PART V RECOMMENDATIONS

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Chapter 1 Approach to Information, Education and Communication (IEC)

1.1 IEC and Hygiene Promotion

This section recommends activities for information, education, and communication activities (IEC) to encourage an increased demand for safe and clean water and hygienic latrines, and to increase the number of participants in the water supply systems as much as possible. IEC is the key to the financial sustainability of the proposed water supply systems. If people rely too much on subsidies, their self-dependence will not mature.

Inhabitants of the rural areas of the Central Highlands have lacked experience in paying for centralized water supply systems and in maintaining and operating them.. The use of these systems has resulted in improvements in health conditions of the local people, a reduction in time spent for water fetching and an increase in time for productive activities, especially, for women. IEC has been identified as the best method to promote the use of safe and clean water.

Formal networks, i.e. formal meetings, and home visits will be used for IEC. Promoters should be appointed by WSU to implement IEC activities for the promotion of piped water supply.

1.2 Parties Responsible for IEC

The parties responsible for IEC include:

Management Unit of CERWASS/PCERWASS,

CPC,

WSU, and

Promoters.

CERWASS/PCERWASS have decided to establish a Management Unit within the organization to train the local staff for rural water supply systems. The Management Unit should be responsible for the financial and technical support for IEC in the rural areas of the Central Highlands. The necessary finance should be earmarked for IEC. External support (i.e. international cooperation) may be necessary to formulate a model program of IEC and to train the IEC staff of the Unit for the initial stage. It is

recommended that the materials developed by DANIDA for IEC be utilized and revised to formulate the model program.

In each commune, promoters should be appointed by the WSU to promote additional connections to the water supply systems. WSU should pay for the promoters with financial support from the CPC/TPC.

Promoters will also co-operate with IEC activities at the commune. Villagers, including health workers, women's union, and teachers may be appointed as promoters if appropriate. People selected as promoters must have the respect of the local people, be able to communicate in the local languages, and know the benefits of safe and clean water. The Management Unit of PCERWASS should train promoters in the model program to become familiar with IEC.

1.2.1 Necessary Information for IEC

Necessary information to be distributed includes the following:

1) **Objectives** of the town meeting
2) The **water supply plan** including the drawings, project cost, maintenance cost and its implementation schedule
3) The **water quality data of the present water sources** and the benefits of safe and clean water
4) **Benefits** of safe and clean water should be emphasized using pictures and drawings
5) **Costs** for house connections and the water charge
6) **Self support of the water supply system by** the local people
7) **Operation and maintenance procedures for public taps**

Objectives of town meeting

The most important information for meetings is to explain the objectives of the water supply schemes. These will be outlined to the local participants in the local languages by the promoters. It is necessary to explain: 1) that local people will benefit from the water supply system, and 2) the local people will be responsible for the management of the piped water supply system. The objectives should be repeated often during meetings.

The water supply plan

The second of type information to be provided is about the water supply plan itself. The information in the plan includes:

- CERWASS/PCERWASS has to be executed the plan;
- the locations of the explored wells and the main and secondary pipes;
- the amount of construction cost and O&M cost;
- the method of providing house connections;
- the time schedule of construction; and
- the safe well yield of the explored wells.

The structure of the explored well will be visually shown to the local users using pictures and drawings because it will further encourage the promotion of safe and clean water. The 10 m concrete and/or clay sealing at the top of the explored well will protect the water source from contamination by surface water.

Water quality

Health hazards, for example, diarrhea, trachoma, etc, from contaminated water will be explained. The importance of hygienic education such as appropriate latrine arrangement and cleaning of hands will also be explained.

The water quality of the present water sources will be explained to show the improved health benefits of using piped water (safe and clean). A simple table showing the water quality of the existing shallow dug wells (or surface water) compared to that of the explored (deep) well will be presented. Understanding the difference between the water quality in the deep well and the existing dug wells (or springs) encourages the promotion of safe and clean water. The comparison of **coliform** (an indicator of micro-organism contamination) between different water sources makes a difference to the local users. The effect of iron and/or manganese removal will also be explained.

Benefits of safe and clean water

The benefits of providing safe and clean water will be explained, including of the positive effects on health and reduction in workload and time, especially for women and children who currently fetch water from springs or dug wells. This information should be emphasized in the ethnic minority communes.

The explanation shall be modified to suit the social and natural condition of each commune.

Costs of the Project

Promoters need to explain the costs for the project, including construction cost, O&M cost and house connection cost. They also need to explain who shall pay each part of the project cost.

After explaining this information, the local people will have a much better understanding about the costs of a house connection and ongoing water charges.

Responsibilities of the local users

It is necessary to explain that the water charge will include the costs for operation and maintenance, and reinvestment. To minimize O&M costs, the following activities are necessary:

- Protection of the groundwater sources by keeping the environment of the wells clean;
- Maintain in good condition for their water meter or taps
- Regularly payment of bills for water used

Public taps

Public taps have been adopted in the design for many of the target ethnic minority villages during phase 1 (up to 2010). However, the operation and maintenance of public taps is complicated, because the tariff collection for public taps is more difficult than that for house connections. Information on how to collect water tariffs among users should be provided if necessary.

1.3 IEC Campaigns

Promoters appointed by WSU will implement IEC campaigns. These include the formal networks, town meetings, face-to-face communication such as home visit, and also local information media such as radio network and loudspeaker.

1.3.1 Formal Meeting

Formal meetings include regular town/commune meetings, meetings at health centers, meetings held by farmer's union, women's union and youth union. In particular, a **town meeting of the people's committee is the most common and easiest to organise**. The key points to follow for formal meetings are as follows:

1) A formal meeting is the starting point for IEC. f IEC activities should start **4-5 months before the completion of construction works**.
2) Necessary information should be clearly identified and given to participants.
3) The **health center** (CHC) should be invited to the meeting and asked to co-operate.
4) **Tell simple and clear messages**.
5) A polite, and friendly **attitude** towards the local people is essential.
6) **Leaflets** and simple questionnaires should be provided after the meeting.

Most of the anticipated users of the piped water supply systems will be farmers. They would pay for a house connection by the income from a harvesting. IEC activities should be initiated (4 to 5 months) before the harvest season.

Cooperation from the health center is essential. The objective of the piped systems should be explained to the local people. In most cases, health workers are respected, and the local people follow their advice.

A gentle and polite attitude of promoters makes the local people comfortable and encourages the use of safe and clean water. As informal communication networks among family members, peers, and neighbours are essential for IEC, the attitude of promoters, whether friendly or arrogant, will quickly become known to all members of the communities.

As it is difficult to remember all details of spoken information at the meeting, simple leaflets will be prepared and distributed after the meeting. All the necessary information at the meeting will be printed in the Kinh and/or minority languages, as

UNICEF emphasizes the importance of the combination of printed materials such as leaflets together with the formal communication networks.

1.3.2 Face-to-face Communication

Home visits of exceptional case when it is required will follow the formal meeting. To promote house connections, promoters need to visit users' houses. Usually, home visits will be undertaken by community leaders (e.g. women's union, farmers' union, youth union), and it is recommended they accompany promoters to explain the necessary information.

In addition to the information elaborated above, the benefits of the provision of safe and clean water should be emphasized during the home visits. The most notable benefits of the use of safe and clean water are the promotion of health and the reduction in workload and time for water transportation. Illustrating with examples will help the local people more easily understand the benefits.

1.3.3 Local media

The local radio network and loud speakers are also useful if available. In the rural areas, communes/towns usually have access to the local radio network and loud speakers. The necessary information mentioned above can be broadcast on the radio in the local languages (Kinh and ethnic minorities' languages). Promoters need to contact CPC/TPC to provide the information outlined above.

1.4 Schedule of IEC and Promotors' Work

In order to ensure the effective IEC activities by promotors, a tentative schedule is shown in Table 1.1. The arrangements for staffing and their salaries should be discussed with PCERWASS and CPC/TPC or international donors if available. IEC activities are estimated as longer for the difficult communes by the construction stages. It is recommended to take a counter measurement such as long and periodical promoting to the difficult communes, and demonstrating the successful pilot model to the users.

