never checked but is NOT saline despite low level coastal location. See Team Hydrogeologist's report. A Canadian team carried out a survey similar to ours a few months ago and did some water testing, results unknown.

1.8 Distance to collect water — Never more than 50 m in the lower Dusun.

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs

2.1 Lower Dusun

A group of 7 springs, called M.A. Nanga Nae, the farthest 600 m from the village, flow from a bank into the river. One has a broncaptering supplying the P3P system described below, the others remain available. Quantity is large. See Team Hydrogeologist's Report.

2.2 Dusun Sori Bura

Supplied from a source called M.A. Sumber Urip 3 km away.

2.3 Dusun Tambora

Supplied from a source called M.A. Sori Sumba 3 km away

3. Deep ground water investigations — None carried out.

4. PDAM supplies — None, and nothing planned

5. Treatment/Storage/Distrib. systems

5.1 Lower Dusun
P3P employed a Contractor to surface lay a 3 inch PVC pipeline from a collection tank at M.A. Nanga Nae supplying 3 standard fiberglass PH and 5 HC in the village. The pipeline is still functioning but the first PH has been by-passed and the other two are out of use. (Probably still reusable.).

5.2 Dusun Sori Bura
CARE Australia laid a 1.5-inch pipe from the spring to the Dusun in 1986/7, which supplies 2 PH. It is still operational but very small flow. However the Dusun is located in a private coffee plantation which has assumed responsibility for domestic water supply.

5.3 Dusun Tambora
The pipeline from the spring is still working okay - no water supply problem. The Dusun is now inside a Govt. coffee plantation, which has assumed responsibility for domestic water supply.

B. MISCELLANEOUS ITEMS

1.	**Water Users' Association**	Does not exist.
2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard PLN O/H line, 11,000/440V/3Ph. Supply at night only.
6.	**Public phone**	Not available

1. **AVAILABLE WATER SOURCES**
No new sources known, they have enough already.

D. PROVISIONAL DEVELOPMENT PROPOSALS None

- CARE Australia and DPU have already developed water supplies in the Desa.
- A Canadian team has recently surveyed the Desa and decided not to proceed.
- The village is well supplied and the Kepala Desa stated quite clearly that the lower Dusun have no problem and do not need a project.
- Kepala Desa is not much concerned about the higher level Dusun which are leaving the Desa anyway.
- The coffee plantation owners have already assumed responsibility for water supply to both higher level Dusun.

NTB # 18

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Kawuwu	**Date of survey:**	April 7, 2001
Kecamatan:	Langgudu	**Total Desa Area:**	1,324 ha.
Kabupaten:	Bima	**Total Desa Population:**	841

Topography:

A remote mountainous Desa far from the main road and civilization! The lower Dusun Lante (Pop 450) is some 3.0 km along a stone and gravel track, passable in all weather, including one Irish bridge just before the village. The higher Dusun Kalemba seems to be up in the clouds but in fact is only 260 m asl. The track then crosses another Irish bridge and is very steep and torturous. It is impassable at present. Subsistence agriculture with a little commodity trading to other villages. Mountain streams and forest.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada	(On his Sepeda Motor)	PDAM Bima (2)
Mr. G. Woollatt	Sekretaris Desa	
Ir. Tian Andrian Noor	(In the lower Dusun only)	
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	1 (In the lower Dusun)
Diameter	+/- 1.0 m
Depth	5.0 m
Lining	Buis beton
Construction by:	Villagers themselves

Note: They have tried to dig more but they find rock all the time.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

1.4 Pumps — None

1.5 Ownership — All water is available to all users.

1.6 Annual cycle

The higher level Dusun has no problem. When Dusun Lante's well dries up, they use the river.

1.7 Water quality

Well water never checked (see Team Hydrogeologist's report) but DPU did check water quality before constructing the pipeline from M. A. Oilipa to Dusun Kalemba. Results unknown.

1.8 Distance to collect water — 300 m in both Dusun

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs — None in use

2.1 Dusun Kalemba

Said to be 6 springs close together, about 0.5 km away. In fact there is only one of any size and only 4 could really be called springs. One supplies the Dusun, three were used to supply the lower Dusun. See Team Hydrogeologist's Report.

2.2 Dusun Lante

A source in the riverbank about 300 m upstream is little more than seepage and there is a very small arising in a dried up riverbed just below the only well.

3. Deep ground water investigations — None carried out

4. PDAM supplies — None, and nothing planned

5. Treatment/Storage/Distrib. systems

5.1 Dusun Kalemba

DPU laid a 3-inch flex PVC pipe from M.A. Oilipa to supply two large concrete tanks, with a long hose pipe extension to the Kepala Desa's family toilet in 1996/7. (Funded by OECF.) The system is still operational but needs rehabilitating and additional PH. O & M by the villagers themselves.

5.2 Dusun Lante

The community was supplied by a long pipeline from the high level springs in Dusun Kalemba, but the pipeline was not maintained and the system has long since been abandoned. Two large concrete tanks stand empty but may be reusable.

B. MISCELLANEOUS ITEMS

1. Water Users' Association

Does not exist per se but they are managing their water supply problems very well.

2. Stone, aggregate and sand Available locally, for payment.

3. Local labor Available and willing to participate for payment.

4. Land acquisition

They are asking for Rp. 50,000 compensation for each PH site. Not clear to whom this payment would be made; it probably simply reflects the poverty of the area.

5. Electric power PLN 440V/3Ph O/H line, in the lower Dusun only.

6. Public phone Not available

C. AVAILABLE WATER SOURCES

With the pipeline to the lower Dusun inoperative, all high-level springs are available to supply Dusun Kalemba. Subject to water quality and quantity analyzes.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area

The overriding target must be the provision of water supplies to Dusun Lante. A secondary sub-project to improve the Dusun Kalemba system is desirable.

2. Population to be served 900 **3. Area to be served** 30 Ha.

4. Source

A new ground water source is required urgently for Dusun Lante.

5. Components

5.1 Dusun Lante

One good ground water supply sited on higher ground just outside the village area feeding by gravity, if possible, to the existing concrete tanks, the Masjid and maybe 2 more standard Cipta Karya design PH, distributed throughout the village on sites selected by the Team working in conjunction with the Village WUA. If the well has to be sited at a lower elevation, pumping up to one of the existing concrete tanks might prove necessary, but this should be avoided if at all possible.

5.2 Dusun Kalemba

The collection of additional supplies from other suitable M.A. by new broncapterings. The possible laying of a second supply line and the provision of two more standard Cipta Karya design fiberglass PH. Rehabilitation of all existing fittings.

NTB # 19

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Ranggo	**Date of survey:**	April 6 & 10, 2001
Kecamatan:	Hu'u	**Total Desa Area:**	5,425 ha.
Kabupaten:	Dompu	**Total Desa Population:**	5,560

Topography:
A relatively flat area amongst rolling, hilly countryside. Some irrigation but not prosperous agriculture. Close enough to provide produce and labor for Dompu. Four Dusun with most of the habitations strung out along the rather winding but predominantly N <--> S road.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II (Many)
Mr. T. Wada	Sekretaris Desa	PDAM Dompu (2)
Mr. G. Woollatt		Asst. Sekwilda
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	50	
Diameter	+/- 1.0 m	(Some 1.2 - 1.5 m dia)
Depth	12.0 - 15.0 m	
Lining	Buis beton	(Some brick lined)
Construction by:	Villagers, with NGO support	

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells
A German aid program machine bored a deep well 110 m, fitted with a windmill driven electric generator. A diesel driven generator has replaced this. The borehole is 250 mm dia with PVC lining at top section. The system is operational, supplies a low level elevated tank (4 x 45 gal. drums) used primarily for irrigation, but also available for drinking in the dry season.

1.4 Pumps
Apart from the German pump above: three of the hand-dug wells have small electric pumps feeding individual houses and toilets.

1.5 Ownership — Wells in open areas are considered to be 'communal'.
Wells in house compounds are considered to be 'private'.

1.6 Annual cycle
Water levels fall seriously in the dry season but the wells do not dry up.

1.7 Water quality — Never checked. See Team Hydrogeologist's report.

1.8 Distance to collect water — 200 m up to 400 m in the dry season

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs — None in use

3. Deep ground water investigations
None carried out, apart from the successful German drilling.

4. PDAM supplies
DPU Tk I constructed a pipeline to supply the village from the Dompu WTP in 1996/7. PVC buried, 6 km x 6 inch - 4 km x 4 inch. It was originally intended to supply 5 PH in the main Dusun Ranggo. But the pipeline is defective, many leakages, probably due to illegal connections and breakages. The stop valve is closed at the PDAM connection point. PDAM claims it never accepted the system from DPU and is not responsible.

5. Treatment/Storage/Distrib. systems
The abandoned fiberglass PH tanks are still available in the village, but most are damaged where the pipes were torn out.

The village also has a 1.0 km pipeline from an irrigation dam which did supply the 5 PH by gravity, but the filter chamber and the pipeline are both broken so the system is inoperative. O & M by the village themselves.

B. MISCELLANEOUS ITEMS

1.	**Water Users' Association**	Does not exist.
2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard PLN O/H line, 11,000/440V/3Ph.
6.	**Public phone**	Not available

C. AVAILABLE WATER SOURCES

1. Local
There are two springs:

1.1 M.A. Madan Libi
2.5 km away to the West along the road to Jambu then up into the forest. Quantity is large but the quality is questionable. See Team Hydrogeologist's Report. A clear mountain stream in an uninhabited area, possibly just high enough above the village to supply by gravity.

1.2 M.A. Madan Dua
A dirty seepage pond in a farming area, used for irrigation, a further 0.5 km along the same road.

2. PDAM
PDAM Dompu will commit to providing 2.5 L/sec if the DPU pipeline system is rehabilitated.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The target area should be the Dusun/hamlets strung out along the N <--> S road, dependent on the location and capacity of the selected source(s).

2. Population to be served 4,000 **3. Area to be served** 55 ha.

4. Source
A new ground water source, unless it is decided to rehabilitate the DPU/PDAM transmission main.

5. Components
Three or four boreholes in target areas supplying standard Cipta Karya design metered PH, possibly 35, distributed throughout the village on sites selected by the Team working in conjunction with the Village WUA. House connections should be offered for discussion with the WUA and Kepala Desa.

NTB # 20

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Jambu	**Date of survey:**	April 10, 2001
Kecamatan:	Pajo	**Total Desa Area:**	3,550 ha.
Kabupaten:	Dompu	**Total Desa Population:**	3,383

Topography:
A very poor, arid area on the flat coastal plain at sea level. Even the compact outlying Dusun are still on the 'salt flats'. A large fish farming facility is under construction on the foreshore, otherwise there is little agriculture and no significant source of income. Much of the available water is brackish and the situation becomes very serious in the dry seasons.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II
Mr. T. Wada	Sekretaris Desa	PDAM Dompu
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

	Number	35
	Diameter	+/- 1.0 m
	Depth	7.0 m
	Lining	Buis beton
	Construction by:	Villagers themselves
Notes:	The Desa has a plan to dig 12 more shallow wells.	
	Wells near the seashore are saline, but more potable inland.	

1.2 Hand-bored wells
Kepala Desa reported that there is one shallow hand bored tube well fitted with a small electric pump, but it is located within a private residence that was locked. We could not gain access.

1.3 Machine-bored deep wells — None

1.4 Pumps
The well supplying the Masjid and two supplying private houses have tiny electric pumps. Four of the dug wells have hand pumps.

1.5 Ownership
All wells seem to be considered 'private' but access by others is obviously accepted.

1.6 Annual cycle
Water levels fall seriously in the dry season and salinity levels rise. The situation can become very serious.

1.7 Water quality — Never checked. See Team Hydrogeologist's report.

1.8 Distance to collect water — 200 m up to 400 m in the dry season

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs
After much private discussion amongst the village elders present at the meeting we were told that there are none. Maybe this was the response they thought would help them get a new project. I suspect there are one or two small springs or seepages, which are used for irrigation, and they do not want us to interfere with the existing situation.

3. Deep ground water investigations — None carried out.

4. PDAM supplies — None and nothing planned.

5. Treatment/Storage/Distrib. systems — None and nothing planned.

B. MISCELLANEOUS ITEMS

1.	**Water Users' Association**	Does not exist.
2.	**Stone, aggregate and sand**	Available locally, for payment.
3.	**Local labor**	Available and willing to participate for payment.
4.	**Land acquisition**	No problem, no compensation required.
5.	**Electric power**	Standard PLN 11,000/440V/3Ph. O/H line. Supply said to be intermittent.
6.	**Public phone**	Not available

C. AVAILABLE WATER SOURCES None known.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
All 6 Dusun are equally in need, but the main centers of population are Jambu itself, the contiguous pair Dorotoi and Nata, and Toa.

2. Population to be served 2,600 **3. Area to be served** 56 ha.

4. Source New ground water source(s) must be located in the target areas.

5. Components
Probably three wells just outside each of the three centers of population to reduce pumping costs. Supplying standard Cipta Karya design metered PH, possibly 25 distributed throughout the village on sites selected by the Team working in conjunction with the Village WUA.

NTB # 21

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Mata Air:	Hodo	**Date of survey:**	April 9, 2001
Kecamatan:	Pekat	**Total Desa Area:**	No Desa
Kabupaten:	Dompu	**Total Area Population:**	Maybe15

Topography:

The main road from Kempo to Calabri is raised about 1.5 m above the seashore along a narrow strip of land where the forest comes down a steep hillside to the sea. A very large spring has been confined into two masonry channels passing under the road. The spring is a minor tourist attraction, located in Desa Doropeti. There is no habitation in the area. The nearest village is Desa Tolokalo about 10 km to the Southeast in Kacamatan Kempo.

PARTICIPANTS

JICA Study Team	**Local**	**Kab. Representatives**
Mr. T. Kozawa	A few by standers	None
Mr. T. Wada		
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells None

2. Springs

M.A. Hodo is a well known major source of clean, clear water. Quantity is very large and quality is renowned locally, although probably never tested. See Team Hydrogeologist's report.

3. Deep ground water investigations

Presumably none carried out, no reason to do so.

4. PDAM supplies None and nothing planned.

5. Treatment/Storage/Distrib. systems None and nothing planned.

B. MISCELLANEOUS ITEMS

1. Water Users' Association No local administration.

2. Stone, aggregate and sand Probably available locally, for payment.

3. Local labor

Could possibly be recruited from villages up and down the road.

4. Land acquisition No problem, no local administration.

5. Electric power None

6. Public phone Not available

C. AVAILABLE WATER SOURCES

The spring M.A. Hodo itself.

D. PROVISIONAL DEVELOPMENT PROPOSALS

None, there is no population to serve.

NTB # 22

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Kwangko	**Date of survey:**	April 11, 2001
Kecamatan:	Manggelewa	**Total Desa Area:**	2,383 ha.
Kabupaten:	Dompu	**Total Desa Population:**	2,100

Topography:
A relatively prosperous farming area on the main road from Dompu to Sumbawa Besar. Probably also benefits from commerce with the passing traffic. The Desa comprises the main Dusun Kwangko in hilly countryside on the mainland and Dusun Pulau Bajo which is three small offshore islands, presumably populated by fishermen. The Desa has an operational PDAM system, including a flexible PVC undersea pipeline to Pulau Bajo.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. T. Kozawa	Kepala Desa	DPU Tk.II (2)
Mr. T. Wada		PDAM Dompu
Mr. G. Woollatt		
Ir. Tian Andrian Noor		
Ir. Bernadi Sitompul		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	8 (All in Dusun Kwangko)
Diameter	+/- 1.0 m
Depth	20.0 m (Probably exaggerated)
Lining	None
Construction by:	Villagers themselves

1.2 Hand-bored wells

Number	12 (All said to be broken)
Diameter	150 mm
Depth	25.0 m (Probably exaggerated)
Lining	None

Constructed by: Villagers themselves

1.3 Machine-bored deep wells
PDAM Dompu owns and operates a borehole on higher ground a few hundred meters South of the main village. It was drilled in 1993/4 by a contractor from Mataram. Depth 100 m or 76.0 m (two different opinions). There is no knowledge of any pump tests but the well capacity is said to be 5.0 L/sec. Diameter 200 mm, steel lined. No records of screens or well construction.

1.4 Pumps

1.4.1 PDAM System
The PDAM borehole has an electric submersible pump set at -66.0 m or - 46.0 m (two different opinions) with a rated capacity of 2.5 L/sec but is said to be producing only 1.5 L/sec at present. They say the riser pipe is corroded, but I also suspect the pump requires maintenance and the foot valve probably needs cleaning. The pump has never been lifted for inspection or maintenance since installation eight years ago. The pump only runs at night when there is PLN supply; the back-up generator was removed some time ago.

1.4.2 Shallow wells
K. Desa says all the hand-dug and hand bored wells had hand pumps but all are broken. This is obviously untrue; buckets do not fit down 150 mm boreholes! He is seeking sympathy for a new project.

1.5 Ownership
Wells in open areas are considered to be 'communal'.
Wells in house compounds are considered to be 'private'.

1.6 Annual cycle
K. Desa says, "All wells dry up in the dry seasons". I can accept that the levels may fall seriously but it is unlikely that they all dry up completely. (Seeking sympathy.)

1.7 Water quality
Never checked, not even for the PDAM system. See Team Hydrogeologist's report.

1.8	Distance to collect water	200 m, maybe up to 400 m in the dry season

1.9 Cost/Tariff structure
Well water is free. PDAM tariff is Rp. 205/cu.m for HC and Rp.160/cu.m for PH.

2. Springs None in use

3. River Source
Water is also taken from an infiltration gallery in the river just outside the main village to the Southwest and is fed by gravity directly into the PDAM system.

4. Deep ground water investigations
None other than the existing PDAM deep well.

5. PDAM supplies
There is no bulk supply meter, the PDAM engineer from Dompu just guesses that the present supply is 1.5 L/sec from the borehole, plus some water from the river. It is insufficient to supply Dusun Pulau Bajo adequately.

6. Treatment/Storage/Distrib. systems
The PDAM pump supplies a GL 200 cu.m steel plate tank situated on a very steep hill adjacent to the borehole. Elev. 30.0 m above the village. Distribution is to 8 PH and 37 HC. This represents about 30% of the population in the served area.

B. MISCELLANEOUS ITEMS

4.	**Water Users' Association**	Exists, 50% Men and 50% Women
5.	**Stone, aggregate and sand**	Available locally, for payment.
6.	**Local labor**	Available and willing to participate for payment.
7.	**Land acquisition**	No problem, no compensation required.
8.	**Electric power**	Standard PLN O/H line, 11.000/440V/3Ph. but service only at night.
9.	**Public phone**	Not available

C. AVAILABLE SOURCES

1. PDAM
It is obvious that rehabilitation of the PDAM well and pump would increase the system capacity. The PDAM states that it is already losing money in Kwangko and has no plans to repair, replace or even maintain the existing pump unless the tariff is raised to realistic levels or an Aid Agency comes along and does it for them.

2. Spring
DPU has a plan to bring additional supplies from M.A. Ncuni that is located 3.0 km along the road to Dompu and is 50 m above village level. The pipeline route would be rocky and difficult. The source is poor, small with seepage and appears colored. See Team Hydrogeologist's report. However, DPU's preliminary design has been completed and the cost estimate has passed Musbang and Rakorbang and is already included in the PJM for this year's construction budget, but NO WATER QUALITY OR QUANTITY ANALYSES HAVE BEEN CARRIED OUT!

D. PROVISIONAL DEVELOPMENT PROPOSALS

- Despite all his "hard luck" stories and complaints, K. Desa stated that he had "No water supply problems".
- The DPU Rep. stated that if JICA would take over the M.A. Ncuni project they would use their budgeted money for another village.
- The PDAM is "playing politics" with the tariff, hoping that the inadequate supply to Dusun Pulau Bajo (which they could easily improve themselves) will persuade the people to accept higher charges.
- The JICA Preliminary Mission recommended "leave the matter to the PDAM".

I agree and recommend that JICA keep out of this situation, there are so many other villages with no water supply which need help much more urgently.

NTT # 4

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Mekendatung	**Date of Survey:**	April 30, 2001
Kecamatan:	Kewapante	**Total Desa Area:**	527 ha.
Kabupaten:	Sikka	**Total Desa Population:**	1,712

Topography:

Mekendatung is on a hilly area toward the mountain 16 km from the city of Maumere through good conditioned national road Maumere-Larantuka, good conditioned provincial road and poor earth Desa road. Desa Mekendatung consists of one Dusun and two Lingkungan, namely Dusun Nitung, Lingkengan Kangae and Lingkungan Wololuma.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	Camat Kewapante	Kimpraswil Tk I NTT
Mr. S. Minami	K. Desa Mr. Tarsisius Trisno	Bappeda Tk II Sikka
Mr. Y. Yamakawa	Desa staff	PDAM
Ir. Sukrisno		DPU
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1	Hand-dug wells	None
1.2	Hand-bored wells	None
1.3	Machine-bored deep wells	None

2. Springs None

3. Rainwater Systems

Rainwater is the only water source for the inhabitants of Desa Mekendatung. There are 98 units of rainwater tank with volumes varies from 8 to 25 m3. In dry seasons when water in rainwater tank is all spent, the inhabitants get water from banana or Enau trees.
A banana tree can produce water of 10 L/day for as long as 14 days, while an Enau tree can produce 3 L/day for as long as 10 days.

4. River Water None

5. PDAM supplies None

B. MISCELLANEOUS ITEMS

1. Water Users' Association None

2. Stone, Aggregate and Sand

Available at Maumere, the Kabupaten capital of Sikka.

3. Access Conditions

Desa Mekendatung located at 16 km from Maumere, the Kabupaten capital, can be reached through 8 km of good conditioned national road Maumere-Larantuka, 6 km of good conditioned provincial road and 2 km of poor conditioned Desa road.

4. Local Labor

Unskilled labor is available at Desa Mekendatung but semi-skilled or skilled labor is available in Maumere.

5. Land Acquisition

Although local government and inhabitants inform that they will provide land needed for project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

6. Electric Power

No public electric power supply is available.

7. Public Phone

Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source

No reliable water source in the Desa.

2. Future Plan for Water Supply System

None

D. PROVISIONAL DEVELOPMENT PROPOSALS

None

NTT # 5

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Kokowahor	**Date of Survey:**	May 01/05, 2001
Kecamatan:	Kewapante	**Total Desa Area:**	393 ha.
Kabupaten:	Sikka	**Total Desa Population:**	1,330

Topography:

Desa Kokowahor extends from coastal to hilly area toward the mountain, located 12 km away from Maumere, the Kabupaten capital, through good conditioned national road leads to Larantuka and good conditioned provincial road. Some part of the settlements in Kokowahor can be reached through poor conditioned Desa road.
Desa Kokowahor consists of 3 Dusun, namely Ili, Kahat and Liantahon.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	Secr. Of Camat Kewapante	Kimpraswil Tk I NTT
Mr. S. Minami	K. Desa Mr. Aloysius Sensus	Bappeda Tk II Sikka
Mr. Y. Yamakawa	Desa staff	PDAM
Ir. Sukrisno		DPU
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells — None

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells

There are three deep wells, one built by P2AT and two built by UNICEF. P2AT deep well, built in 1994, is 80 m deep and located about 3 km downward from the Desa office toward coastal area, equipped with an electric generator and a submersible pump. In the year of 1998, P3DT project, funded by OECF, installed a booster pump, 4 inches transmission pipe of about 3 km in length and 8 public hydrants. The system only functioned at the contractor's test run period and after then, the system has never worked. There remains a problem of the land compensation at the well site. The other two deep wells built by UNICEF are complete with deep hand pumps, however, presently out of order because of damage on the foot-valve of the pump and difficulties to find substitute parts.

2. Springs — None

3. Rainwater Systems

Rainwater is the only water source for the inhabitants of Desa Kokowahor. No record of number of rainwater tanks, but from our site survey it seems that every three households have one rainwater tank. The volume varies from 8 to 25 m3. In dry seasons when water in rainwater tank is all spent, the inhabitants get water from banana or Enau trees.

4. River Water — None

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand

Available at Maumere, the Kabupaten capital of Sikka.

3. Access Conditions

Desa Kokowahor located 12 km away from Maumere, the Kabupaten capital, can be reached through 8 km of good conditioned national road Maumere-Larantuka, 4 km of good conditioned provincial road. The settlement of Dusun Liantahon can be reached 3 km of poor conditioned Desa road.

4. Local Labor

Unskilled labor is available at Desa Kokowahor but semi-skilled or skilled labor is available in Maumere.

5. Land Acquisition
Although local government and inhabitants inform that they will provide land needed by project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

6. Electric Power
Available in two Dusun (Ili and Kahat) located along the provincial road, however, no public electric power supply is available in Liantahon.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Groundwater at the existing deep wells.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
Dusun Kahat

2. Population to be Served 431 **3. Area to be served** 9ha.

4. Water Source
Groundwater of the existing P2AT deep well

5. System Components

- A pumping system at the P2AT borehole,
- 1,000 m long transmission pipe, a ground reservoir with chlorinator, 1,000 m distribution pipe, and
- 6 nos. of public hydrants.

NTT # 6

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Sinar Hading	**Date of survey:**	April 24, 2001
Kecamatan:	Tanjung Bunga	**Total Desa Area:**	1,922 ha.
Kabupaten:	Flores Timur	**Total Desa Population:**	1,345

Topography:

A coastal village comprising three main Dusun around the 'Tee' junction where the road from Larantuka reaches the shore and splits NE and SW, and a remote Dusun some 3 km up the coast. There is a little flat land for cultivation but the land is poor, probably saline, hot and arid. There are sulfurous hot springs in the area, which probably contaminate the ground water. The volcano Ile Mandiri overshadows the whole area.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. G. Woollatt	Village elders	DPU Tk.II
Mr. T. Wada		PDAM Flotim
Ir. Bernadi Sitompul		
Ir. Tian Andrian Noor		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1	Hand-dug wells	Number	2 in the remote Dusun Dorbera 4 in the center of population
		Diameter	+/- 0.8 m
		Depth	7.0 m
		Lining	Masonry and concrete
		Construction by:	Villagers themselves
1.2	Hand-bored wells		None
1.3	Machine-bored deep wells		None
1.4	Pumps		None
1.5	Ownership	All wells are considered to be 'communal'.	

1.6 Annual cycle

We were told that in the dry season the wells dry up in the daytime but water is available at night. Despite persistent questioning we were unable to understand this statement unless it is caused by excessive usage.

1.7 Water quality

They told us that the well water is either salty or tastes of sulfur. It did not seem so to our taste, but see Team Hydrogeologist's report. Puskesmas checked water quality 'once' and now gives out Calcium Hypochlorite free of charge once a year at the beginning of the dry season.

1.8	Distance to collect water	Up to 2 km for some people.
1.9	Cost/Tariff structure	None, all water is free of charge.

2. Springs None within the Desa.

3. Deep ground water investigations

P2AT from Kupang drilled for ground water some time ago, but they got the tool stuck in gravel and broke the drill stem. The attempt was abandoned.

4. PDAM supplies None, and nothing planned

5. Treatment/Storage/Distrib. systems None

B. MISCELLANEOUS ITEMS

1. Water Users' Association Does not exist.

2. Stone, aggregate and sand
Available locally, for payment, including sand from the mountain NOT from the beach.

3. Local labor Available and willing to participate for payment.

4. Land acquisition No problem, no compensation required.

5. Electric power
No mains power supply. Dusun are served by ten small gen. sets owned and operated by private individuals and Kelompok. Not all inhabitants are served.

6. Public Phone Not available

C. AVAILABLE WATER SOURCES

1. None within the present Desa boundaries, they can only hope to take a secondary supply from Desa Ile Padung, but are not prepared to pay pumping costs. A gravity supply from either of the higher level sources is preferred. This may be a problem as the two Desa are already fighting over water supply.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area
The three Dusun grouped around the road junction are the obvious target.

2. Population to be served 1,000 **3. Area to be served** 32 ha.

4. Source
A secondary supply from whatever system is developed for Desa Ile Padung. This will require the approval of the people of Ile Padung if the pipeline is to survive and payment between the two Desa. The availability of ground water should be investigated but the chances do not look good in a volcanic area with surface sulfurous hot springs.

5. Components
Whichever source is selected there will be a requirement for some 2.0 km of transmission main from Desa Ile Padung. Distribution should be to maybe 10 Cipta Karya design standard PH sited by the team working with the village WUA.

NTT # 7

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Ile Padung	**Date of survey:**	April 24, 2001
Kecamatan:	Tanjung Bunga	**Total Desa Area:**	2,235 ha.
Kabupaten:	Flores Timur	**Total Desa Population:**	1,151

Topography:
A coastal village comprising three Dusun spread nearly a kilometer apart along the shoreline. The Desa boundaries have been reduced recently to exclude Dusun Lewokluok. The background hills are close, steep and wooded. No really flat areas for agriculture, cashew nuts and small crops for local consumption. A recent Tsunami disaster killed 200 persons.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. G. Woollatt	Kepala Desa	DPU Tk.II
Mr. T. Wada		PDAM Flotim (2)
Ir. Bernadi Sitompul		
Ir. Tian Andrian Noor		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Number	2
Diameter	+/- 0.8 m
Depth	4.0 m
Lining	Masonry and concrete
Construction by:	Villagers themselves

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

1.4 Pumps — None

1.5 Ownership — Wells are considered to be 'communal'.

1.6 Annual cycle — No dry season reduction.

1.7 Water quality
Kepala Desa says the water in both wells is either salty or tastes of sulfur. It did not seem so to our taste, but see Team Hydrogeologist's report. Puskesmas checked water quality 'once' and now gives out Calcium Hypochlorite free of charge once a year at the beginning of the dry season.

1.8 Distance to collect water — Up to a kilometer in some cases.

1.9 Cost/Tariff structure — None, all water is free of charge.

2. Springs — There are three that are relevant.

2.1 M.A. Wai Langu
A major low level source close to the road in Dusun Leworahang. Large capacity and apparently clean and clear. See Team Hydrogeologist's report for water quality and quantity analyses. This was the source for the failed AusAid project to supply piped water to Dusun Riang Pedang and Riang Tobi and the adjoining Desa Sinar Hading. (See below.) The source is currently used by all these communities and Leworahang itself, hand carrying water.

2.2 M.A. Wai Kebong and Wai Belen etc.
A group of 7 sources high up in the mountains above Dusun Riang Tobi, only 3.0 km away in a straight line but 650 m asl. Was the intended source for a second AusAid project. (See below.)

2.3 M.A. Balatawa
Another source in the same general area but on the North side of the watershed with a more direct potential pipeline route.

3. Deep ground water investigations — None carried out.

4. PDAM supplies None, and nothing planned

5. Treatment/Storage/Distrib. systems

5.1 M.A. Wai Langu System

AusAid installed a shallow pumping sump, diesel generator and electric submersible pump supplying all three Dusun through a 3-inch pipe, surface laid. (Steel, uPVC and HDPE.) 10 PH were constructed, no HC, no meters. A BPAM was created to operate the system but there was no WUA or other village organization. DPU donated one month's supply of Solar but the village refused to purchase any more so the system was shut down and has subsequently been cannibalized for construction materials and other projects. Some of the fiberglass PH tanks are probably still usable. The transmission main to Desa Sinar Hading was never completed.

5.2 M.A. Wai Kebong

Some of the pipe from the AusAid system was carried up the mountain by village labor working unpaid and supervised for a Contractor retained by AusAid. The pipe was surface laid, loosely connected without thrust blocks or break-pressure tanks. It was never completed.

B. MISCELLANEOUS ITEMS

1. Water Users' Association Does not exist.

2. Stone, aggregate and sand

Sand is NOT available, other materials available locally, for payment.

3. Local labor Available and willing to participate for payment.

4. Land acquisition No problem, no compensation required.

5. Electric power

No mains power supply. Dusun are served by many small gen. sets owned and operated by private individuals and Kelompok.

6. Public Phone Not available

C. AVAILABLE WATER SOURCES

1. M.A. Wai Langu

Available, subject to satisfactory quantity and quality analyzes, but it is a low-level source, which would require pumping. To recreate the AusAid project, against the clearly indicated wishes of the people, would simply invite the same rejection.

2. M.A. Wai Kebong

Available, subject to satisfactory quantity and quality analyzes. A very high level source, far away and with difficult access. Investigation of the status of the pipeline Contractor's activities is essential.

3. M.A. Balatawa

Available, subject to satisfactory quantity and quality analyzes. Just as high but with less difficult access. Quantity and quality unknown.

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target area

The three Dusun along the shoreline road provide habitation for virtually the entire population of the Desa and constitute the obvious target area, although it might be argued that Dusun Leworahang is already well supplied from M.A. Wai Langu.

2. Population to be served 1,000 **3. Area to be served** 27 ha.

4. Source

K. Desa stated that a gravity supply from M.A. Balatawa is preferred, to avoid pumping costs. Further investigations are required to determine quality, quantity, access and the practicalities of pipeline construction.

5. Components

Whichever source is selected there will be a requirement for 3.0 to 5.0 km of transmission main. If the low-level source is adopted there will be a pumping requirement whereas both the high level sources would require break pressure tanks and the construction of very vulnerable pipelines in extremely difficult terrain. The existing PH tanks are sufficient but some may not be reusable. New fittings and service pipelines will be required.

DESA ILE PADUNG **NTT # 7**

FOLLOW-UP VISIT TO HIGH LEVEL SPRINGS

PARTICIPANTS	**Dates of visits:**	May 11 & 12, 2001
JICA Study Team	**Desa Ile Padung**	**Representatives of:-**
Mr. G Woollatt	Kepala Desa	PDAM FloTim (2)
Ir. Sukrisno	4 Mountain Guides	

A. PURPOSE OF VISIT

To locate and investigate the high level sources identified by the Desa as being their preferred source of supply.

B. FINDINGS

Contrary to earlier information the springs are all within Desa boundaries. All are high level (+/- 650 m. asl.), approximately 3.0 km from the main Dusun in a straight line. The Kepala Desa prefers M.A. Balatawa because it is on the North side of the watershed with a direct pipeline route straight down the valley. Unfortunately the source is inadequate. (See Team Hydrogeologist's Report.)

M.A. Wai Kebong is the first of a group of 7 springs in a deep defile not much further South but at a slightly lower level in the next watershed, which presents a very difficult and lengthy pipeline route. The source, which is very large, maybe 20 L/sec., was selected for the second AusAid project. The broncaptering is in place but inoperative. Much of the pipeline has already been surface laid by the villagers themselves, working unpaid for a Contractor funded by AusAid. There are no thrust blocks, no break-pressure tanks and many of the pipeline joints have come apart. The project was never completed. The villagers complain that they were not trained, not told what to do and were not supervised either by the Contractor or by AusAid. They are very angry, having done so much work for nothing and still have no water supply.

We advised Kepala Desa that M.A. Balatawa was not a suitable source and that although a gravity pipeline from M.A. Kebong was technically possible, it would be extremely difficult to construct and maintain. We recommended reconstruction of the low-level pumped system from M.A. Wai Langu. Despite our advice and recommendations, Kepala Desa still prefers M.A. Balatawa, but concedes he might be able to persuade the people to pay for pumping, given a lot of support from the JICA Social team.

We also discussed onward transmission to Desa Sinar Hading. Again Kepala Desa said that his people would reject this, as there is already a 'war' between the two villages over water supply. He agreed to see if his people would accept a valve and bulk supply meter at the Desa border, with Ile Padung controlling the system and charging for the water supplied.

We discussed all the above with Dir. PDAM and Bupati FloTim who both agreed that in such a contentious situation the only solution was to use a third party, i.e. the PDAM as owners and operators of the system. Bupati also said that would be in accordance with recent recommendations from Governer NTT, that PDAMs should take over and operate more village water supply systems.

C. CONCLUSION

This is a socially contentious situation, which will take a lot of time and patience to resolve successfully. The only logical solution is to reconstruct the original AusAid low-level pumped scheme from M.A. Wai Langu as a metered system to be operated by PDAM FloTim on behalf of both Desa. I.e. create a very small new regional system.

NTT # 8

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Watuneso	**Date of survey:**	April 26, 2001
Kecamatan:	Lio Timur	**Total Desa Area:**	371 ha.
Kabupaten:	Ende	**Total Desa Population:**	1,508

Topography:

Kelurahan Watuneso is a coastal settlement extending to a hilly area toward the mountains of the central part of the Flores Island, 95 km from Ende through fair conditioned national road leads to Maumere. Kelurahan Watuneso consists of five Dusun named Kolijana, Hutanggala, Watuneso Wano Watuneso Wena and Wologomo. Incidentally, Watuneso is located just beside the Kabupaten boundary between Ende and Sikka. The distance from Maumere, the capital of Kabupaten Sikka, is 54 km and can be reached through good conditioned national road.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	Camat Lio Timor,	Bappeda Tk II Sikka
Mr. S. Minami	Drs Gabriel Da	PDAM
Mr. Y. Yamakawa	K. Desa, Mr. Bernardus, Bae	DPU
Ir. Sukrisno	Desa Staff	
Ir. Sentot D. Prahoro		

A PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Only one well is located 10 m away from the seashore, and the groundwater table fluctuates seasonally but the well is never dried up.

1.2 Hand-bored wells None

1.3 Machine-bored deep wells None

2. Springs

One hot spring named Aipetu Spring at Aipetu Settlements, is located 50 m away from national road Ende – Maumere. The capacity of the spring is around one L/sec. Villagers told that the spring water is sulfurous.

3. Rainwater Systems None

4. River Water

The Lowolise River is the main water source for most of the inhabitants in Kelurahan Watuneso. The river water is collected into a small intake chamber and flows through distribution pipe of 2 inches in diameter supplying to some public taps. Unfortunately, when floods happen, the water becomes very turbid and the system must be temporary stopped running, furthermore, at the height of the dry seasons, for about two months, the river dries up.

