

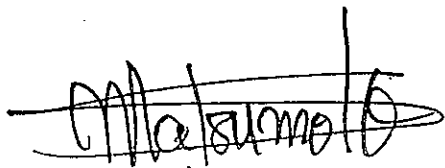
資料-6      テクニカルノート (T/N)

TECHNICAL NOTES  
ON  
THE BASIC DESIGN STUDY  
ON  
THE PROJECT  
FOR  
RURAL DRINKING WATER SUPPLY IN PERI-URBAN OF PHNOM PENH CITY  
IN  
THE KINGDOM OF CAMBODIA

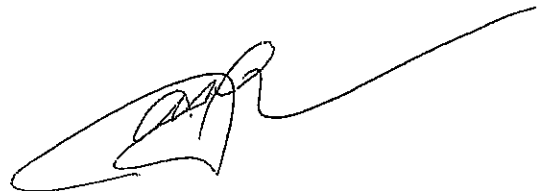
Based on the Minutes of Discussions signed on October 3, 2001 between the Basic Design Study Team (hereinafter referred to as "the Team") of Japan International Cooperation Agency (hereinafter referred to as "JICA") and Department of Rural Water Supply, Ministry of Rural Development of the Kingdom of Cambodia, the consultant members of the Team had a series of discussions and conducted field surveys from September 26 to November 2, 2001.

As a result of the discussions and the surveys, both sides confirmed the technical conditions described on attached sheets.

Phnom Penh, October 26, 2001



Mr. Shinichiro Matsumoto  
Chief Consultant,  
JICA Basic Design Study Team for  
the Project for Rural Drinking Water Supply  
in Peri-Urban of Phnom Penh City



Dr. Mao Saray  
Director,  
Department of Rural Water Supply,  
Ministry of Rural Development

## ATTACHMENT

The both parties agreed upon and confirmed the following items.

### 1. Spaces and facilities of the workshop in the DRWS

The Cambodian side agreed that the spaces and facilities of the workshop in DRWS should be prepared by the Cambodian side in order to enable the implementation of the Project.

### 2. Modification of the numbers and specifications of the requested equipment

The Cambodian side requested the following modifications to the numbers and specifications of requested equipment.

- 1) One (1) unit of track-mounted fuel tank (4,000 L) should be added to efficiently serve the necessary fuel to each drilling site.
- 2) Number of water tank truck is reduced from two (2) units to one (1) unit.
- 3) Workshop equipment and tools should be deleted.

The equipment made in Japan should be procured for the Project due to the quality and applicability of after sales services by manufactures.

### 3. Name of Village

The both sides agreed that names of the projected villages shall be standardized, being the same as village name in the Population Census of Cambodia 1998.

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### 4. ~~Proposed Well Construction Sites~~

The both side agreed that 165 proposed well sites shall be selected for the Project as shown in Annex-1. The following five (5) villages in the services area of the World Bank Urban Water Supply Project shall be excluded from the Project. However, well construction sites shall be selected for the poor in these villages.

①Village No.47:Russey, ②Village No.48:Mean Chey, ③Village No.52:Phnom Penh Thmey, ④ Village No.54:Dey Thmey and ⑤Village No.59:Sleng Roleung

### 5. Evaluation of the Proposed Well Sites

The both sides agreed that the proposed well sites shall be evaluated by using evaluation criteria as shown in Annex-2.

### 6. Other Relevant Issues

Cambodian side requested the following technical assistance in the Project. The Team will convey the request to the Government of Japan.

- 1) Technical assistance for the database of existing well inventory.
- 2) Technical transfer for geophysical survey and borehole logging technology.
- 3) Technical assistance for capacity building of sustainable O&M system of handpump.