Table 1.1 Tentative schedule for Soft Component activities

	Descriptions	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	M/M
A	**Overall Management Team**											
1	Team Leader											96
2	Capacity building specialist											36
3	Administrator											96
B	**Provincial and Commune Team**											
B1	Implementation Period of 5-system											
	(K2-3, G3-1, G2, D1, D2)					(construction)						
1	Capacity building specialist											12
2	IEC activities by Promoters											24
B2	Implementation Period of 4-system											
	(K4-1, G1, G4-1, D3-1, D6)							(construction)				
1	Capacity building specialist											12
2	IEC activities by Promoters											48
B3	Implementation Period of 5-system											
	(K3-1, G5-1, G6-1, D4-1)									(construction)		
1	Capacity building specialist											12
2	IEC activities by Promoters											72
B4	Implementation Period of 7-system											
	(K1-1, K2-1, G7-1, D3-2, D4-2, D5-1, D7)									(construction)		
1	Capacity building specialist											12
2	IEC activities by Promoters											96

Table 1.2 Necessary Activities for Target Communes

Weaknesses	Strengths	Necessary Activities
K-1, Bo Y commune, Ngoc Hoi district		
▪ Living standard is very low. ▪ About 20% suffer from typhoid. ▪ 1/4 believes that springs are cleaner than groundwater, and about 43% drink surface water. ▪ The quantity of water is insufficient in the dry season (60%). ▪ 2/3 do not use a latrine, and 20% rarely collect garbage.	▪ The influence of CPC and village chiefs is strong. ▪ The Ca Dong and Kinh live together in the villages.	▪ Overall IEC campaigns are necessary with the help of CHC, including the promotion of the use of deep groundwater, hygienic latrines, hand washing, and garbage collection. ▪ CHC has to hold village meetings with the help of village chiefs for minority communities. ▪ Intensive home visits by health workers and WU will be necessary.
▪ **K-2, Dak Su commune, Ngoc Hoi district**	▪	
Weaknesses	**Strengths**	
▪ Living standard is very low, and villages are very scattered and difficult to access. ▪ More than 40% suffer from typhoid. ▪ WU is not active at all. ▪ The quantity of water is insufficient in the both seasons (83%, 47%). ▪ More than 80% do not use a latrine, and 27% rarely collect garbage. ▪ Hand washing is not well practiced.	▪ The influence of CPC and village chiefs is strong.	
K-3, Dak Ui commune, Dac Ha district	▪	
Weaknesses	**Strengths**	
▪ Living standard is very low. ▪ About 36% suffer from typhoid, and 18% suffer from cholera. ▪ The quantity of water is insufficient in the dry season (54%). ▪ Only 7% use a latrine, and about 18% rarely collect garbage. ▪ Latrines are located close to dug wells.	▪ IEC activities have been carried out through the pilot model project. ▪ The influence of CPC and village chiefs is strong. ▪ CHC' awareness is relatively high, and minority-oriented health care is carried out.	
▪ **K-4, Dak Hiring commune, Dac Ha district**	▪	
Weaknesses	**Strengths**	
▪ About 24% suffer from typhoid, and 48% suffer from diarrhea. ▪ 1/3 still believes that surface water is cleaner than groundwater. ▪ The quantity of water is insufficient in the dry season (31%). ▪ Only 10% use a latrine, and about 1/3 rarely collect garbage. ▪ Hand washing is not well practiced.	▪ The influence of CPC and village chiefs is strong. ▪ CHC' awareness is relatively high, and a map is prepared to show the health conditions of the local people.	
K-5, Sa Nghia commune, Sa Thay district		
Weaknesses	**Strengths**	**Necessary Activities**
▪ About 53% suffer from typhoid. ▪ The quantity of water is insufficient in the dry season (63%). ▪ Only 15% use a latrine for defecation.	▪ The influence of CPC is very strong. ▪ The commune is Kinh-dominated.	▪ Deep groundwater development, and improvement of dug wells are urgent. ▪ IEC campaigns for appropriate environment of dug wells, and latrine promotion are necessary.
▪ K-6, Chu Hreng commune, Kon Tum city	▪	
Weaknesses	**Strengths**	
▪ About 27% suffer from typhoid. ▪ The quantity of water is insufficient in the dry season (53%). ▪ Only 20% use a latrine for defecation.	▪ Health workers are influential in the Ba Na communities. ▪ The Ba Na people live together with the Kinh people in the same villages.	

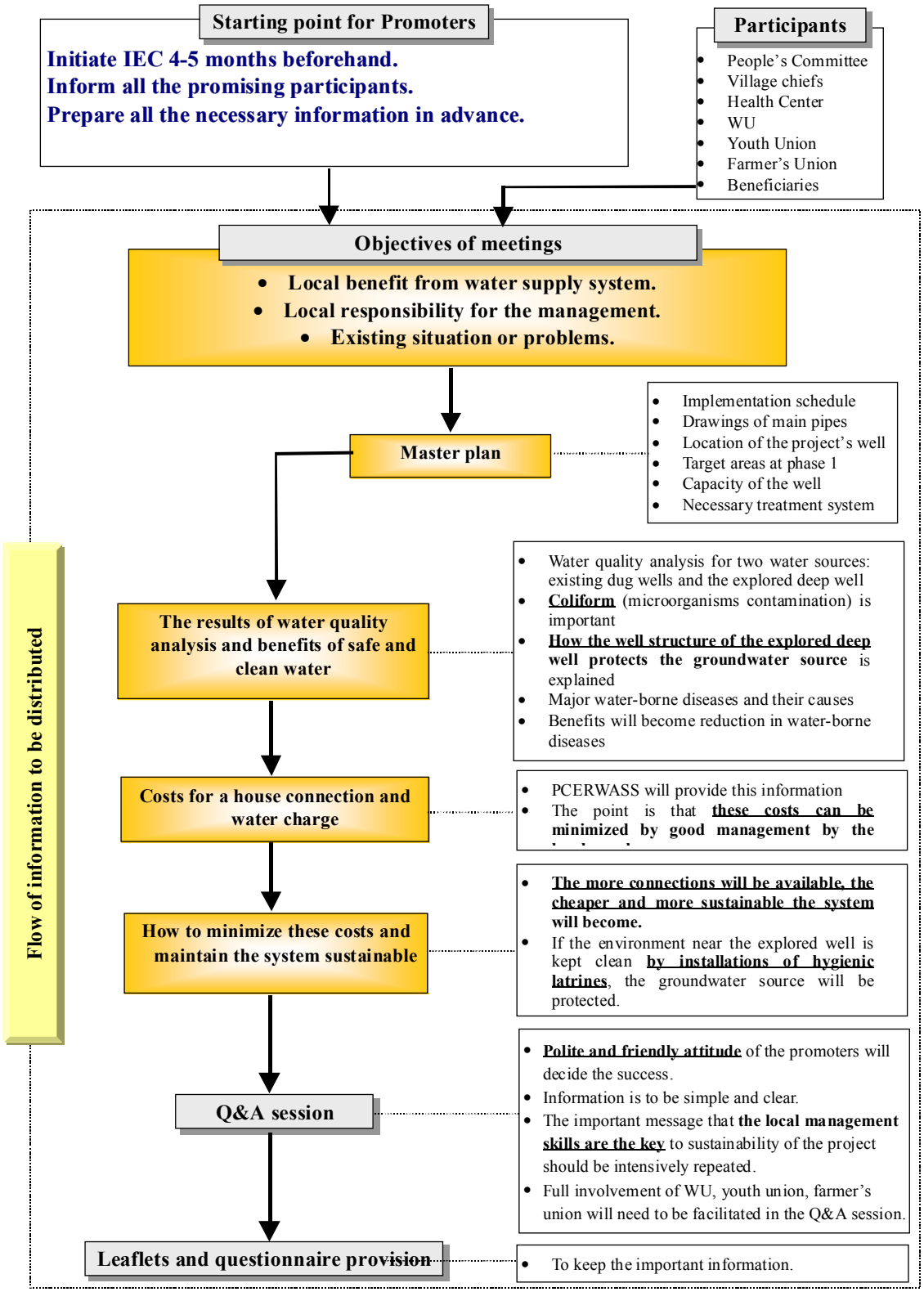


Figure 1.1 Information Flow at Town Meeting for Well-off Communities

Chapter 2 Other Recommendations

2.1 Short-term Measures

It would be very important to have the WSUs properly established through general regulations adopted by the respective CPCs. The articles should include provisions on the institutional structure of the WSU, rights and responsibilities of the WSU, its staff members and clients, management of public taps, and the implications of violating regulations. The regulations would clarify the roles of various parties and authorize the WSU to take measures in case of non-payment and vandalism K3-1 would need closer follow-up and support than G2, but Kon Tum PCERWASS itself would need considerable capacity building. There is no easy solution. The support should come from a higher level of the government hierarchy.

Much of the necessary IEC could not be carried out in the short time prior to and during the construction of the schemes. There is a great need to promote IEC.

2.2 Long-term Measures

One of the most important aspects of successful implementation will be to give time for the communes to be ready for the investment. In practice this can take place by phasing the implementation such that the first stage of physical implementation will commence in about five of the communes (those with the most potential). Simultaneously, extensive IEC activities will need to be carried out in the other communes to build their capacity to implement the project in later stages.