5. PDAM supplies None

B. MISCELLANEOUS ITEMS

1. Water Users' Association None

2. Stone, Aggregate and Sand

Available at Maumere, the Kabupaten capital of Sikka.

3. Access Conditions

Kelurahan Watuneso is located 95 km eastward away from Ende, the capital of Kabupaten Ende, and can be reached through fair conditioned national road leads to Maumere and also 54 km from Maumere, the capital of Kabupaten Sikka through good conditioned national road.

4. Local Labor

Unskilled labor is available at Kelurahan Watuneso but semi-skilled or skilled labor is available in Maumere.

6. Land Acquisition
Although local government and inhabitants inform that they will provide land needed for project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

6. Electric Power
PLN electric power supply is available except in Dusun Wologomo.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
No reliable water source in the Desa.
Aikele Spring proposed by Camat Lio Timur is in another Desa.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS
None

NTT # 9

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Borokanda	**Date of survey:**	April 21/22, 2001
Kecamatan:	Ende	**Total Desa Area:**	1,488 ha.
Kabupaten:	Ende	**Total Desa Population:**	1,607

Topography:
Borokanda is a coastal Desa that majority of settlement lies along the national road Ende – Ruteng. Desa Borokanda consists of four Dusun named Barai Wawo, Barai Wena, Pautora and Puumbara.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Desa, Mr. Ismail A.	Kimpraswil Tk I NTT
Mr. S. Minami	Desa Staff	Bappeda Tk II Ende
Mr. Y. Yamakawa		PDAM
Ir. Sukrisno		DPU
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells
12 wells, 10 of them are dried in dry seasons. All the wells are located close to the seashore (15 to 20 m from the coast, except one well located 200 m away from the coast). Depth of the wells varies from 5 to 15 m. Wells are main water sources for villagers at Dusun Pautora and Puumbara.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs
No spring at Desa Borokanda, but inhabitants at Dusun Barai Wena and Barai Wawo has pipe system as the main water source with also hand-dug wells as reserve. The source of pipe system comes from Aeredu Spring located at Desa Gheogoma, which lies next to Desa Borokanda.

3. Rainwater Systems — None

4. River Water — None

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand
Available at Ende, the capital of Kabupaten Ende.

3. Access Conditions
Desa Borokanda is located about 8 km westward away from Ende, and can be reached through good conditioned national road.

4. Local Labor
Unskilled labor is available at Desa Borokanda but semi-skilled or skilled labor is available in Ende.

5. Land Acquisition
Although local government and inhabitants inform that they will provide land needed for project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

6. Electric Power
PLN electric power supply of 220 V/ 50 Hz is available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
No reliable water source in the Desa.
A spring named Rowa Aewromba is located in Desa Emburia, on the north of Borokanda.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS
None

NTT # 10

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Bheramari	**Date of survey:**	April 24, 2001
Kecamatan:	Nangapanda	**Total Desa Area:**	1,440 ha.
Kabupaten:	Ende	**Total Desa Population:**	1,925

Topography:

Desa Bheramari consists of six Dusun, which are Reda Rangga, Mboturamba, Nangge Panda, Niomaga, Pauwawa and Ndetukuene.
Bheramari is located at areas from the coast extending to Wawonato Mountains. The settlements of Dusun Boturamba and Dusun Reda Rangga are lying along the national road Ende – Ruteng, and the rest are located on a hilly area towards Wawonato Mountains.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
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Mr. S. Minami	Desa Staff	PDAM
Mr. Y. Yamakawa		DPU
Ir. Sukrisno		
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells
Eight wells, seven of them dries in the dry seasons. Depth of the wells varies from 5 to 15 m. Wells and River are main water sources for villagers of Desa Bheramari.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs
There is a spring named Aepara Spring, with capacity 0.5 L/sec located at hilly area, 2 hours walk from national road through Desa road and footpath.

3. Rainwater Systems — None

4. River Water
There is a river named the Agana River, which flows through Desa Bheramari. The river water is being utilized as water source for inhabitants nearby. Although the quantity of water decreases in the dry seasons but the river has never dried.

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand
Available at Ende, the capital of Kabupaten Ende.

3. Access Conditions
Desa Bheramari is located about 15 km westward away from Ende, and can be reached through good conditioned national road. However, the access to the spring is difficult.

4. Local Labor
Unskilled labor is available at Desa Bheramari, but semi-skilled or skilled labor is available in Ende.

5. Land Acquisition
Although local government and inhabitants inform that they will provide land needed for project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

2. Electric Power
PLN electric power supply of 220 V/ 50 Hz is available only in the area along the national road.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
No reliable water source in the Desa.
Aepara Spring yields only 0.5 L/sec.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS
None

NTT # 11

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Nggorea	**Date of survey:**	April 25, 2001
Kecamatan:	Nangapanda	**Total Desa Area:**	1,214 ha.
Kabupaten:	Ende	**Total Desa Population:**	1,863

Topography:
Nggorea is a coastal Desa, that settlements are lies along the national road Ende – Ruteng facing the Sawa Sea. Desa Nggorea consists of three Dusun, which are Maunggora, Anaraja and Penggajawa.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
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Mr. S. Minami	Desa Staff	PDAM
Mr. Y. Yamakawa		DPU
Ir. Sukrisno		
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells
14 salty wells has never dried. Depth of the wells varies from 6 to 15 m. Well water, although it is saline, is a main water source for villagers.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs
No spring at Desa Nggorea, but there was a water supply plan with and agreement between Desa Nggorea and neighboring Desa Raporendu to make use of the Aesonga Spring, which is located in Desa Raporendu. The yield of the spring is estimated at 9 to 15 L/sec in the Team's survey, and is enough amount of water to meet the water demand in the two Desa. The location of Aesonga spring is about 1800 m from national road toward the hill.
Since the pipeline from the Aesonga Spring to settlements of Desa Nggorea will be through settlements of Desa Raporendu, a consideration to the water demand for inhabitants of Desa Raporendu should be taken in the design of the water supply system.

3. Rainwater Systems — None

4. River Water — None

5. PDAM Supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand
Available at Ende, the capital of Kabupaten Ende.

3. Access Conditions
Desa Nggorea is located about 24 km westward away from Ende, and can be reached through good conditioned national road. However, the access to the Aesonga Spring is difficult by footpath. Settlements of Desa Raporendu are also along the national road, on the east of Desa Nggorea.

4. Local Labor
Unskilled labor is available at Desa Nggorea, but semi-skilled or skilled labor is available in Ende.

1. Land Acquisition
Although local government and inhabitants inform that they will provide land needed for project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

2. Electric Power
PLN electric power supply of 220 V/ 50 Hz is available only in the area along the national road.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
No reliable water source in the Desa.
Aesonga Spring yields 9 to 15 L/sec, however, the spring is located in another Desa.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS
None

NTT # 12

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Ndetundora I	**Date of survey:**	April 22, 2001
Kecamatan:	Ende	**Total Desa Area:**	590 ha.
Kabupaten:	Ende	**Total Desa Population:**	718

Topography:
Ndetundora I is located on a hilly area, 15 km northward from Ende through good conditioned Kabupaten road. Desa Ndetundora I consists of two Dusun, Dusun Nuabosi and Dusun Puuperi.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
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Mr. S. Minami	Desa Staff	Bappeda Tk II Ende
Mr. Y. Yamakawa		PDAM
Ir. Sukrisno		DPU
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1	Hand-dug wells	None
1.2	Hand-bored wells	None
1.3	Machine-bored deep wells	None

2. Springs
There are two groups of springs, one group called PDAM spring has a capacity of about 5 L/sec and the other group consists of five springs (Aeweo, Aedjaru, Aepota I, II and III) and has a capacity of about 15 L/sec.
They are the main water source for inhabitants of Desa Ndetundora I.

3. Rainwater Systems None

4. River Water None

5. PDAM Supplies None

B. MISCELLANEOUS ITEMS

1. Water Users' Association None

2. Stone, Aggregate and Sand
Available at Ende, the capital of Kabupaten Ende.

3. Access Conditions
Desa Ndetundora I is located about 15 km northward away from Ende, and can be reached through rather good conditioned Kabupaten road.

4. Local Labor
Unskilled labor is available at Desa Ndetundora I, but semi-skilled or skilled labor is available in Ende.

5. Land Acquisition
Although local government and inhabitants inform that they will provide land needed by the project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

6. Electric Power
PLN electric power supply of 220 V/ 50 Hz is available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source

Aforementioned springs in the Desa.

2. Future Plan for Water Supply System

The Kabupaten Government allocated Rp 980,000,000 in 2001 fiscal year for construction of a water supply system for Desa Ndetundora I and Ndetundora II. The water source planned for the system is a potential spring somewhere in Wawonato Mountain. The spring water is to be supplied to Ndetundora by gravity.

D. PROVISIONAL DEVELOPMENT PROPOSALS

None

NTT # 13

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Hepang	**Date of survey:**	May 02/03, 2001
Kecamatan:	Lela	**Total Desa Area:**	447 ha.
Kabupaten:	Sikka	**Total Desa Population:**	2,526

Topography:

Hepang is a coastal and hilly area extending toward the mountain, and located 18 km away from Maumere, the Kabupaten capital through good conditioned national road Maumere – Ende and also good conditioned provincial road.
Desa Hepang consists of four Dusun named Bangboler, Napungliti, Rohot and Wolora. Dusun Bangboler located on a coastal area while another three Dusun are located on a hilly area.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
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Mr. S. Minami	K. Desa Mr.Y. T. Gaharpung	Bappeda Tk II Sikka
Mr. Y. Yamakawa	Desa Staff	PDAM
Ir. Sukrisno	Some Villagers	DPU
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells
There are two hand-dug wells located at downward settlement close to the seashore, one of them is dried up in the dry seasons while the other is not. Water of the wells is saline.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs

A spring named Wairdoik is located at upward of the Desa, 50 m from the national road Maumere – Ende, about 3 km from the center of the Desa. The yield of the spring is 0.6 L/sec. The spring has never dried up even in the dry seasons but the yield decreases about 30 %.

3. Rainwater Systems

Rainwater is a main source for inhabitants of Dusun Wolora, and Dusun Bangboler and complementary water source, beside Wairdoik spring, for inhabitants of Dusun Rohot and Napungliti.
There were 54 unit rainwater systems, 10 built by AusAID, 22 built by NGOs and 22 built by P3DT.

4. River Water — None

5. PDAM supplies

There is a water supply system managed by PDAM Maumere Unit Lela, using springs (20 L/sec) as water source, 4 inches GI pipelines as transmission pipe and metered house connections. The water is being supplied by gravity. The service area in Desa Hepang is the coastal area i.e. Dusun Bangboler.
Formerly, water is distributed to public hydrants also, however, according to PDAM information, difficulties in bill collections for public hydrant customers made PDAM remove the public hydrant.

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand

Available at Maumere, the capital of Kabupaten Sikka.

3. Access Conditions

Desa Hepang is located about 18.5 km away from Maumere, the Kabupaten capital, and can be reached through 15 km of good conditioned national road Maumere – Ende, 3.5 km of

good conditioned provincial road. Dusun Napungliti and Wolora can be reached through 3 km of poor conditioned Desa road.

4. Local Labor
Unskilled labor is available at Desa Hepang, but semi-skilled or skilled labor is available in Maumere.

1. Land Acquisition
Although local government and inhabitants inform that they will provide land needed by project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

2. Electric Power
PLN electric power supply of 220 V/ 50 Hz is available in Dusun Bangboler which are located along the provincial road, however no public electric power supply is available in other three Dusun.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Wairdoik Spring and PDAM water

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
Dusun Napungliti where the Desa office is located.

2. Population to be served 825 **3. Area to be served** 10ha.

3. Water Source
Groundwater of proposed deep well

2. System Components
- A deep borehole and a pumping system,
- A ground reservoir with chlorinator, 200m of transmission pipe, 800 m of distribution pipe, and
- 11 nos. of public hydrants.

NTT # 14

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Bloro	**Date of survey:**	May 02/03, 2001
Kecamatan:	Nita	**Total Desa Area:**	1,553 ha.
Kabupaten:	Sikka	**Total Desa Population:**	1,478

Topography:

Bloro is on a hilly area 15 km away from Maumere, the Kabupaten capital through good conditioned national road leads to Ende and good conditioned provincial road. All the settlements are located along the provincial road.
Desa Bloro consists of four Dusun, namely Siransina, Bloro, Koligahar, and Wukak.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	Camat Nita	Kimpraswil Tk I NTT
Mr. S. Minami	K. Desa Mr. Fuigensius Magnus	Bappeda Tk II Sikka
Mr. Y. Yamakawa	Desa Staff	PDAM
Ir. Sukrisno	Some Villagers	DPU
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1	Hand-dug wells	None
1.2	Hand-bored wells	None
1.3	Machine-bored deep wells	None

2. Springs

There are two groups of springs named Diruk and Watugong Spring. Both springs are located at Desa Riit, the neighboring Desa. Because of its location, the springs cannot be utilized by Desa Riit without any pumping but on the contrary they can be utilized by Desa Bloro by gravity.
Diruk Spring, which has a yield of one L/sec, is composed of four close small springs. Watugong Spring, which has a yield of only 0.02 L/sec, consists of two close small springs. Water from the both springs is being supplied by gravity through 2 inches GI pipelines to Desa Bloro and part of Desa Lusitada with 11 public hydrants that are sometimes functioning as break pressure tanks. Presently, the system can supply water only to Dusun Wukak, which is the nearest and highest area in the Desa.

3. Rainwater Systems

Rainwater is their indispensable water source since the pipeline system supplies water only to Dusun Wukak. There are 68 rainwater tanks, 40 built by NGOs, 10 built by P3DT and the rest built by villagers.

4. River Water None

5. PDAM supplies None

B. MISCELLANEOUS ITEMS

1. Water Users' Association None

2. Stone, Aggregate and Sand

Available at Maumere, the capital of Kabupaten Sikka.

3. Access Conditions

Desa Bloro is located 15 km away from Maumere, the Kabupaten capital, and can be reached through 13 km of good conditioned national road and 2 km of good conditioned provincial road.

4. Local Labor

Unskilled labor is available at Desa Bloro, but semi-skilled or skilled labor is available in Maumere.

3. Land Acquisition
Although local government and inhabitants inform that they will provide land needed for project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

4. Electric Power
PLN electric power supply of 220 V/ 50 Hz is available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
No proposed water source in the Desa.
Diruk Spring and Watugong Spring are located in next Desa.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS
None

NTT # 15

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Watuliwung	**Date of survey:**	May 01/04, 2001
Kecamatan:	Kewapante	**Total Desa Area:**	678 ha.
Kabupaten:	Sikka	**Total Desa Population:**	1,761

Topography:

Watuliwung is a coastal and hilly area extending toward the mountains, located 7.5 km away from Maumere, the Kabupaten capital through good conditioned national road Maumere – Larantuka and also good conditioned provincial road. Almost all of the settlements are located along the provincial road.

Desa Watuliwung consists of three Dusun, which are named Watuliwung, Wairhubing and Wetakara.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Desa, Mr. Godfridus Erasmus	Kimpraswil Tk I NTT
Mr. S. Minami	Desa Staff	Bappeda Tk II Sikka
Mr. Y. Yamakawa	Some Villagers	PDAM
Ir. Sukrisno		DPU
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

There are about 30 hand-dug wells, almost all are located at downward settlements close to the seashore. The yields of the wells are not influenced by the seasonal precipitation but almost all of the wells are saline.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells

There are three deep wells, two of which built by P2AT and one built by UNICEF. P2AT deep wells, which are located about 1 km and 750 m away from the seashore, are built in 1993 and 1996, and their depths are 75 and 65 m respectively. One of P2AT deep wells is being used for irrigation purpose while the other one is being used for both irrigation (8 hours/day) and domestic water supply (2 hours/day).

The domestic water is distributed through 4 inches GI Pipe to public hydrant (formerly rain water tank). There is at least one public hydrant for each group of settlement. The users pay Rp. 100 per 20 liters of water to an attendant responsible for collecting the money. The public hydrant attendant brings the collected money to K. Desa monthly. The operation and maintenance of all the pumping and water supply system are under the responsibility of the Desa itself.

The deep well built by UNICEF (1974) are equipped with a hand pump, but presently out of order because of damages of its foot-valve of the pump and difficulties to find substitute parts.

2. Springs — None

3. Rainwater Systems

Rainwater tank and collector are complementary source for inhabitants of Desa Watuliwung. No record of number of rainwater tanks, but from our site survey, it seems that every three households have one rainwater tank. The volume varies from 8 to 25 m3.

4. River Water — None

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association

There exists an informal WUA, the water supply system are operated and maintained under the responsibility of Desa itself. Kepala Desa delegates the responsibility to villagers (1 attendant for each public hydrant).

2. Stone, Aggregate and Sand
Available at Maumere, the capital of Kabupaten Sikka.

3. Access Conditions
Desa Watuliwung is located 7.5 km away from Maumere, the capital city of Kabupaten Sikka, and can be reached through 5 km of good conditioned national road Maumere – Larantuka, and 2.5 km of good conditioned provincial road. Almost all of the settlements are located along the provincial road.

4. Local Labor
Unskilled labor is available at Desa Watuliwung, but semi-skilled or skilled labor is available in Maumere.

1. Land Acquisition
Although the local government and villagers inform that they provide enough land needed for the project by free of charge, but it is better to prepare a budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

2. Electric Power
PLN electric power supply of 220 V/ 50 Hz is available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Groundwater from a new deep well.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
All of the settlement area in the Desa

2. Population to be Served 1,761 **3. Area to be Served** 38 ha.

4. Water Source
Groundwater of the proposed deep well

5. System Components
- A deep well and a pumping system,
- A ground reservoir with chlorinator,
- 100 m of transmission pipe, 5 km of distribution pipe, and
- 20 nos. of public hydrants.

NTT # 16

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Patialadete	**Date of survey:**	April 14, 2001
Kecamatan:	Lamboya	**Total Desa Area:**	3,541 ha.
Kabupaten:	Sumba Barat	**Total Desa Population:**	1,210

Topography:

Patialadete is located on a hilly area with scattered settlements located near the south coast, 32 km away from the city of Waikabubak through good but narrow conditioned Kabupaten road.

Desa Patialadete consists of three scattered Dusun, namely Kotamawe, Kapaka Bisa and Pagarewa.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Desa, Mr. D. Dj. Ngailu	Bappeda Tk II Sumba Barat
Mr. S. Minami	Desa Staff	
Mr. Y. Yamakawa	Some Villagers	
Ir. Sukrisno		
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1	Hand-dug wells	None
1.2	Hand-bored wells	None
1.3	Machine-bored deep wells	None

2. Springs

Three springs are observed in the field visit to Desa Patialadete, namely Kapaka Bisa, Wee Kuta and Wee Lagaya. The first two springs are located at Dusun Kapaka Bisa while the last spring is located at Dusun Pagarewa. The capacities of yielding of the three springs are 0.2, 1.0 and 0.5 L/sec respectively. The inhabitants come to these springs to fetch their domestic water.

3. Rainwater Systems

About 4 to 5 rainwater tanks are located at public buildings such as school, church and Desa office with each capacity of about 10 m3 on average.

4. River Water None

5. PDAM supplies None

B. MISCELLANEOUS ITEMS

1. Water Users' Association None

2. Stone, Aggregate and Sand

Available at Waikabubak, the Kabupaten capital.

3. Access Conditions

Desa Patialadete is located 32 km away from the city of Waikabubak through good but narrow conditioned Kabupaten road. The road from Kabupaten road to the Desa, which is about 3 km, is poor in its condition.

4. Local Labor

Unskilled labor is available at Desa Patialadete, but semi-skilled or skilled labor is available in Waingapu or Waikabubak.

5. Land Acquisition

Although local government and inhabitants inform that they will provide land needed for project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

4. Electric Power
No public electric power supply is available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Kapaka Bisa Spring, 0.2 L/sec, Wee Kuta Spring, 1.0 L/sec and Wee Lagaya Spring, 0.5 L/sec. However, these springs are considered to be sacred by the villagers so that their development seems to be difficult.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS
None

NTT # 17

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Welibo	**Date of survey:**	April 15, 2001
Kecamatan:	Lamboya	**Total Desa Area:**	899 ha.
Kabupaten:	Sumba Barat	**Total Desa Population:**	1,522

Topography:
Welibo, neighboring Desa of Patialadete, is on a hilly area with scattered settlements located near the south coast, 24 km from Waikabubak through about 21 km of good but narrow conditioned Kabupaten road and about 3 km of poor conditioned Desa road. Desa Welibo consists of four scattered Dusun, namely Padaka, Tobe, Kamairo and Kapaka Kalla.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Desa Mr. P. Pabalu	Bappeda Tk II Sumba Barat
Mr. S. Minami	Desa Staff	
Mr. Y. Yamakawa	Some Villagers	
Ir. Sukrisno		
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells
There are six dug wells located at Dusun Padaka near the Loko Kadengar River. Although the river dries at the end of the dry seasons, the wells has never dried.

1.2 Hand-bored wells
Two hand-bored wells equipped with hand pumps are located at Dusun Padaka. The wells are well functioning.

1.3 Machine-bored deep wells — None

2. Springs
Four springs are observed in field visit to Desa Welibo, namely Liti Dete, 0.5 L/sec, and Wee Karara, 3.0 L/sec, both are located at Dusun Padaka, Wee Lowa, 0.5 L/sec at Dusun Kamairo and Wee Lega, 0.1 L/sec, beside the Kabupaten road at Dusun Tobe. Among the four springs observed, Liti Dete and Wee Lega springs have open type broncapterings. Wee Legahas separate bathing and washing facilities.

3. Rainwater Systems — None

4. River Water — None

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand
Available at Waikabubak, the Kabupaten capital.

3. Access Conditions
Desa Welibo is located 24 km away from Waikabubak through about 21 km of good but narrow conditioned Kabupaten road and about 3 km of poor conditioned Desa road.

4. Local Labor
Unskilled labor is available at Desa Welibo, but semi-skilled or skilled labor is available in Waingapu or Waikabubak.

5. Land Acquisition
Although local government and inhabitants inform that they will provide land needed for project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

2. Electric Power
No public electric power supply is available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Liti Dete spring (0.5 L/sec), Wee Karara spring (3.0 L/sec), Wee Lowa spring (0.5 L/sec), and Wee Lega spring (0.1 L/sec)
However, these springs are considered to be sacred by the villagers so that their development seems to be difficult.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS
None

NTT # 18

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Weerame	**Date of survey:**	April 16, 2001
Kecamatan:	Wewewa	**Total Desa Area:**	1,026 ha.
Kabupaten:	Sumba Barat	**Total Desa Population:**	2,294

Topography:

Weerame is on flat and hilly area with scattered settlements located along the national highway from Waikabubak to Tambolaka, 19 km from the city of Waikabubak through about 17.5 km of good but narrow conditioned national road and about 1.5 km of poor conditioned Desa road. Desa Weerame consists of four scattered Dusun, namely Pandua Tana, Sunga Tamo, Dappa Taka and Kali Ngara.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Desa, Mr. Ng. T. B. Oleawa	Bappeda Tk II Sumba Barat
Mr. S. Minami	Desa Staff	
Mr. Y. Yamakawa	Some Villagers	
Ir. Sukrisno		
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Two private dug wells used by 20 households for each. Never dried.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs

Four springs are observed in field visit to Desa Weerame, namely Wee Labonga at Dusun Sunga Tamo, 6.5 L/sec, and Wee Maliti, 10 L/sec, Wee Rame, 50 L/sec and Wee Lebara, 10 L/sec.

Wee Labonga is being used for small paddy field irrigation and water for houses nearby. Wee Maliti is used for water supply for settlements along the Desa road from Wee Maliti to the national road. The water supply is through one and a half inches GI pipeline by gravity and equipped with public hydrants. The inhabitants get water from the system for free of charge. Wee Rame is used mainly for irrigation purpose and small part of it for water supply, by gravity, to church using one and a half inches GI pipe, and some houses around the spring itself. Wee Lebara is used for irrigation and as water source for houses nearby. The four springs in Desa Wee Rame slightly decrease in capacity in the dry seasons, but never dried.

3. Rainwater Systems — None

4. River Water

One underground river named Wee Paneru. The estimated capacity of flow is around 5 m3/sec and used as main water source for neighboring Desa in the dry seasons.

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand

Available at Waikabubak City.

3. Access Conditions

Weerame is located 19 km northwestward away from the city of Waikabubak through about 17.5 km of good conditioned national road and about 1.5 km of poor conditioned Desa road.

4. Local Labor

Unskilled labor is available at Desa Weerame, but semi-skilled or skilled labor is available in Waingapu or Waikabubak.

1. Land Acquisition
Although local government and inhabitants inform that they will provide land needed by project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

2. Electric Power
PLN electric power supply of 220 V/ 50 Hz is available only in the area along the national road.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Four springs namely Wee Labonga, 6.5 L/sec, Wee Maliti, 10 L/sec, Wee Rame, 50 L/sec and Wee Lebara, 10 L/sec.
Wee Paneru underground river, which was estimated at around 5 m3/sec of flow rate.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
Major settlement area in the Desa

2. Population to be Served 2,394 **3. Area to be Served** 18 ha.

4. Water Source
Underground river in the cave of Wee Paneru

5. System Components
- A pumping system at the cave,
- A protection facilities at the intake site,
- 500 m of transmission pipe, 3 km of distribution pipelines,
- a ground reservoir with chlorinator on a hill,
- 21 nos. of public hydrants.

NTT # 19

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Kondamara	**Date of survey:**	April 10, 2001
Kecamatan:	Lewa	**Total Desa Area:**	3,120 ha.
Kabupaten:	Sumba Timur	**Total Desa Population:**	1,600

Topography:

Kondamara is on a flat area of 500 m above sea level, adjacent to the borderline of Kabupaten Sumba Timur and Kabupaten Sumba Barat. The Desa is 70 km from Waingapu through some 60 km of good but narrow conditioned national road Waingapu – Waikabubak and about 10 km of poor conditioned Kabupaten road from the national road.
Desa Kondamara consists of three scattered Dusun named Kilimbatu Balar, Dendu Mara and Ngarupindu.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Desa, Mr. Umbu Anatana	Bappeda Tk II Sumba Timur
Mr. S. Minami	Desa Staff	
Mr. Y. Yamakawa	Some Villagers	
Ir. Sukrisno		
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells
There are about 37 dug wells, 25 built by the government aid and 12 built by NGO in 1988. Every dug well is used by about 10 families and 50 % of the dug wells run dry in the dry seasons.

1.2 Hand-bored wells
There are five hand-bored wells completed with hand pumps provided by government aid. These wells are now in use.

1.3 Machine-bored deep wells None

2. Springs

Three springs were observed in our field visit to Desa Kondamara, two of them were carefully investigated.
A spring named Wowo Spring is located in the middle of paddy field 500 m away from the Kabupaten road. The yield of the upflow water was estimated at 20 L/sec. The water is being utilized for domestic and irrigation purpose.
Lailama Spring is located about 3 km away from the Desa office and its yield was estimated at 28 L/sec. The spring was developed for irrigation and water supply. The spring has an intake facility and water overflowed is collected to a pumping well. A submersible pump and a photovoltaic power plant were equipped in the well site. Water in the well is then transmitted to a reservoir on a hill and is distributed by gravity with 4 inches PVC pipelines to the settlement area. However, the system didn't function from the beginning of its operation because of the damage in facilities of the power by vandals.

3. Rainwater Systems None

4. River Water None

5. PDAM supplies None

B. MISCELLANEOUS ITEMS

1. Water Users' Association None

2. Stone, Aggregate and Sand
Available at Waingapu City.

3. Access Conditions
Kondamara is located 67 km westward away from the city of Waingapu, the Kabupaten capital of Sumba Timur, and can be reached through 60 km of good conditioned national road Waingapu – Waikabubak and 7 km of poor conditioned Kabupaten road.

4. Local Labor
Unskilled labor is available at Desa Kondamara , but semi-skilled or skilled labor is available in Waingapu or Waikabubak.

3. Land Acquisition
Although local government and inhabitants inform that they will provide land needed for project free of charge, but better to provide budget for land acquisition and compensation to avoid private claim of part of the system component after project completion.

4. Electric Power
Not available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Wowo and Lailama springs.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
Major settlement area of the Desa

2. Population to be Served 1,600 **3. Area to be Served** 31 ha.

4. Water Source
Lailama Spring

5. System Components
- A pumping facility at the spring site,
- A reservoir with a chlorinator on a hill,
- 700 m of transmission pipe, 7 km of distribution pipelines, and
- 16 nos. of public hydrants.

NTT # 20

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Pulupanjang	**Date of survey:**	April 09, 2001
Kecamatan:	Nggaha Ori Anggu	**Total Desa Area:**	6,930 ha.
Kabupaten:	Sumba Timur	**Total Desa Population:**	1,544

Topography:

Pulupanjang is on a hilly area near the south coast of the Sumba Island, 70 km westward from Waingapu through 55 km of good but narrow conditioned national road leads to Waikabubak and 15 km of poor conditioned Kabupaten road.
Desa Pulupanjang consists of three scattered Dusun named Pahomba, Lakokur and Ngadu Langgi.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Desa, Mr. Marthinus Kaley	Bappeda Tk II Sumba Timur
Mr. S. Minami	Desa Staff	DPU
Mr. Y. Yamakawa	Some Villagers	
Ir. Sukrisno		
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

There are five dug wells built with the government aid in 1995. Two dug wells located near the Kanyongga River are presently in use by the inhabitants. Three dug wells have collapsed.
The two wells being used are never dried up even in the dry seasons and mainly used as drinking and cooking water source.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs

There is a spring close to Dusun Pahomba/Kanjilu named Rirara Spring with capacity of 0.2 L/sec and never dried, but the capacity decreases to 0.1 L/sec in the dry seasons. The spring water is presently in use by 15 surrounding households.

3. Rainwater Systems — None

4. River Water

The Palahunda and its tributary, the Kanyongga River, are the main water sources especially for bathing and washing purpose. The flow somewhat decreases in the dry seasons but never dried up.

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand

Available at Waingapu, the Kabupaten capital.

3. Access Conditions

Desa Pulupanjang, which is located 70 km westward away from Waingapu, the Kabupaten capital of Sumba Timur, can be reached through 55 km of good conditioned national road leads to Waikabubak, and about 15 km of poor conditioned Kabupaten road.

4. Local Labor

Unskilled labor is available at Desa Pulupanjang, but semi-skilled or skilled labor is available in Waingapu or Waikabubak.

5. Land Acquisition

Need to provide budget for land acquisition and compensation.

4. Electric Power
Not available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
None

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS
None

NTT # 21

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Oebau	**Date of survey:**	March 31, 2001
Kecamatan:	Pantai Baru	**Total Desa Area:**	2,800 ha.
Kabupaten:	Kupang	**Total Desa Population:**	940

Topography:

Desa Oebau is on a hilly area located about 10 km away from Olifulihaa, the capital of Kecamatan Pantai Baru, toward the south coast of the Rote Island. Oebau can be reached from Olifulihaa through a poor conditioned Kabupaten road.

Desa Oebau consists of six Dusun named Ngaek, Ladoen, Oekupi, Batu Kolau and Oebau Dale.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	Camat Pantai Baru,	Kimpraswil Tk I NTT
Mr. S. Minami	Danramil P. Baru	P3P
Mr. Y. Yamakawa	K. Desa, Mr. Yustur	PDAM
Ir. Sukrisno	Desa Staff	DPU
Ir. Sentot D. Prahoro	Some Villagers	

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

There are 10 public hand-dug wells with 20 m deep and 1 to 1.5 m in diameter, nearly dried in the dry seasons but never completely dried. About 20 families use each well together.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs

There are two springs named Ngaek and Sibasoe with capacity of 0.3 and one L/sec respectively. About 50 families use each spring, however, the discharge of these springs much reduces in the dry seasons. But never dried. In the dry seasons, these springs are the main water source for drinking and cooking.

3. Rainwater Systems — None

4. River Water — None

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand

Available in Kupang City, the provincial capital of NTT.

3. Access Conditions

Desa Oebau is located about 10 km away from Olifulihaa, the capital of Kecamatan Pantai Baru, toward the south coast of the Rote Island, and can be reached from Olifulihaa through a poor conditioned Kabupaten road.

4. Local Labor

Unskilled labor is available at Desa Oebau, but semi-skilled or skilled labor is available in Kupang.

5. Land Acquisition

Need to provide budget for land acquisition and compensation.

6. Electric Power

Not available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Ngaek and Sibasoe springs, both need to be pumped to the settlement area.
Oekupi dug well, which also needs to be pumped.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
Dusun Ngaek, Ladoen and Oekupi

2. Population to be Served 533 **3. Area to be Served** 14 ha.

4. Water Source
Groundwater of Oekupi dug well

3. System Components
- A pumping facility at the dug well site,
- 1200 m of transmission pipeline, 2 km of distribution pipe,
- a reservoir with a chlorinator, and
- 7 nos. of public hydrants.

NTT # 22

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Sonimanu	**Date of survey:**	April 02, 2001
Kecamatan:	Pantai Baru	**Total Desa Area:**	576 ha.
Kabupaten:	Kupang	**Total Desa Population:**	574

Topography:

Desa Sonimanu, neighboring Desa of Oebau, is on a hilly coastal area located at the south coast of the Rote Island, about 15-km away from Olifulihaa, the capital of Kecamatan Pantai Baru. Sonimanu can be reached from Olifulihaa through a poor conditioned Kabupaten road.

Desa Sonimanu consists of five Dusun named Oekima, Lolale, Sak, Fufuno and Oelean.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Desa, Mr. Anis Tasik	Kimpraswil Tk I NTT
Mr. S. Minami	Desa Staff	P3P
Mr. Y. Yamakawa	Some Villagers	
Ir. Sukrisno		
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells

Eight hand-dug wells are nearly dried up in the dry seasons but never completely dried. About 20 families use each well.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs

There are three springs named Vuvuno, Lolale and Oekima.

Vuvuno Spring, which has 5 L/sec of yielding capacity, lies about 50 m below the nearest settlement area. It has separate washing and bathing facilities and the yield of the spring is not influenced by seasonal change of precipitation. It has been used as water source for inhabitant lived nearby.

Lolale Spring lies at a higher level than settlement area, however, the yield of the spring is more or less one L/sec.

Oekima Spring, which has a yield of 0.5 L/sec, is located near the main Desa road and settlement area. It has open capturing facilities and is utilized by the inhabitants surrounding the area.

3. Rainwater Systems — None

4. River Water — None

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand

Available in Kupang City, the provincial capital of NTT.

3. Access Conditions

Desa Sonimanu is located about 15 km away from Olifulihaa, the capital of Kecamatan Pantai Baru, toward the south coast of the Rote Island, and can be reached from Olifulihaa through a poor conditioned Kabupaten road.

4. Local Labor

Unskilled labor is available at Desa Sonimanu, but semi-skilled or skilled labor is available in Kupang.

4. Land Acquisition
Need to provide budget for land acquisition and its compensation.

5. Electric Power
Not available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Vuvuno Spring, which has 5 L/sec in yielding capacity, is available. The water needs to be pumped to supply to the settlements. The pump head will be some 80 m.
Lolale Spring of one L/sec in yielding is not yet developed and also available.
Oekima Spring, which has 0.5 L/sec of yielding capacity, is to be pumped.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
Major settlement area in the Desa

2. Population to be Served 574 **3. Area to be Served** 25 ha.

4. Water Source
Vuvuno Spring

3. System Components
- A pumping facility at the spring site,
- 1200 m of transmission pipeline, 2 km of distribution pipe,
- a reservoir with a chlorinator, and
- 6 nos. of public hydrants.

NTT # 23

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Nusakdale	**Date of survey:**	April 01, 2001
Kecamatan:	Pantai Baru	**Total Desa Area:**	769 ha.
Kabupaten:	Kupang	**Total Desa Population:**	841

Topography:

Desa Nusakdale is on a hilly coastal area located at south coast of the Rote Island, about 17 km from Olifulihaa, the capital of Kecamatan Pantai Baru, toward the south coast. Nusakdale can be reached from Olifulihaa through a poor conditioned Kabupaten road.
Desa Nusakdale consists of five Dusun named Bengubelan, Bero, Nusakdale, Meakoen and Oenusa.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	Camat Pantai Baru,	Kimpraswil Tk I NTT
Mr. S. Minami	Danramil P. Baru	P3P
Mr. Y. Yamakawa	Desa Secr., Mr. A. Malelak	PDAM
Ir. Sukrisno	Desa Staff	DPU
Ir. Sentot D. Prahoro	Some Villagers	

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells
Three hand-dug wells are 12 m deep each, and two of them are dried up in the dry seasons and the last one is seriously reduced but never completely dried.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs

There are two springs named Oeleak and Meakoen.
Oeleak Spring, which has a yield of one L/sec, is located at Dusun Bengubelan near the seashore. The spring has a protection for contamination from the surrounding area, and separate washing and bathing facilities. However because of its location, this spring is sometimes covered by seawater when the tide rises.
Meakoen Spring consists of two outflows. The total yielding capacity is 2 L/sec. It had been captured and utilized with a pipeline, but because of lack of design and maintenance the system does not work anymore. Presently, the inhabitants go to the spring site to take the water by jerry cans or jars.

3. Rainwater Systems — None

4. River Water — None

5. PDAM supplies — None

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand

Available in Kupang City, the provincial capital of NTT.

3. Access Conditions

Desa Nusakdale is located about 17 km away from Olifulihaa, the capital of Kecamatan Pantai Baru, toward the south coast of the Rote Island, and can be reached from Olifulihaa through a poor conditioned Kabupaten road.

4. Local Labor

Unskilled labor is available at Desa Nusakdale, but semi-skilled or skilled labor is available in Kupang.

5. Land Acquisition

Need to provide budget for land acquisition and compensation.

6. Electric Power

Not available.