## Annex-1: Proposed Well Construction Sites (Required Number of Handpump)

District	Commune	Village	Population in 1998	Annual population growth rate	Population in 2005	Population served by existing safe water supply facilities and other donor project	Design Population	DWSP	Required number of handpump		Beneficiary Population of 1 well	
			①	②	③	④	⑤=③-④	⑥	⑦=⑤/⑥			
Dangkao	Chaom Chau	1 Prey Pring Khang	1,245	0.028	1,511	453	1,057	210	5.0	5	211.5	
	Kakab	2 Kakab	508	0.028	616	0	616	210	2.9	3	205.4	
		3 Trapaing Chrey	292	0.028	354	0	354	210	1.7	2	177.1	
		4 Prey Sala	529	0.028	642	192	450	210	2.1	3	149.0	
	Samaraong Kraom	5 Chamkar S Beng	229	0.028	278	0	278	210	1.3	2	138.0	
		6 Trapaing Thnong	599	0.028	727	0	727	210	3.5	4	181.7	
		7 Kok Prech	304	0.028	369	0	369	210	1.8	2	184.4	
		8 Tekak Panhor	368	0.028	446	0	446	210	2.1	3	145.8	
		9 Sam Rong	453	0.028	550	0	550	210	2.6	3	183.2	
		10 Chak Chrouk	333	0.028	404	0	404	210	1.9	2	202.0	
		11 Ork Rumdoul	190	0.028	231	0	231	210	1.1	2	155.3	
		12 Sre Reacheas	487	0.028	591	0	591	210	2.8	3	197.0	
		13 Andong Taom	361	0.028	438	0	438	210	2.1	3	146.0	
		Kouk Roka	14 Kab Srov Toch	664	0.028	806	0	806	210	3.8	4	201.4
			15 Kab Srov Thom	637	0.028	773	0	773	210	3.7	4	193.2
	16 Prey Thom		135	0.028	164	0	164	210	0.8	1	163.8	
	17 Toul Sam Pauv		122	0.028	148	0	148	210	0.7	1	145.0	
	18 Chum Rov		277	0.028	336	0	336	210	1.6	2	168.0	
	19 Thlork		192	0.028	233	0	233	210	1.1	2	116.0	
	20 Philou Phaem		305	0.028	370	0	370	210	1.8	2	185.0	
	21 Putrea		222	0.028	269	0	269	210	1.3	2	134.2	
	22 Svay Chek		434	0.028	527	0	527	210	2.5	3	175.5	
	23 Kok Rokar		261	0.028	317	0	317	210	1.5	2	158.3	
	24 Angk Takov	164	0.028	199	0	199	210	0.9	1	199.0		
	25 Trapaing Por	277	0.028	336	0	336	210	1.6	2	168.0		
P. Chheh Rotch	26 Koppluk	304	0.028	369	0	369	210	1.8	2	184.4		
Prey Veang	27 Prey Veng Keut	421	0.028	511	0	511	210	2.4	3	170.3		
	28 Trapaing Svay	191	0.028	232	0	232	210	1.1	2	115.0		
Prey Sa	29 Piam	323	0.028	392	10	382	210	1.8	2	190.9		
	30 Thor Tray	233	0.028	283	0	283	210	1.3	2	141.5		
	31 Anlong Kong	502	0.028	609	0	609	210	2.9	3	203.0		
	32 Prey Sa Keut	396	0.028	480	0	480	210	2.3	3	160.1		
	33 Prey Thom	285	0.028	346	0	346	210	1.6	2	172.9		
	34 Prey Tituy	315	0.028	382	0	382	210	1.8	2	191.1		
	35 Momphey Boun	206	0.028	250	0	250	210	1.2	2	125.0		
	Dangkao	Cheung Aek	36 Prek Pranak	224	0.028	272	192	80	210	0.4	1	79.8
		Trapaing Krasang	37 Trapaing Tear	390	0.028	473	0	473	210	2.3	3	157.7
			38 Trapaing Andong	428	0.028	519	0	519	210	2.5	3	173.1
39 Trapaing Karasang			455	0.028	552	0	552	210	2.6	3	184.0	
40 Khva			182	0.028	221	0	221	210	1.1	2	110.4	
41 Veal			306	0.028	371	0	371	210	1.8	2	185.6	
Sak Sampov		42 Prey Daun Ok	118	0.028	143	0	143	210	0.7	1	143.0	
		43 Sam Bour	150	0.028	182	5	177	210	0.8	1	177.0	
		44 Kraing Tapho	248	0.028	301	5	296	210	1.4	2	147.0	
		45 Khvet	572	0.028	694	210	484	210	2.3	3	161.3	
	46 Pou Rolurnn	181	0.028	220	0	220	210	1.0	1	210.0		
Mean Chey	47 Russey	4,376	0.030	5,382	4,844	538	210	2.6	3	179.4		
	48 Mean Chey	5,317	0.030	6,539	6,095	444	210	2.1	3	148.0		
Ruessei Keo	Khmuonh	49 Khmuonh	1,134	0.028	1,376	0	1,376	210	6.6	7	210.0	
		50 Sang Raong	511	0.028	620	0	620	210	3.0	3	210.0	
		51 Bunlar Soet	1,268	0.028	1,538	197	1,341	210	6.4	7	191.6	
	Phnom Penh Thmei	52 Phnom Penh Thmei	3,693	0.028	4,481	4,057	423	210	2.0	3	141.0	
		53 Pong Peay	1,686	0.028	2,046	1,038	1,008	210	4.8	5	201.6	
		54 Dey Thmei	1,964	0.028	2,383	2,145	238	210	1.1	2	119.0	
		55 Roung Chak	1,723	0.028	2,090	1,463	627	210	3.0	3	209.0	
		56 Bayab	2,266	0.028	2,749	222	2,527	210	12.0	12	210.6	
	57 Kok Khleang ***	1,882	0.028	2,102	1,471	631	210	3.0	3	210.2		
	58 Trapaing Svay	287	0.028	348	192	156	210	0.7	1	156.2		
Tuek Thla	59 Sleng Roleung	3,322	0.028	4,030	3,627	403	210	1.9	2	201.5		
Svay Pak	60 Lor Kambao	4,258	0.028	5,166	4,649	517	210	2.5	3	172.2		
Total			49,705		60,284	31,068	29,216		165			