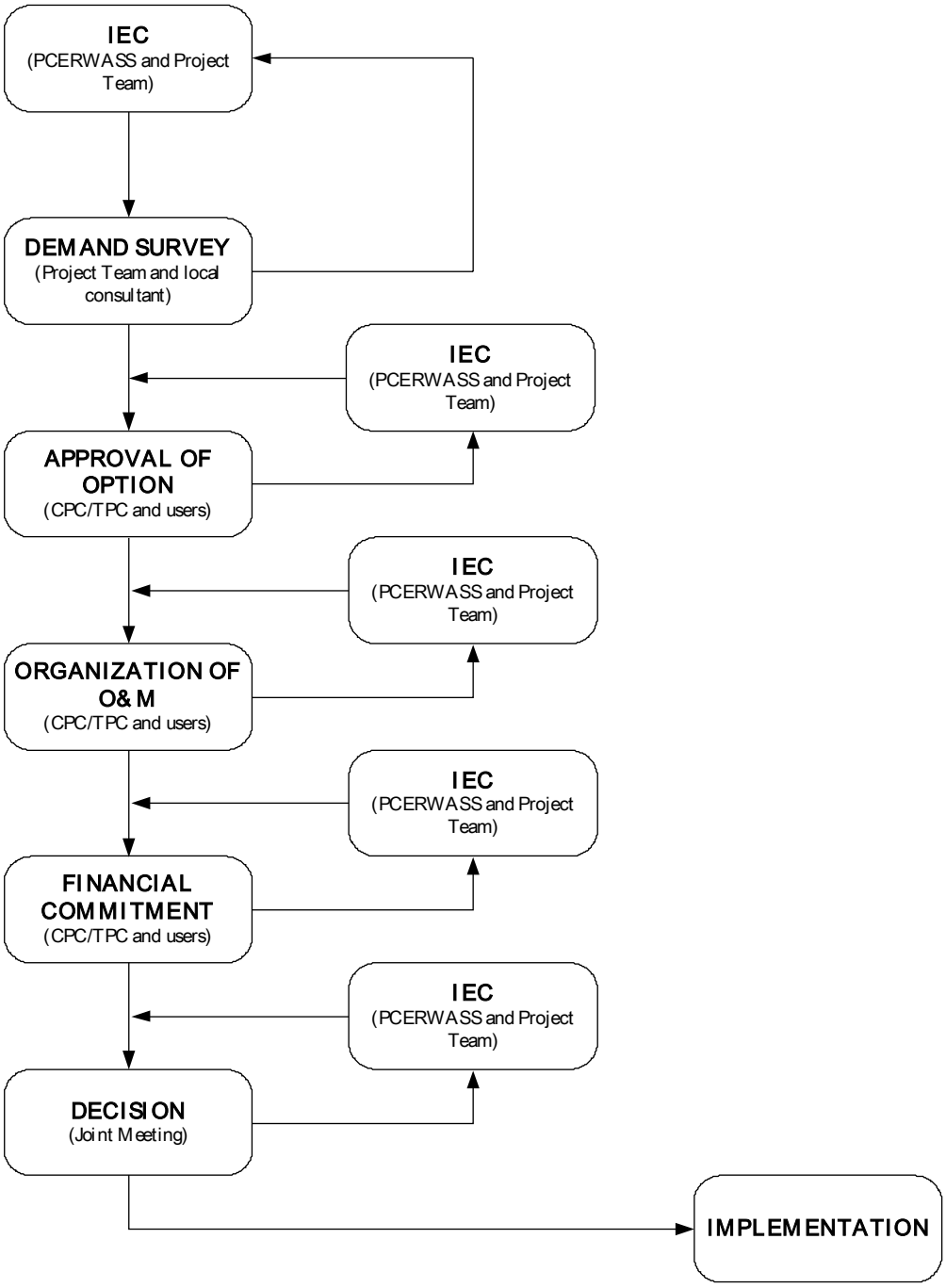


Figure 2.1 Flowchart of Community Sensitivity for Project Implementation

2.3 Preconditions for Construction

2.3.1 Central Level

Objectives:

- Adequate capacity of all relevant PCERWASS to assume responsibilities in accordance with NRWSS and the Project; and
- Assurance of timely and efficient IEC and support to be provided by PCERWASS.

Preconditions for decision on scheme construction:

- Proven capacity of PCERWASS to coordinate and support IEC, training, follow-up and long-term support;
- Secure budget allocations to relevant PCERWASS for IEC activities, training, follow-up and long -term support; and
- Appropriate IEC and training materials and management and O&M manuals made available by PCERWASS for distribution to Project communes

2.3.2 Provincial level

Objectives:

- Capacity to coordinate and support IEC; and
- Capacity to provide training (courses and on-the-job) to WSUs and board members, to follow-up their performance and provide them with long-term support.

Preconditions for the decision on scheme construction:

- Adoption of and commitment to NRWSS;
- Secured budget for IEC activities, training, follow-up and long-term support (from CERWASS/PCP); and
- Proven capacity to provide support to CPC/TPCs, and WSUs.

2.3.3 Commune Level

Objectives:

- Generation of demand for improved water supply (health, convenience, status,) through education and "social marketing";
- Introduction of option(s) available, their impacts and related costs, rights and duties; and
- Introduction of Project concept: conditions, procedures, and contribution requirements

Preconditions for decision on scheme construction:

- Adequate demand for improved water supply: at least 35% of households to be willing (and able) to pay for water on a monthly basis that initially covers the cost of one cubic meter *per capita* per month at a tariff calculated to cover all costs in the long term;
- Acceptance of the option(s) provided by the Project: the location of facilities accepted by the community members, the service level and costs known and accepted by the users, and the decision on inclusion/exclusion of public taps made in consultation with the users;
- Management and operation of the system organized: WSU and its board established (the latter includes user representation), regulations adopted, rights and responsibilities of WSU and users defined and accepted by both parties, relevant documentation formats adopted, user groups of possible public taps established; and
- Measurable commitment to sustain the system[1]: households to be connected to have deposited at least 50% of the connection cost, user groups of public taps to have deposited at least 10% of the public tap cost, and CPC/TPC to have deposited sufficient amount to cover i) at least the salaries/wages of two WSU staff members for their participation in construction for the entire construction period, and ii) to cover the cost of necessary O&M tools.

[1] On the other hand, the Project has to assure the community of the quality of the improved water supply. If the service level (including water quality) does not comply with what has been advertised, deposits shall be returned.

2.4 Necessity of Subsidy from Government

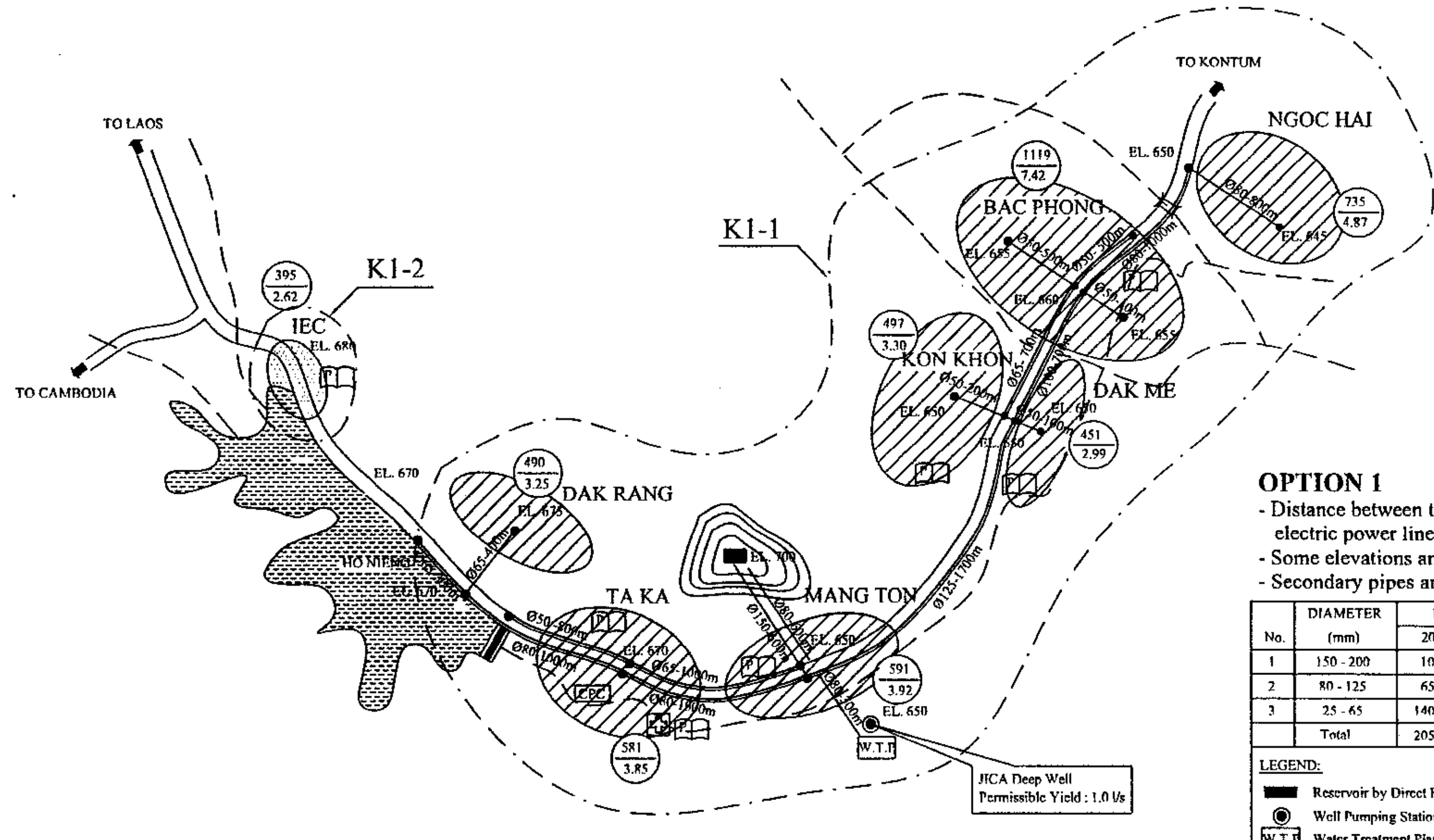
Because of the rather unstable and difficult management of the small sized rural water supplies, it is recommended that support, by way of subsidy, be provided by the Vietnam government.