7. Public Phone
Not available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Meakoen Spring, which has 2 L/sec in yielding capacity, is available with some rehabilitation.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
Dusun Bengubelan

2. Population to be Served 177 **3. Area to be Served** 10 ha.

4. Water Source
Meakoen Spring

5. System Components
- A broncapturing and protection facilities at the spring site,
- A reservoir with a chlorinator,
- 200 m of transmission pipeline, 1.5 km of distribution pipeline, and
- 3 nos. of public hydrants.

NTT # 24

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Tarus	**Date of survey:**	April 03, 2001
Kecamatan:	Kupang Tengah	**Total Desa Area:**	1,019 ha.
Kabupaten:	Kupang	**Total Desa Population:**	6,436

Topography:

Kelurahan Tarus is only 12 km from the center of Kupang City, along the national highway Kupang – Atambua. So Tarus is rather urbanized area. PDAM water supply is available in the area astride the highway and also majority of the houses has hand-dug wells. The settlements are rather scattered all over the Kelurahan.
Kelurahan Tarus consists of five Lingkungan named Lingkungan I through V.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Urusan, Mr. Abjun Saek	Kimpraswil Tk I NTT
Mr. S. Minami	Desa Staff	P3P
Mr. Y. Yamakawa	Some Villagers	PDAM
Ir. Sukrisno		Bappeda Tk II Kupang
Ir. Sentot D. Prahoro		DPU

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells
There are a number of private dug wells, at least one dug well for every two households. Most of the dug wells has never dried.

1.2 Hand-bored wells — None

1.3 Machine-bored deep wells — None

2. Springs

A spring named Tarus Spring was observed in our field visit to Kelurahan Tarus. We were told that the yield of the spring water was 65 L/sec.
PDAM has utilized and managed some 20 L/sec of this spring water for the water supply of PDAM Kupang, Cabang Tarus. The PDAM system is composed of a pumping facility at the spring site, distribution pipelines, house connections, and public hydrants. PDAM also serves bulk water with tank trucks.

3. Rainwater Systems — None

4. River Water — None

5. PDAM supplies

There is a PDAM pipe network and water was distributed formerly both through house connections and public hydrants. However, because of problem on bill collection and operation of public hydrants, most of public hydrants were removed or replaced by house connections.

B. MISCELLANEOUS ITEMS

1. Water Users' Association — None

2. Stone, Aggregate and Sand

Available in Kupang City, the provincial capital of NTT.

3. Access Conditions

Tarus is located 12 km off the center of Kupang City, along the good conditioned national highway Kupang – Atambua. There is no access problem here.

4. Local Labor

Available in Kupang and its surrounding area.

5. Land Acquisition

Need to provide budget for land acquisition and compensation.

6. Electric Power

PLN electric power supply of 220 V/ 50 Hz is available.

7. Public Phone
Public telephone is available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Tarus Spring managed by Cabang Tarus of PDAM Kupang.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
Lingkungan II, III and IV

2. Population to be Served 4,000 **3. Area to be Served** 200 ha.

4. Water Source
Tarus Spring of PDAM

5. System Components
- New pumping facilities at the existing PDAM spring site,
- 2 km of transmission pipeline,
- a ground reservoir with a chlorinator,
- 4 km of distribution pipeline, and
- 40 nos. of public hydrants.

NTT # 25

QUESTIONNAIRE ON EXISTING WATER SUPPLY FACILITIES

Desa:	Bolok	**Date of survey:**	April 04, 2001
Kecamatan:	Kupang Barat	**Total Desa Area:**	1,276 ha.
Kabupaten:	Kupang	**Total Desa Population:**	1,744

Topography:
Desa Bolok is rather urbanized area, 15 km westward from the center of Kupang City, through good conditioned national road. Bolok has a ferry port and a harbor of Kupang. Desa Bolok consists of five Dusun named Dusun I through V.

PARTICIPANTS

JICA Study Team	**Village**	**Representatives of:**
Mr. S. Takahashi	K. Desa, Mr. Oktovianus Kesse	Kimpraswil Tk I NTT
Mr. S. Minami	Desa Staff	Bappeda Tk II Kupang
Mr. Y. Yamakawa	Some Villagers	PDAM
Ir. Sukrisno		DPU
Ir. Sentot D. Prahoro		

A. PRESENT WATER SUPPLY SITUATION

1. Wells

1.1 Hand-dug wells
There are public and private dug wells at least one dug well for every group of settlements. Most of the dug wells are never dried up even in the dry seasons. They have very deep water level, 19 to 50 m. Dug wells located at public facilities such as schools or public offices are public and wells located in private premises are usually private but neighboring inhabitants can take water from such private dug wells.

1.2 Hand-bored wells
There is one deep hand-bored well built by UNICEF. The well is completed with a hand pump, however, it is not functioning because of pump damage and difficulties to find a part to be replaced.

1.3 Machine-bored deep wells
There are two deep wells, one is completed with pump, pump house, electric generator and pipeline to distribute water to Desa Bolok and Desa Kuanhuem, but the system does not work because of some damage at generator part.
The other deep well is not yet completed.

2. Springs
There is one underground spring called Oeklau Spring with 2 L/sec in capacity. The spring is located at Dusun V, downward in the limestone cave about 30 m below ground level. This spring is main drinking and cooking water source for inhabitants living surrounding the area and almost all villagers at the height of the dry seasons when well water becomes saline.

3. Rainwater Systems None

4. River Water None

5. PDAM supplies None

B. MISCELLANEOUS ITEMS

1. Water Users' Association None

2. Stone, Aggregate and Sand
Available in Kupang City, the provincial capital of NTT.

3. Access Conditions
Desa Bolok is located 15 km off the center of Kupang City, along the good conditioned national highway. There is no access problem here.

4. Local Labor
Available in Kupang and its surrounding area.

3. Land Acquisition
Need to provide budget for land acquisition and compensation.

4. Electric Power
PLN electric power supply of 220 V/ 50 Hz is available.

7. Public Phone
Public telephone is available.

C. AVAILABLE WATER SOURCES

1. Available Water Source
Groundwater of deep wells and Oeklau Spring.

2. Future Plan for Water Supply System
None

D. PROVISIONAL DEVELOPMENT PROPOSALS

1. Target Area
Major settlement area in the Desa.

2. Population to be Served 1,400 **3. Area to be Served** 72 ha.

4. Water Source
Groundwater of the existing P2AT deep well.

5. System Components
- A submersible pump at the existing pump station,
- Elevated tanks
- 2 km of transmission pipeline to the elevated tanks,
- 3 km of distribution pipeline, and
- 16 nos. of public hydrants.

Appendix 9

SURVEY OF EXISTING VILLAGE WATER SUPPLY SYSTEMS AND RECOMMENDATIONS

Appendix 9

SURVEY OF EXISTING VILLAGE WATER SUPPLY SYSTEMS AND RECOMMENDATIONS

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Appendix 9 SURVEY OF EXISTING VILLAGE WATER SUPPLY SYSTEMS AND RECOMMENDATIONS

9.1 Introduction

The level of development in all sectors decreases progressively eastwards from Mataram across the lesser Sunda Island chain of Lombok, Sumbawa and Flores, and continues to decline through the more remote and much smaller southern chain, but increases sharply in Timor Barat. This is reflected in agricultural productivity, the prosperity of the villages, the sophistication of the water supply facilities already constructed and the efficiency and deployment of the PDAM. Conversely, the requirement for rural water supply development increases progressively from west to east, with the same exception of Timor Barat.

9.2 Nusa Tenggara Barat (NTB)

9.2.1 Kabupaten Lombok Barat

The five villages nominated for survey in Lombok Barat are suburban communities, providing workers and produce for the Provincial capital, Mataram. They are all within the service area of PDAM Mataram and are in fact the five villages identified as the next phase of development on their sketch map published for consideration by all potential funding agencies. The main transmission system is already in place and the available capacity grossly exceeds even the longest-term demand predictions. There is no water supply problem in this area. The Bupati was particularly outspoken as to why we had been directed to work in this relatively prosperous urban area when there were so many poor villages with desperate water supply problems in the south of the district.

(1) Desa Kuranji NTB # 1

1) Situation

A PDAM transmission main crosses the village from east to west. The PDAM has confirmed in writing that sufficient capacity is available to supply the two northern hamlets, Mapak Belatung and Mapak Dasan and has submitted its preliminary design proposals for consideration by the team.

2) Recommendation

A 500m feeder main is proposed, supplying a network of service lines, metered PH and HC, which we believe would be acceptable in this community.

(2) Desa Bajur NTB # 2

1) Situation

The adjacent village to Desa Kuranji. The same PDAM transmission main also crosses this village from east to west and a second main bisects the village from north to south. The PDAM has confirmed in writing that sufficient capacity is available to supply the two main hamlets, Dusun Pohdodol and Dusun Bajur, and has submitted its preliminary design proposals for consideration by the team.

2) Recommendation

A 1.0km feeder main is proposed, supplying a network of service lines, metered PH and HC, which we believe would be acceptable in this community.

(3) Desa Sembung NTB # 3

1) Situation

A 400mm PDAM transmission main passes along the main road through the village and there is already distribution through a 75 mm service line to metered HC in Dusun Sembung Jejelok and Lendangre. PDAM Mataram has confirmed in writing that there is sufficient capacity to install new service lines to supply additional metered HC and PH in adjacent hamlet and has submitted its preliminary design proposals for consideration by the team.

2) Recommendation

Additional service lines should be installed to extend the PDAM distribution network to additional PH and HC.

(4) Desa Duman NTB # 4

1) Situation

The higher level hamlets are already served by many piped gravity systems, installed by CARE Australia in 1985. The villagers manage them themselves, although no organized WUA could be identified. The PDAM supply line in this area passes east to west just 1.5 km south of the village boundary.

2) Recommendation

The high-level systems should be reconstructed and extended, although the quantity may be insufficient to supply the long-term needs of the main most southerly Dusun Dumandesa. Supply from the PDAM pipeline would be

the logical source for Dusun Dumansesa, in accordance with the PDAM/district development plan.

(5) Desa Peresak NTB # 5

1) Situation

The four densely populated hamlets in the west already have two small piped systems supplying PH and HC through hydraulic rams. These systems were installed and are operated by the villagers themselves, managed by informal Kelompok, but are in poor condition and need repair, rehabilitation and extension. The extreme eastern end of the village has PDAM metered HC supplied from the small M.A. Golong system, which lacks any additional capacity. The four main PDAM transmission mains from Mount Rinjani to Mataram and Sengiggi pass just 1.0 km north of the village, though the PDAM operated M.A. Montong source and reservoir. There are also several major springs both inside and just outside the northern village boundary. There is no shortage of water in this area.

2) Recommendations

The two small village systems in the west should be reconstructed and extended as a low priority secondary project. Either the main PDAM pipelines or one of the major springs in Desa Suranadi should be used as the source for a new system to supplement the PDAM distribution network in the eastern hamlets through additional metered PH and HC.

9.2.2 Kabupaten Lombok Tengah

PDAM Lombok Tengah operates two comprehensive regional systems and has a third planned system which when completed will effectively cover the entire district. Two systems (one 50% constructed and operational and one planned) will bring gravity supplies from a group of three major springs on Mt. Rinjani to all villages in the northern and western areas of the district. The third system, which is already operational, provides pumped potable water supplies to the district capital Praya and villages in the south of the district from a large WTP sited alongside the huge irrigation lake just outside the city. The uncompleted portions of the gravity systems are already designed and several sections are currently under consideration for construction by Kimpraswil/P3P as and when Development Budget or Donor funding becomes available.

(1) Desa Jelantik NTB # 6

1) Situation

No water supply system at present. Desa Jelantik will be supplied from the partially completed PDAM gravity system which has already reached Pringgarata, 9.0 kms away. There is no schedule for the funding and construction of the next section. There is no other source identified and the ground water potential is described as "No hope".

2) Recommendation

No short-term projects are possible.

(2) Desa Labulia NTB # 7

1) Situation

No water supply system at present. Similarly, Desa Labulia will be supplied from the same partially completed PDAM gravity system (via Jelantik) that has already reached Pringgarata, 15.0 kms away. There is no schedule for the funding and construction of the next sections. There is no other source identified and the ground water potential is described as "No hope".

2) Recommendation

No short-term project is possible.

(3) Desa Setanggor NTB # 8

1) Situation

No water supply system at present. Setanggor is one of the very few villages not included in PDAM development planning. There is no source identified within the village. The only groundwater possibility is some 5.0 kms away in another village, the use of which would necessitate supplying other communities en route to protect pipeline integrity. This would be contrary to JICA criteria.

2) Recommendation

No projects are possible.

(4) Desa Rembitan NTB # 9

1) Situation

The main PDAM 400mm transmission main from the Praya WTP to the south coast passes along the main road through the village. The PDAM is unable to supply the village at present, the capacity of the source and the

pipeline system is sufficient, but the pumping capability is inadequate. They need a bigger pump and a new reservoir in the area but have not yet identified a source of funding. No other source has been identified. The groundwater potential has already been unsuccessfully test drilled by a New Zealand team and VES investigations under this Study confirmed - "No hope".

2) Recommendation

No projects are possible.

9.2.3 Kabupaten Lombok Timur

The district has several large spring sources, predominantly in the north, which have been developed into regional systems, each serving four or five villages, operated and managed by the PDAM.

(1) Desa Bagik Papan NTB # 10

1) Situation

The village includes the very large M.A. Telega Murni to the south of the main road. This major PDAM facility supplies a number of 'downstream' villages through a regional piped gravity system, NOT including Desa Bagik Papan itself. There is ample capacity to do so but the pumping requirement would be excessive and probably beyond the villagers' capacity and willingness to pay. The three high level hamlets had a piped gravity supply from M.A. Balas I, which was installed by CARE Australia in 1989, but there is no WUA and the villagers have allowed the system to fall into disrepair. Some supply still reaches Dusun Dasanimba.

2) Recommendation

It is proposed to rehabilitate and extend the CARE system to include the target area nominated by the Kepala Desa - Dusun Bagik Papan itself.

(2) Desa Selaparang NTB # 11

1) Situation

Selaparang is an intermediate village in a PDAM regional system that provides piped gravity supplies to six villages, including the Kacamatan capital Pringgabaya, from M.A. Lemor. This high level, multi-source spring has been developed as a recreational/tourist facility. The combined yield of the many sources is possibly as high as 350 L/sec and could be considered as an alternative gravity source for the previous village, Bagik

Papan. The main transmission line is only 100m, well constructed and buried. There are no known or obvious leakages; the valves and break-pressure tanks are in good repair. The PDAM already has house connections and billing accounts in the village, but very little water reaches Selaparang.

2) Recommendations

The PDAM needs an exploratory investigation and reconstruction of the pipeline, a project that could quickly restore reliable piped water supplies to some 25,000 persons.

(3) Desa Batu Nampar NTB # 12

1) Situation

This village has two PDAM systems. The first was used to bring a piped supply from WTP Praya in Kab. Lombok Tengah. This was vandalized by the people and eventually disconnected by PDAM Lombok Tengah as Desa Batu Nampar is in fact in Kabupaten Lombok Timur. A totally new piped system has now been constructed using funds from an ADB Fisheries project. The project included significant upgrading of PDAM Lombok Timur's main transmission system for the southeastern portion of the district, to ensure sufficient capacity for Desa Batu Nampar. The system was designed and construction was supervised by the PDAM itself, which will assume responsibility for operation and management following commissioning in June 2001.

2) Recommendations

The system, as constructed, needs more PH and the old Australian concrete tanks should be connected to the system to increase storage capacity. These minor items could be offered to the PDAM as a very low priority secondary sub-project.

9.2.4 Kabupaten Sumbawa

Sumbawa Island is much drier than Lombok and the level of development of piped water supplies is significantly lower but, in addition to the main Sumbawa Besar system, the PDAM operates three multi-village regional systems.

(1) Desa Labuan Mapin NTB # 13

1) Situation

Lb. Mapin is an intermediate village on a PDAM regional gravity supply system that supplies four villages (6 communities) from a major high level source, M.A. Remas. The PDAM already has 120 metered HC and 6 metered PH on the system in Lb. Mapin. The system is in good repair; the pipeline is well constructed and predominantly buried in extremely difficult terrain. There are six concrete break pressure tanks that are functioning satisfactorily. The distribution system is in good condition except where the people have willfully by-passed the PDAM meters and made illegal connections to avoid payment. The characteristics of the spring source have changed recently, probably due to tree-root growth in the rock cracks and fissures. The principal arising is now 2.0 m outside the broncaptering, running to waste down the hillside. As a result insufficient water now enters the pipeline system. The site is remote and inaccessible.

2) Recommendation

The PDAM has a repair plan for which it is actively seeking funding. A very small project would immediately restore piped potable water supplies to 10,000 persons, including Lb. Mapin.

(2) Desa Labuan Lalar NTB # 14

1) Situation

Lb. Lalar has no water supply, apart from shallow hand-dug wells, which tend to be saline in the beachfront areas where the majority of the community lives. There is no other known source, but the groundwater prospects are rated as "Good".

2) Recommendation

Providing suitable boreholes can be developed without imposing excessive pumping costs on the people, a simple pumped system to a reservoir and PH managed by a village WUA is proposed.

(3) Desa Poto NTB # 15

1) Situation

Poto has no water supply apart from hand-dug shallow wells and there is no other known source. The groundwater potential is only rated as "Medium". The PDAM has a regional supply system under construction in a group of neighboring villages. Poto is not included in the first phase of this project,

but will likely be supplied in subsequent unscheduled developments of the system.

2) Recommendation

A test borehole is proposed. Subject to satisfactory water quality and quantity analyses, production wells will be developed to supply the three main hamlets strung out along the road through ground reservoirs and PH. The system would be managed, operated and maintained by the village.

9.2.5 Kabupaten Dompu

This is a relatively new district and apart from the Dompu WTP, which also supplies a number of surrounding villages, the PDAM service area is limited.

(1) Desa Ranggo NTB # 19

1) Situation

Ranggo has two inoperative water supply systems. DPU constructed a 12.0 km pipeline from WTP Dompu, but the people along the route vandalized the pipeline before completion and it was never handed over to the PDAM. The villagers also owned and operated a gravity pipeline from an infiltration gallery in a high-level irrigation dam, but they have allowed the filter chamber and the pipeline to fall into disrepair and the system is no longer operative. The only supply is hand-dug shallow wells and a German KFW borehole that is used primarily for agriculture. This indicates that the groundwater potential is good.

2) Recommendation

Subject to confirmation that neither Kimpraswil nor the PDAM intends to reactivate the pipeline project, it is proposed to carry out a test drilling prior to developing groundwater sources for three of the disparate communities along the main road, pumping to reservoir(s).

(2) Desa Jambu NTB # 20

1) Situation

Jambu is an extremely poor coastal community without an adequate water supply and there is no apparent source. Due to salinity problems the groundwater potential is rated as "Medium but very deep".

2) Recommendation

A test drilling is recommended but it is unlikely that this community can accept the pumping costs. If a suitable aquifer is located, production wells should be developed to supply the three main hamlets through a ground reservoir and PH.

(3) M.A. Hodo NTB # 21 (There is no village)

1) Situation

Hodo is a major spring, a minor tourist attraction and a stopping point on the beach for passing travelers. There is no community.

2) Recommendation

No project required

(4) Desa Kwangko NTB # 22

1) Situation

Kwangko has two systems operated and managed by PDAM Dompu, a pumped borehole and a river infiltration gallery, both feeding a comprehensive distribution system of HC and PH. The capacity of the system is inadequate, a larger borehole pump would suffice, but Kimpraswil has obtained budgetary approval for the construction of a new gravity supply from an undeveloped spring.

2) Recommendation

No projects are required.

9.2.6 Kabupaten Bima

PDAM Bima is only active in the larger communities. (IKKs)

(1) Desa Piong NTB # 16

1) Situation

Piong had a gravity system, built by TNI, which they owned and operated themselves, but the people vandalized and eventually destroyed the buried pipeline. Their only source of water at present is shallow wells, which tend to be saline. The groundwater potential is rated as "Excellent" but the Kapala Desa refuses to pay any pumping costs. (Although the people themselves are not so resistant.)

2) Recommendation

A test drilling is not considered necessary. The development of a production well pumping to a reservoir, PH and HC is feasible; providing public resistance to pumping costs can be overcome. Reconstruction of the old TNI system is a viable technical alternative, but an intensive public education program would be necessary to promote sustainability.

(2) Desa Labuan Kenanga NTB # 17

1) Situation

The two high level hamlets have piped systems installed by CARE Australia which the people have allowed to fall into disrepair, but the commercial coffee plantations in which the hamlets are located have accepted responsibility for domestic water supply in their areas. DPU constructed a surface laid piped gravity system from a series of springs to PH in the two lower hamlets. This system was handed over to the village but the people have already by-passed the PH to take small diameter flexible pipes to individual houses. The pipeline still runs full, every house has its own individual dug well and even the very shallow wells actually on the beach are, surprisingly, not saline. This village does not have a water supply problem.

2) Recommendation

No project required.

(3) Desa Kawuwu NTB # 18

1) Situation

There are two quite separate hamlets with totally different water supply problems.

a) The high level Dusun Kalemba has four springs. A piped gravity system was constructed from one spring to two large concrete tanks/PH, using OECF funding. The villagers have allowed the system to deteriorate.

b) The low level Dusun Lante had a gravity system constructed by DPU, supplied from three of the Dusun Kalemba springs. This has become inoperative and has been abandoned by the villagers who now rely on the river and one hand dug well as their only water supply. The groundwater potential is rated as "Good" but in hard rock.

2) Recommendations

A small, secondary rehabilitation and extension project would be beneficial in the upper Dusun Kalemba but the main project should be the construction of a production well supplying the two existing concrete tanks and maybe two new PH in the lower hamlet.

9.3 Nusa Tenggara Timur (NTT)

9.3.1 Kabupaten Sikka

Water shortages, especially in the dry seasons, are an endemic problem in this district. Villagers suffering from the problem are accustomed to utilizing rainwater, sometimes even extracting water from banana trees at the height of the dry season. Water tank trucks are widely utilized. Among the five villages in this district, PDAM Sikka is only active in some hamlets in Desa Hepan.

(1) Desa Mekendatung NTT # 4

1) Situation

There is no reliable water source in this village; the villagers mainly utilize rainwater collected from their roofs. There are 98 rain water collectors. In very dry seasons, villagers use water from banana trees and tank trucks, provided by the PDAM and some private contractors. The groundwater potential is rated as "Poor".

2) Recommendation

No project recommended.

(2) Desa Kokowahor NTT # 5

1) Situation

The villagers mainly utilize rainwater collected from their house roofs and water from tank trucks. A water supply project for the village was initiated by the Provincial government, but never completed. The proposed source was an existing deep well constructed by P2AT. The project was initiated without any proper investigation, planning or design.

2) Recommendations

A pumping test is required at the existing P2AT deep well in order to confirm the optimum pumping discharge and water quality. Subject to satisfactory results, a water supply project will be developed to supply PH in Dusun Kahat.

(3) Desa Hepang NTT # 13

1) Situation

More than 100 rainwater collectors are in use in the village. Around 20 households nearby use one spring, located in the northwestern part of the village, which has a yield of 0.7 L/sec. A PDAM water supply system covers the southern coastal area of the village. There are 42 metered HC but no PH. The system is functioning, but supplies are rationed. There are also four hand-dug wells in the area. The groundwater potential is rated as "Good".

2) Recommendations

A test boring is proposed. A water supply plan will then be prepared subject to the results of the test boring. Since the hamlets are scattered far apart, the initial stage of the system will be limited to Dusun Napungliti along the main road.

(4) Desa Bloro NTT # 14

1) Situation

The village has a water supply system constructed by DPU. The source is several springs located in Desa Riit to the north. The total discharge of the springs is around 1.0 L/sec. The water is supplied to the village by gravity through a 1.0 inch diameter pipeline. There are four reservoirs and several PH along the pipeline route but the quantity is insufficient, especially for the lower areas of the village. There are also 68 rainwater collectors. The groundwater potential is rated as "Poor".

2) Recommendations

Since there is no reliable water source in the village, no project is recommended.

(5) Desa Watuliwung NTT # 15

1) Situation

The village has a water supply system consisting of two reservoirs and 9 PH. The source is a deep well constructed by P2AT for irrigation purposes. The water is utilized for two hours a day for water supply. The system is functioning, but not satisfactorily. There are also some rainwater collectors in the village. The ground water potential is rated as "Good".

2) Recommendations

A test drilling is proposed. Subject to satisfactory results, a water supply system serving PH in all communities is proposed.

9.3.2 Kabupaten Flores Timur

PDAM Flores Timur met the team at Maumere, provided cars, hosted and escorted us on three visits, including the 9-hour mountain climb to the high-level spring sources, although they do not yet have any presence in either of the Study villages.

(1) Desa Sinar Hading NTT # 6

1) Situation

The three main hamlets rely on two shallow wells, which the villagers consider to be saline and sulfurous. There is no other apparent source of supply and the groundwater potential is rated as "Difficult". A previous test drilling by P2AT was abandoned. The expected source is a secondary supply from whatever system is developed for the adjoining Study village, Desa Ile Padung. Unfortunately relationships between the two villages are not good; an intensive social program would be necessary before this can be confirmed.

2) Recommendations

The outcome of the project planning for Desa Ile Padung must be awaited, but any supply to Desa Sinar Hading would be pumped to PH.

(2) Desa Ile Padung NTT # 7

1) Situation

The AusAID FLOWS originally funded the construction of a pumped system from the low level M.A Wai Langu to all three hamlets and to Desa Sinar Hading; although the pipeline to Sinar Hading was never completed. The BPAM provided an operator and diesel fuel supply for one month. The villagers refused to purchase any more fuel and dismantled the system. The engine and electric generator are in use in the village to power television sets (for which they will happily purchase fuel) and the surface laid pipeline has been cannibalized for use as building materials.

AusAID then retained a contractor to lay a gravity pipeline from the high level M.A. Wai Kebong, about 3.0 km away and 650 m above the village. The villagers were persuaded to carry the pipeline (3-inch steel and PVC) up

the mountainside without payment. Much of the pipe is still visible; surface laid, loosely jointed, without any break-pressure tanks or thrust blocks, and there is an inoperative broncaptering. The village is very angry that after all these efforts they still do not have an operative water supply system. They insist on a gravity system but prefer another spring, M.A. Balatawa in the same general location, because the pipeline route is more direct, but this is an inadequate source. Pipelaying in this terrain would be technically possible, but unrealistic and unsustainable at village level.

The only reasonable project is the reconstruction of the original AusAID low level system. K. Desa thought he might eventually persuade the people to accept this, but it would take a long time and need a lot of support from the JICA social team. With regard to supplying water from "their" spring to Desa Sinar Hading, he thought the only way would be to have a bulk meter and main valve at the village border and to sell the water to finance their own pumping costs.

In subsequent discussions, Bupati Flores Timur said he knew and understood the local situation very well. He suggested it would take about six months of intensive social work to sort out the communities' water supply problems. He also directed that in accordance with the instructions he was receiving from the Governor of NTT, the completed project must be owned and operated by the PDAM. In the prevailing circumstances and recognizing the history of failure at village level, the team accepts his counsel in this specific instance.

2) Recommendations

Subject to successful resolution of the social problems, it is proposed to repeat the original low-level AusAID project, with significant changes in the selection of pumping facilities.

9.3.3 Kabupaten Ende

Among the five villages selected for the Study, Borokanda, Beramari and Nggorea are located 5.0 to 15.0 km to the west of Ende along the national road facing onto the Sawu Sea. They have good accessibility from the district capital. There are several springs suitable for water supply in this area and some have been developed by the AusAID FLOWS implemented in 1998. Desa Ndetundora I is located about 5.0 km to the north of Ende on a hilly area, and has a PDAM piped system although it is not functioning. Desa Watuneso is located some 100.0 km to the east of Ende, and has a water supply system constructed by DPU.

(1) Kelurahan Watuneso NTT # 8

1) Situation

There is no available water source except surface water from the river flowing along the main road in the village. Even the river water dries up for about two months at the peak of some the dry seasons. A water supply system has been constructed using the river as the water source. The facilities consist of an intake chamber, PH and pipelines. There are no treatment facilities for the river water. Most of the water is consumed in the upper part of the village, so that no water is available at the extremity of the pipelines.

The team surveyed a spring located in another mountainous village about 7.0 km to the northwest of Watuneso. The yield was about 4.0 L/sec which would satisfy the demand of both Watuneso and other hamlets along the pipeline route, although the seasonal variation of the yield must be confirmed. Taking the accessibility and scale of the system into consideration, a water supply based on this source is not considered to be a viable project.

2) Recommendations

No project is recommended.

(2) Desa Borokanda NTT # 9

1) Situation

In two hamlets, located at the southeastern part of the village, water is distributed by an existing piped system that supplies two villages, Borokanda and Desa Geoghoma. The system was constructed under the AusAID Project. Its water source is a spring located in Desa Geoghoma. The water is only supplied through PH. Villagers in the other two hamlets are using water from hand-dug wells. The team investigated a proposed spring source located in another village and found that the yield was about 2.0 L/sec.

2) Recommendations

No project proposed, since no reliable water source was identified in the village.

(3) Desa Bheramari NTT # 10

1) Situation

There is no reliable source for water supply in the village. During the team's reconnaissance, a proposed spring source was investigated, however,

the site is too remote and the yield of the spring water is estimated at only around 0.5 L/sec. For some parts of the village, water is being supplied from an existing system covering four villages. The source is a spring in the neighboring village. The system was constructed in 1998 by the AusAID FLOWS and has 12 PH in Desa Bheramari. There are also some hand-dug wells in the village.

2) Recommendations

No project proposed, since no reliable water source was identified in the village.

(4) Desa Nggorea NTT # 11

1) Situation

There is no reliable water source in the village. Most villagers are utilizing water from hand dug wells. A water supply system for this village and the neighboring Desa Raporendu was planned and partially constructed by the AusAID Project. However, the system was never completed. The water source was to be M.A. Maurongga located in Desa Raporendu. The yield of the spring is estimated at around 10.0 L/sec, which is sufficient for the two villages.

2) Recommendations

No project is proposed since no reliable water source was identified in the village.

(5) Desa Ndetundora I NTT # 12

1) Situation

In 1992, PDAM Ende tried to construct a water supply system for the village. The system has 1.5 L/sec capacity and consists of intake pump facilities at the spring site, distribution pipelines and PH. Presently, the system is not functioning because of damage to the pump facilities and the villagers' unwillingness to pay for repairs. Kabupaten Ende is now planning to develop a new regional water supply system for the area, including Desa Ndetundora I.

2) Recommendation

Since the Kabupaten Ende is planning to develop a regional water supply in this area including Desa Ndetundora I, no project is proposed.

9.3.4 Kabupaten Sumba Barat

Among three villages designated for the Study, Desa Patialade and Welibo are located 20.0 to 30.0 km to the southwest of Waikabubak, the district capital. There is no public electric power supply in this area and some of the villagers are still living in primitive settlements. On the contrary, Desa Weerame is about 20.0 km to the northwest of Waikabubak on the national road, and is located on a hilly area.

(1) Desa Patialadete NTT # 16

1) Situation

There is no reliable water source in the village. The team investigated three springs flowing from limestone caves, but their yields were estimated at only 0.5 L/sec. The villagers utilize these springs as their domestic water supply. There are also four rainwater collectors in the public facilities of the village.

2) Recommendations

Since no reliable water source was identified in the village, no project is proposed.

(2) Desa Welibo NTT # 17

1) Situation

The neighboring village to Desa Patialadete. There are six hand-dug wells, two hand-bored wells equipped with hand pumps, and four small springs in the village. One of the four springs has separate concrete basins for bathing and washing. These springs are considered to be sacred by the villagers and presumably cannot be developed.

2) Recommendations

No water source can be developed, so no project is proposed.

(3) Desa Weerame NTT # 18

1) Situation

The villagers mainly rely on water from the four springs in this village. M.A. Wee Labonga has a yield of 6.5 L/sec and is used for irrigation and water supply for the villages nearby. The inhabitants living along the village road are utilizing M.A. Wee Maliti, which the team estimates to have a yield of 10.0 L/sec, for domestic water supplies. The spring water is being supplied to them by gravity through GI pipelines, 3.0 inches in diameter, to PH. M.A. Wee Rame has a yield around 50.0 L/sec and has

been developed mainly for irrigation. However, it is also utilized for water supply. The water is supplied, by gravity, to a Church through GI pipelines 1.5 inches in diameter. Villagers surrounding the spring site also utilize the water. M.A. Wee Lebara has a yield of some 10.0 L/sec and is being utilized for irrigation and domestic water supply for villagers nearby. The team was told that these yields would decrease slightly at the height of dry seasons, i.e. end of August.

2) Recommendations

Subject to a satisfactory result of a pumping test at the groundwater source named Wee Pareru, a water supply project will be planned. The villagers, who will have to meet the pumping costs, will manage the system. An intensive education program will be required to promote the sustainability of the system.

9.3.5 Kabupaten Sumba Timur

The two villages selected for the Study are located 60.0 to 70.0 km to the west of Waingapu, the district capital. This district is, like Kabupaten Sumba Barat, one of the poorest areas in Indonesia. Some villagers are still living in primitive settlements together with their livestock. Animism is still popular and there is a tendency not to accept any changes in their ideas. There is no public electric power supply in the village.

(1) Desa Kondamara NTT # 19

1) Situation

The villagers utilize water from hand-dug wells and hand-bored wells for domestic use. There are 37 hand-dug wells and five hand-bored wells equipped with hand pumps. The team was told that half of the hand-dug wells would dry up in very dry seasons. There are three springs in the village. One is used only for irrigation. The other two are used for irrigation and domestic water. M.A. Wowo, which has a yield of 20.0 L/sec, is located in the center of some paddy fields and is used by the villagers nearby. M.A. Lailama is located near the settlement and has a yield of 28.0 L/sec. A water supply system, using this spring as its source, was constructed by DPU but the villagers damaged the solar power generation facilities shortly after completion and it has never operated.

2) Recommendations

A pumped water supply system utilizing M.A. Lailama is proposed. The system would be managed, operated and maintained by the village, who must also meet the pumping costs. A public education program is required to promote the sustainability of the system.

(2) Desa Pulupanjang NTT # 20

1) Situation

The villagers are suffering from acute water shortages, getting water from a few hand-dug wells, a river, rainfall and a small spring. No reliable water source was identified.

2) Recommendations

No projects are possible.

9.3.6 Kabupaten Kupang

Desa Oebau, Sonimanu and Nusakdale are located on Rote Island, which is small and undeveloped. There is no public electric power supply, poor accessibility to site and little development planning. On the contrary, Kelurahan Tarus and Desa Bolok, located on Timor Island, are suburbs of Kupang City, the provincial capital.

(1) Desa Oebau NTT # 21

1) Situation

There are ten hand-dug wells and two springs in the village. The potential water sources in the village are Oekupi Dug Well and M.A. Sibasoe. The team estimated the yields of the sources at 5.0 L/sec and 1.0 L/sec respectively.

2) Recommendations

A pumping test is to be made at the dug well for water supply planning purposes. Subject to satisfactory results, a pumped water supply system with PH will be developed. The villagers will have to pay the pumping costs. An intensive education program is needed to promote the sustainability of the system.

(2) Desa Sonimanu NTT # 22

1) Situation

The team investigated three springs in the village and found that M.A. Vuvuno is a reliable water source with a yield estimated at 5.0 L/sec although located at very low level. (80.0 m below the level of the majority of the user communities.) There are also eight hand-dug wells with around 20 households using each.

2) Recommendations

A water supply project using M.A. Vuvuno as its source is technically feasible, although the per capita capital cost of the system and the operating costs are probably unrealistic.

(3) Desa Nusakdale NTT # 23

1) Situation

There are two springs in the village, named M.A. Oeleak and M.A. Meakoen. The team estimated the yields at 1.0 L/sec and 2.0 L/sec respectively. There are also three hand-dug wells, two of which dry up in very dry seasons.

2) Recommendations

A water supply project, using M.A. Meakoen as source will be developed to supply PH in only one hamlet of the village, by gravity.

(4) Kelurahan Tarus NTT # 24

1) Situation

PDAM Kupang has a water supply system in the area although its capacity is insufficient. The source for the PDAM system is a spring located beside the main road. The yield of the spring is 65.0 L/sec. The PDAM supplies water to Kelurahan Tarus and adjacent villages along the main road by pumping to HC and with tanker trucks. There is few PH on the PDAM system. In the Kelurahan there are also many hand-dug wells, one for every two households, even in the PDAM service area.

2) Recommendation

It is proposed to upgrade the existing PDAM system. New pumping facilities near the spring, a ground reservoir on a high level site in Tarus and metered PH are recommended.

(5) Desa Bolok NTT # 25

1) Situation

There are many hand-dug wells scattered through public and private premises. Private wells are utilized by the owner's family and sometimes by neighboring families. There are also three deep wells equipped with pumps, but they are damaged and not functioning.

2) Recommendations

A pumping test will be carried out at one of the existing deep wells. Subject to satisfactory results a water supply system using PH will be developed. Since the area is level terrain, some elevated tanks may be required for effective water distribution. An intensive education program for the villagers is recommended to sustain the system.