Source: General Population Census of Cambodia 1998/ National Institute of Statistics, Ministry of Planning  
Population of Village No.57 is a order of socio-economic survey (2001)

Note: DWSP: Design water supply population per handpump

Annex-2 Evaluation Criteria for Well Construction Sites

Criteria	Evaluation Standard	Point
<b>1. Socio-economic conditions in village level</b>		
① Willingness to form VDC	A: yes (including VDCs already existing) D: no	A: 3 D: 0
② Willingness to form VWC	A: yes D: no	A: 3 D: 0
③ Willingness to offer free land	A: yes B: maybe D: no	A: 3 B: 2 D: 0
④ Prevalence of water-borne disease	A: very common B: common C: rare D: very rare	A: 3 B: 2 C: 1 D: 0
⑤ DRWS's priority	A: high priority B: middle priority C: low priority	A: 5 B: 3 C: 1
⑥ Potentiality of groundwater based on geophysical survey	A: high potential B: middle potential C: low potential	A: 5 B: 3 C: 1
⑦ Water quality of groundwater	A: good B: acceptable C: bad	A: 5 B: 3 C: 1
<b>2. Socio-economic conditions in proposed well construction sites</b>		
⑧ Willingness to form WPC	A: yes D: no	A: 3 D: 0
⑨ Willingness to pay water charge	A: over 1,000 Riel B: 500-1,000 Riel C: less than 500 Riel	A: 3 B: 2 C: 1
⑩ Access condition	A: good B: acceptable C: bad	A: 5 B: 3 C: 1
⑪ Voluntary participation in land/road preparation	A: yes D: no	A: 3 D: 0
⑫ Willingness to construct platform, if material is supplied by the Project	A: yes B: yes, but need technical assistance C: no	A: 3 B: 2 C: 1
⑬ Willingness to construct fence around the well	A: yes B: maybe D: no	A: 3 B: 2 D: 0
⑭ Existing drinking water supply facility in dry season	A: Lake/Pond/River/Water Seller B: Dug Well C: Handpump	A: 3 B: 2 C: 1
⑮ Distance to the drinking supply facility in dry season	A: over 200m (including 200m) B: 100-200m (including 100m)/ Water Seller C: less than 100m	A: 3 B: 2 C: 1