2.5 Sustainable Operation of Two Pilot Models

It is recommended that the two pilot models constructed by JICA study team should be properly and sustainably operated as a model case in the rural area in the central highlands and also as a model for the entire rural area of Vietnam.

Appendix 1

Water Supply Systems in the 9 Systems (Tables of Facilities in Each System)



OPTION 1

- Distance between the deep well and existing electric power line is approx. 300m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	1000		* Secondary pipes : - 5000m along main road - 4000m (1000m/village)
2	80 - 125	6500	600	
3	25 - 65	14000	1300	
	Total	20500	1900	

LEGEND:

- Reservoir by Direct Foundation
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a/b: Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam

Draw.Name
BO Y NETWORK DIAGRAM _ K1 OPTION 1

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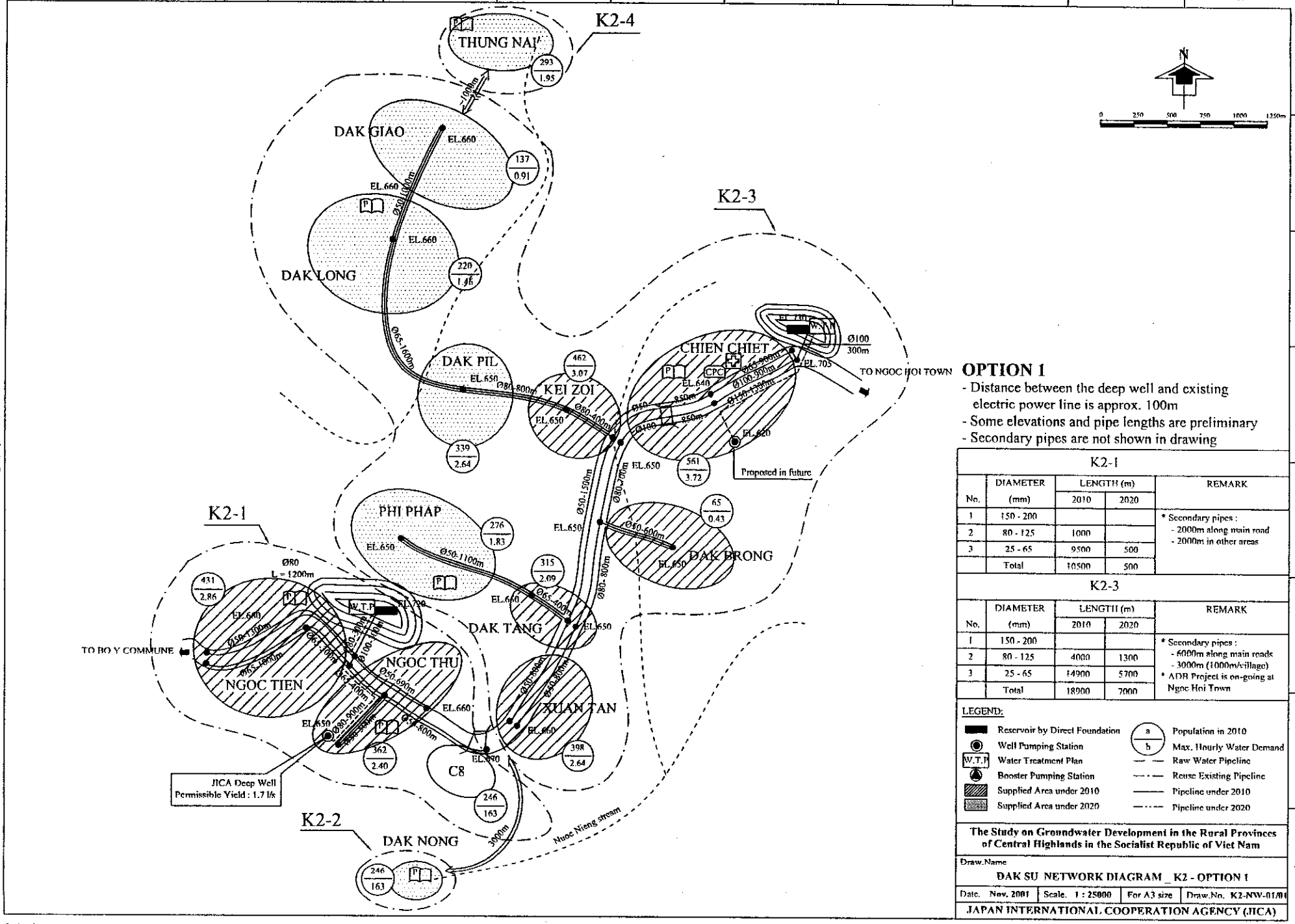

OPTION 1

- Distance between the deep well and existing electric power line is approx. 100m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

K2-1

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200			* Secondary pipes : - 2000m along main road - 2000m in other areas
2	80 - 125	1000		
3	25 - 65	9500	500	
	Total	10500	500	

K2-3

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200			* Secondary pipes : - 6000m along main roads - 3000m (1000m/village) * ADB Project is on-going at Ngoc Hoi Town
2	80 - 125	4000	1300	
3	25 - 65	14900	5700	
	Total	18900	7000	

LEGEND:

- Reservoir by Direct Foundation
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a / b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

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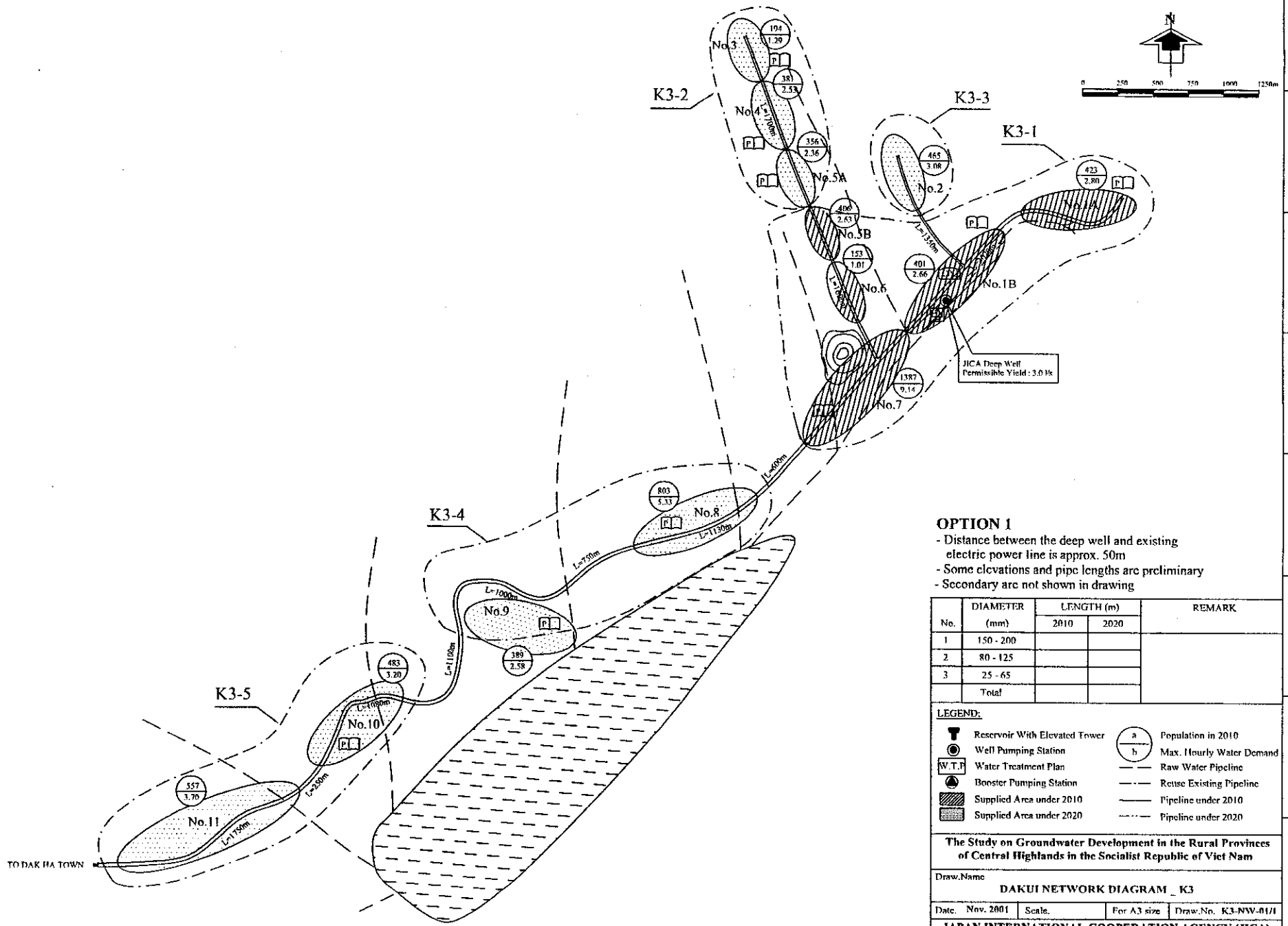