Appendix 10

PRELIMINARY BASIC DESIGN STUDIES

Appendix 10
PRELIMINARY BASIC DESIGN STUDIES

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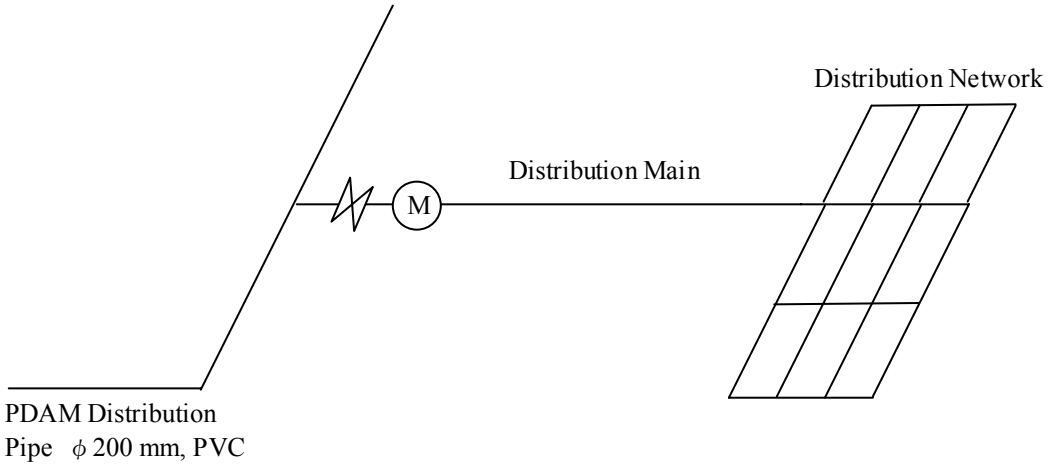
Appendix 10 PRELIMINARY BASIC DESIGN STUDIES

10.1 NTB #1 Kuranji

Village: Kuranji	Total village area:	600 Ha.
District: Lombok Barat	Total village population:	5,100
Area to be served by new and/or rehab. distribution:		28.0 Ha.
Population to be served by proposed JICA project:		1,787 (2001)
System capacity:		2.06 L/Sec

10.1.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.1.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	1,894
Population using PH:	70 % = 1,326 @ 30 l/c/d
Number of PH required:	11 @ 125 persons
Population using HC:	30 % = 568 @ 60 l/c/d
Average daily demand:	88.6 m^3 (including 20 % wastage)
Average hourly demand:	3.69 m^3
Maximum hourly demand:	7.38 m^3 (x 2.0)

10.1.3 Source

(1) Selected Source

Name/Location/Identification:	Treated water from PDAM Lombok Barat (200 mm PVC pipeline)		
Quality analysis:	Confirmed	Altitude:	5.0 m. asl
Available capacity:	24.7 L/Sec	Pressure:	3.4 kg/cm^2

(2) Construction Work

Tee branch (ϕ 200 × ϕ 75), valve (ϕ 75) and bulk meter (ϕ 75) at Kuranji connection point.

The method of connection without service interruption requires further discussion with PDAM Technical Division.

Branch pipe installation crossing a main road (ϕ 75 × 10 m, GSP).

10.1.4 Pumping Facilities None

10.1.5 Pumping Main None

10.1.6 Storage None

10.1.7 Transmission Main None

10.1.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	360 m
Material:	PVC, GSP	Diameter:	75 mm
Roughness coefficient:	120, 100	Head loss:	1.8 m
Laying:	Underground	Maximum flow:	2.1 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	One (ϕ 75), at PDAM connection		
Stop valves:	One (ϕ 75), at PDAM connection		
Main road crossing:	One (ϕ 75), at PDAM connection		
River/stream crossings:	None		

10.1.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	1,894	HC/PH split:	30/70 %
HC:	114 nos.	PH:	11 nos.
Public taps:	10		
River/stream crossings:	One (ϕ 75 × 10 m, GSP), underground		
Schools:	2	Mosques:	3
Health centers:	1	Total no. of PH:	17

(1) Existing Distribution Facilities None

(2) Proposed New Work Required

1) Description

Construction of 17 new PH and 10 public taps.

Installation of dia. 75 mm and 50 mm distribution pipelines as shown on the Site Layout Drawing.

25 mm service connections to HC, PH and public taps.

Service meter installation.

2) Material estimates

PVC Pipe:	75 mm	1,550 m	Service meters:	25 mm	141
	50 mm	1,380 m	Stop valves:	75 mm	2
GSP	75 mm	10 m		50 mm	5
	25 mm	2,720 m		25 mm	141

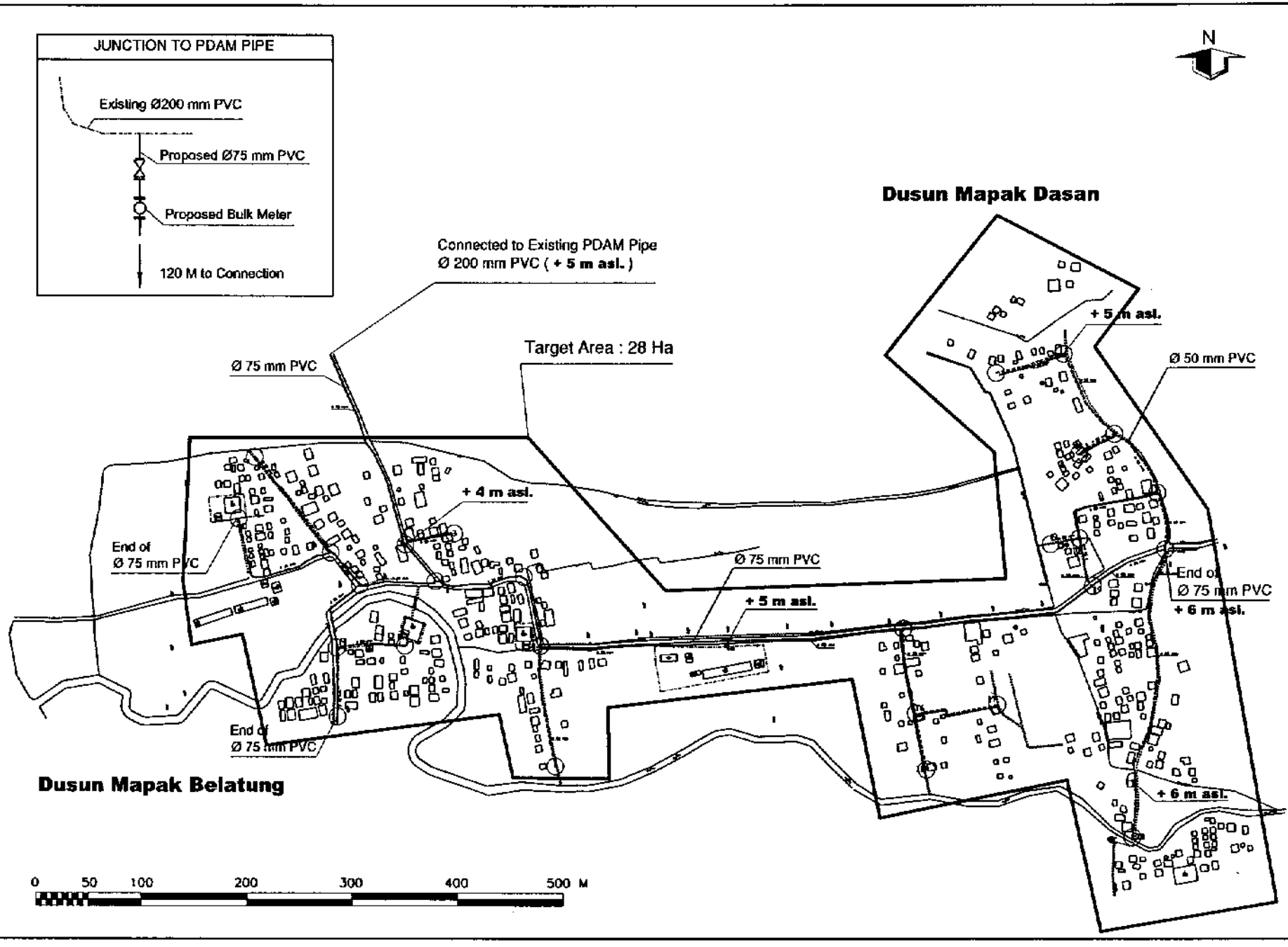


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Figure A10 - 1 : Site Layout Drawing

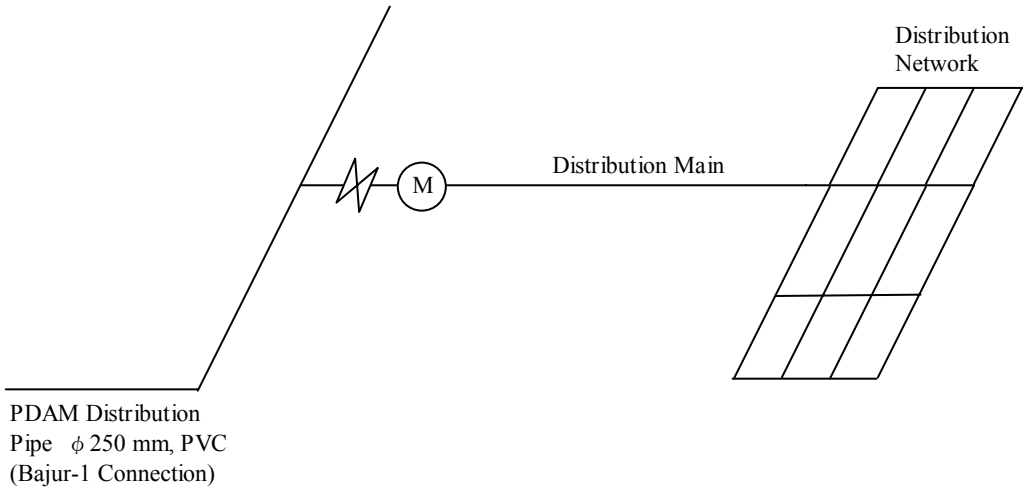
KURANJI - (NTB#1)

10.2 NTB #2 Bajur

Village: Bajur	Total village area:	320 Ha.
District: Lombok Barat	Total village population:	7,104
Area to be served by new and/or rehab. distribution:		24.8 Ha.
Population to be served by proposed JICA project:		5,782 (2001)
System capacity:		7.16 L/Sec

10.2.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.2.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	6,130
Population using PH:	60 % = 3,678 @ 30 l/c/d
Number of PH required:	29 @ 125 persons
Population using HC:	40 % = 2,452 @ 60 l/c/d
Average daily demand:	309.0 m^3 (including 20 % wastage)
Average hourly demand:	12.87 m^3
Maximum hourly demand:	25.74 m^3 (x 2.0)

10.2.3 Source

(1) Selected Sources

1) Bajur 1

Name/Location/Identification: Treated water from PDAM Lombok Barat (250 mm PVC pipeline)

Quality analysis: Confirmed Altitude: 15.0 m. asl

Available capacity: 66.7 L/Sec Pressure: 4.2 kg/cm^2

2) Bajur 2

Name/Location/Identification: Treated water from PDAM Lombok Barat (200 mm PVC pipeline)

Quality analysis: Confirmed Altitude: 15.0 m. asl

Available capacity: 20.3 L/Sec Pressure: 4.2 kg/cm^2

(2) Construction Work

1) Bajur 1

Tee branch (ϕ 250 × ϕ 100), valve (ϕ 100) and bulk meter (ϕ 100) at connection point.

The method of connection without service interruption requires further discussion with PDAM Technical Division.

Branch pipe installation crossing main road (ϕ 100 mm × 10 m).

2) Bajur 2

Tee branch (ϕ 200 × ϕ 50), 2 valves (ϕ 50) and 2 bulk meters (ϕ 50) at Bajur-2 connection point. (Two separate small service areas.)

The method of connection without service interruption requires further discussion with PDAM Technical Division.

Branch pipe installation crossing main road (ϕ 50 mm × 6 m).

10.2.4 Pumping Facilities None

10.2.5 Pumping Main None

10.2.6 Storage None

10.2.7 Transmission Main None

10.2.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	580 m
Material:	PVC, GSP	Diameter:	100 mm
Roughness coefficient:	120, 100	Head loss:	5.1 m
Laying:	Underground	Maximum flow:	6.0 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	Three (ϕ 100 mm, ϕ 50 mm x 2), at PDAM connections		
Stop valves:	Three (ϕ 100 mm, ϕ 50 mm x 2), at PDAM connections		
Main road crossings:	Two (ϕ 100 mm, ϕ 50 mm), at PDAM connections		
River/stream crossings:	None		

10.2.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	6,130	HC/PH split:	40/60 %
HC:	490 nos.	PH:	29 nos.
Public taps:	15		
River/stream crossings:	3 (75 mm × 5 m × 2 nos., underground, 50 mm × 3 m, hung on the bridge)		
Schools:	3	Mosques:	2
Health centers:	1	Total no. of PH:	35

(1) Existing Distribution Facilities None

(2) Proposed New Work Required

1) Description

Construction of 35 new PH and 15 public taps.

Installation of dia. 75 mm and 50 mm distribution pipelines as shown on the Site Layout Drawing.

25 mm GSP service connections to HC, PH and public taps.

Service meter installation.

2) Material estimates

PVC Pipe:	75 mm	430 m	Service meters:	25 mm	540
	50 mm	2,400 m	Stop valves:	75 mm	None
GSP	75 mm	10 m		50 mm	8
	50 mm	3 m		25 mm	540
	25 mm	10,650 m			

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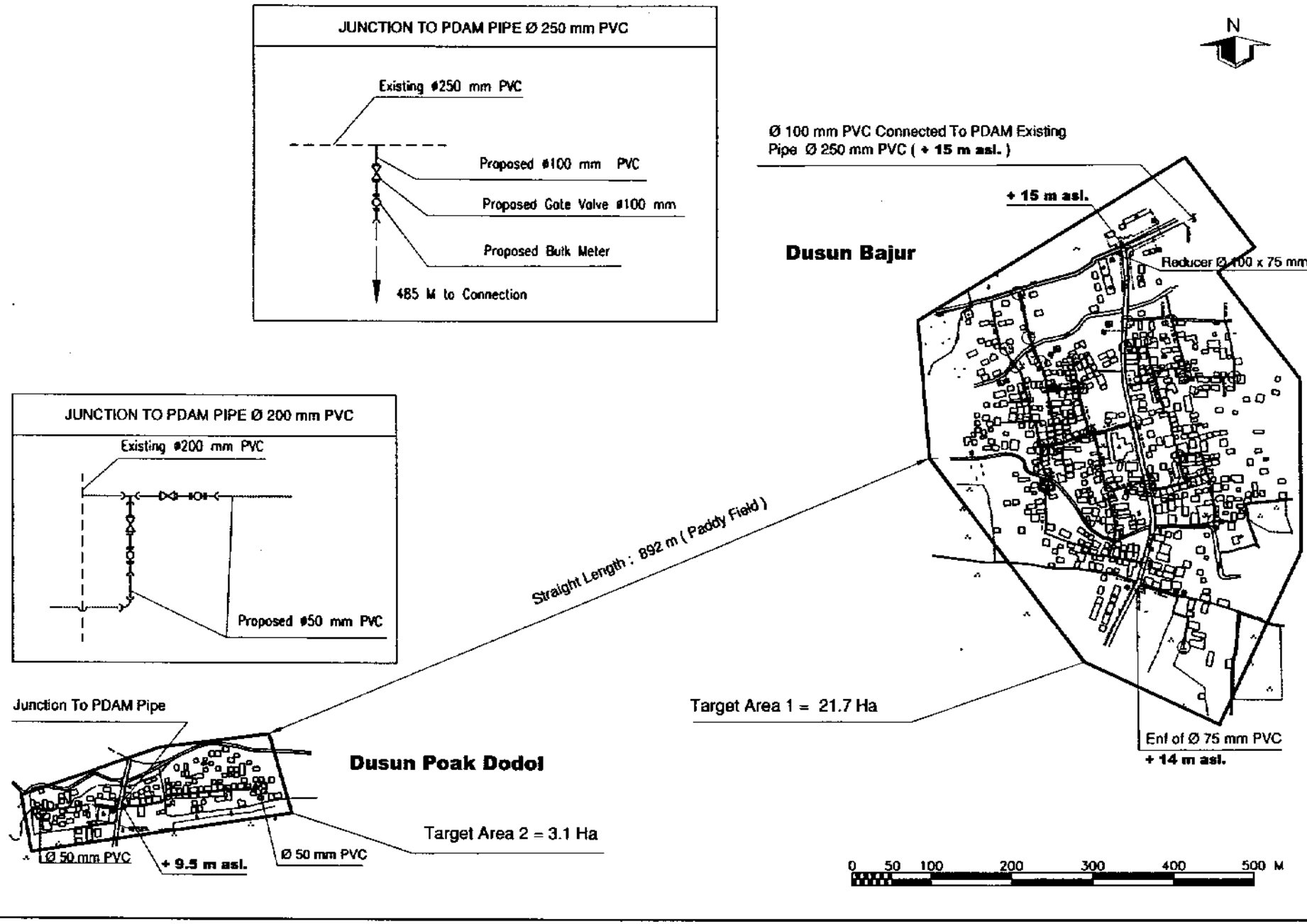
Figure A10 - 2 : Site Layout Drawing
BAJUR - (NTB#2)

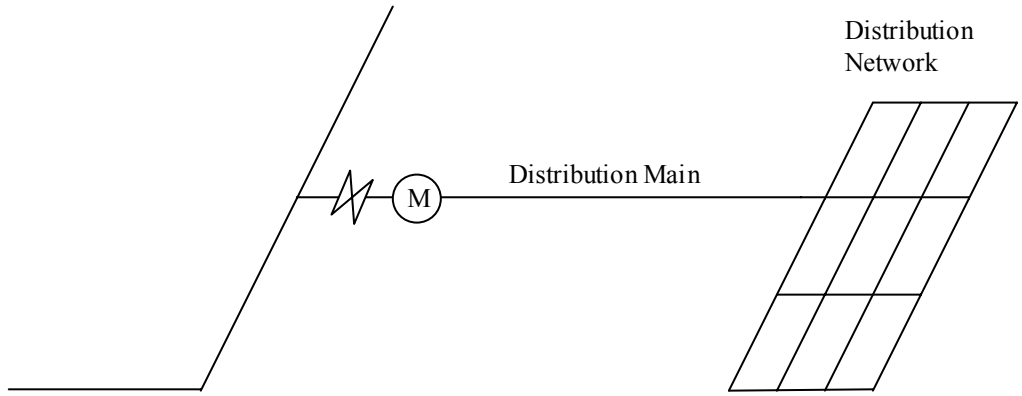


10.3 NTB #3 Sembung

Village: Sembung	Total village area:	164 Ha.
District: Lombok Barat	Total village population:	2,874
Area to be served by new and/or rehab. distribution:		16.2 Ha.
Population to be served by proposed JICA project:		2,099 (2001)
System capacity:		2.42 L/Sec

10.3.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



PDAM Distribution
Pipe ϕ 400 mm, PVC
(ϕ 150 mm flanged blow-off branch)

10.3.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	2,225
Population using PH:	70 % = 1,557 @ 30 l/c/d
Number of PH required:	12 @125 persons
Population using HC:	30 % = 668 @ 60 l/c/d
Average daily demand:	104.1 m^3 (including 20 % wastage)
Average hourly demand:	4.34 m^3
Maximum hourly demand:	8.68 m^3 (x 2.0)

10.3.3 Source

(1) Selected Source

Name/Location/Identification:	Treated water from PDAM Lombok Barat (150 mm blow-off branch of 400 mm PVC pipeline)		
Quality analysis:	Confirmed	Altitude:	50.0 m. asl
Available capacity:	174.2 L/Sec	Pressure:	N.A.

(2) Construction Work

Installation of tee (ϕ 150 × ϕ 150), reducer (ϕ 150 × ϕ 75), valve (ϕ 75) and bulk meter (ϕ 75) .

Rehabilitation of PDAM blow-off branch with additional gate valve (ϕ 150).

10.3.4 Pumping Facilities None

10.3.5 Pumping Main None

10.3.6 Storage None

10.3.7 Transmission Main None

10.3.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	500 m
Material:	PVC	Diameter:	75 mm
Roughness coefficient:	120	Head loss:	3.3 m
Laying:	Underground	Maximum flow:	2.4 L/Sec
Washouts:	None		
Air valves:	One (ϕ 13 mm), at river crossing		
Bulk meters:	One (ϕ 75 mm), at PDAM connection		
Stop valves:	Two (ϕ 75/150 mm), at PDAM connection		
River/stream crossings:	Two (ϕ 75 mm x 5 m each), underground (GSP)		

10.3.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	2,225	HC/PH split:	30/70 %
HC:	134 nos.	PH:	12 nos.
Public taps:	10		
Schools:	1	Mosques:	3
Health centers:	1	Total no. of PH:	17

(1) Existing Distribution Facilities

PDAM 40 mm dia. pipeline along the main road for about 300 m, will be incorporated into the new system.

(2) Proposed New Work Required

1) Description

Construction of 17 new PH and 10 public taps.

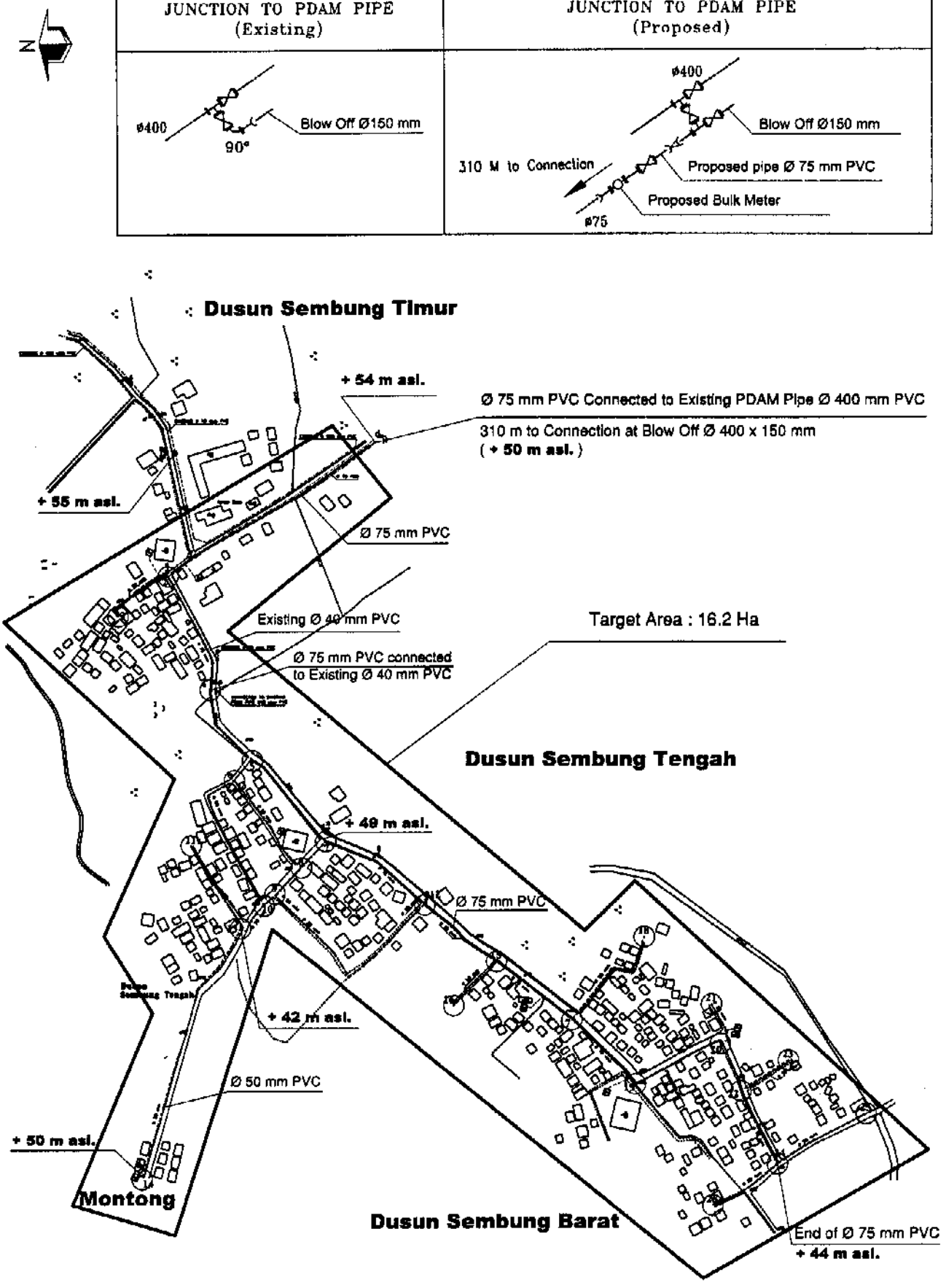
Installation of dia. 75 mm and 50 mm distribution pipelines as shown on the Site Layout Drawing.

25 mm service connections to HC, PH and public taps.

Service meter installation.

2) Material estimates

PVC Pipe:	75 mm	1,250 m	Service meters:	25 mm	161
	50 mm	1,140 m	Stop valves:	75 mm	1
GSP Pipe	25 mm	3,120 m		50 mm	7
				25 mm	161



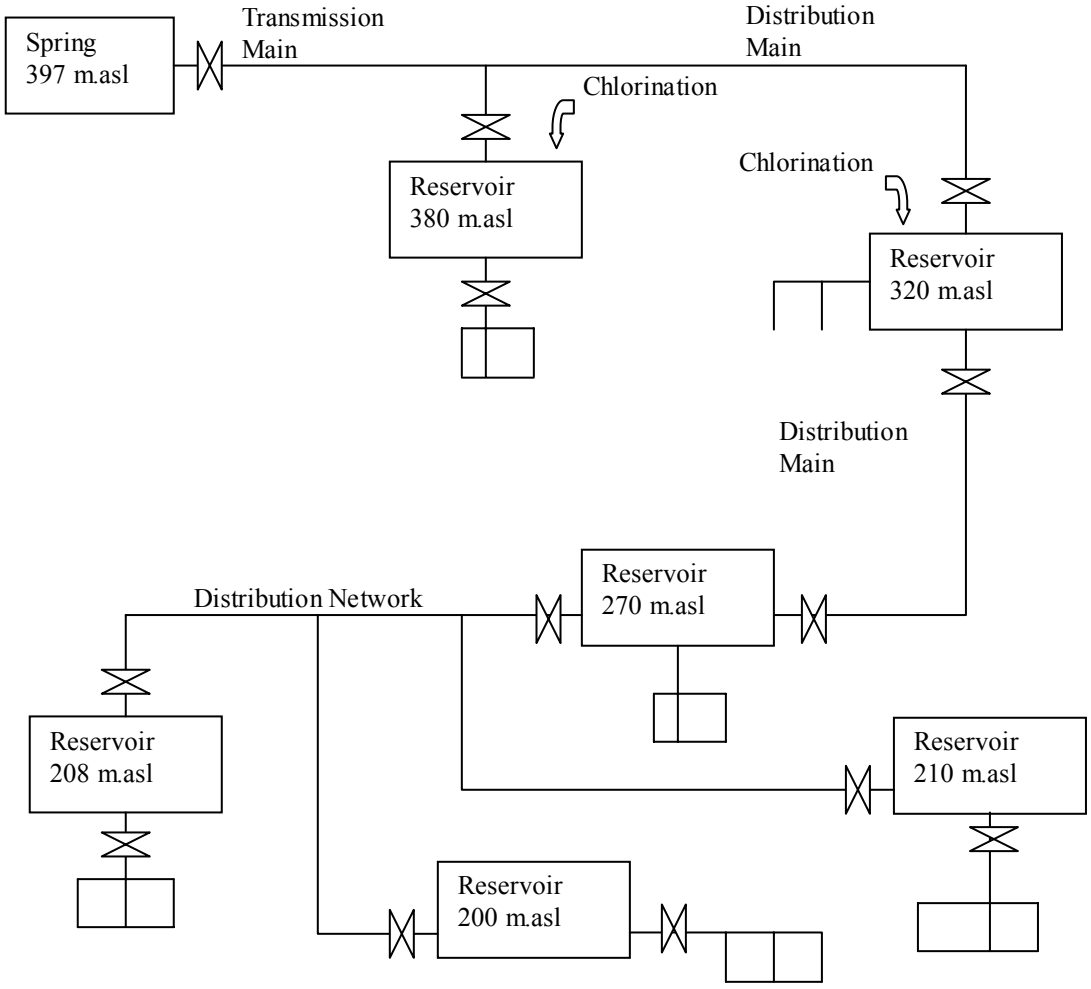
The Study on Rural Water Supply Project in Nusa Tenggara Barat and Nusa Tenggara Timur	Figure A10 - 3 : Site Layout Drawing
Japan International Cooperation Agency	SEMBUNG - (NTB#3)

10.4 NTB #4(a) Duman (Upper)

Village: Duman (Upper) Total village area: 1,400 Ha.
District: Lombok Barat Total village population: 3,225 (Upper Dusun)
Area to be served by new and/or rehab. distribution: 26.0 Ha.
Population to be served by proposed JICA project: 2,903 (2001)
System capacity: 3.08 L/Sec

10.4.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.4.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	3,078
Population using PH:	80 % = 2,462 @ 30 l/c/d
Number of PH required:	20 @ 125 persons
Population using HC:	20 % = 616 @ 60 l/c/d
Average daily demand:	133.0 m^3 (including 20 % wastage)
Average hourly demand:	5.54 m^3
Maximum hourly demand:	11.08 m^3 (x 2.0)

10.4.3 Source

(1) Selected Source

Name/Location/Identification:	M.A Kokoh Bukit Trawasan (Upper)		
Quality Analysis:	Confirmed	Altitude:	397 m. asl
Available Capacity:	4.0 L/Sec	Pressure:	N.A.

(2) Construction Work

Build a new covered broncaptering

(Higher than the old existing broncaptering)

10.4.4 Pumping Facilities None

10.4.5 Pumping Main None

10.4.6 Storage

Name	Capacity	Altitude	Inlet/Outlet dia.
Kebun Baru	15 m^3	380 m.asl	50/50 mm
Awang Upper	6 m^3	320 m.asl	50/50 mm
Awang Madya	10 m^3	270 m.asl	50/50 mm
Montong Galur	4 m^3	210 m.asl	25/25 mm
Duman Utara	6 m^3	200 m.asl	25/25 mm
Leong	6 m^3	208 m.asl	50/50 mm
Total	47 m^3		

Material: All reinforced concrete

Inlet:	Stop valves	4 (ϕ 50 mm)	Outlet:	Stop valves	4 (ϕ 50 mm)
		2 (ϕ 25 mm)			2 (ϕ 25 mm)
	Float valves	4 (ϕ 50 mm)			
		2 (ϕ 25 mm)			
Washout:	6 (ϕ25 mm)		Access:	Village road	

10.4.7 Transmission Main

Routing:	See Site Layout Drawing attached.		
Diameter:	ϕ 75 mm	Length:	1,650 m
Diameter:	ϕ 50 mm	Length:	125 m
Material:	GSP		
Roughness Coefficient:	100	Head loss:	9.3 m
Laying:	Buried and above ground	Maximum flow:	1.54 L/Sec
Washouts:	2 (ϕ 75 mm)	Air valves:	3(ϕ13 mm)
Bulk meters:	None		
Stop valves:	1 (ϕ 75 mm), at spring site		
River/stream crossings:	One (ϕ 75 mm x 10 m)		

10.4.8 Distribution Main

Routing:	See Site Layout Drawing. (Dusun Kebun Baru to Awang Madya reservoir)		
Diameter:	ϕ 50 mm	Length:	1,530 m
Material:	PVC		
Roughness Coefficient:	120	Head loss:	83.6 m
Laying:	Buried	Maximum flow:	2.61 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	None	Stop valves:	None
River/stream crossings:	None		

10.4.9 Distribution Network

Target Area:	See Site Layout Drawing		
2011 Design population:	3,078	HC/PH split:	20/80 %
HC:	123 nos.	PH:	20 nos.
Schools:	3	Mosques:	7
Health centers:	1	Temple:	2
Total no. of PH:	33	Public taps:	10

(1) Existing Distribution Facilities

Many small system exist, small diameter pipelines everywhere.

Some tanks maybe reusable, but basically all should be abandoned.

(2) Proposed New Work Required

1) Description

Construct 33 new PH and 10 public taps.

Install dia. 50 mm and 25 mm distribution lines in areas shown on the Site Layout Drawing.

Provide 25 mm GSP service connections to HC, PH and public taps.

2) Material estimates

PVC Pipe:	50 mm	1,670 m	Service meters:	None	
GSP Pipe:	25 mm	5,970 m	Stop valves:	50 mm	12
		(2,750 m + 3,220 m)		25 mm	166

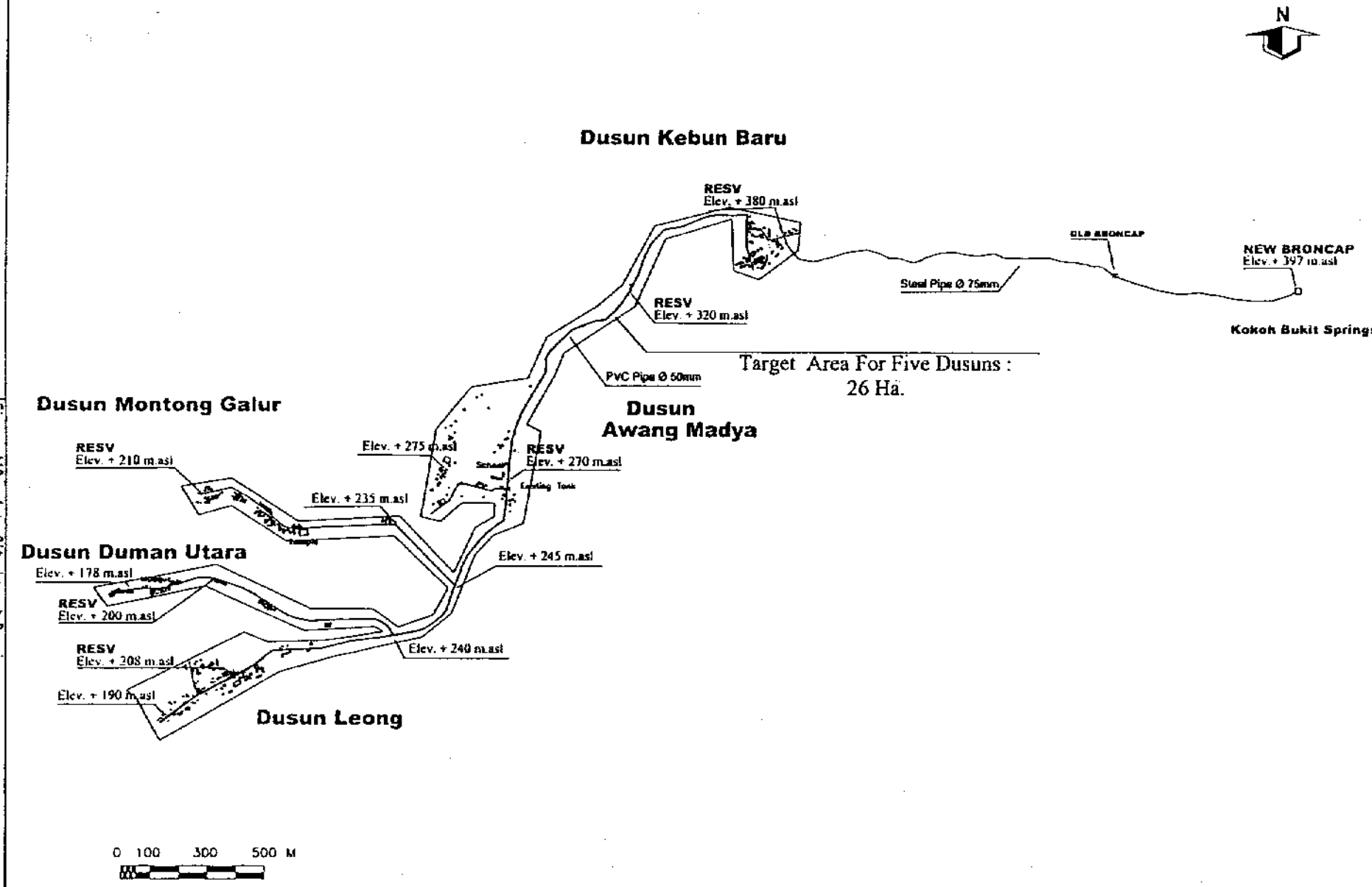


Figure A10 - 4 : Site Layout Drawing

DUMAN (UPPER) - (NTB#4)

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Japan International Cooperation Agency

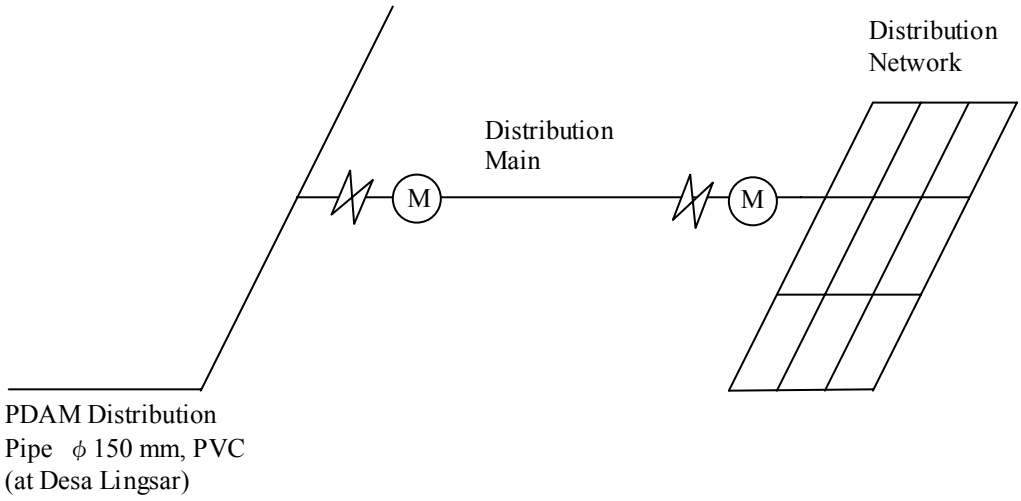
10.5 NTB #4(b) Duman (Lower)

Village:	Duman (Lower)	Total village area:	1,400 Ha.
District:	Lombok Barat	Total village population:	2,019(Lower Dusun)

Area to be served by new and/or rehab. distribution: 48.4 Ha.
Population to be served by proposed JICA project: 1,817 (2001)
System capacity: 2.08 L/Sec

10.5.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.5.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	1,926
Population using PH:	70 % = 1,348 @ 30 l/c/d
Number of PH required:	11 @ 125 persons
Population using HC:	30 % = 578 @ 60 l/c/d
Average daily demand:	90.1 m^3 (including 20 % wastage)
Average hourly demand:	3.76 m^3
Maximum hourly demand:	7.52 m^3 (x 2.0)

10.5.3 Source

(1) Selected Source

Name/Location/Identification:	Treated water from PDAM Lombok Barat (150 mm PVC pipeline at Desa Lingsar)		
Quality analysis:	Confirmed	Altitude:	70.0 m. asl
Available capacity:	N.A.	Pressure:	4.3 kg/cm^2

(2) Construction Work

Installation of tee branch (ϕ 150 × ϕ 100), valve (ϕ 100) and bulk meter (ϕ 100) at PDAM connection.