**資料-7 事業事前評価表**

## 資料-7 事業事前評価表

<b>1. 協力対象事業名</b>																																											
カンボディア王国 ペリアーバン地区村落給水計画																																											
<b>2. 我が国が援助することの必要性・妥当性</b>																																											
<p>(1) カンボディアは一人あたりの国民所得が 260 米ドル(98 年・世銀資料)、UNDP 人間開発指標で第 136 位(174 カ国中、2000 年)に位置する後発開発途上国(LLDC)のひとつである。カンボディアの新政府は和平合意後の荒廃した国土の復旧・復興及び民主化の推進途上にあり、アジア・太平洋地域の平和と安定及び発展にとり、カンボディアの安定が不可欠であるため、我が国は同国の復興及び民主化に向けた努力に対し、積極的に支援を行っている。</p> <p>(2) 同国政府が策定した「第 2 次社会経済開発 5 ヶ年計画(2001-2005)」では、貧困削減と持続性のある経済成長が重点課題とされている。同国は、周辺諸国と比較し、保健・衛生環境が劣悪であり、同計画では、安全な飲料水の供給率を、1999 年の 29%から、2005 年には 40%にすることが目標に掲げられている。プノンペン市周辺部のペリアーバン地区(Dangkao 郡、Mean Chey 郡及び Ruessei Keo 郡)は、プノンペン市内で給水率が低い地域の 1 つであり、上記給水率は満たしているものの、プノンペン市中心部とは隔たりがあり、乾期の水不足が深刻で衛生状況の悪化による水因性疾患の発病率も高く、同地域の貧困削減が進まない要因の 1 つとなっている。</p>																																											
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<p>(3) 協力対象地域は、国際協力事業団が 1996 年 12 月から 2002 年 1 月までに開発調査を実施した「南部地下水開発計画」の中で、硬岩が比較的浅く分布し、水理地質上水源開発が困難な地域であることから、優先度が高いとされている。</p>																																											
<b>3. 協力対象事業の目的 (プロジェクト目標)</b>																																											
プノンペン市ペリアーバン地区の対象村落において、給水状況を改善させることを目標とする。																																											
<b>4. 協力対象事業の内容</b>																																											
(1) 対象地域 プノンペン市 Dangkao 郡、Mean Chey 郡及び Ruessei Keo 郡の 60 村落																																											
(2) アウトプット ・ 165 ヶ所のハンドポンプ付き深井戸給水施設が建設される																																											

- (3) インプット
- a) 165ヶ所のハンドポンプ、周辺施設(水叩き、排水溝)及び鉄分除去装置(含有鉄分が許容量を超えると想定される12ヶ所のみ設置)からなる深井戸給水施設の建設
  - b) 井戸掘削機材及び支援機材(1セット)の調達
  - c) 水利組合組織強化の指導
- (4) 総事業費  
概算事業費 12.41 億円 (日本側 12.37 億円、カンボディア国側 401 万円)
- (5) スケジュール  
詳細設計を含め 32 ヶ月の工期を予定
- (6) 実施体制  
カンボディア国地方開発省地方給水局(DRWS)  
施設完成後の運営・維持管理: DRWS の監督・指導の下に受益者により組織される水利用組合(WPC)

## 5. プロジェクトの成果

- (1) プロジェクトにて裨益を受ける対象の範囲及び規模  
協力事業対象 60 村落の住民約 60,000 人

- (2) 事業の目的(プロジェクトの目標)を示す成果指標

項目	1998 年 (実施前)	2005 年 (実施後)
給水人口	25,682	60,284
給水率	51.7%	100.0%

## 6. 外部要因リスク

- (1) カンボディア国側負担事項の要員確保と予算措置  
調達機材を使用して日本側監理のもとにカンボディア側が行うこととなっている井戸掘削、揚水試験、ハンドポンプの設置を担当する DRWS 職員の要員確保と予算措置(401 万円)が確実に行われること。
- (2) 継続的な維持管理洪水・旱魃の発生  
異常気象による洪水や旱魃などの天候不順による水因性疾患の突発的大流行により、成果指標値に影響が及ぶ可能性もある。