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200			
2	80 - 125			
3	25 - 65			
	Total			

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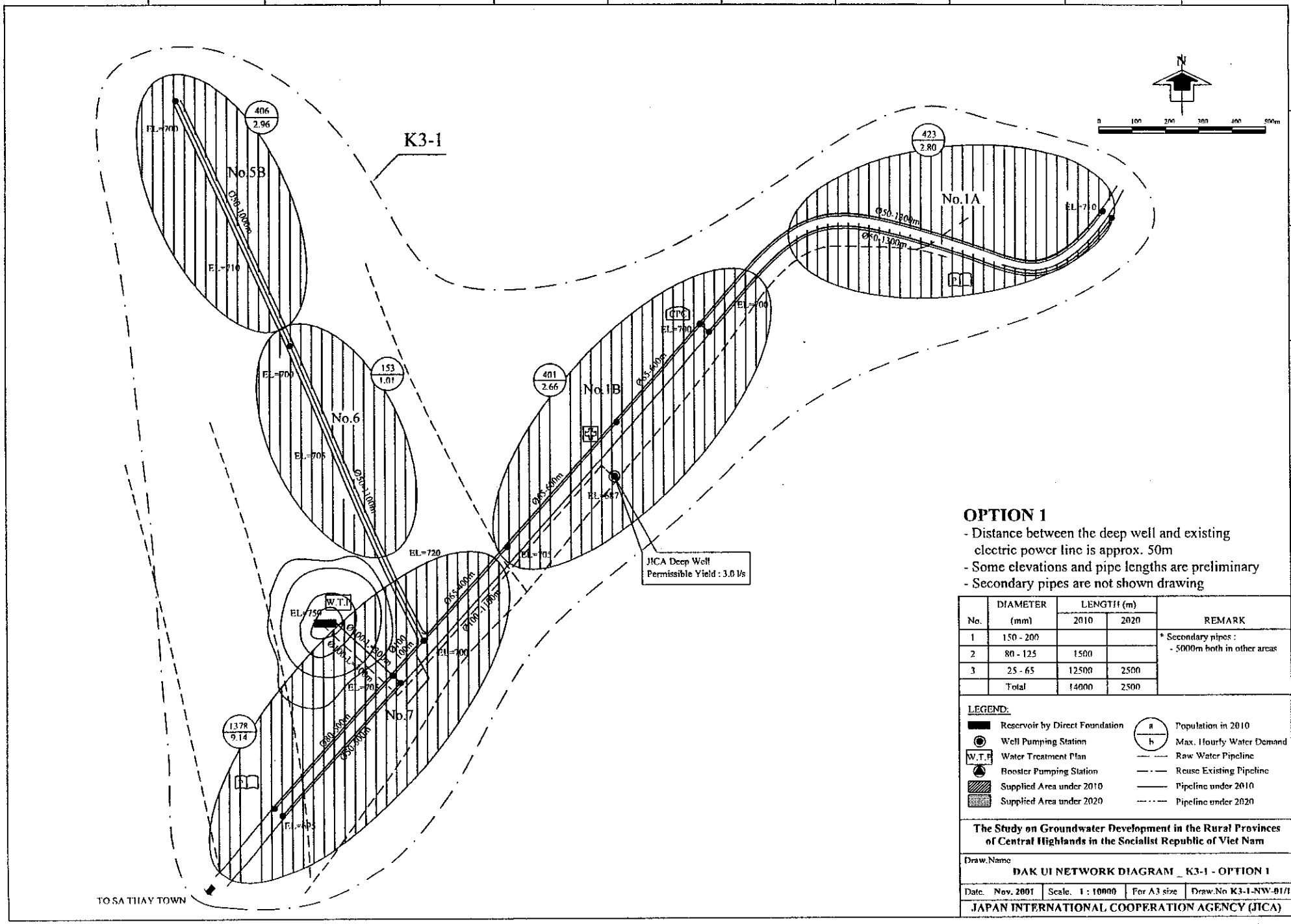

OPTION 1

- Distance between the deep well and existing electric power line is approx. 50m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200			* Secondary pipes : - 5000m both in other areas
2	80 - 125	1500		
3	25 - 65	12500	2500	
	Total	14000	2500	

LEGEND:

- Reservoir by Direct Foundation
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a/b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

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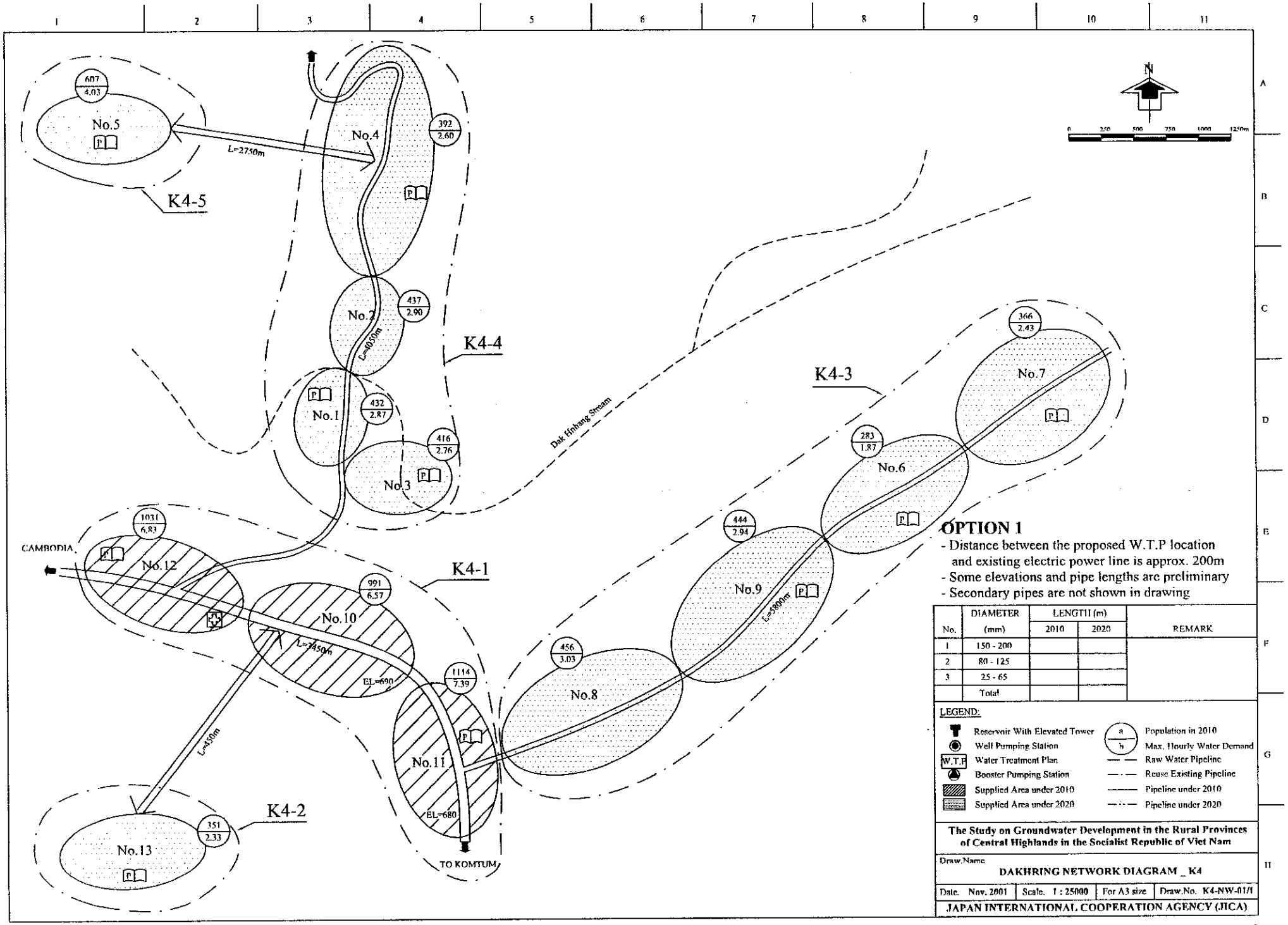