Method of connection requires further discussion with PDAM Technical Division.

10.5.4 Pumping Facilities None

10.5.5 Pumping Main None

10.5.6 Storage None

10.5.7 Transmission Main None

10.5.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	1,670 m
Material:	PVC/GSP	Diameter:	100 mm
Roughness coefficient:	120/100	Head loss:	2.1 m
Laying:	Underground	Maximum flow:	2.1 L/Sec
Washouts:	One, at river crossing	Air valves:	Two (ϕ 13 mm)

Bulk meters: ϕ 100 mm x 2 nos. (at PDAM connection and village boundary)

Stop valves: ϕ 100 mm x 2 nos. (at PDAM connection and village boundary)

River/stream crossings: Four (ϕ 100 x 6 m x 2 nos., underground, GSP)
(ϕ 100 x 26 m x 1 no., hung on the bridge, GSP)
(ϕ 100 x 20 m x 1 no., hung on the bridge, GSP)

10.5.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	1,926	HC/PH split:	30/70 %
HC:	116 nos.	PH:	11 nos.
Public taps:	10		
Schools:	2	Mosques:	4
Health centers:	1	Total no. of PH:	18

(1) Existing Distribution Facilities None

(2) Proposed New Work Required

1) Description

Construction of 18 new PH and 10 public taps.

Installation of dia. 75 mm and 50 mm distribution pipelines as shown on the Site Layout Drawing.

Installation of 25 mm GSP service connections to HC, PH and public taps.

2) Material estimates

PVC Pipe:	100 mm	230 m	Service meters:	25 mm	144
	75 mm	2,110 m	Stop valves:	75 mm	4
	50 mm	2,700 m		50 mm	15
GSP Pipe	25 mm	2,780 m		25 mm	144

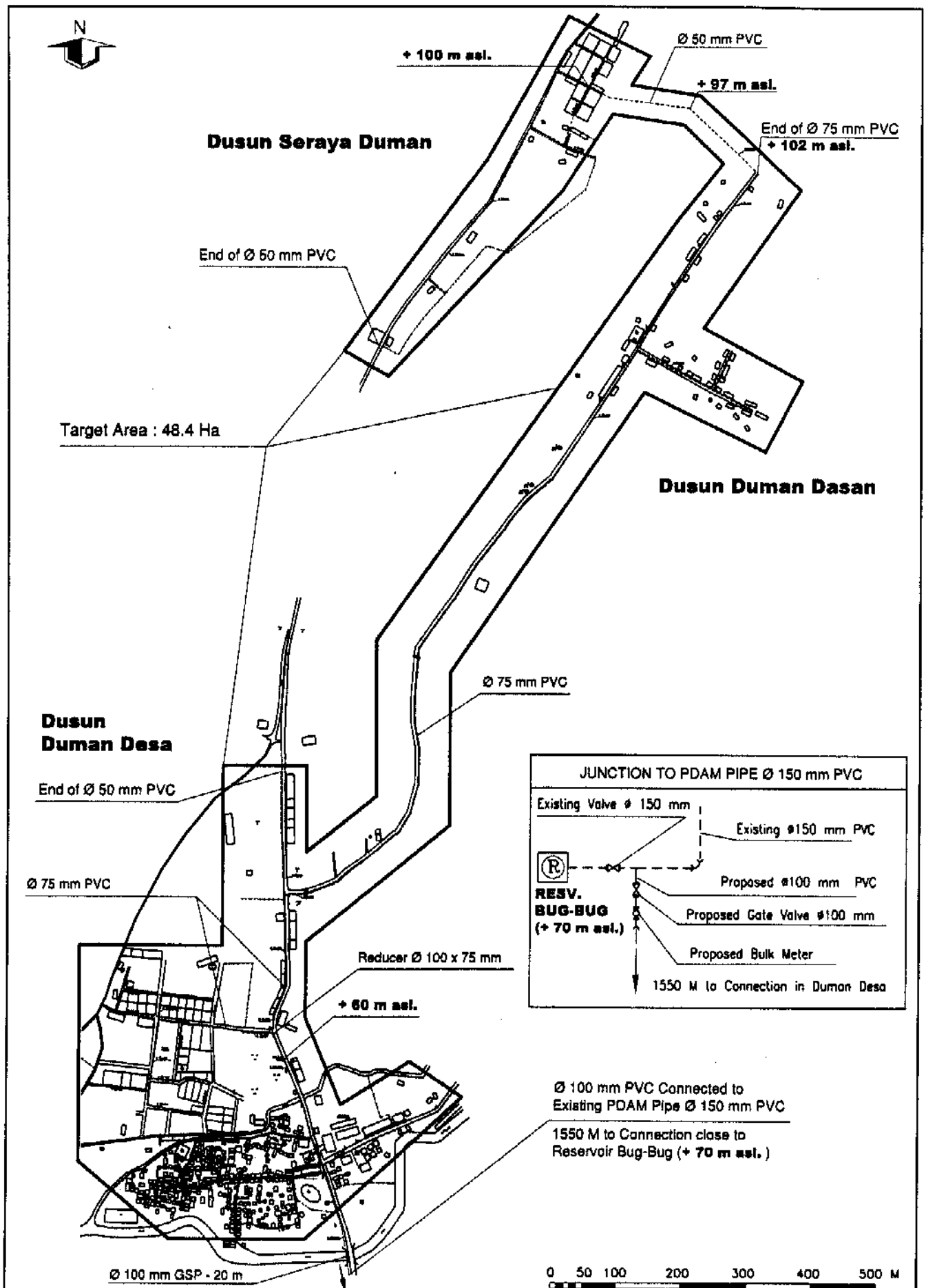


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Figure A10 - 5 : Site Layout Drawing

DUMAN (LOWER) - (NTB#4)

10.6 NTB #10 Bagik Papan

Village: Bagik Papan — Total village area: 900 Ha.

District: Lombok Timur — Total village population: 8,975

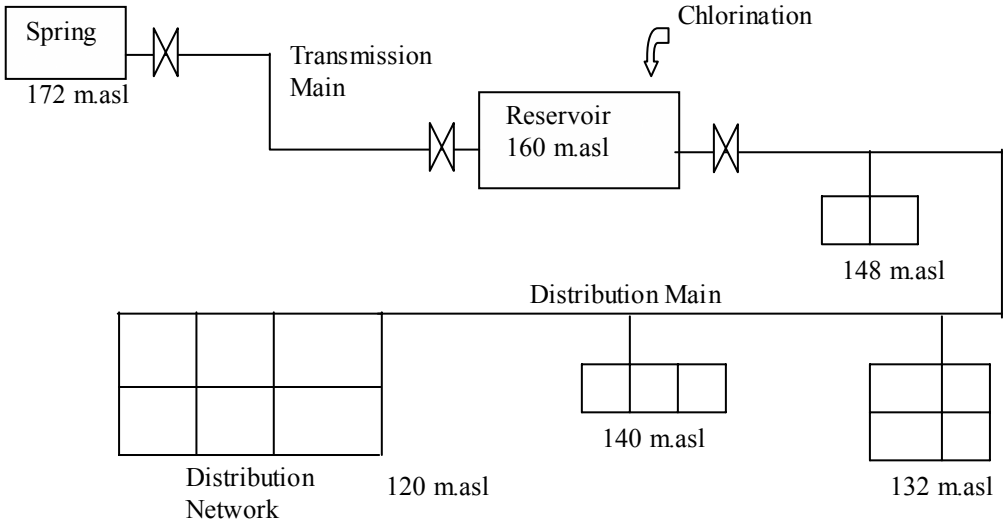
Area to be served by new and/or rehab. distribution: 19.0 Ha.

Population to be served by proposed JICA project: 2,974 (2001)

System capacity: 3.18 L/Sec

10.6.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.6.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	3,182
Population using PH:	80 % = 2,546 @ 30 l/c/d
Number of PH required:	20 @ 125 persons
Population using HC:	20 % = 636 @ 60 l/c/d
Average daily demand:	137.5 m^3 (including 20 % wastage)
Average hourly demand:	5.73 m^3
Maximum hourly demand:	11.46 m^3 (x 2.0)

10.6.3 Source

(1) Selected Source

Name/Location/Identification:	M.A. Balas I		
Quality Analysis:	Confirmed	Altitude:	172 m. asl
Available Capacity:	5.0 L/Sec	Pressure:	N.A.

(2) Construction Work

Build a new broncaptering to capture many arisings of the spring, about 500 m upstream of the old AusAID source.

10.6.4 Pumping Facilities None

10.6.5 Pumping Main None

10.6.6 Storage

Location:	Dusun Dasanimba, adjacent to the existing tank.		
Altitude:	160 m.asl	Capacity:	30 m^3
Material:	Reinforced concrete		
Inlet:	Dia. 75 mm	Outlet:	Dia. 75 mm
Washout:	Dia. 75 mm	Access:	Village road
Overflow:	No float valve		

10.6.7 Transmission Main

The existing 75 mm and 50 mm CARE Australia transmission main has been flow-tested. Leakage is minimal and the line is reusable with minor repairs.

Rebuild irrigation canal crossing, GSP 75 mm x 35 m.

Replace existing PVC 50 mm x 200 m with GSP 75 mm x 200 m near the top Dusun.

Extend the pipeline to the new broncaptering, GSP, 75 mm x 500 m.

Main stop valve should be provided at the broncaptering.

Routing:	See Site Layout Drawings	Length:	735 m (New)
Material:	GSP	Diameter:	75 mm
Roughness Coefficient:	100		
Head loss:	7.5 m (for whole main, ϕ 75 mm x 1,750m)		
Laying:	Underground and partly surface laying		
Maximum flow:	1.6 L/Sec		
Washouts:	1 (ϕ 50 mm)	Air valves:	2 (ϕ 13 mm)
Bulk meters:	None	Stop valves:	2 (ϕ 75 mm)
			1 (ϕ 50 mm)
River/canal crossings:	1 (GSP ϕ 75 mm x 35 m)		

10.6.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	1,700 m
Material:	PVC	Diameter:	75 mm
Roughness coefficient:	120	Head loss:	18.8 m
Laying:	Underground	Maximum flow:	3.2 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	None		
Stop valves:	1 (ϕ 75 mm)		
River/stream crossings:	None		

10.6.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	3,182	HC/PH split:	20/80 %
HC:	127 nos.	PH:	20 nos.
Schools:	1	Mosques:	8
Health centers:	1	Total no. of PH:	30
Public taps:	5		

(1) Existing Distribution Facilities

The reinforced concrete tank in Dusun Dasanimba is still in use and serviceable. Some other tanks and public hydrants, presently abandoned, can be incorporated into the new system but all existing pipe-work should be replaced.

(2) Proposed New Work Required

1) Description

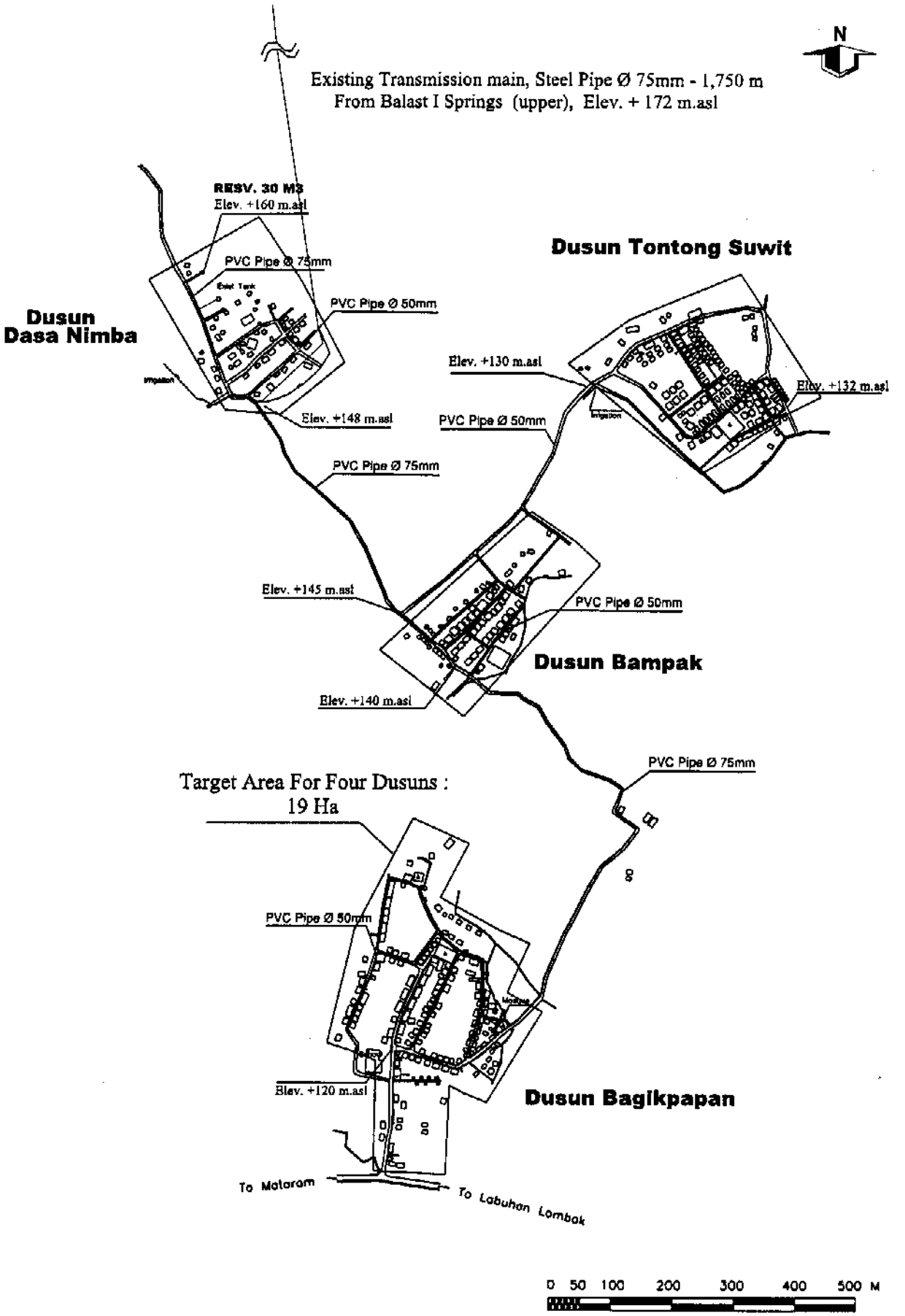
Construct 25 new public hydrants and 5 public taps.

Install dia. 50 mm distribution pipelines as shown on the Site Layout Drawing.

Install dia. 25 mm GSP service connections to HC, PH and public taps.

2) Material estimates

PVC Pipe:	50 mm	3,175 m	Service meters:	None	
GSP Pipe:	25 mm	3,190 m	Stop valves:	50 mm	11
				25 mm	162



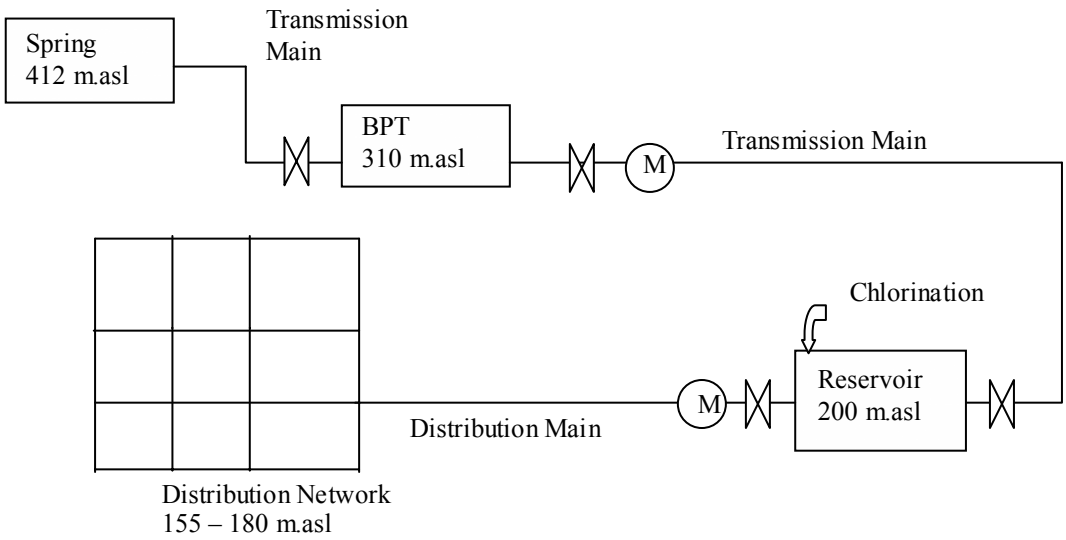
The Study on Rural Water Supply Project in Nusa Tenggara Barat and Nusa Tenggara Timur	Figure A10 - 6 : Site Layout Drawing
Japan International Cooperation Agency	BAGIKPAPAN - (NTB # 10)

10.7 NTB #11 Selaparang

Village:	Selaparang	Total village area:	800 Ha.
District:	Lombok Timur	Total village population:	3,566
Area to be served by new and/or rehab. distribution:			14.5 Ha.
Population to be served by proposed JICA project:			3,209 (2001)
System capacity:			5.14 L/Sec

10.7.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.7.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	3,433
Population using PH:	20 % = 687 @ 30 l/c/d
Number of PH required:	5 @ 125 persons
Population using HC:	80 % = 2,746 @ 60 l/c/d
Average daily demand:	222.4 m^3
Average hourly demand:	9.27 m^3
Maximum hourly demand:	18.54 m^3 (x 2.0)

10.7.3 Source

(1) Selected Source

Name/Location/Identification:	MA. Lemor in Desa Swela		
Quality Analysis:	Confirmed	Altitude:	412 m.asl
Available Capacity:	350 L/Sec	Pressure:	N.A.

(2) Construction Work None

10.7.4 Pumping Facilities None

10.7.5 Pumping Main None

10.7.6 Storage

(1) New BPT

Location:	On PDAM site (Adjacent to existing Storage)		
Altitude:	310 m.asl	Capacity:	24 m^3
Material:	Reinforced concrete		
Inlet:	GSP ϕ 150 mm	Outlet:	GSP ϕ 100 mm
Stop valves:	1 (ϕ 150 mm) 1 (ϕ 100 mm)		
Washout:	1 (ϕ 100 mm)	Access:	Main road
Overflow:	ϕ 150 mm, transfer to existing PDAM BPT.		

(2) Village Reservoir

Location:	550 m north of Selaparang Health Center		
Altitude:	200 m.asl	Capacity:	60 m^3
Material:	Reinforced concrete		
Inlet:	GSP ϕ 75 mm	Outlet:	GSP ϕ 100 mm
Stop valves:	1 (ϕ 75 mm)	Float valves:	1 (ϕ 50 mm) 1 (ϕ 100 mm)
Washout:	1 (ϕ 100 mm)	Access:	Public road

10.7.7 Transmission Main None

(1) From Node Point (existing) to New BPT:

GSP ϕ 150 mm x 800 m (Parallel pipe)

(2) From New BPT to Village Resirvoir:

GSP ϕ 100 mm x 690 m

GSP ϕ 75 mm x 2,500 m

Routing:	See Site Layout Drawings	Length:	3,190 m
Material:	GSP	Diameter:	100/75 mm
Roughness Coefficient:	100	Head loss:	27.7 m
Laying:	Buried	Maximum flow:	2.57 L/Sec
Washouts:	1 (ϕ 100 mm)	Air valves:	2(ϕ13 mm)
	1 (ϕ 75 mm)		
Bulk meters:	1 (ϕ 100 mm)		
Stop valves:	1 (ϕ 100 mm)		
	3 (ϕ 75 mm)		
River/stream crossings:	1 (GSP ϕ 100 mm x 100 m)		

10.7.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	550 m
Material:	PVC	Diameter:	100 mm
Roughness coefficient:	120	Head loss:	5.1 m
Laying:	Underground	Maximum flow:	5.14 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	One (ϕ 100 mm)		
River/stream crossings:	None		

10.7.9 Distribution Network

Target Area:	See Site Layout Drawing attached.		
2011 Design population:	3,433	HC/PH split:	80/20 %
HC:	549 nos.	PH:	5 nos.
Schools:	2	Mosques:	6
Health centers:	1	Tourist resort:	1
Total no. of PH:	15	Public taps:	10

(1) Existing Distribution Facilities

Very little worth serving. For planning purposes assume all existing facilities abandoned.

(2) Proposed New Work Required

1) Description

Reconstruction and extension of existing network.

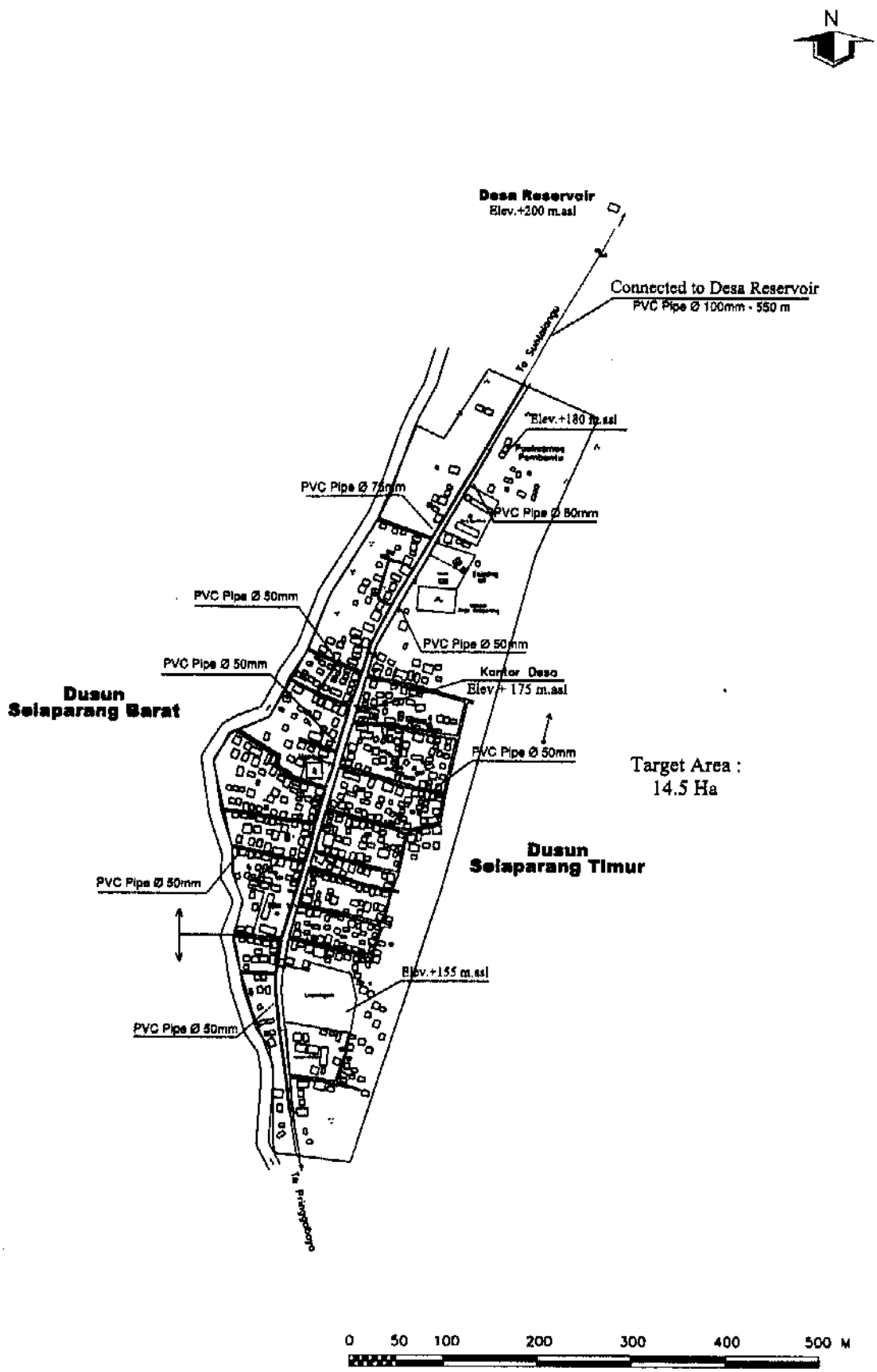
Construct 15 new PH and 10 public taps.

Install 75mm and 50mm distribution lines in the area shown on the Site Layout Drawing.

Install 25 mm service lines to PH, HC and public taps.

2) Material estimates

GSP Pipe:	75 mm	420 m	Service meters:	25 mm	574
	50 mm	1,820 m	Stop valves:	75 mm	1
	25 mm	11,380 m		50 mm	6
				25 mm	574



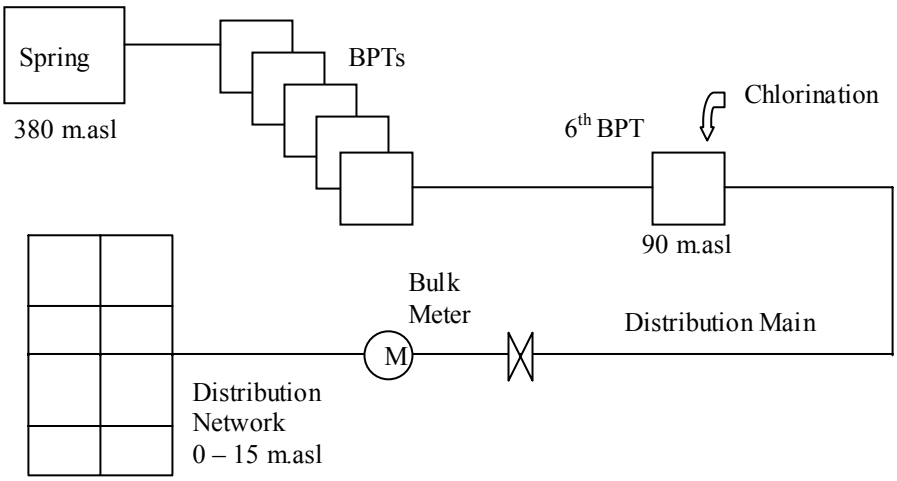
The Study on Rural Water Supply Project In Nusa Tenggara Barat and Nusa Tenggara Timur	Figure A10 - 7 : Site Layout Frawing SELAPARANG - (NTB # 11)
Japan International Cooperation Agency	

10.8 NTB #13 Labuhan Mapin

Village:	Labuhan Mapin	Total village area:	2,369 Ha.
District:	Sumbawa	Total village population:	5,021
Area to be served by new and/or rehab. distribution:			29.3 Ha.
Population to be served by proposed JICA project:			3,119 (2001)
System capacity:			5.20 L/Sec

10.8.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.8.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	3,570
Population using PH:	25 % = 892 @ 30 l/c/d
Number of PH required:	7 @ 125 persons
Population using HC:	75 % = 2,678 @ 60 l/c/d
Average daily demand:	224.9 m^3 (including 20 % wastage)
Average hourly demand:	9.37 m^3
Maximum hourly demand:	18.74 m^3 (x 2.0)

10.8.3 Source

(1) Selected Source

Name/Location/Identification:	M.A. Remas		
Quality analysis:	Confirmed	Altitude:	380 m. asl
Total capacity:	11.0 L/Sec	Pressure:	N.A.

(2) Construction Work

PDAM Sumbawa has already reconstructed the broncaptering of M.A. Remas.

10.8.4 Pumping Facilities None

10.8.5 Pumping Main None

10.8.6 Storage None

10.8.7 Transmission Main None

10.8.8 Distribution Main

The existing distribution main from the sixth BPT to the service area is PVC about 5 km in length, 150 mm in diameter, and in good condition. During the Team's Survey, the flow was measured at the outlet of the BPT and at the beginning of the service area, no significant leakage was apparent.

10.8.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	3,570	HC/PH split:	75/25 %
HC:	536 nos. (including 90 nos. of existing HC)		
PH:	7 nos.		
Public taps:	None		
Schools:	1	Mosques:	4
Health centers:	1	Total no. of PH:	13

(1) Existing Distribution Facilities

The existing PVC distribution pipelines, ranging from 13mm to 75 mm in diameter, are serviceable. There are 120 metered HC and 6 metered PH in the service area. It should be assumed the house connections and the public hydrant are reusable but 25 % of the existing meters should be replaced.

(2) Proposed New Work Required

1) Description

Construct 7 new PH.

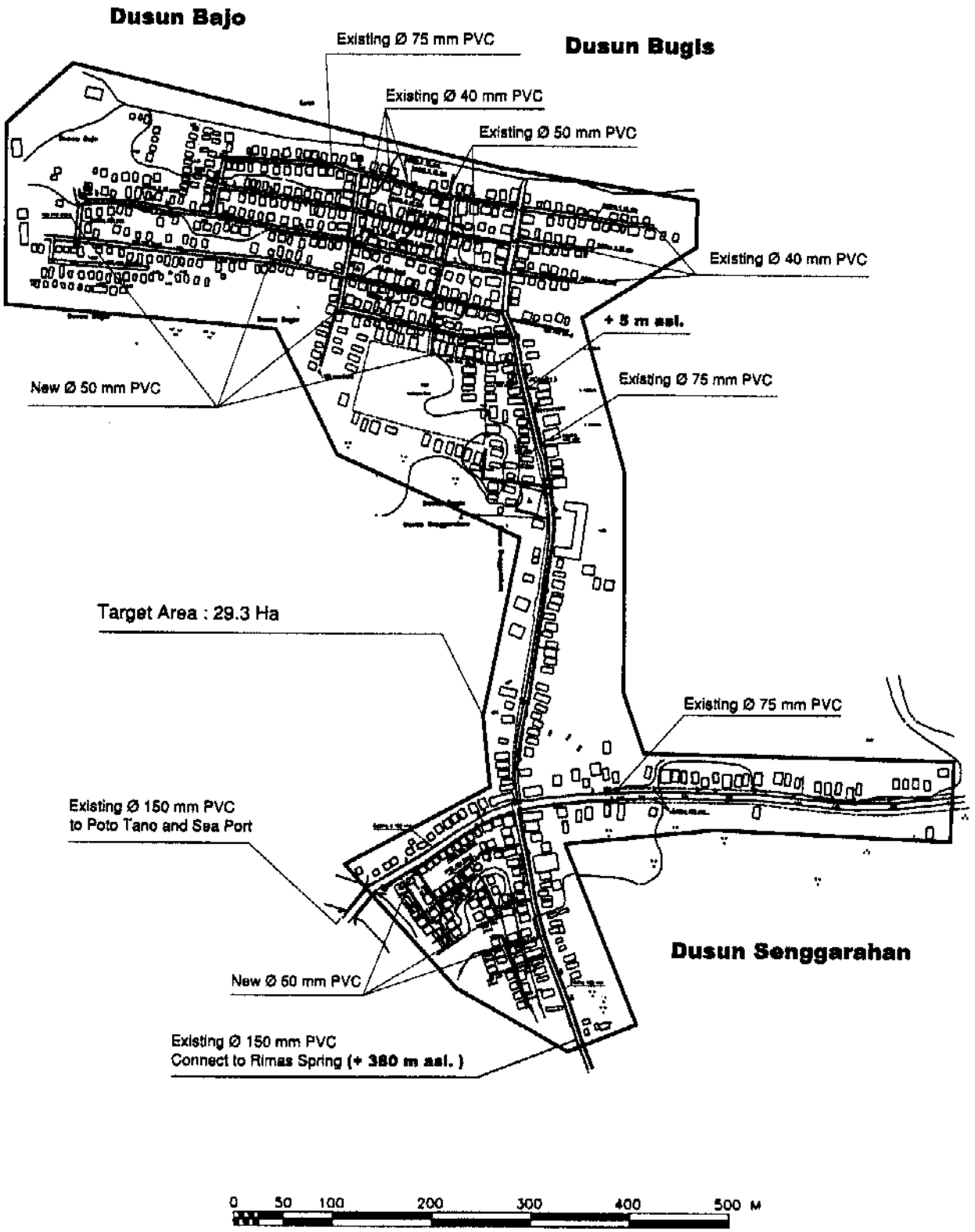
Installation of new 75/50 mm distribution pipelines in the area shown on the Site Layout Drawing.

Replacement of public hydrant fittings and service meters.

25 mm service connections to new PH and HC

2) Material estimates

PVC Pipe:	50 mm	1,810 m	Service meters:	25 mm:	454
GSP Pipe	25 mm	8,460 m	Stop valves:	50 mm:	12
				25 mm:	454



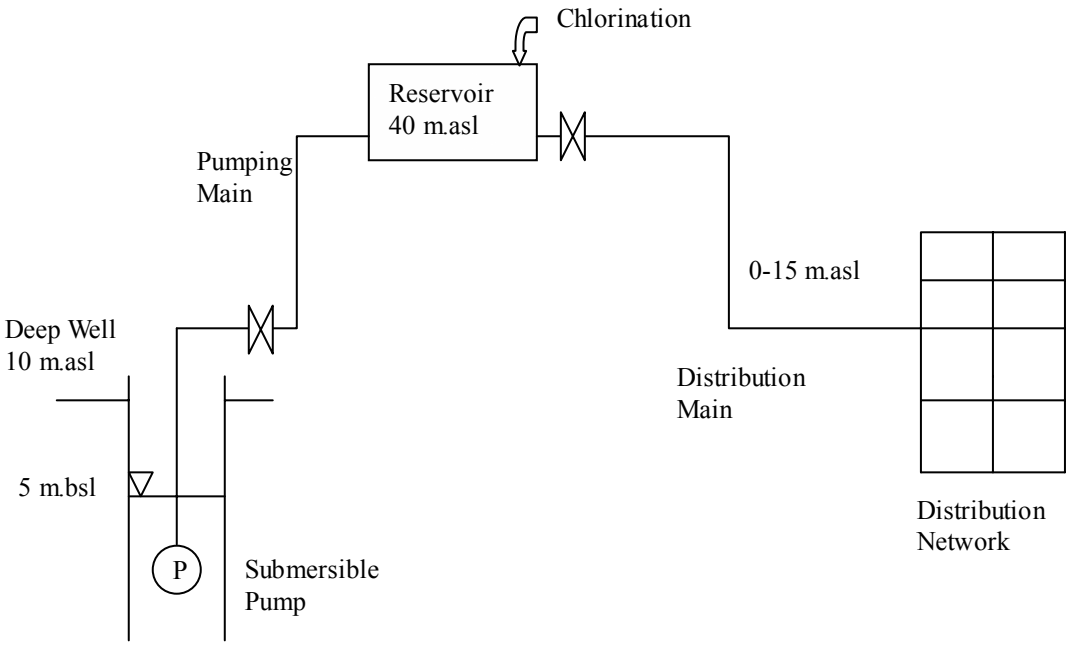
The Study on Rural Water Supply Project in Nusa Tenggara Barat and Nusa Tenggara Timur	Figure A10 - 8 : Site Layout Drawing
Japan International Cooperation Agency	LABUHAN MAPIN - (NTB#13)

10.9 NTB #14 Labuhan Lalar

Village:	Labuhan Lalar	Total village area:	3,079 Ha.
District:	Sumbawa	Total village population:	3,656
Area to be served by new and/or rehab. distribution:			41.8 Ha.
Population to be served by proposed JICA project:			2,740 (2001)
System capacity:			3.40 L/Sec

10.9.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.9.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	3,136
Population using PH:	70 % = 2,195 @ 30 l/c/d
Number of PH required:	18 @ 125 persons
Population using HC:	30 % = 941 @ 60 l/c/d
Average daily demand:	146.8 m^3 (including 20 % wastage)
Average hourly demand:	6.12 m^3
Maximum hourly demand:	12.24 m^3 (x 2.0)

10.9.3 Source

(1) Selected Source

Name/Location/Identification:	New JICA deep well at Dusun Liang		
Quality analysis:	Confirmed	Altitude:	10 m. asl
Available capacity:	3.5 L/Sec	Pressure:	N.A.

(2) Construction Work

Develop JICA test borehole to a production well.

Construct a pump station and guard house, in a fenced compound, which includes the borehole.

Arrange connection to PLN.