## 7. 今後の評価計画

- (1) 事業評価に用いる成果指標  
計画対象地域における給水人口及び給水率
- (2) 評価のタイミング  
事業終了時を目処に評価実施予定



**資料-8 第2次地方給水5ヶ年計画 (2001-2005)**



**MINISTRY OF  
RURAL DEVELOPMENT**

**Department of Rural Water Supply**  
Five Years Plan for Rural Water Supply Program  
2001-2005 by Technology  
Target Number of Water Point Sources

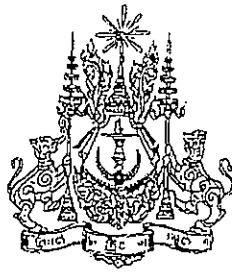
N	Technology	2001	2002	2003	2004	2005	Total
1	Hand-Dug Well	3500	3500	3700	3700	3700	18100
2	Dug-Drilled Well	1750	1750	2000	2000	2000	9500
3	Hand Pump Well	2000	2000	2000	2500	2500	11000
4	H.Pump Deep Well	1100	1100	1300	1300	1300	61001
5	Total	8350	8350	9000	9500	9500	44700

Rural Water Supply Investments by  
Technology (US\$.000's)

N	Technology	2001	2002	2003	2004	2005	Total
1	Hand-Dug Well	1,050	1,050	1,110	1,110	1,110	5,430
2	Dug-Drilled Well	1,137	1,137	1,300	1,300	1,300	6,175
3	Hand Pump Well	1,600	1,600	1,600	2,000	2,000	8,800
4	H.Pump Deep Well	1,760	1,760	2,080	2,080	2,080	9,760
5	Total	5,547	5,547	6,090	6,490	6,490	30,165

Rural Water Supply Technologies  
Selection and Specification

N	Technology	Unit Cost \$	Users/Well	Remarks
1	Hand-Dug Well	300	40	
2	Dug-Drilled Well	650	60	
3	Hand Pump Well	800	100	
4	H.Pump Deep Well	1600	120	



MINISTRY OF  
RURAL DEVELOPMENT

Department of Rural Water Supply  
Estimated Resource Requirement for Universal Access  
to Water Supply in Rural Areas, 2001-2005

	Province	Total Pop. to be covered by 2005 in 000's	Total number of water points required	Remarks
1	Banteay Meanchey	240	3000	
2	Battambang	320	4000	
3	Kampot	280	3500	
4	Kandal	280	3500	
5	Koh Kong	120	1500	
6	Kg. Cham	320	4000	
7	Kg. Chhnang	120	1500	
8	Kg. Speu	200	2500	
9	Kg. Thom	120	1500	
10	Kratie	120	1500	
11	Mondulkiri	16	200	
12	Phnom Penh	240	3000	
13	Preah Vihear	40	500	
14	Prey Veng	0	0	
15	Pursath	120	1500	
16	Rattanakiri	80	1000	
17	Siem Reap	240	3000	
18	Sihanukville	80	1000	
19	Stung Treng	40	500	
20	Svay Rieng	200	2500	
21	Takeo	320	4000	
22	Odormeanchey	40	500	
23	Kep	20	250	
24	Pailin	20	250	
25	Total	3576	44700	

**Ministry of Rural Development**  
**Department of Rural Development**  
 Rural Water Supply Program  
 Rural Water Supply Coverage by Provinces