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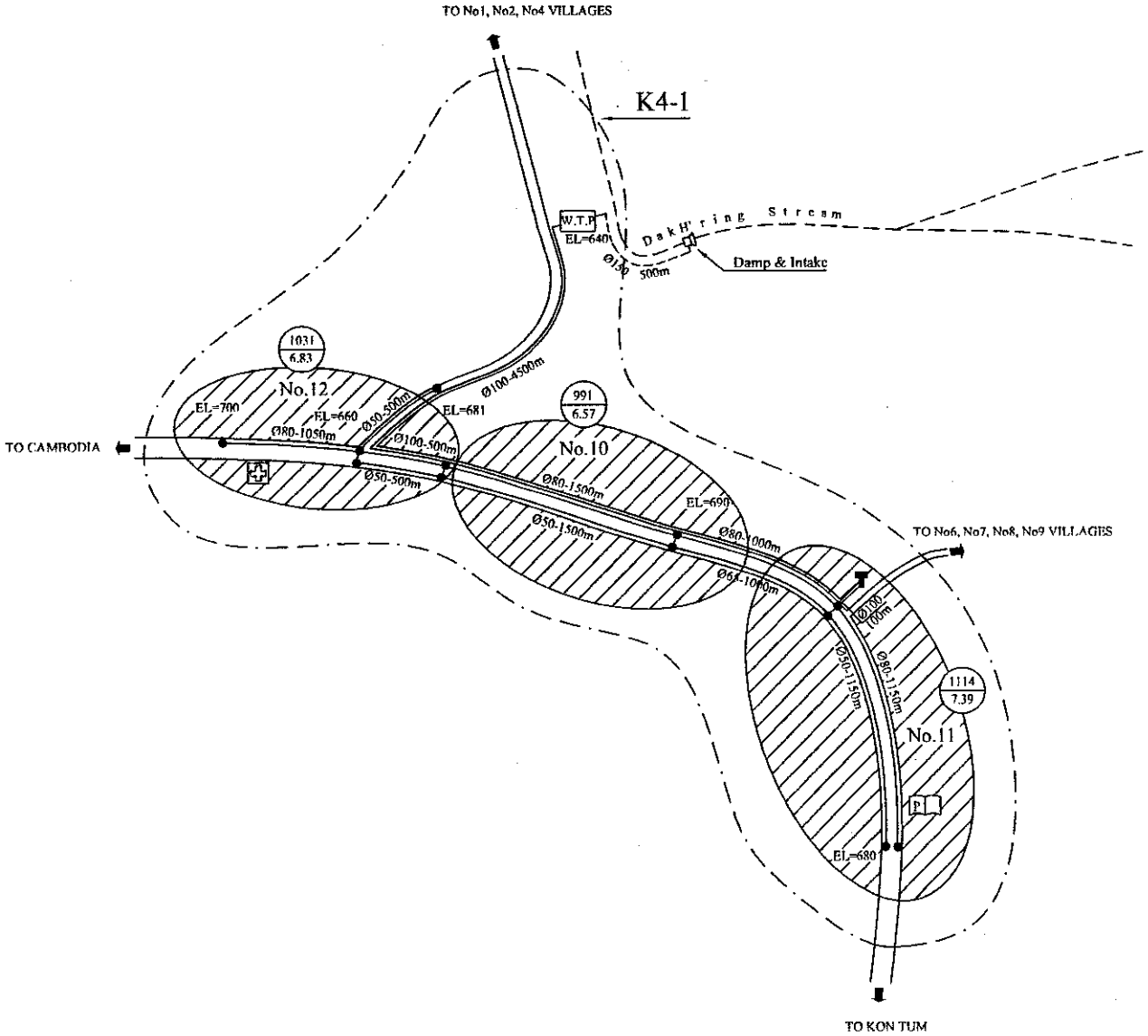

N

0 250 500 750 1000 1250m

OPTION 1

- Distance between the proposed W.T.P location and existing electric power line is approx. 200m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200			* Secondary pipes : - 3000m along main road - 3000m (1000m/village)
2	80 - 125	10800	1000	
3	25 - 65	10700	2500	
	Total	21500	3500	

LEGEND:

- Reservoir With Elevated Tower
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a / b : Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam

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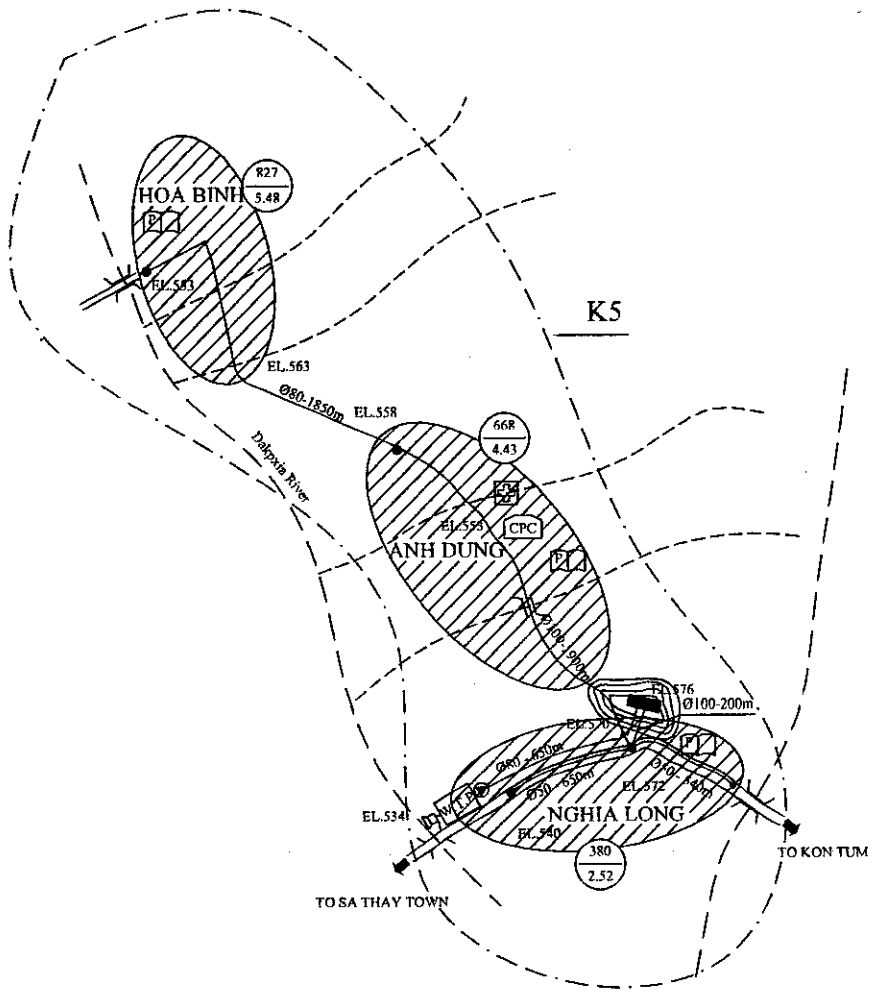

N

0 250 500 750 1000 1250m

OPTION 1

- Distance between the WTP location and existing electric power line is approx. 200m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	2020	REMARK
1	150 - 200			* Secondary pipes : - 3000m along main road - 3000m (1000m/village)
2	80 - 125	4600		
3	25 - 65	7200	2000	
	Total	11800	2000	

LEGEND:

- Reservoir by Direct Foundation
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a/b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam

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SA NGHIA NETWORK DIAGRAM _ K5 OPTION 1

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CAD File : K5-NW-01-1.DWG

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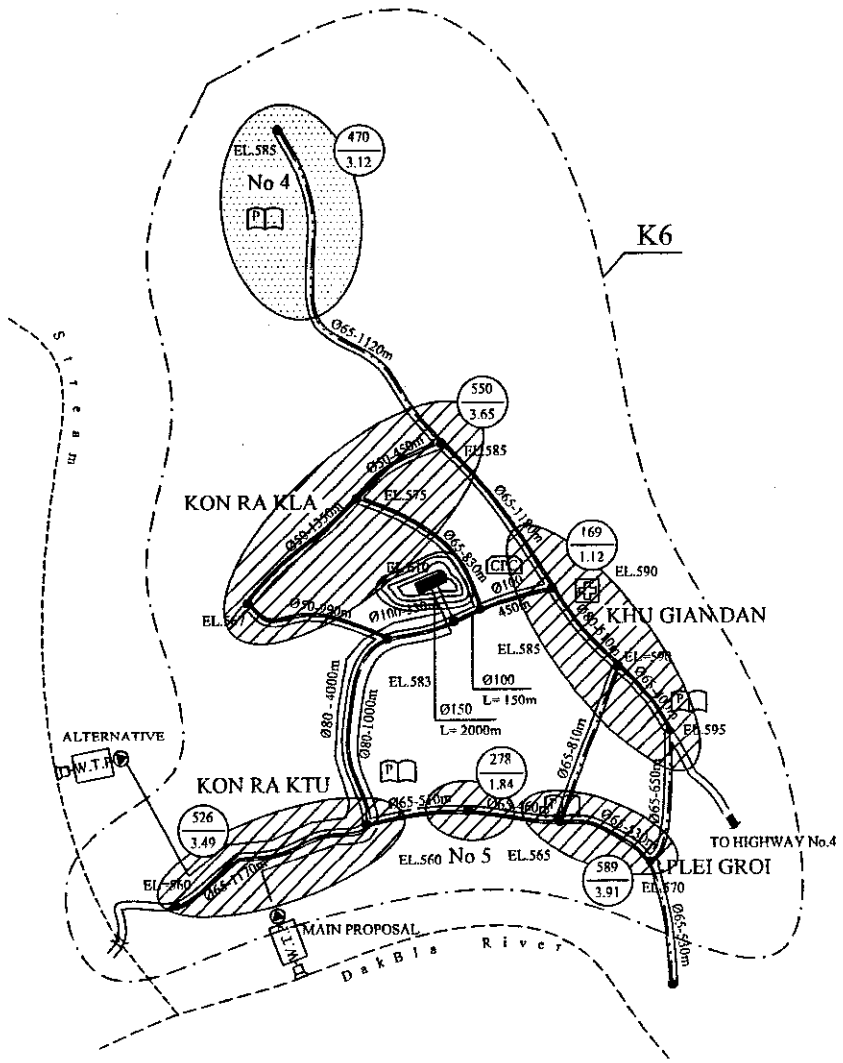