10.9.4 Pumping Facilities

(1) Calculations

Basic 12 hour pumping rate:	3.5 L/Sec
Distance to first "break-pressure" point:	320 m
Drawdown below ground level:	15 m
Altitude differential to first "break-pressure" point:	30 m
Head losses:	5 m
Pumping head to first "break-pressure" point:	50 m

(2) Pump Selection

Quantity:	One		
Type:	Electric submersible (PLN power connection)		
Rated capacity:	210 L/min x 50 m x 4.0 kW		
Inlet:	N.A.	Outlet:	Dia. 75 mm

10.9.5 Pumping Main

Routing:	See Site Layout Drawing.	Length:	320 m
Material:	GSP	Diameter:	100 mm
Roughness coefficient:	100	Head loss:	1.4 m
Laying:	Underground	Maximum flow:	3.5 L/Sec
Washouts:	One (ϕ 100 mm), at pump site		
Air valves:	None	Bulk meters:	None
Stop valves:	One (ϕ 100 mm), at pump site		
River/stream crossings:	One (ϕ 100 mm x 8 m, GSP)		

10.9.6 Storage

Description:	Ground level reinforced concrete reservoir in a fenced compound.		
Location:	Halfway up the hill on the South of residential area of Dusun Liang. (See Site Layout Drawing.)		
Altitude:	40 m.asl	Capacity:	40 m^3
Inlet:	Dia. 100 mm	Outlet:	Dia. 100 mm
Washout:	Dia. 50 mm	Access:	Mountain path
Overflow:	No float valve		

10.9.7 Transmission Main None

10.9.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	2,480 m
Material:	PVC	Diameter:	100 mm
Roughness coefficient:	120	Head loss:	7.6 m
Laying:	Underground	Residual head:	12 m
Washouts:	None	Maximum flow:	3.4 L/Sec
Air valves:	Five (13 mm), at river crossings		
Bulk meters:	None		
Stop valves:	One (100 mm), at storage site		
River/stream crossings:	Five: GSP, hung on bridge (100 mm x 10 m x 2 nos., 100 mm x 12 m x 1 no., 100 mm x 20 m x 1 no., 100 mm x 25 m x 1 no.)		

10.9.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	3,136	HC/PH split:	30/70 %
HC:	188 nos.	PH:	18 nos.
Public taps:	5		
Schools:	2	Mosques:	3
Health centers:	1	Total no. of PH:	24

(1) Existing Distribution Facilities None

(2) Proposed New Work Required

1) Description

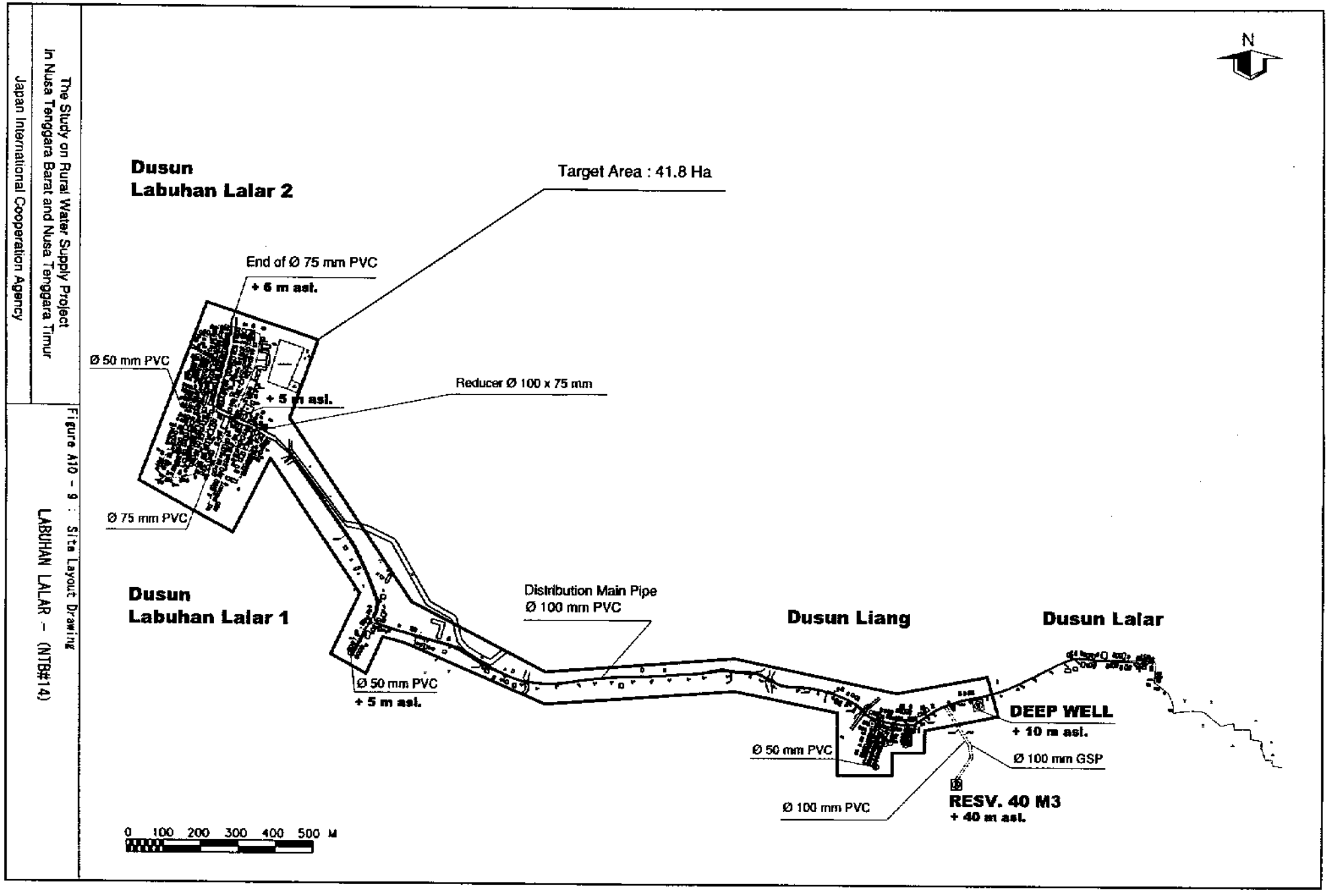
Construct 24 new PH and 5 public taps.

Dia. 75 and 50 mm distribution pipelines as shown on the Site Layout Drawing.

25 mm GSP service connections to HC, PH and public taps.

2) Material estimates

PVC Pipe:	75 mm	1,350 m	Service meters:	None	
	50 mm	2,720 m	Stop valves:	75 mm:	5
GSP Pipe:	25 mm	4,290 m		50 mm:	7
				25 mm:	217

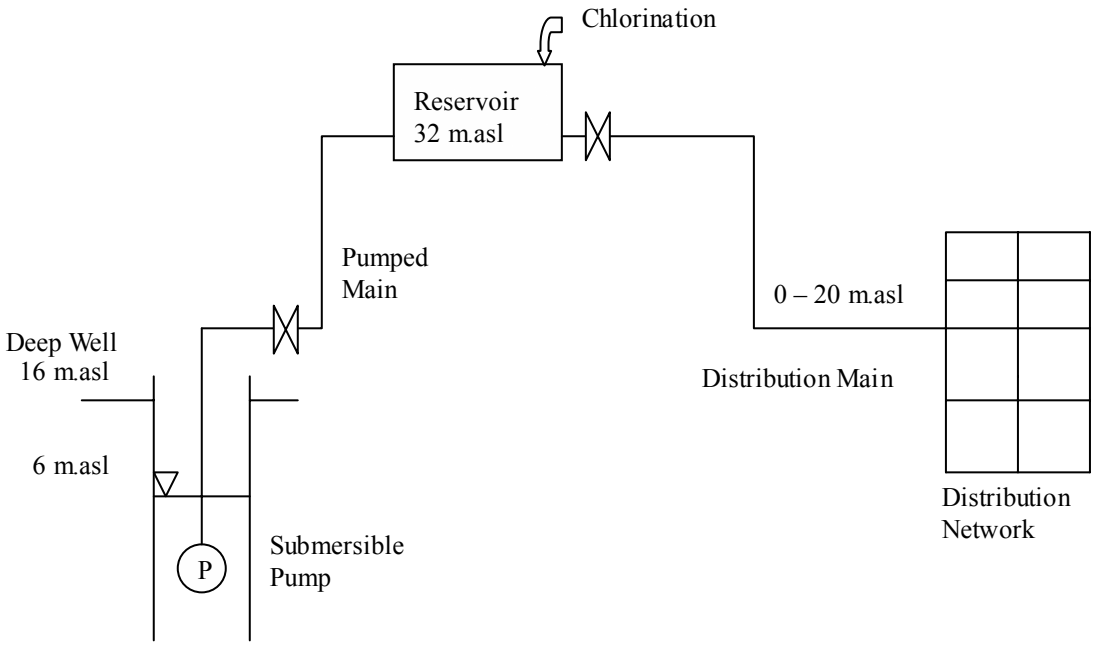

The Study on Rural Water Supply Project
In Nusa Tenggara Barat and Nusa Tenggara Timur
Japan International Cooperation Agency
Figure A10 - 9 : Site Layout Drawing
LABUHAN LALAR - (NTB#14)
N
Dusun
Labuhan Lalar 2
Target Area : 41.8 Ha
End of Ø 75 mm PVC
+ 6 m asl.
Ø 50 mm PVC
+ 5 m asl.
Reducer Ø 100 x 75 mm
Ø 75 mm PVC
Dusun
Labuhan Lalar 1
Distribution Main Pipe
Ø 100 mm PVC
Dusun Liang
Dusun Lalar
Ø 50 mm PVC
+ 5 m asl.
DEEP WELL
+ 10 m asl.
Ø 50 mm PVC
Ø 100 mm GSP
Ø 100 mm PVC
RESV. 40 M3
+ 40 m asl.
0 100 200 300 400 500 M

10.10 NTB #16 Piong

Village:	Piong	Total village area:	36,600 Ha.
District:	Bima	Total village population:	1,708
Area to be served by new and/or rehab. distribution:			18.6 Ha.
Population to be served by proposed JICA project:			1,537 (2001)
System capacity:			1.94 L/Sec

10.10.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.10.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	1,662
Population using PH:	60 % = 997 @ 30 l/c/d
Number of PH required:	8 @ 125 persons
Population using HC:	40 % = 665 @ 60 l/c/d
Average daily demand:	83.8 m^3 (including 20 % wastage)
Average hourly demand:	3.49 m^3
Maximum hourly demand:	6.98 m^3 (x 2.0)

10.10.3 Source

(1) Selected Source

Name/Location/Identification:	New deep well development at the corner of the playground in the village. (See Site Layout Drawing.)		
Quality analysis:	Assumed	Altitude:	16 m. asl
Available capacity:	2.0 L/Sec	Pressure:	N.A.

(2) Construction Work

Construct a new production well: dia. 150 mm x depth 60 m

Built a pump station, guard house, in a fenced compound which includes the borehole.

Arrange connection to PLN.

10.10.4 Pumping Facilities

(1) Calculations

Basic 12 hour pumping rate:	2.0 L/Sec
Distance to first "break-pressure" point:	360 m
Drawdown below ground level:	10 m
Altitude differential to first "break-pressure" point:	16 m
Head losses:	9 m
Pumping head to first "break-pressure" point:	35 m

(2) Pump Selection

Quantity:	One		
Type:	Electric submersible (PLN power connection)		
Rated capacity:	120 L/min x 35 m x 1.5 kW		
Inlet:	N.A.	Outlet:	Dia. 75 mm

10.10.5 Pumping Main

Routing:	See Site Layout Drawing.	Length:	360 m
Material:	GSP	Diameter:	75 mm
Roughness coefficient:	100	Friction loss:	2.3 m
Laying:	Underground	Maximum flow:	2.0 L/Sec
Washouts:	One (50 mm), at pump site		
Air valves:	None	Bulk meters:	None
Stop valves:	One (75 mm), at pump site		
River/stream crossings:	None		

10.10.6 Storage

Description:	Ground level reinforced concrete reservoir in a fenced compound		
Location:	Halfway to the hill on the South of residential area (See Site Layout Drawing.)		
Altitude:	32 m.asl	Capacity:	20 m^3
Inlet:	Dia. 75 mm	Outlet:	Dia. 75 mm
Washout:	Dia. 50 mm	Access:	Footpath
Overflow:	No float valve		

10.10.7 Transmission Main None

10.10.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	230 m
Material:	PVC	Diameter:	75 mm
Roughness coefficient:	120	Head loss:	1.0 m
Laying:	Underground	Residual head:	11 m
Washouts:	None	Maximum flow:	1.9 L/Sec
Air valves:	None	Bulk meters:	None
Stop valves:	One (75 mm), at storage site		
River/stream crossings:	None		

10.10.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	1,662	HC/PH split:	40/60 %
HC:	133 nos.	PH:	8 nos.
Public taps:	5		
Schools:	2	Mosques:	2
Health centers:	1	Total no. of PH:	13

(1) Existing Distribution Facilities

Five existing fiberglass PH tanks could be reused but would require refitting.

(2) Proposed New Work Required

1) Description

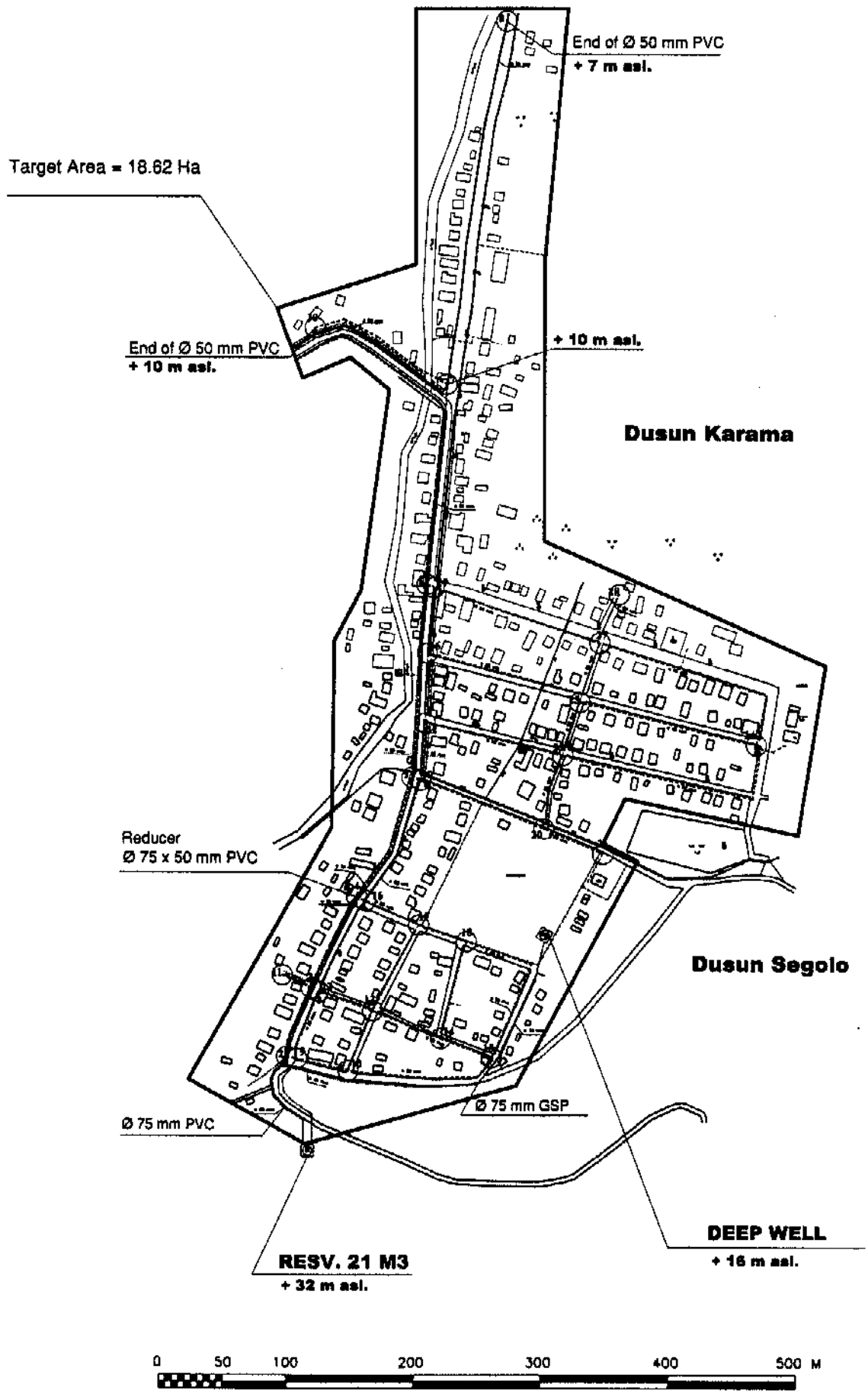
Construct 8 new PH and 5 public taps.

Installation of 50 mm distribution pipelines as shown on the Site Layout Drawing.

25 mm GSP service connections to HC, PH and public taps.

2) Material estimates

PVC Pipe:	50 mm	3,270 m	Service meters:	None	
GSP Pipe:	25 mm	2,970 m	Stop valves:	50 mm:	7
				25 mm:	151



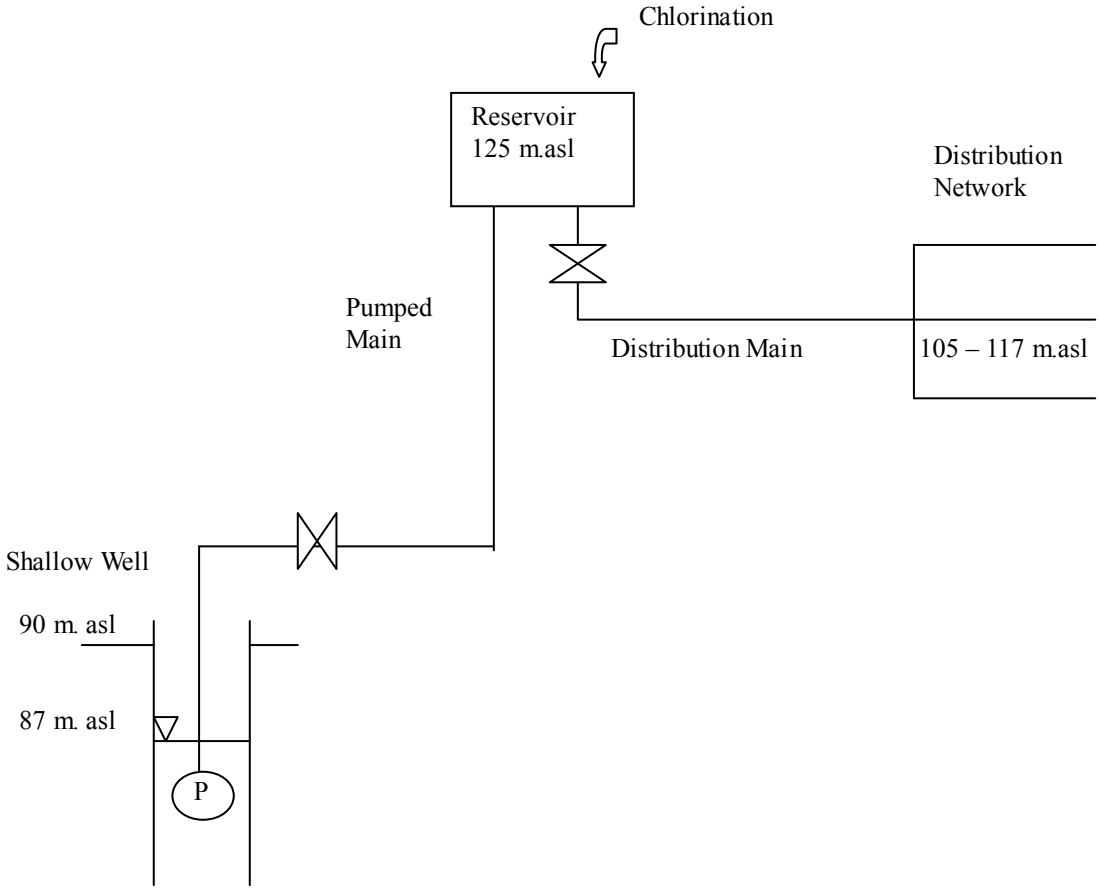
The Study on Rural Water Supply Project in Nusa Tenggara Barat and Nusa Tenggara Timur	Figure A10 - 10 : Site Layout Drawing
Japan International Cooperation Agency	PIONG - (NTB#16)

10.11 NTB #18(a) Kawuwu (Lower)

Village:	Kawuwu (Lower)	Total village area:	1,324 Ha.
District:	Bima	Total village population:	426 (Lower Dusun)
Area to be served by new and/or rehab. distribution:			5.4 Ha.
Population to be served by proposed JICA project:			383 (2001)
System capacity:			0.42 L/Sec

10.11.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.11.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	414
Population using PH:	80 % = 331 @ 30 l/c/d
Number of PH required:	3 @ 125 persons
Population using HC:	20 % = 83 @ 60 l/c/d
Average daily demand:	17.9 m^3 (including 20 % wastage)
Average hourly demand:	0.75 m^3
Maximum hourly demand:	1.50 m^3 (x 2.0)

10.11.3 Source

(1) Selected Source

Name/Location/Identification:	Shallow well to be dug beside the river 500 m to the West of the residential area. (See Site Layout Drawing.)		
Quality analysis:	Assumed	Altitude:	90 m. asl
Available capacity:	0.7 L/Sec	Pressure:	N.A.

(2) Construction Work

Construct a new shallow well, dia. 2.5 m x depth 4.0 m, sealed, in a fenced compound.

Built a pump station with guard house, in a fenced compound which includes the well.

Arrange connection to PLN.

10.11.4 Pumping Facilities

(1) Calculations

Basic 8 hour pumping rate:	0.7 L/Sec
Distance to first “break-pressure” point:	700 m
Drawdown below ground level:	3 m
Altitude differential to first “break-pressure” point:	35 m
Head losses:	5 m
Pumping head to first “break-pressure” point:	45 m

(2) Pump Selection

Quantity:	One		
Type:	Electric submersible (PLN power connection)		
Rated capacity:	42 L/min x 45 m x 1.5 kW		
Inlet:	50 mm	Outlet:	50 mm

10.11.5 Pumping Main

Routing:	See Site Layout Drawing	Length:	700 m
Material:	Steel	Diameter:	50 mm
Roughness coefficient:	100	Friction loss:	4.7 m
Laying:	Underground	Maximum flow:	0.7 L/Sec
Washouts:	None		
Air valves:	None	Bulk meters:	None
Stop valves:	One (50 mm), at pump site		
River/stream crossings:	One (50 mm x 5 m), GSP		

10.11.6 Storage

Description:	Ground level reinforced concrete reservoir in a fenced compound		
Location:	Halfway to the hill on the North of residential area (See Site Layout Drawing.)		
Altitude:	125 m.asl	Capacity:	4 m^3
Inlet:	Dia. 50 mm	Outlet:	Dia. 50 mm
Washout:	Dia. 50 mm	Access:	Footpath
Overflow:	No float valve		

10.11.7 Transmission Main None

10.11.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	440 m
Material:	Steel	Diameter:	50 mm
Roughness coefficient:	100	Head loss:	1.1 m
Laying:	Underground	Residual head:	18 m
Washouts:	None	Maximum flow:	0.4 L/Sec
Air valves:	None	Bulk meters:	None
Stop valves:	One (50 mm), at storage site		
River/stream crossings:	None		

10.11.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	414	HC/PH split:	20/80 %
HC:	17 nos.	PH:	3
Public taps:	2		
Schools:	1	Mosques:	1
Health centers:	1	Total no. of PH:	6

(1) Existing Distribution Facilities

Two 6.0 m^3 concrete tanks and one 2.0 m^3 public hydrant are to be incorporated in the new system.

(2) Proposed New Work Required

1) Description

Construction of 3 new public hydrants and rehabilitation of 3 existing public hydrants.

Float valves and stop valves are essential on every tank.

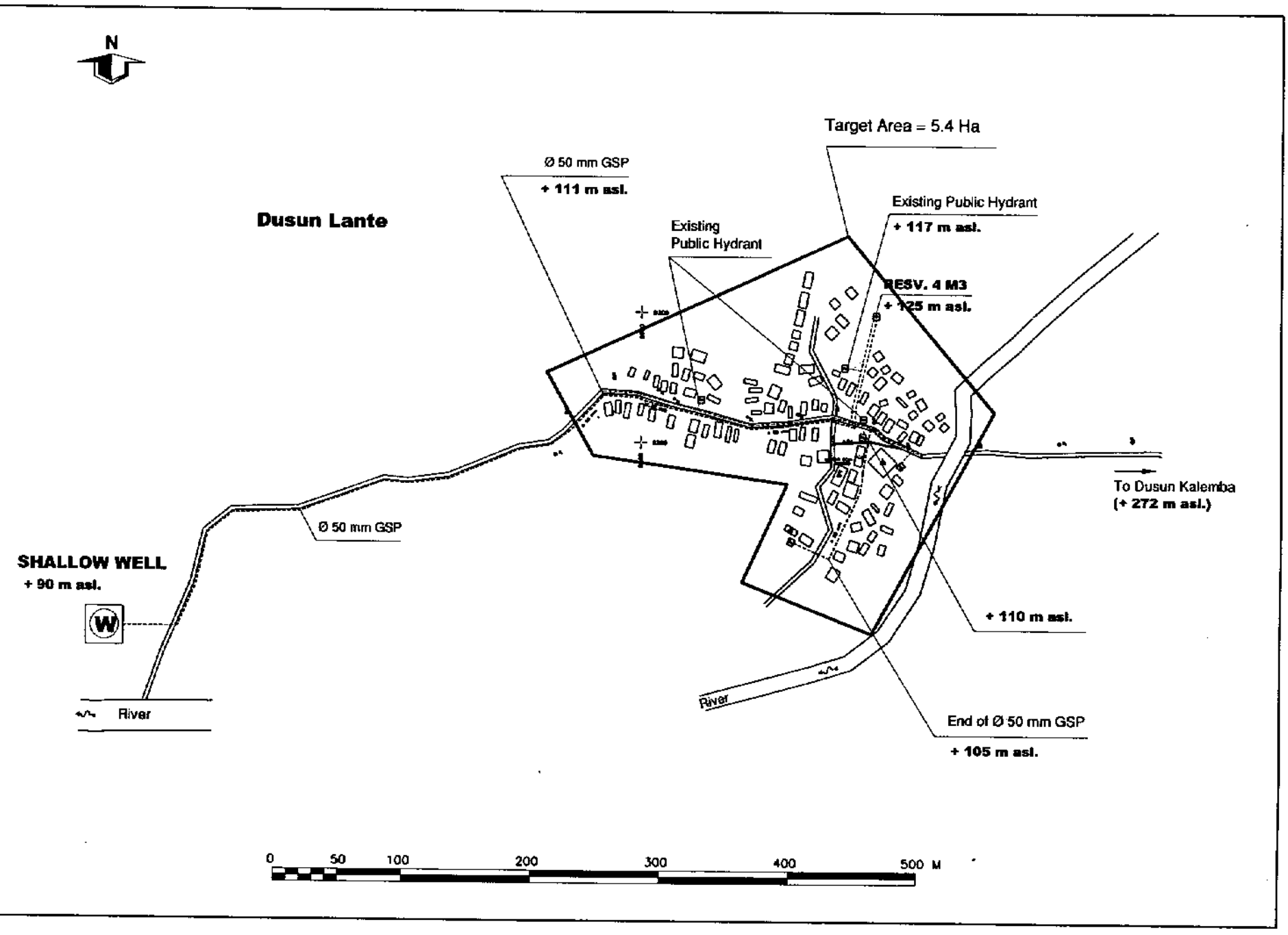
Installation of 17 house connections.

Construction of 2 public taps.

Service connections from distribution main to PH and HC.

2) Material estimates

GSP Pipe:	25 mm	480 m	Service meters:	None
Stop valves:	25 mm	25		



The Study on Rural Water Supply Project in Nusa Tenggara Barat and Nusa Tenggara Timur

Japan International Cooperation Agency

Figure A10 - 11 : Site Layout Drawing

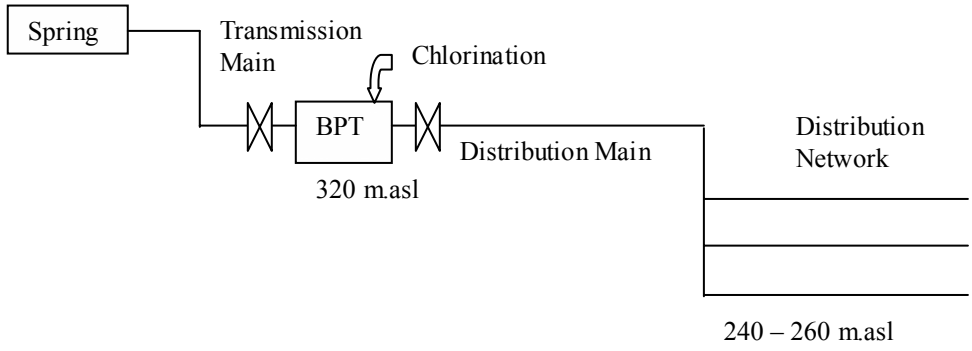
KAWUNU (LOWER) - (NTB#18)

10.12 NTB #18(b) Kawuwu (Upper)

Village:	Kawuwu (Upper)	Total village area:	1,324 Ha.
District:	Bima	Total village population:	415 (Upper Dusun)
Area to be served by new and/or rehab. distribution:			5.7 Ha.
Population to be served by proposed JICA project:			374 (2001)
System capacity:			0.34 L/Sec

10.12.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.12.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	404
Population using PH:	100 % = 404 @ 30 l/c/d
Number of PH required:	3 @ 125 persons
Population using HC:	None
Average daily demand:	14.5 m^3 (including 20 % wastage)
Average hourly demand:	0.61 m^3
Maximum hourly demand:	1.22 m^3 (x 2.0)

10.12.3 Source

(1) Selected Source

Name/Location/Identification:	Ompu Beda BPT supplied by existing transmission main from M.A. Madalipa		
Quality analysis:	Confirmed	Altitude:	320.0 m. asl
Available capacity:	0.5 L/Sec	Pressure:	N.A.

(2) Construction Work None

10.12.4 Pumping Facilities None

10.12.5 Pumping Main None

10.12.6 Storage

Description: Rehabilitation and improvement of Ompu Beda BPT.
Replacement of about 100 m of dia. 75 mm PVC inlet pipe with GSP.
Installation of a 100 mm float valve, washout, and stop valves at inlet and outlet of BPT.

10.12.7 Transmission Main existing, usable

10.12.8 Distribution Main

Description:	Existing PVC pipe is mostly serviceable, but some 100 m should be replaced with GSP.		
Routing:	See Site Layout Drawing.	Length:	970m (Existing)
Material:	PVC/GSP	Diameter:	50 mm
Roughness coefficient:	120/100	Head loss:	0.1 m
Laying:	Underground	Maximum flow:	0.34 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	None	Stop valves:	None
River/stream crossings:	None		

10.12.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	404	HC/PH split:	0/100 %
HC:	None	PH:	3 nos.
Public taps:	None		
Schools:	1	Mosques:	1
Health centers:	None	Total no. of PH:	5

(1) Existing Distribution Facilities

The piped gravity distribution system to public hydrants in the residential areas of Dusun has deteriorated and needs to be rehabilitated and extended.

(2) Proposed New Work Required

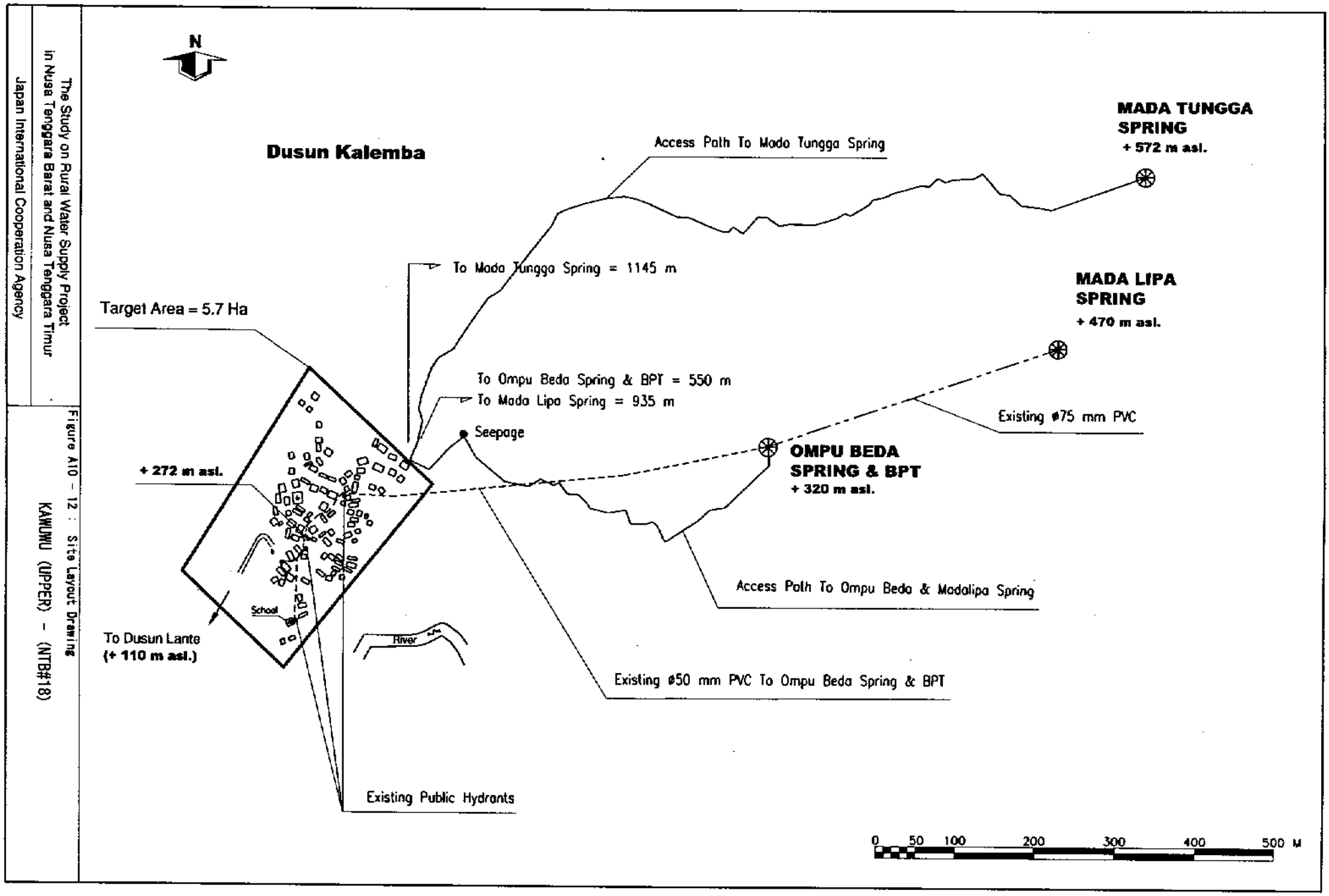
1) Description

Construction of 3 new public hydrants and rehabilitation of 2 existing concrete public hydrants.

Renew service connections to public hydrants from distribution main.

2) Material estimates

GSP Pipe:	25 mm	100 m	Service meters:	None	
			Stop valves:	25 mm	5



The Study on Rural Water Supply Project in Nusa Tenggara Barat and Nusa Tenggara Timur

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Figure A10 - 12 : Site Layout Drawing

KAWUNU (UPPER) - (NTB#18)

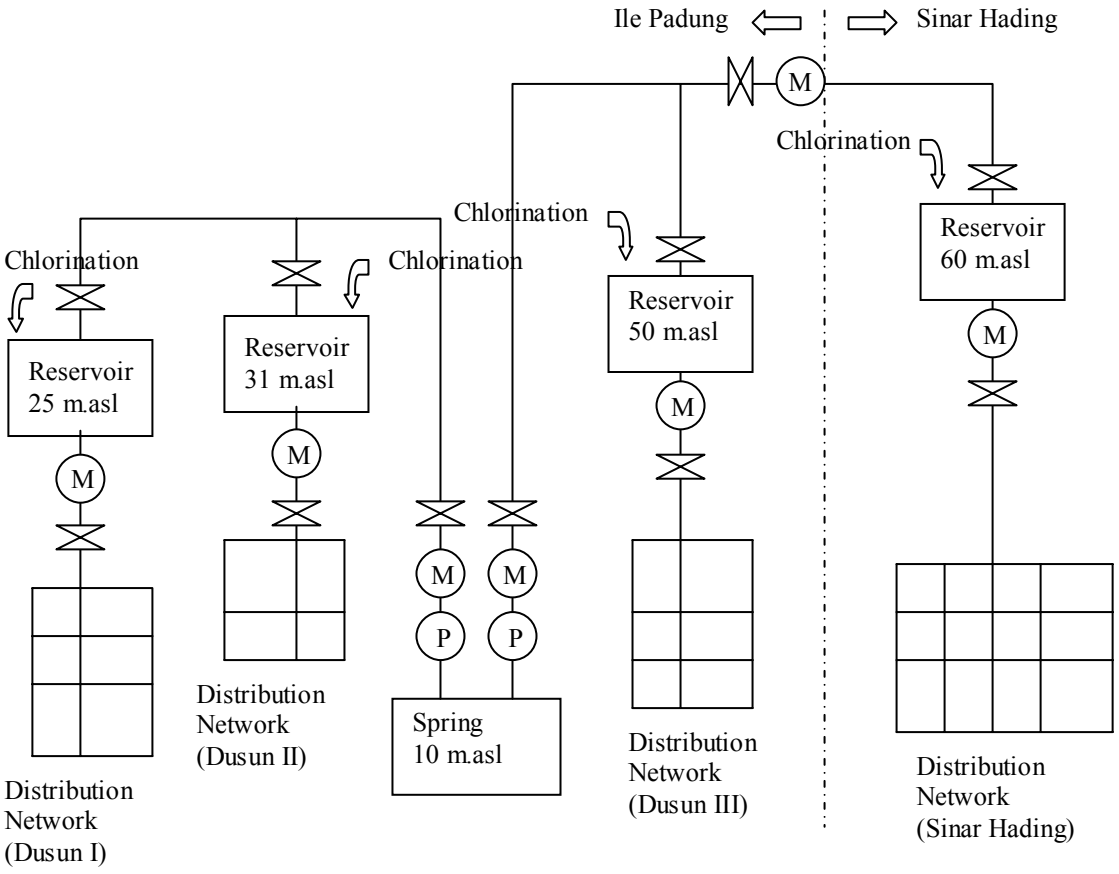
10.13 NTT #6 Sinar Hading

Village:	Sinar Hading	Total village area:	1,922 Ha.
District:	Flores Timur	Total village population:	1,345
Area to be served by new and/or rehab. distribution:			9.8 Ha.
Population to be served by proposed JICA project:			1,224 (2001)
System capacity:	(System includes Desa Ile Padung)		3.62 L/Sec

10.13.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)

Water Supply System for Desa Ile Padung and Sinar Hading



10.13.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	1,294
Population using PH:	20 % = 259 @ 30 l/c/d
Number of PH required:	2 @ 125 persons
Population using HC:	80 % = 1,035 @ 60 l/c/d
Basic daily demand:	83.8 m^3 (including 20 % wastage)
Average hourly demand:	3.49 m^3
Maximum hourly demand:	6.98 m^3 (x 2.0)

10.13.3 Source

(1) Selected Source

Name/Location/Identification:	M.A. Wae Langu in Desa Ile Padung		
Quality Analysis:	Confirmed	Altitude:	10 m. asl
Available Capacity:	15.0 L/Sec	Pressure:	N.A.