OPTION 1

- Distance between the deep well and existing electric power line is approx. 200m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	200		* Secondary pipes : - 4000m along main road - 3000m (1000m/village)
2	80 - 125	6500	2500	
3	25 - 65	14900	2000	
	Total	21600	4500	

LEGEND:

- Reservoir by Direct Foundation
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a / b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam

Draw.Name: CHU HRENG NETWORK DIAGRAM _ K6 OPTION 1

Date. Nov. 2001	Scale. 1 : 25000	For A3 size	Draw.No. K6-NW-01/1

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

A1-8

CAD File : K6-NW-01-1.DWG

Format A3

Appendix 2

Cost Estimation in Priority Communes

Cost estimates for feasibility study, bo y commune _ K1-1 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	7	3	266,000	14,000	114,000	6,000		
		Well head	Set	8	3	13,600	1,600	5,100	600		
		Submersible,MotorProtection,Pipe and Acessories	set	8	3	40,000	8,000	15,000	3,000		
		Power Suppy System	set	8	3	32,000	2,400	12,000	900		
		Well House	m2	96	36	14,400	2,880	5,400	1,080		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	33,000	3,300	16,500	1,650		
		Aeration Tower	m2	5	2	500	150	200	60		
		Reaction Tank	m3	26	12	5,200	1,820	2,300	805		
		Rapid Filter Basin	m2	10	5.0	17,000	3,000	8,500	1,500		
		Reservoir	m3	207	90	15,939	6,210	6,930	2,700		
		Elevated Tower	m3	None	None						
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/h	52	22	20,720	6,216	8,800	2,640		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				466,559	50,576	194,730	20,935		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	12.0	4.5	144,000	48,000	54,000	18,000		
	1.1	80-100									
	1.2	150-200									
	2	Distribution Pipeline	km								
	2.1	25-65		14.0	1.3	35,000	49,000	3,250	4,550		
	2	80-125		6.5	0.6	39,000	22,750	3,600	2,100		
	3	150-200		1	0.0	11,500	5,500	0	0		
	4	Public taps	Unit	8		3,600	400				
		Sub-Total				233,100	125,650	60,850	24,650		
C	**Construction cots (A+B)**					699,659	176,226	255,580	45,585		
D	**Land cost**										
E	**Engineering Service (15%C)**					104,949	26,434	38,337	6,838		
		(Incl. Soil investigation, field serve, detailed design and construction supervisor									
F	**Base cost (C+D+E)**					804,608	202,660	293,917	52,423		
G	**Physical contingency (10%F)**					80,461	20,266	29,392	5,242		
H	**Project cost (F+G)**					885,069	222,926	323,309	57,665		
I	**Price contingency (10%H)**					88,507	22,293	32,331	5,767		
J	**Total financing required (H+I)**					**973,575**	**245,218**	**355,640**	**63,432**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, dak su commune _ K2-1 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	0	1	0	0	38,000	2,000		
		Well head	Set	1	1	1,700	200	1,700	200		
		Submersible,MotorProtection,Pipe and Acessories	set	1	1	5,000	1,000	5,000	1,000		
		Power Suppy System	set	1	1	4,000	300	4,000	300		
		Well House	m2	12	12	1,800	360	1,800	360		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	25,000	2,500	12,500	1,250		
		Aeration Tower	m2	1	1	100	30	50	15		
		Reaction Tank	m3	8	0.2	1,560	546	40	14		
		Rapid Filter Basin	m2	3	1	5,100	900	1,700	300		
		Reservoir	m3	42	20	3,234	1,260	1,540	600		
		Elevated Tower	m3	None	None						
		Booster Pumping Station : Pumps, Pipes and Acessories	item	None	None						
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				55,694	8,096	66,330	6,039		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	1.5	1.5	18,000	6,000	18,000	6,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		9.5	0.5	23,750	33,250	1,250	1,750		
		80-125		1.0	0.0	6,000	3,500	0	0		
		150-200		0.0	0.0	0	0	0	0		
	3	Public taps	Unit	4		1,800	200				
		Sub-Total				49,550	42,950	19,250	7,750		
C	**Construction cots (A+B)**					105,244	51,046	85,580	13,789		
D	**Land cost**										
E	**Engineering Service (15%C)**					15,787	7,657	12,837	2,068		
		(Incl. Soil investigation, field serve, detailed design and construction supervisor									
F	**Base cost (C+D+E)**					121,031	58,703	98,417	15,857		
G	**Physical contingency (10%F)**					12,103	5,870	9,842	1,586		
H	**Project cost (F+G)**					133,134	64,573	108,259	17,443		
I	**Price contingency (10%H)**					13,313	6,457	10,826	1,744		
J	**Total financing required (H+I)**					**146,447**	**71,031**	**119,085**	**19,187**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, dak su commune _ K2-3

option 1

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	2,020	2010		2020		2010	2020
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	3	1	114,000	6,000	38,000	2,000		
		Well head	Set	3	1	5,100	600	1,700	200		
		Submersible,MotorProtection,Pipe and Acessories	set	3	1	15,000	3,000	5,000	1,000		
		Power Suppy System	set	3	1	12,000	900	4,000	300		
		Well House	m2	36	12	5,400	1,080	1,800	360		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	33,000	3,300	16,500	1,650		
		Aeration Tower	m2	5	1	450	135	50	15		
		Reaction Tank	m3	16	7	3,240	1,134	1,460	511		
		Rapid Filter Basin	m2	6	4.0	10,200	1,800	6,800	1,200		
		Reservoir	m3	129	55	9,933	3,870	4,235	1,650		
		Elevated Tower	m3	None	None						
		Booster Pumping Station : Pumps, Pipes and Acessories	item	None	None						
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				216,523	22,819	79,545	8,886		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	4.5	1.5	54,000	18,000	18,000	6,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		14.9	5.7	37,250	52,150	14,250	19,950		
		80-125		4.0	1.3	24,000	14,000	7,800	4,550		
		150-200		-	0.0	0	0	0	0		
	3	Public taps	Unit	10		4,500	500				
		Sub-Total				119,750	84,650	40,050	30,500		
C	**Construction cots (A+B)**					336,273	107,469	119,595	39,386		
D	**Land cost**										
E	**Engineering Service (15%C)**					50,441	16,120	17,939	5,908		
		(Incl. Soil investigation, field serve, detailed design and construction supervisor									
F	**Base cost (C+D+E)**					386,714	123,589	137,534	45,294		
G	**Physical contingency (10%F)**					38,671	12,359	13,753	4,529		
H	**Project cost (F+G)**					425,385	135,948	151,288	49,823		
I	**Price contingency (10%H)**					42,539	13,595	15,129	4,982		
J	**Total financing required (H+I)**					**467,924**	**149,543**	**166,416**	**54,806**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, dak ui commune _ K3-1 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	0	1	0	0	38,000	2,000		
		Well head	Set	1	1	1,700	200	1,700	200		
		Submersible,MotorProtection,Pipe and Acessories	set	1	1	5,000	1,000	5,000	1,000		
		Power Suppy System	set	1	1	4,000	300	4,000	300		
		Well House	m2	12	12	1,800	360	1,800	360		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	25,000	2,500	12,500	1,250		
		Aeration Tower	m2	2	1	150	45	100	30		
		Reaction Tank	m3	9	4	1,880	658	820	287		
		Rapid Filter Basin	m2	4	2	6,800	1,200	3,400	600		
		Reservoir	m3	74	33	5,698	2,220	2,541	990		
		Elevated Tower	m3	None	None						
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/h	None	None						
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				60,228	9,483	69,861	7,017		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	1.5	1.5	18,000	6,000	18,000	6,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		12.5	2.5	31,250	43,750	6,250	8,750		
		80-125		1.5	0.0	9,000	5,250	0	0		
		150-200		0.0	0.0	0	0	0	0		
	3	Public taps				0	0				
	4	Semi-Reservoir + Public Tap (2m3)	set	45		20,250	2,250	6,250	8,750		
		Sub-Total				78,500	57,250	30,500	23,500		
C	**Construction cots (A+B)**					138,728	66,733	100,361	30,517		
D	**Land cost**										
E	**Engineering Service (15%C)**					20,809	10,010	15,054	4,578		
		(Incl. Soil investigation, field serve, detailed design and construction supervisor									
F	**Base cost (C+D+E)**					159,537	76,743	115,415	35,095		
G	**Physical contingency (10%F)**					15,954	7,674	11,542	3,509		
H	**Project cost (F+G)**					175,491	84,417	126,957	38,604		
I	**Price contingency (10%H)**					17,549	8,442	12,696	3,860		
J	**Total financing required (H+I)**					**193,040**	**92,859**	**139,652**	**42,464**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, dak su commune _ K4-1 **option 1**