(2) Construction Work

Included in Ile Padung project.

10.13.4 Pumping Facilities

Included in Ile Padung project.

10.13.5 Pumping Main

Included in Ile Padung project.

10.13.6 Storage

Description:	Ground level reinforced concrete reservoir in a fenced compound.		
Location:	See Site Layout Drawing attached.		
Altitude:	60 m.asl	Capacity:	20 m^3
Inlet:	Dia. 100 mm	Outlet:	Dia. 100 mm
Washout:	Dia. 50 mm	Access:	Main asphalt road
Float valve:	None		
Bulk meter:	One (100 mm)		
Stop valves:	One (100 mm)		
	One (50 mm)		

10.13.7 Transmission Main None

10.13.8 Distribution Main None

10.13.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	1,294	HC/PH split:	80/20 %
HC:	207 nos.	PH:	2 nos.
Public taps:	10		
Schools:	1	Churches:	1
Health centers:	1	Total no. of PH:	5

(1) Existing Distribution Facilities None

(2) Proposed New Work Required

1) Description

Construct 5 new PH and 10 public taps.

Install dia. 50 mm distribution pipelines as shown on the Site Layout Drawing.

Install dia. 25 mm GSP service connections to HC, PH and public taps.

Service meter installation.

2) Material estimates

PVC Pipe:	50 mm	2,900 m	Service meters:	25mm	222
GSP Pipe:	50 mm	250 m	Stop valves:	50 mm	6
	25 mm	4,340 m		25 mm	222

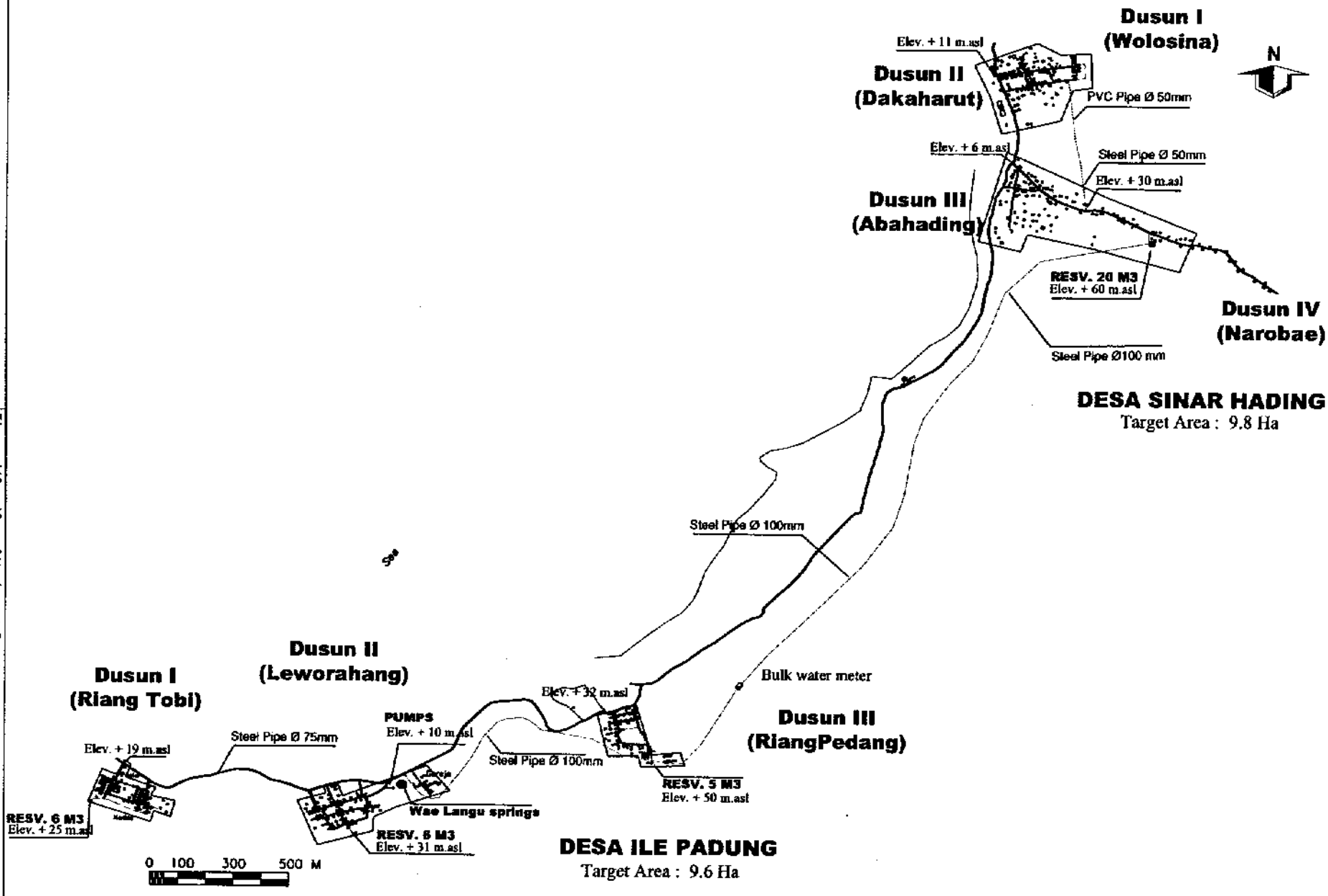


Figure A10 - 13 : Site Layout Drawing

SINAR HADING (NTT # 6)

The Study on Rural Water Supply Project
In Nusa Tenggara Barat and Nusa Tenggara Timur

Japan International Cooperation Agency

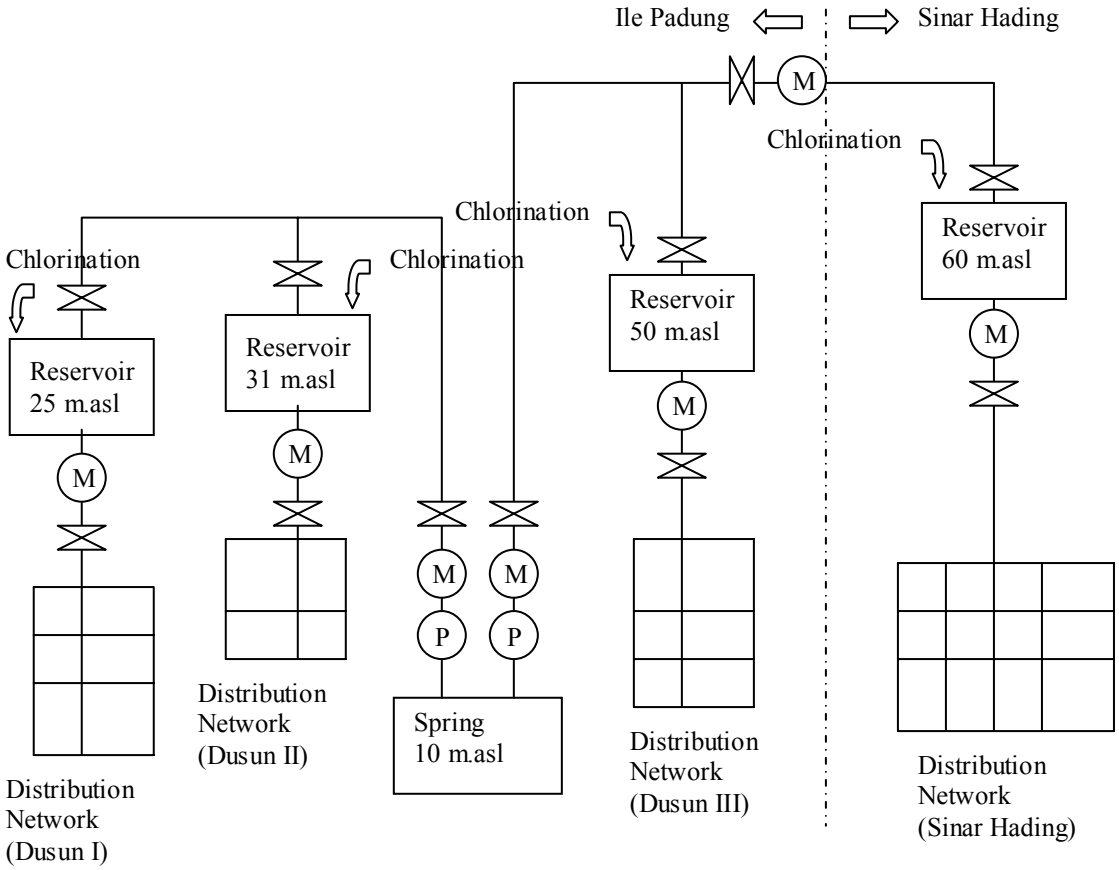
10.14 NTT #7 Ile Padung

Village:	Ile Padung	Total village area:	2,235 Ha.
District:	Flores Timur	Total village population:	1,151
Area to be served by new and/or rehab. distribution:			9.6 Ha.
Population to be served by proposed JICA project:			1,061 (2001)
System capacity: (Including bulk supply to Desa Sinar Hading)			3.62 L/Sec

10.14.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)

Water Supply System for Desa Ile Padung and Sinar Hading



10.14.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	1,122
Population using PH:	20 % = 224 @ 30 l/c/d
Number of PH required:	3 @ 125 persons
Population using HC:	80 % = 898 @ 60 l/c/d
Average daily demand:	72.7 m^3 (including 20 % wastage)
Average hourly demand:	3.03 m^3
Maximum hourly demand:	6.06 m^3 (x 2.0)

10.14.3 Source

(1) Selected Source

Name/Location/Identification:	M.A. Wae Langu in Dusun Leworahang		
Quality Analysis:	Confirmed	Altitude:	10 m. asl
Available Capacity:	15.0 L/Sec	Pressure:	N.A.

(2) Construction Work

Construct a new covered broncaptering separate from washing/bathing areas.

Construct a new deep pumping sump 20 m^3.

Build a new pump station and guard house in a fenced compound that includes the pumping sump.

10.14.4 Pumping Facilities (For both Desa Ile Padung and Sinar Hading)

(1) Calculations

1) For Dusun I and Dusun II

Basic 8 hour pumping rate:	1.8 L/Sec
Distance to decisive “break-pressure” point:	1,340 m
Drawdown below ground level:	2 m
Altitude differential to decisive “break-pressure” point:	21 m
Head losses:	7 m
Pumping head to decisive “break-pressure” point:	30 m

2) For Dusun III and Desa Sinar Hading

Basic 8 hour pumping rate:	3.7 L/Sec
Distance to decisive "break-pressure" point:	3,500 m
Drawdown below ground level:	2 m
Altitude differential to decisive "break-pressure" point:	50 m
Head losses:	18 m
Pumping head to decisive "break-pressure" point:	70 m

(2) Pump Selection

1) Pump for Dusun I and Dusun II

Quantity:	Two		
Type:	Diesel engine centrifugal		
Rated capacity:	70 L/min x 30 m x 0.5 kW (each)		
Inlet:	Dia. 75 mm	Outlet:	Dia. 75 mm

2) Pump for Dusun III and Desa Sinar Hading

Quantity:	Two		
Type:	Diesel engine centrifugal		
Rated capacity:	150 L/min x 70 m x 2.2 kW (each)		
Inlet:	Dia. 75 mm	Outlet:	Dia. 75 mm

10.14.5 Pumping Main

(1) To Storage I and Storage II

Routing:	See Site Layout Drawing.	Length:	1,340 m
Material:	Steel	Diameter:	75 mm
Roughness coefficient:	100	Head loss:	3.5 m
Laying:	Underground	Maximum flow:	1.8 L/Sec
Washouts:	None		
Air valves:	None		
Bulk meters:	One (ϕ 75 mm), at pump site		
Stop valves:	One (ϕ 75 mm), at pump site		
River/stream crossings:	None		

(2) To Storage III and Desa Sinar Hading

Routing:	See Site Layout Drawing.	Length:	3,500 m
Material:	Steel	Diameter:	100 mm
Roughness coefficient:	100	Head loss:	13.6 m
Laying:	Underground		Maximum flow: 3.7 L/Sec
Washouts:	None		
Air valves:	None		
Bulk meters:	Two (ϕ 100 mm), at pump site and village boundary		
Stop valves:	Two (ϕ 100mm), at pump site and village boundary		
River/stream crossings:	None		

10.14.6 Storage

(1) Storage I

Description:	Ground level reinforced concrete tank in a fenced compound above Dusun I.		
Location:	See Site Layout Drawing attached.		
Altitude:	25 m.asl	Capacity:	6 m^3
Inlet:	Dia. 75 mm	Outlet:	Dia. 50 mm
Washout:	Dia. 50 mm	Access:	Village road
Float valve:	One, Dia. 75 mm	Stop valve:	1 (50 mm)

(2) Storage II

Description:	Ground level reinforced concrete tank in a fenced compound above Dusun II.		
Location:	See Site Layout Drawing attached.		
Altitude:	31 m.asl	Capacity:	6 m^3
Inlet:	Dia. 75 mm	Outlet:	Dia. 50 mm
Washout:	Dia. 50 mm	Access:	Village road
Float valve:	One, Dia. 75 mm	Stop valve:	1 (50 mm)

(3) Storage III

Description:	Ground level reinforced concrete tank in a fenced compound above Dusun III.		
Location:	See Site Layout Drawing attached.		
Altitude:	50 m.asl	Capacity:	5 m^3
Inlet:	Dia. 100 mm	Outlet:	Dia. 50 mm
Washout:	Dia. 50 mm	Access:	Village road
Float valve:	One, Dia. 100 mm	Stop valve:	1 (50 mm)

(4) Storage IV In Desa Sinar Hading.

10.14.7 Transmission Main None

10.14.8 Distribution Main

(1) For Dusun I

Routing:	See Site Layout Drawing.	Length:	35 m
Material:	PVC	Diameter:	50 mm
Roughness coefficient:	120	Head loss:	0.1 m
Laying:	Underground	Residual head:	5.9 m
Washouts:	None	Maximum flow:	0.6 L/Sec
Air valves:	None		
Bulk meters:	One (50 mm)		
Stop valves:	One (50 mm)		
River/stream crossings:	None		

(2) For Dusun II

Routing:	See Site Layout Drawing.	Length:	20 m
Material:	PVC	Diameter:	50 mm
Roughness coefficient:	120	Head loss:	0.1 m
Laying:	Underground	Residual head:	20.9 m
Washouts:	None	Maximum flow:	0.6 L/Sec
Air valves:	None		
Bulk meters:	One (50 mm)		
Stop valves:	One (50 mm)		
River/stream crossings:	None		

(3) For Dusun III

Routing:	See Site Layout Drawing.	Length:	60 m
Material:	PVC	Diameter:	50 mm
Roughness coefficient:	120	Head loss:	0.2 m
Laying:	Underground	Residual head:	17.8 m
Washouts:	None	Maximum flow:	0.5 L/Sec
Air valves:	None		
Bulk meters:	One (50 mm)		
Stop valves:	One (50 mm)		
River/stream crossings:	None		

10.14.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	1,122	HC/PH split:	80/20 %
HC:	180 nos.	PH:	3 nos.
Public taps:	15 (Existing)		
Schools:	2	Churches:	1
Health centers:	1	Total no. of PH:	7

(1) Existing Distribution Facilities

A large number of simple public taps are still serviceable in Dusun Riang Tobi. 15 should be incorporated into the distribution network.

There is pipe of all sizes laid around the village, and most of it reusable.

(2) Proposed New Work Required

1) Description

Construct 7 new PH and incorporate 15 existing public taps into the system.

Install dia. 50 mm distribution pipelines as shown on the Site Layout Drawing.

Install 25 mm GSP service connections to HC, PH and public taps.

Service meter installation.

2) Material estimates

PVC Pipe:	50 mm	2,850 m	Service meters:	25 mm	202
GSP Pipe:	25 mm	3,890 m	Stop valves:	50 mm:	10
				25 mm:	202

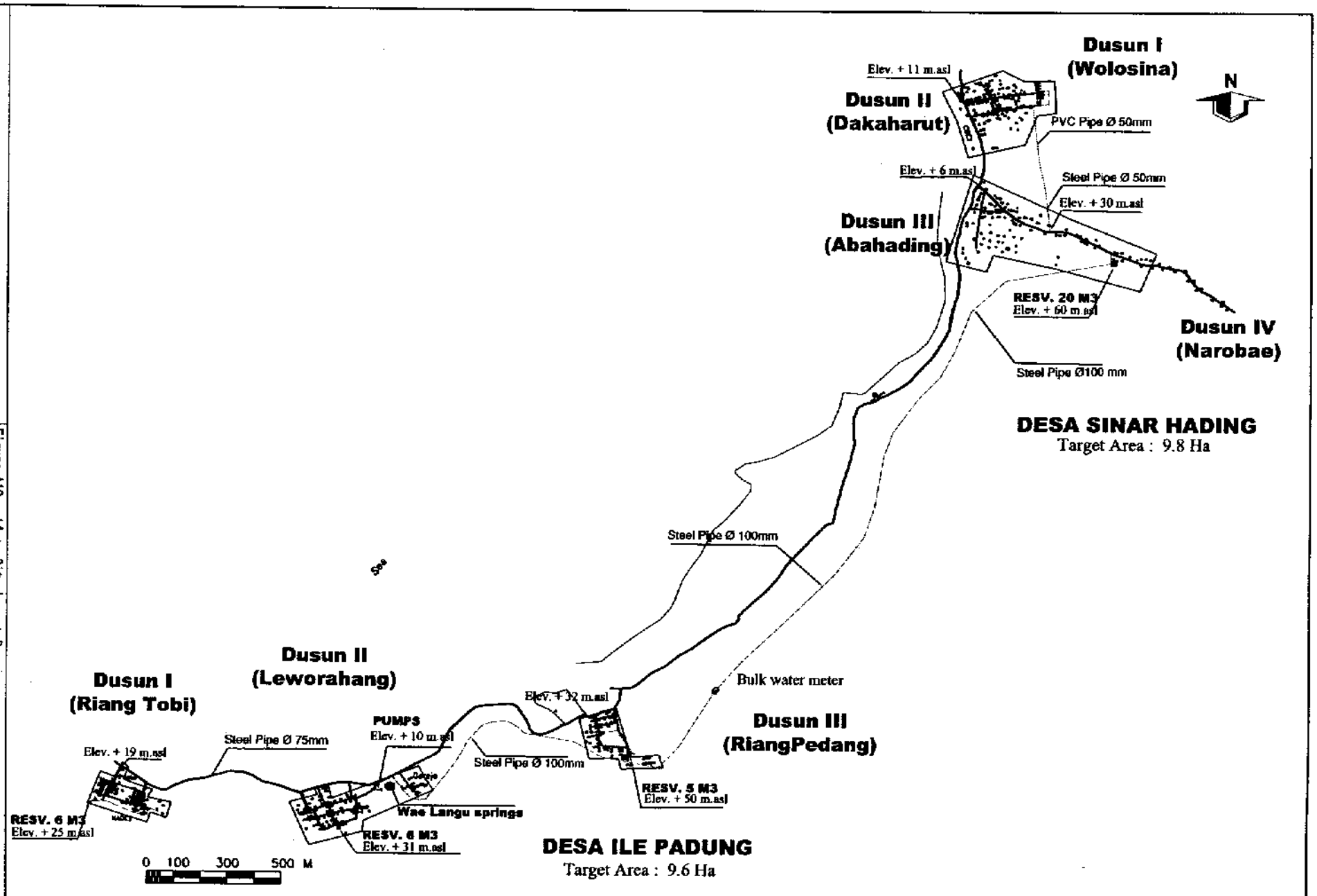


Figure A10 - 14 : Site Layout Drawing

ILE PADUNG - (NTT # 7)

The Study on Rural Water Supply Project in Nusa Tenggara Barat and Nusa Tenggara Timur

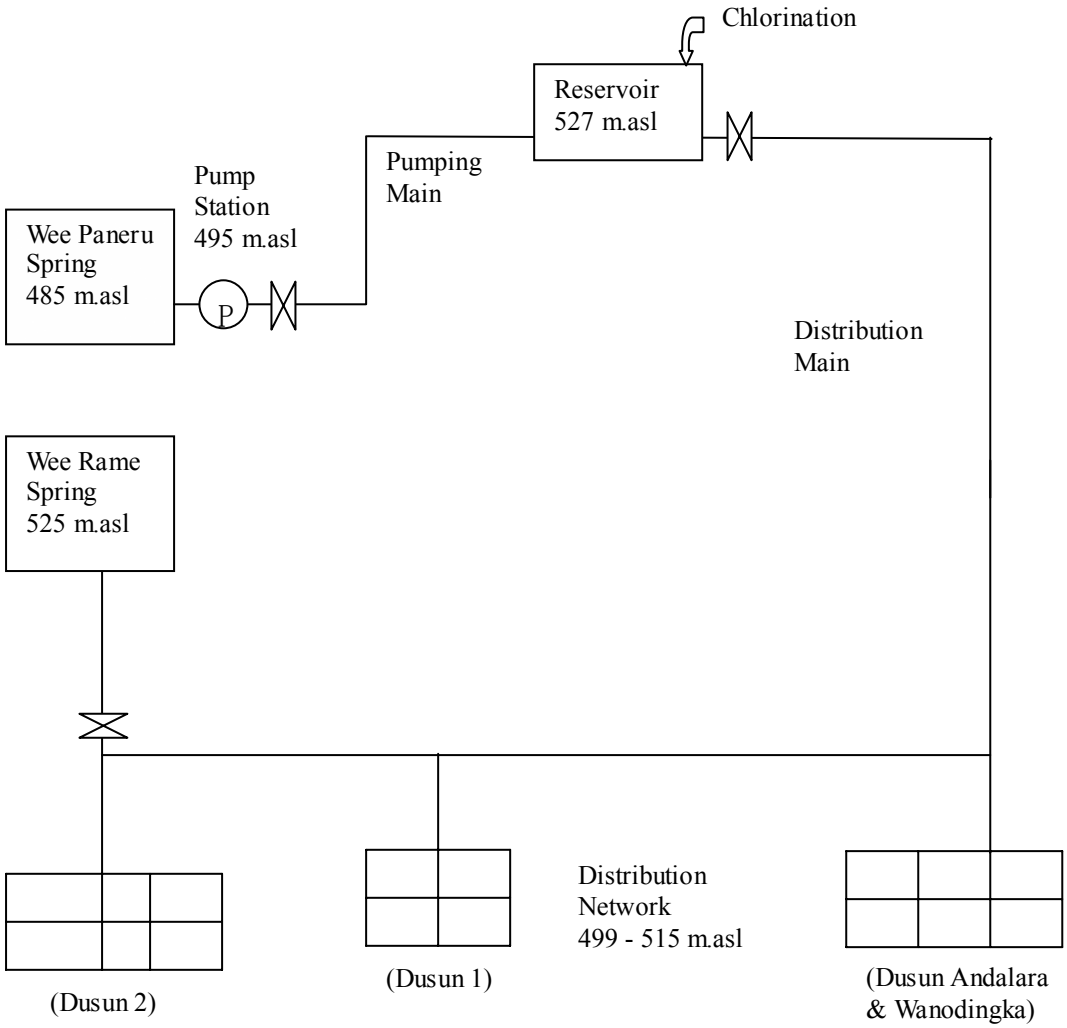
Japan International Cooperation Agency

10.15 NTT #18 Weerame

Village:	Weerame	Total village area:	1,026 Ha.
District:	Sumba Barat	Total village population:	2,294
Area to be served by new and/or rehab. distribution:			45.0 Ha.
Population to be served by proposed JICA project:			1,350 (2001)
System capacity:			2.42 L/Sec

10.15.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.15.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	1,616
Population using PH:	20 % = 323 @ 30 l/c/d
Number of PH required:	4 @ 125 persons
Population using HC:	80 % = 1,293 @ 60 l/c/d
Average daily demand:	104.7 m^3 (including 20 % wastage)
Average hourly demand:	4.36 m^3
Maximum hourly demand:	8.72 m^3 (x 2.0)

10.15.3 Source

(1) Selected Source

1) Main source

Name/Location/Identification:	M.A. Wee Paneru		
Quality Analysis:	Confirmed	Altitude:	485 m. asl
Available Capacity:	>8.0 L/Sec	Pressure:	N.A.

2) Supplementary source

Name/Location/Identification:	M.A. Wee Rame		
Quality Analysis:	Confirmed	Altitude:	525 m. asl
Available Capacity:	0.5 L/Sec	Pressure:	N.A.

(2) Construction Work

Cover access to underground river with concrete slab. (5.0 m x 2.0 m x 100 mm)

Provide access cover securely locked.

Build pump house and guard house in a fenced compound which includes the source.

10.15.4 Pumping Facilities

(1) Calculations

Basic 8 hour pumping rate:	3.63 L/Sec
Distance to first "break-pressure point:	270 m
Drawdown below ground level:	11 m
Altitude differential to first "break-pressure" point:	32 m
Head losses:	7 m
Pumping head to first "break-pressure" point:	50 m

(2) Pump Selection

Quantity:	Two		
Type:	Direct diesel driven centrifugal		
Rated capacity:	150 L/min x 50 m x 2.2 kW (each)		
Inlet:	75 mm	Outlet:	75 mm

10.15.5 Pumping Main

Routing:	See Site Layout Drawings.		Length: 270 m
Material:	GSP	Diameter:	75 mm
Roughness Coefficient:	100	Head loss:	5.3 m
Laying:	Buried	Maximum flow:	3.63 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	None	Stop valves:	1 (ϕ75 mm)
River/stream crossings:	None		

10.15.6 Storage

(1) **Reservoir**

Description:	Ground level reinforced concrete on prominent hill feature.		
Location:	Dusun Ombawo		
Altitude:	527 m.asl	Capacity:	26 m^3
Inlet:	75 mm	Outlet:	75 mm
Washout:	One (50 mm)	Access:	Mountain path
Overflow:	No float valve		

10.15.7 Transmission Main None

10.15.8 Distribution Main

Description:	Gravity system		
Routing:	See Site Layout Drawing.	Length:	280 m
Material:	PVC	Diameter:	75 mm
Roughness Coefficient:	120	Head loss:	1.9 m
Laying:	Buried	Maximum flow:	2.42 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	None	Stop valves:	1 (75 mm)
River/stream crossings:	None		

10.15.9 Distribution Network

Target Area:	See Site Layout Drawings attached.		
2011 Design population:	1,616	HC / PH split:	80/20 %
HC:	259 nos.	PH:	4 nos.
Schools:	3	Churches:	None
Health centers:	1	Total no. of PH:	8
Public taps:	10		

(1) Existing Distribution Facilities

Existing distribution pipe GSP 40 mm from Wee Rame spring to Dusun 2, will be incorporated into the new system in order to increase a residual head in Dusun 1.

Otherwise no existing facilities in the new target areas.

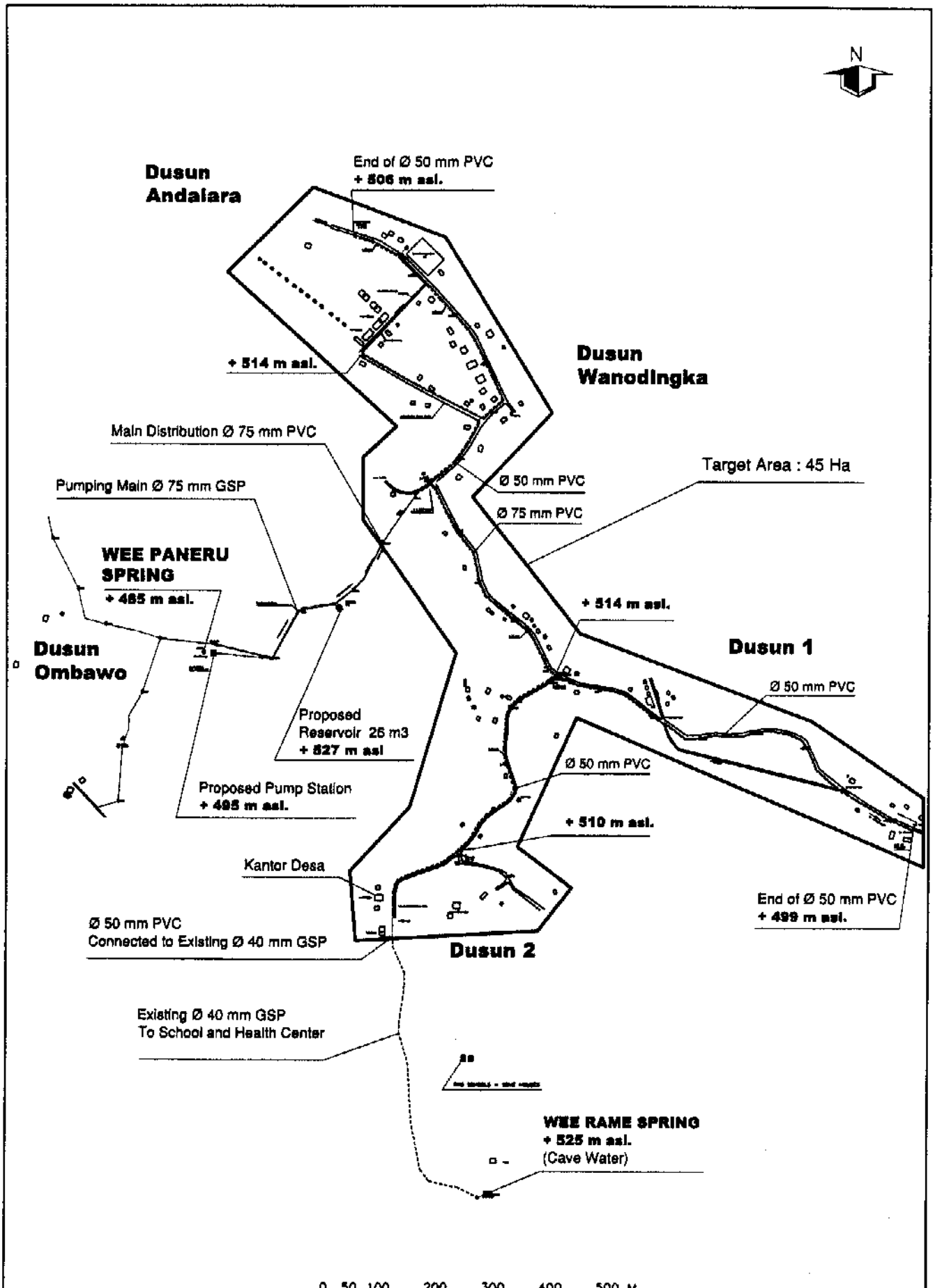
(2) Proposed New Work Required

1) Description

Construct 8 new PH and 10 public taps. Install 50 mm distribution pipes and 25 mm service lines to PH, HC and public taps.

2) Material estimates

PVC Pipe:	75 mm	420 m	Service meters:	None
	50 mm	2,330 m	Stop valves:	75 mm, 1
GSP Pipe:	25 mm	5,440 m		50 mm, 5
				25 mm, 277



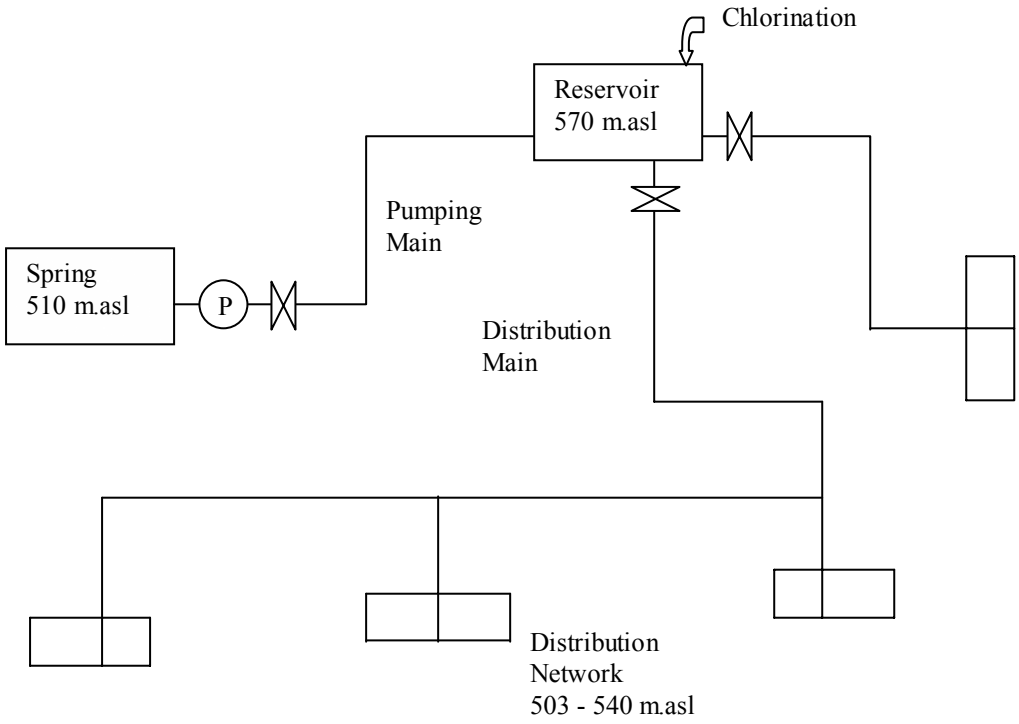
The Study on Rural Water Supply Project in Nusa Tenggara Barat and Nusa Tenggara Timur	Figure A10 - 15 : Site Layout Drawing
Japan International Cooperation Agency	WEERAME - (NTT#18)

10.16 NTT #19 Kondamara

Village:	Kondamara	Total village area:	3,120 Ha.
District:	Sumba Timur	Total village population:	1,600
Area to be served by new and/or rehab. distribution:			306.0 Ha.
Population to be served by proposed JICA project:			1,500 (2001)
System capacity:			1.82 L/Sec

10.16.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.16.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	1,828
Population using PH:	80 % = 1,462 @ 30 l/c/d
Number of PH required:	12 @ 125 persons
Population using HC:	20 % = 366 @ 60 l/c/d
Average daily demand:	79.0 m^3 (including 20 % wastage)
Average hourly demand:	3.29 m^3
Maximum hourly demand:	6.58 m^3 (x 2.0)

10.16.3 Source

(1) Selected Source

Name/Location/Identification:	M.A. Lailana		
Quality Analysis:	Confirmed	Altitude:	510 m. asl
Available Capacity:	28.8 L/Sec	Pressure:	N.A.

(2) Construction Work

Construct a caisson in the main collection tank area.

Construct a pump house alongside the existing guard house, enclose both in a fenced compound.

10.16.4 Pumping Facilities

(1) Calculations

Basic 8 hour pumping rate:	2.73 L/Sec
Distance to first "break-pressure point:	300 m
Drawdown below ground level:	1 m
Altitude differential to first "break-pressure" point:	60 m
Head losses:	9 m
Pumping head to first "break-pressure" point:	70 m

(2) Pump Selection

Quantity:	Two
Type:	Direct diesel driven centrifugal
Rated capacity:	110 L/min x 70 m x 2.2 kW (each)
Inlet:	75 mm Outlet: 75 mm

10.16.5 Pumping Main

Routing:	See Site Layout Drawings.	Length:	300 m
Material:	GSP	Diameter:	75 mm
Roughness Coefficient:	100	Head loss:	3.5 m
Laying:	Buried	Maximum flow:	2.73 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	None		
Stop valves:	1 (ϕ75 mm), at pump site		
River/stream crossings:	None		

10.16.6 Storage

Description:	Existing reinforced concrete structure on a prominent hill feature.		
Location:	300 m to the north of the source and the road.		
Altitude:	570 m.asl	Capacity:	12 m^3
Inlet:	75 mm	Outlet:	2 x 50 mm
Washout:	50 mm	Access:	Mountain path
Overflow:	No float valve		

10.16.7 Transmission Main None

10.16.8 Distribution Main

Description: There are two separate distribution systems, one East to Menangadu existing 350 m, one West to Kondamara new >6.0 km.

(1) East

Routing:	See Site Layout Drawing.	Length:	350 m
Material:	PVC	Diameter:	50 mm
Roughness Coefficient:	110	Head loss:	0.2 m
Laying:	Buried	Maximum flow:	0.18 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	None	Stop valves:	None
River/stream crossings:	None		

(2) West

Routing:	See Site Layout Drawing.		
Length:	6,776 m (GSP 75 mm x 330 m, PVC 75 mm x 2,645 m, PVC 50 mm x 3,801 m)		
Material:	PVC/GSP	Diameter:	75/50 mm
Roughness Coefficient:	120/100	Head loss:	29.6 m
Laying:	Buried	Maximum flow:	1.64 L/Sec
Washouts:	2 (50 mm)	Air valves:	3 (13 mm)
Bulk meters:	None	Stop valves:	3 (75 mm) 4 (50 mm)
River/stream crossings:	Two, (75 mm x 10 m x 2 nos.,GSP)		

10.16.9 Distribution Network

Target Area:	See Site Layout Drawings attached.		
2011 Design population:	1,828	HC / PH split:	20/80 %
HC:	73 nos.	PH:	12 nos.
Public taps:	20		
Schools:	1	Churches:	1
Health centers:	1	Total no. of PH:	15
River/stream crossings:	One, (50 mm x 4 m, GSP)		

(1) Existing Distribution Facilities

Some PH tanks are available but recommended replacement.

(2) Proposed New Work Required

1) Description

Construct 15 new PH and 20 public taps.

Install 25 mm service lines to PH, HC and public taps.

Install 224 m of dia 50 mm SGP for extension of East distribution system.

2) Material estimates

GSP Pipe:	ϕ 50 mm	224 m	Service meters:	None	
	ϕ 25 mm	1,960 m	Stop valves:	50 mm	1
				25 mm	108

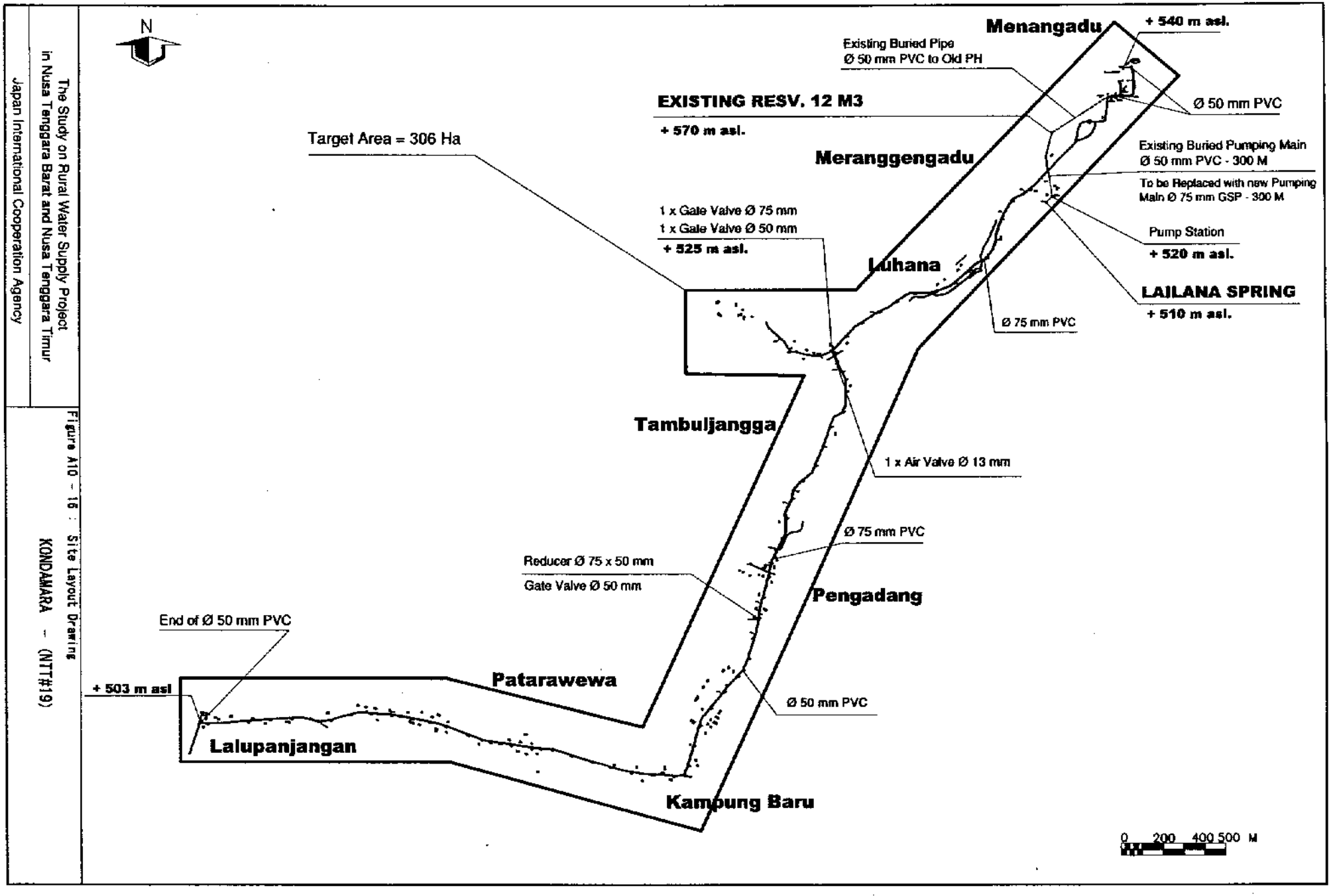


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Figure A10 - 15 : Site Layout Drawing

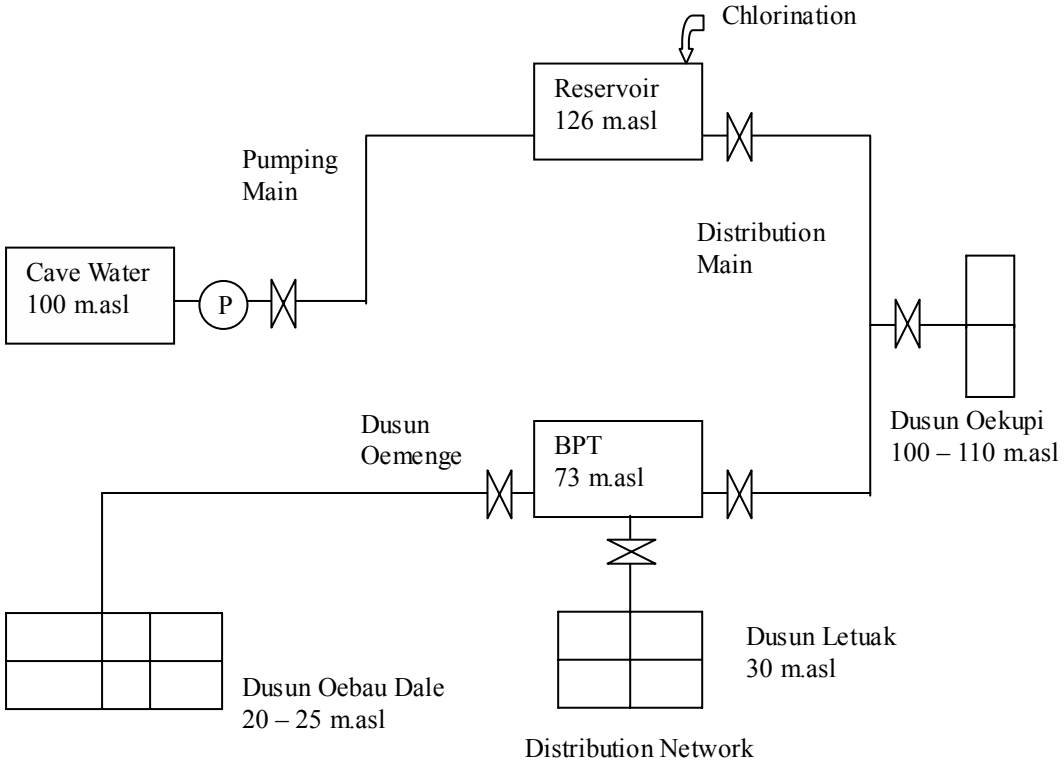
KONDAMARA - (NTT#19)

10.17 NTT #21 Oebau

Village:	Oebau	Total village area:	2,800 Ha.
District:	Kupang	Total village population:	940
Area to be served by new and/or rehab. distribution:			8.0 Ha.
Population to be served by proposed JICA project:			513 (2001)
System capacity:			0.58 L/Sec

10.17.1 Schematic Diagram of Proposed System

(See Site Layout and Section Drawings attached.)



10.17.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	632
Population using PH:	90 % = 569 @ 30 l/c/d
Number of PH required:	5 @ 125 persons
Population using HC:	10 % = 63 @ 60 l/c/d
Average daily demand:	25.0 m^3 (including 20 % wastage)
Average hourly demand:	1.04 m^3
Maximum hourly demand:	2.08 m^3 (x 2.0)

10.17.3 Source

(1) Selected Source

Name/Location/Identification:	Cave Water in Dusun Oekupi		
Quality Analysis:	Confirmed	Altitude:	100 m. asl
Available Capacity:	5.0 L/Sec	Pressure:	N.A.

(2) Construction Work

Cover the Cave Water.

Construct a pump house and guard house in a fenced compound that includes the source.

10.17.4 Pumping Facilities

(1) Calculations

Basic 8 hour pumping rate:	0.87 L/Sec
Distance to first "break-pressure point:	550 m
Drawdown below ground level:	4 m
Altitude differential to first "break-pressure" point:	26 m
Head losses:	10 m
Pumping head to first "break-pressure" point:	40 m

(2) Pump Selection

Quantity:	One		
Type:	Direct diesel driven centrifugal		
Rated capacity:	52 L/min x 40 m x 0.75 kW		
Inlet:	50 mm	Outlet:	50 mm

10.17.5 Pumping Main

Routing:	See Site Layout Drawings.	Length:	550 m
Material:	GSP	Diameter:	50 mm
Roughness Coefficient:	100	Head loss:	5.5 m
Laying:	Buried	Maximum flow:	0.87 L/Sec
Washouts:	None	Air valves:	None
Bulk meters:	None		
Stop valves:	1 (ϕ50 mm), at pump site		
River/stream crossings:	None		

10.17.6 Storage

(1) Reservoir

Description:	A ground level reinforced concrete tank.		
Location:	Alongside the first house in Dusun Oekupi, at the top of the village		
Altitude:	126 m.asl	Capacity:	6 m^3
Inlet:	50 mm	Outlet:	50 mm
Washout:	One (50 mm)	Access:	Village road
Overflow:	No float valve		

(2) Break Pressure Tank

Location:	Above Dusun Oemenge		
Altitude:	73 m.asl	Capacity:	2 m^3
Material:	Reinforced concrete		
nlet:	50 mm	Outlet:	2 x 50 mm
Washout:	One (50 mm)	Access:	Village road

10.17.7 Transmission Main None

10.17.8 Distribution Main

Description: Gravity system through Dusun Oekupi to BPT above Dusun Oemenge. Branch directly from the BPT to Dusun Letuak and separately to small hamlets along the southern village boundary. Facilities NOT to cross the village boundary.

Routing:	See Site Layout Drawing.	Length:	530 m
Material:	GSP	Diameter:	50 mm
Roughness Coefficient:	100	Head loss:	2.5 m
Laying:	Buried	Maximum flow:	0.58 L/Sec
Washouts:	1 (50 mm)	Air valves:	1 (13 mm)
Bulk meters:	None	Stop valves:	1 (50 mm)
River/stream crossings:	Two, both GSP 50 mm x 50 m, underground		

10.17.9 Distribution Network

Target Area:	See Site Layout Drawings attached.		
2011 Design population:	632	HC / PH split:	10/90 %
HC:	13 nos.	PH:	5 nos.
Public taps:	10		
Schools:	1	Churches:	2
Health centers:	2	Total no. of PH:	10

(1) Existing Distribution Facilities None

(2) Proposed New Work Required

1) Description

Construct 10 new PH and 10 public taps.

Install 50 mm distribution pipes and 25 mm service lines to PH, HC and public taps.

2) Material estimates

PVC Pipe:	ϕ 50 mm	4,950 m	Service meters:	None	
GSP Pipe:	ϕ 25 mm	560 m	Stop valves:	50 mm	5
				25 mm	33

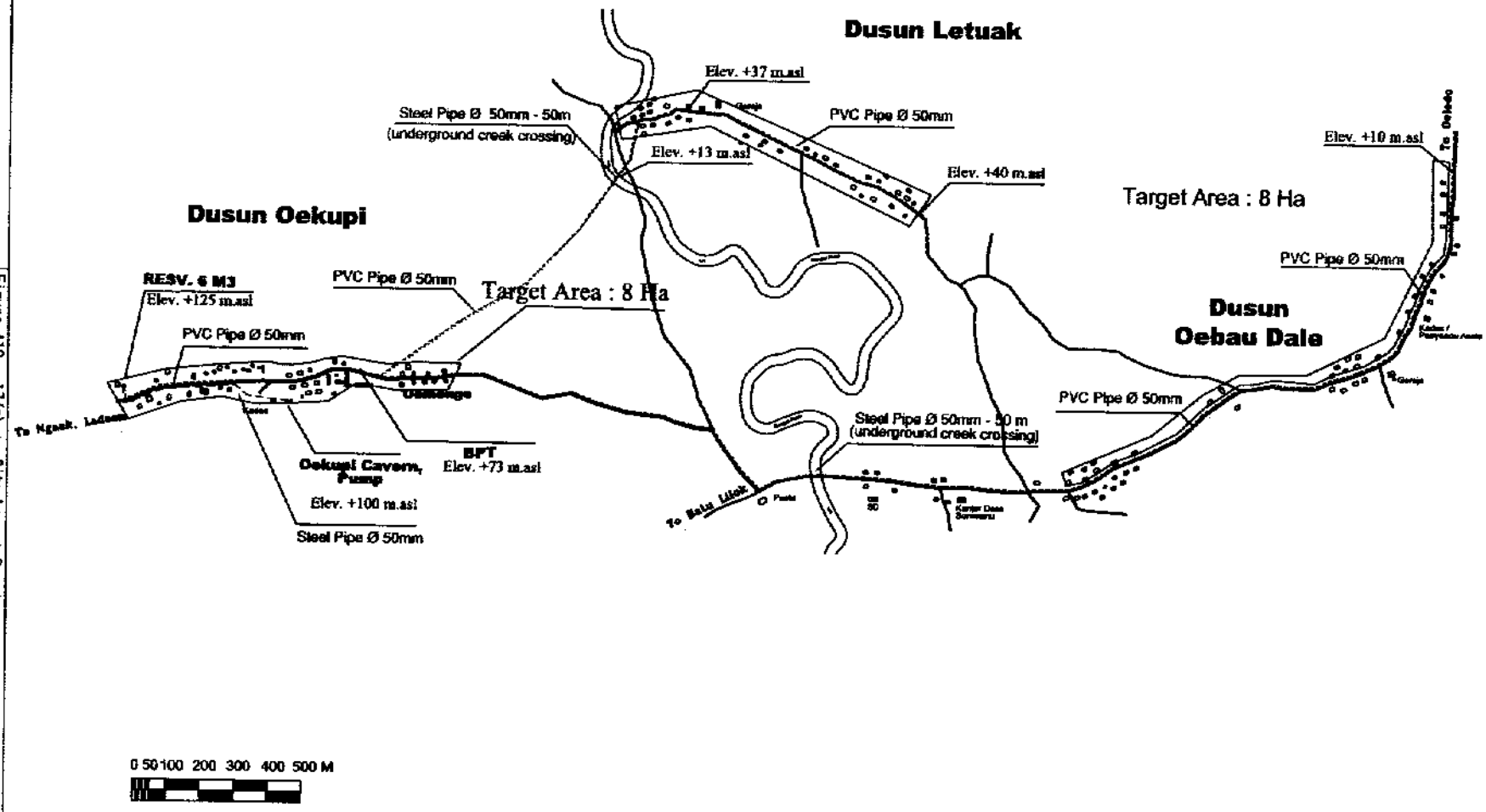


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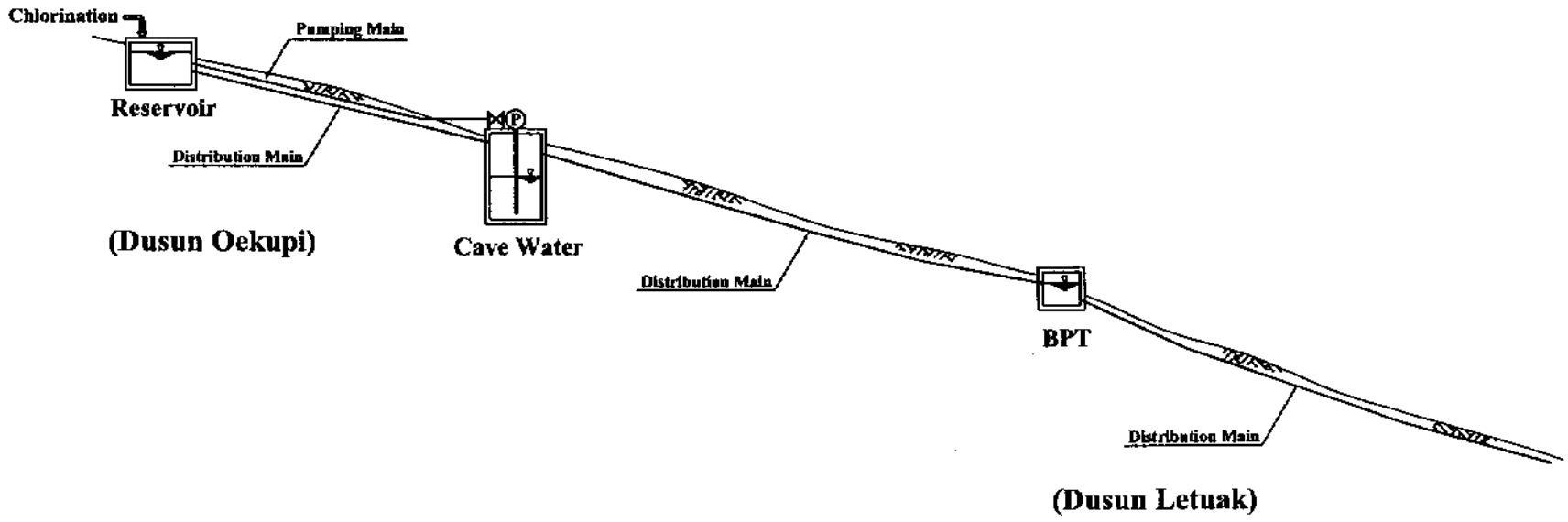
Figure A10 - 17(a) : Site Layout Drawing

OEBAU - (NTT # 21)



Remarks: **Water source for the system is cave water in Dusun Oekupi.**
Water table of the cave water is about 3 m below the ground level, so that pump facilities are required.
The cave water is pumped up to the reservoir.
After chlorination at the reservoir, the water is distributed to Dusun Oekupi, Letuak and Oebau Dale by gravity.

Figure A10 - 17(b) : Schematic Section Drawing
OEBAU - (NTT # 21)

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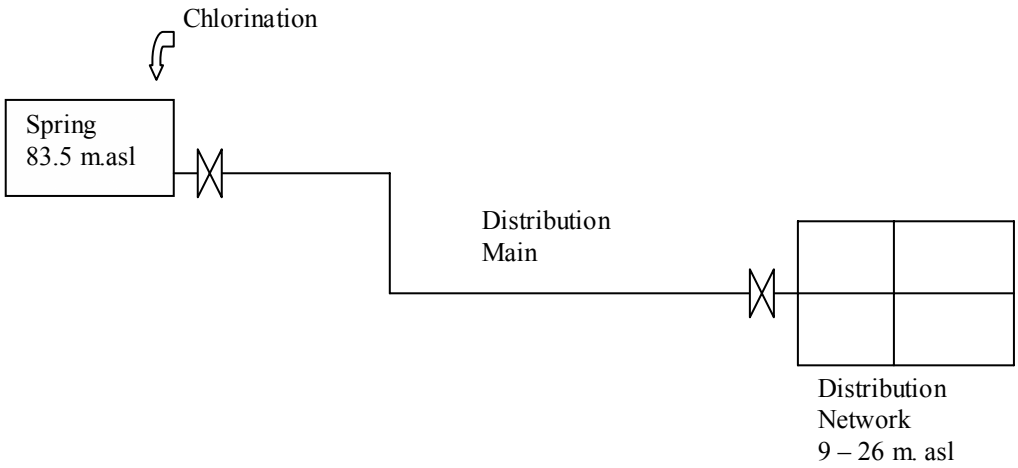
10.18 NTT #23 Nusakdale

Village:	Nusakdale	Total village area:	769 Ha.
District:	Kupang	Total village population:	841
Area to be served by new and/or rehab. distribution:			16.0 Ha.
Population to be served by proposed JICA project:			365 (2001)
System capacity:			0.42 L/Sec

10.18.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.18.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	450
Population using PH:	90 % = 405 @ 30 l/c/d
Number of PH required:	3 @ 125 persons
Population using HC:	10 % = 45 @ 60 l/c/d
Average daily demand:	17.8 m^3 (including 20 % wastage)
Average hourly demand:	0.74 m^3
Maximum hourly demand:	1.48 m^3 (x 2.0)

10.18.3 Source

(1) Selected Source

Name/Location/Identification:	M.A Meakoen in Dusun Meakoen		
Quality Analysis:	Confirmed	Altitude:	83.5 m. asl
Available Capacity:	5.0 L/Sec	Pressure:	N.A.

(2) Construction Work

Remove a very large tree and existing inoperative broncaptering.

Build a new broncaptering, L x W x D = 1.9 x 2.0 x 0.7 m

Build a cover for spring location.

10.18.4 Pumping Facilities None

10.18.5 Pumping Main None

10.18.6 Storage None

10.18.7 Transmission Main None

10.18.8 Distribution Main

Routing:	See Site Layout Drawing.	Length:	1,500 m
Material:	GSP	Diameter:	50 mm
Roughness Coefficient:	100	Head loss:	3.6 m
Laying:	Buried	Maximum flow:	0.4 L/Sec
Washouts:	2 (ϕ 50 mm)	Air valves:	3(ϕ13 mm)
Bulk meters:	None	Stop valves:	2(ϕ50 mm)
River/stream crossings:	3 @ 6 to10 m		

10.18.9 Distribution Network

Target Area:	See Site Layout Drawing attached.		
2011 Design population:	450	HC/PH split:	10/90 %
HC:	9 nos.	PH:	3 nos.
Public taps:	10		
Schools:	1	Churches:	1
Health centers:	1	Total no. of PH:	6

(1) Existing Distribution Facilities

Significant quantities of small dia GSP are available for reuse.

A reusable GSP in small diameters are available for reuse.

Need new reconstruction, but material quantities have been reduced by 20 % to allow reuse of existing pipe.

(2) Proposed New Work Required

1) Description

Construct 6 new PH and 10 public taps.

Install 50 mm and 25 mm service connections to PH, HC and public taps.

2) Material estimates

PVC Pipe:	50 mm	1,000 m	Stop valves:	50 mm	3
GSP Pipe:	25 mm	400 m		25 mm	25

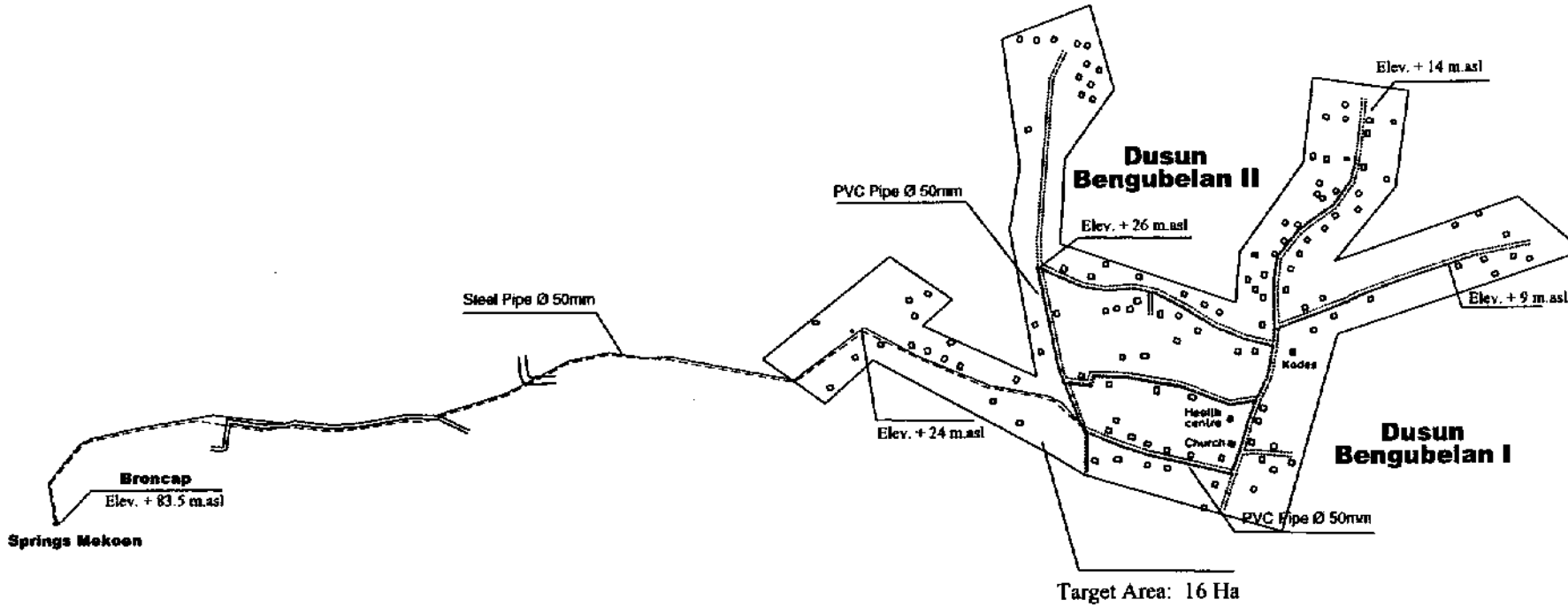


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Figure A10 - 18 : Site Layout Drawing

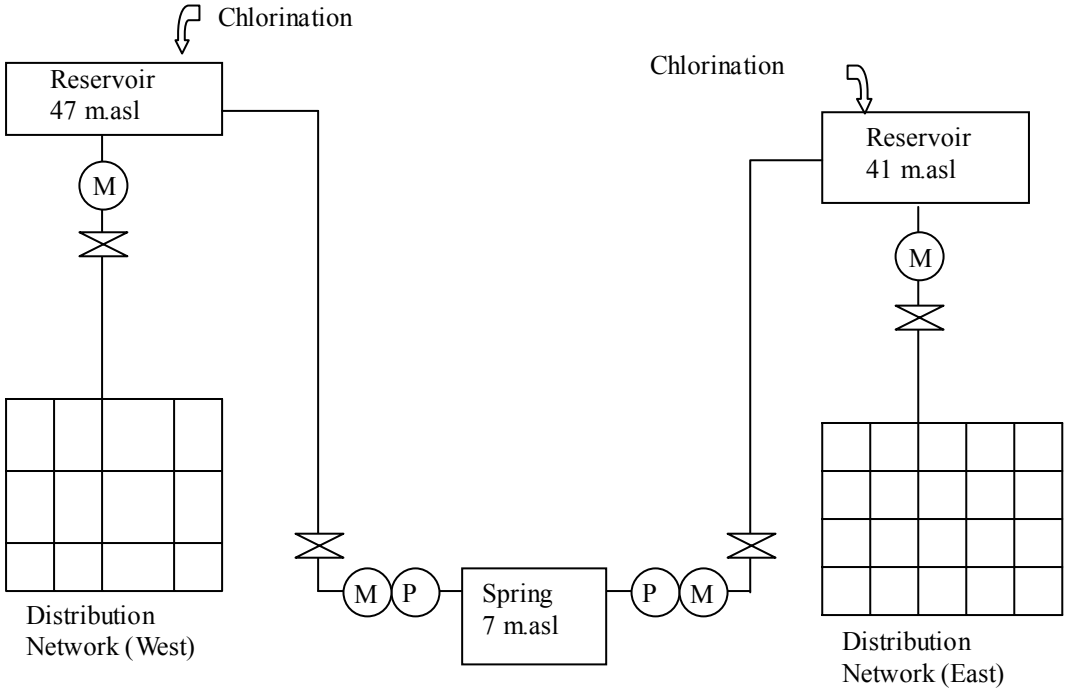
NUSAKDALE - (NTT # 23)

10.19 NTT #24 Tarus

Village:	Tarus	Total village area:	900 Ha.
District:	Kupang	Total village population:	6,436
Area to be served by new and/or rehab. distribution:			95.0 Ha.
Population to be served by proposed JICA project:			3,226 (2001)
System capacity:			5.96 L/Sec

10.19.1 Schematic Diagram of Proposed System

(See Site Layout Drawing attached.)



10.19.2 Demand Calculations

(Refer to Table 5.3.1 in Main Report.)

Design population in 2011:	3,977
Population using PH:	20 % = 795 @ 30 l/c/d
Number of PH required:	6 @ 125 persons
Population using HC:	80 % = 3,182 @ 60 l/c/d
Average daily demand:	257.7 m^3 (including 20 % wastage)
Average hourly demand:	10.74 m^3
Maximum hourly demand:	21.48 m^3 (x 2.0)

10.19.3 Source

(1) Selected Source

Name/Location/Identification:	M.A. Tarus in Lingkungan IV		
Quality Analysis:	Confirmed	Altitude:	7 m. asl
Available Capacity:	25.0 L/Sec	Pressure:	N.A.

(2) Construction Work

Construct a low level cover for the spring area (50 cm^2).

Rehabilitate the existing pump station.

Completely replace all electrical control panels, switch gear and meters, to include unified facilities for all pumps.

10.19.4 Pumping Facilities

(1) Calculations

1) Pump for western region

Basic 8 hour pumping rate:	3.9 L/Sec
Distance to first "break-pressure" point:	2,100 m
Drawdown below ground level:	2 m
Altitude differential to first "break-pressure" point:	40 m
Head losses:	18 m
Pumping head to first "break-pressure" point:	60 m

2) Pump for eastern region

Basic 8 hour pumping rate:	5.2 L/Sec
Distance to first "break-pressure" point:	1,150 m
Drawdown below ground level:	2 m
Altitude differential to first "break-pressure" point:	34 m
Head losses:	14 m
Pumping head to first "break-pressure" point:	50 m

(2) Pump Selection

1) New pumps

Quantity:	2 identical units		
	One for West supply area (Manumuti and Osiloa)		
	One for East supply area (Oetete and Boapua)		
Type:	Electric submersible		
Rated capacity:	300 L/min x 60 m x 7.5 kW (each)		
Inlet:	N.A.	Outlet:	ϕ 100 mm

2) Replacement of PDAM pumps

Quantity:	2 units		
	One for tank truck supply		
	One for distribution pipelines service		
Type:	Electric centrifugal		
Rated capacity:	7.5 kW (each)		
Inlet:	ϕ 100 mm	Outlet:	ϕ 100 mm

10.19.5 Pumping Main

(1) To Western Reservoir

Routing:	See Site Layout Drawings	Length:	2,100 m
Material:	GSP	Diameter:	100 mm
Roughness Coefficient:	100	Head loss:	11.6 m
Laying:	Underground	Maximum flow:	3.9 L/Sec
Washouts:	None	Air valves:	2 (13 mm)
Bulk meters:	One (100 mm), at pump site.		
Stop valves:	One (100 mm), at pump site.		
River/stream crossings:	One, (GSP ϕ 100 mm x 75 m)		

(2) To Eastern Reservoir

Routing:	See Site Layout Drawings	Length:	1,150 m
Material:	GSP	Diameter:	100 mm
Roughness Coefficient:	100	Head loss:	10.8 m
Laying:	Underground	Maximum flow:	5.2 L/Sec
Washouts:	None	Air valves:	1 (13 mm)
Bulk meters:	One (100 mm), at pump site.		
Stop valves:	One (100 mm), at pump site.		
River/stream crossings:	None		

10.19.6 Storage

(1) Western Reservoir

Location:	Dusun Manumuti (See Site Layout Drawing.)		
Altitude:	47 m.asl	Capacity:	30 m^3
Material:	Reinforced concrete		
Inlet:	100 mm	Outlet:	100 mm
Washout:	100 mm	Access:	Track
Overflow:	No float valve		

(2) Eastern Reservoir

Location:	Dusun Oetete (See Site Layout Drawing.)		
Altitude:	41 m.asl	Capacity:	40 m^3
Material:	Reinforced concrete		
Inlet:	100 mm	Outlet:	100 mm
Washout:	100 mm	Access:	Track
Overflow:	No float valve		

10.19.7 Transmission Main None

10.19.8 Distribution Main

(1) For Western Region

Routing:	See Site Layout Drawings.	Length:	100 m
Material:	PVC	Diameter:	75 mm
Roughness Coefficient:	120	Head loss:	0.8 m
Laying:	Underground	Maximum flow:	2.6 L/Sec
Washouts:	1 (100 mm)	Air valves:	2 (13 mm)
Bulk meters:	1 (100 mm)	Stop valves:	1(100 mm)
River/stream crossings:	None		

(2) For Eastern Region

Routing:	See Site Layout Drawings.	Length:	450 m
Material:	GSP	Diameter:	100 mm
Roughness Coefficient:	100	Head loss:	1.9 m
Laying:	Underground	Maximum flow:	3.4 L/Sec
Washouts:	1 (100 mm)	Air valves:	1 (13 mm)
Bulk meters:	1 (100 mm)	Stop valves:	1(100 mm)
River/stream crossings:	None		

10.19.9 Distribution Network

Target area:	See Site Layout Drawing attached.		
2011 Design population:	3,977	HC/PH split:	80/20 %
HC:	636 nos.	PH:	6 nos.
Public taps:	10		
Schools:	4	Churches:	1
Health centers:	2	Total no. of PH:	13

(1) Existing Distribution Facilities

The existing PDAM distribution system remains operational but separate, no direct connection to the proposed JICA system.

(2) Proposed New Work Required

1) Description

Construct 13 new PH and 10 public taps.

Install dia. 75 mm and 50 mm distribution pipelines as shown on the Site Layout Drawing.

Install 25 mm service connections to HC, PH and public taps.

Service meter installation.

2) Material estimates

PVC Pipe:	75 mm	1,100 m	Service meters:	25 mm	659
	50 mm	5,600 m	Stop valves:	75 mm	5
GSP Pipe:	25 mm	13,080 m		50 mm	9
				25 mm	659

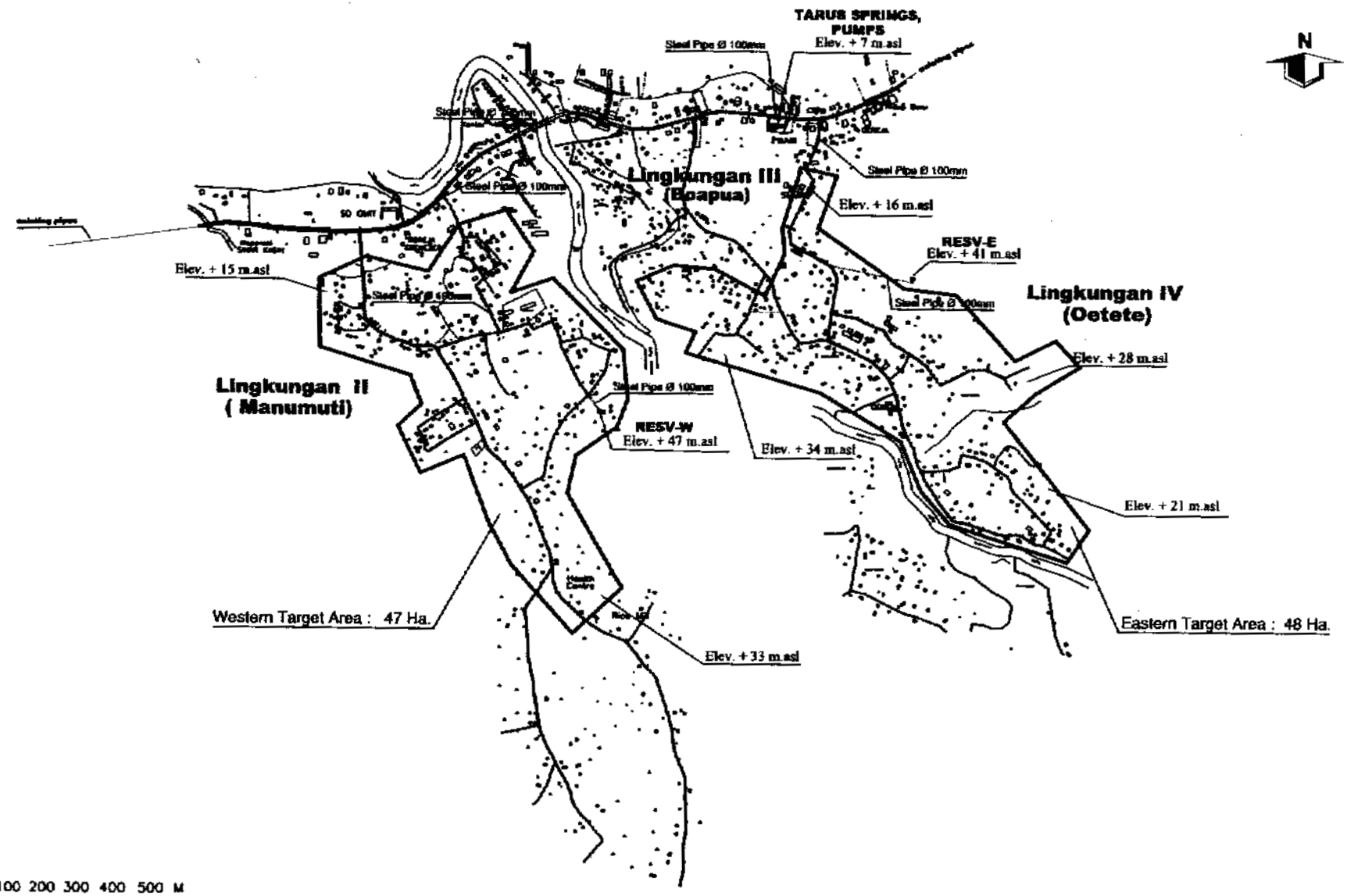


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Figure A10 - 19 : Site Layout Drawing

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