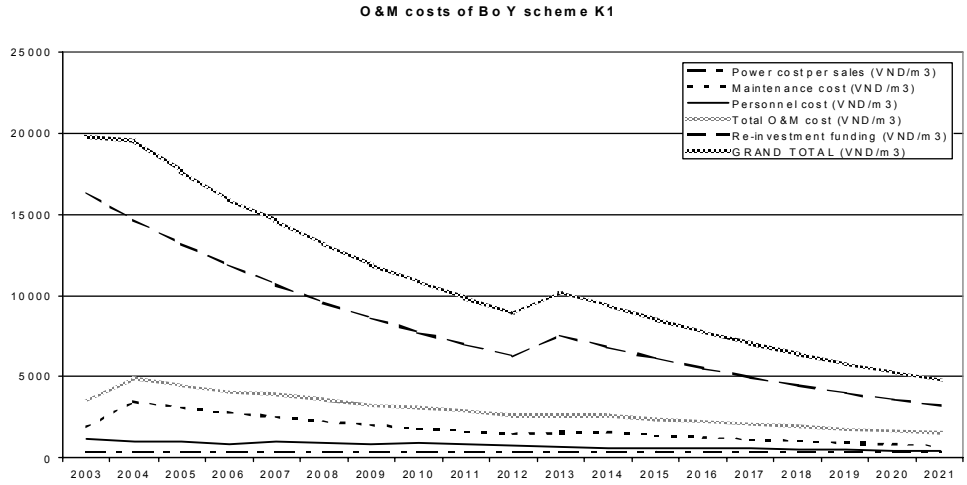
Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Intake Works									
		Intake	item	1		15,000	8,800				
		Raw transmission Pipe and Acessories	set	1		15,000	7,000				
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	42,000	4,200	21,000	2,100		
		Roughing Filter	m2	2.0	1	2,400	600	1,200	300		
		Slow sand filter	m2	104	51	124,800	31,200	61,200	15,300		
		Reservoir	m3	73	35	5,621	2,190	2,695	1,050		
		Elevated Tower	m3	10	6	2,300	1,000	1,380	600		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	21	10	8,320	2,496	4,000	1,200		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				223,641	58,486	91,475	20,550		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	0.5		6,000	2,000	0	0		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		10.7	2.5	26,750	37,450	6,250	8,750		
		65-125		10.8	1.0	64,800	37,800	6,000	3,500		
		150-200		0	0	0	0	0	0		
	3	Public taps	unit	5		2,250	250				
		Sub-Total				99,800	77,500	12,250	12,250		
C	**Construction cots (A+B)**					323,441	135,986	103,725	32,800		
D	**Land cost**										
E	**Engineering Service (15%C)**					48,516	20,398	15,559	4,920		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					371,957	156,384	119,284	37,720		
G	**Physical contingency (10%F)**					37,196	15,638	11,928	3,772		
H	**Project cost (F+G)**					409,153	172,022	131,212	41,492		
I	**Price contingency (10%H)**					40,915	17,202	13,121	4,149		
J	**Total financing required (H+I)**					**450,068**	**189,225**	**144,333**	**45,641**		

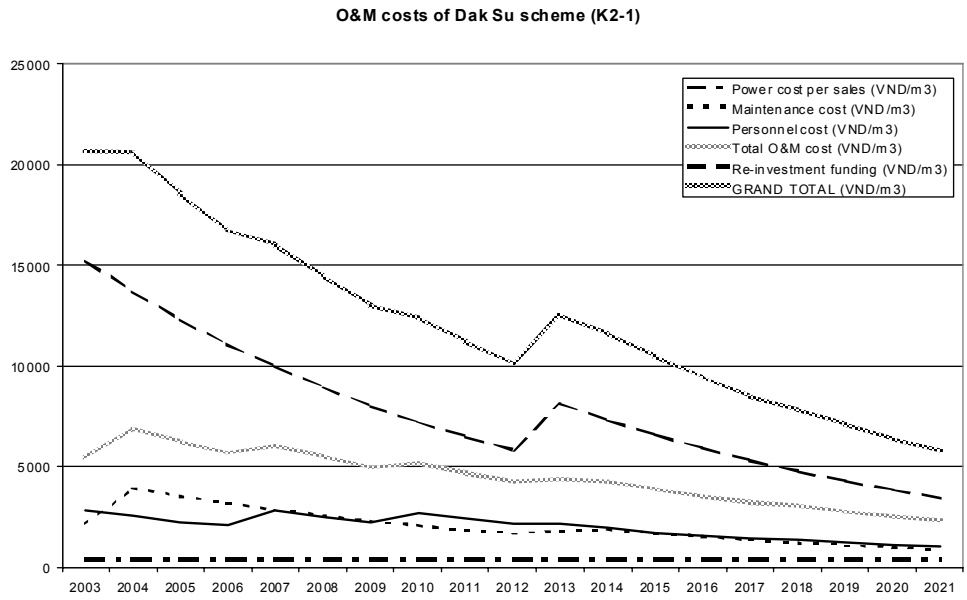
Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

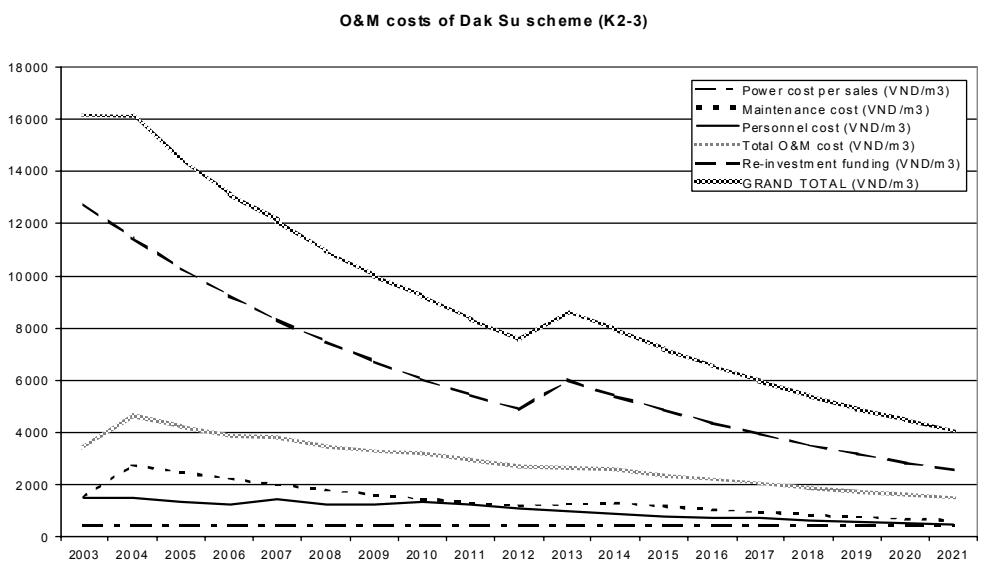
Appendix 3

O&M Costs for Each Target Communes

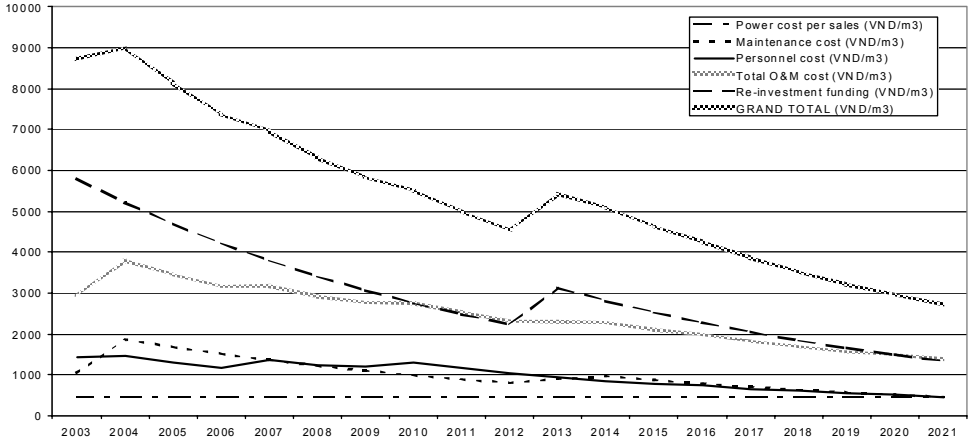
Appendix 3


O&M costs of Bo Y scheme K1
Power cost per sales (VND/m3)
Maintenance cost (VND/m3)
Personnel cost (VND/m3)
Total O&M cost (VND/m3)
Re-investment funding (VND/m3)
GRAND TOTAL (VND/m3)
25000
20000
15000
10000
5000
0
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021


O&M costs of Dak Su scheme (K2-1)
Power cost per sales (VND/m3)
Maintenance cost (VND/m3)
Personnel cost (VND/m3)
Total O&M cost (VND/m3)
Re-investment funding (VND/m3)
GRAND TOTAL (VND/m3)
25000
20000
15000
10000
5000
0
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021


O&M costs of Dak Su scheme (K2-3)
Power cost per sales (VND/m3)
Maintenance cost (VND/m3)
Personnel cost (VND/m3)
Total O&M cost (VND/m3)
Re-investment funding (VND/m3)
GRAND TOTAL (VND/m3)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021

O&M costs of Dak Ui scheme K3-1



O&M costs of Dak Hring scheme K4