<i>N</i>	<i>Province</i>	<i>Total pop.</i>	<i>Total water points</i>	<i>Total pop. accessed water</i>	<i>Pop. needs water</i>	<i>Water points required</i>	<i>Remarks</i>
1	Banteay Meanchey	577,300	3677	294,160	283,140	3,339	
2	Battam Bang	791,958	1791	143,280	648,678	8,108	
3	Kampot	527,904	445	35,600	492,304	61,538	
4	Kandal	1,073,586	2754	220,120	853,266	10,665	
5	Koh Kong	131,912	24	1,920	129,992	1,624	
6	Kg. Cham	1,607,913	9916	793,280	814,633	10,182	
7	Kg. Chhnang	416,999	1974	157,920	259,079	3,238	
8	Kg. Speu	598,101	2602	208,160	389,941	4,874	
9	Kg. Thom	568,454	4762	380,960	187,494	2,343	
10	Kratie	262,945	723	57,840	205,105	2,561	
11	Mondulkin	32,392	0	0	32,392	404	
12	Phnom Penh	997,986	3061	244,880	753,106	9,413	
13	Preah Vihear	119,160	170	14,320	104,840	1,310	
14	Prey Veng	945,129	23684	945,129	0	0	
15	Pursath	360,291	1819	145,520	214,771	2,684	
16	Rattanakiri	94,188	0	0	94,188	1,177	
17	Siem Reap	695,485	3925	314,000	381,485	4,768	
18	Sihamuk Vllie	155,376	52	4,160	151,216	1,890	
18	Slung Treng	80,978	173	13,840	67,138	839	
20	Svay Reang	479,710	9226	738,080	258,370	3,229	
21	Takeo	789,710	2350	198,000	601,710	7,521	
22	Odorneanchey	68,836	0	0	68,836	856	
23	Kep	28,677	108	8,640	20,037	250	
24	Pailin	22,844	21	1,680	21,164	264	
25	<b>Total</b>	<b>11,427,834</b>	<b>345,912</b>	<b>4,911,689</b>	<b>7,032,585</b>	<b>143,279</b>	

**資料-9 「力」国側運営・維持管理費算定根拠**

Phase	Subject	Item	Quantity		Unit Price (US\$)	Amount	
						(US\$)	(Yen)
Phase-1	D/D	Chief counterpart for Japanese team	3	M/M	25	75	
		Counterpart for cost estimation	3	M/M	20	60	
		Counterpart for geophysical survey (2 persons x 2.5M)	5	M/M	20	100	
		Counterpart for test boring (1person x 3M)	3	M/M	20	60	
		Fuel/expendable	1	LS	500	500	
		sub-total					795
	Soft Component	Counterpart for Community Development (2 persons x 19M)	36	M/M	20	720	
		Counterpart for O/M expert (1 person x 9 M)	9	M/M	20	180	
		sub-total					900
	Equipment Procurement	Arrangement of DRWS's workshop and motor pool	1	LS	500	500	
		Materials and labor cost	1	LS	500	500	
		sub-total					1,000
	Construction	Chief coordinator (1person x 13M)	13	M/M	30	390	
		Vice coordinator (1person x 13M)	13	M/M	25	325	
		Drilling crew (6 persons x 8M)	48	M/M	20	960	
		Pumping test crew (2persons x 3crew x 8.5M)	51	M/M	20	1,020	
		Handpump installation crew (2persons x 2crew x 8.5M)	34	M/M	20	680	
		Instructor for platform construction (1person x 7.1M)	7.1	M/M	20	142	
		Instructor for iron removal device (1person x 5M)	5	M/M	20	100	
		Fuel/expendable	1	LS	2,000	2,000	
		sub-total					5,617
	Workshop	Workshop crew (2persons x 8 M)	16	M/M	20	320	
		Fuel/expendable	1	LS	500	500	
sub-total						820	100,737
Rural road	Rehabilitation of rural road in flooding area	6	LS	500	3,000	368,550	
	Commissions for Japanese foreign exchange bank	1	LS		6,407	784,800	
Phase-2	D/D	Chief counterpart for Japanese team	3	M/M	25	75	
		Counterpart for cost estimation	3	M/M	20	60	
		Counterpart for geophysical survey (2 persons x 2.5M)	5	M/M	20	100	
		Fuel/expendable	1	LS	500	500	
		sub-total					735
	Soft Component	Counterpart for Community Development (2 persons x 11M)	22	M/M	20	440	
		Counterpart for O/M expert (1 person x 8 M)	8	M/M	20	160	
		sub-total					600
	Construction	Chief coordinator (1person x 13M)	13	M/M	30	390	
		Vice coordinator (1person x 13M)	13	M/M	25	325	
		Drilling crew (6 persons x 13M)	78	M/M	20	1,560	
		Pumping test crew (2persons x 3crew x 8M)	48	M/M	20	960	
		Handpump installation crew (2persons x 2crew x 8M)	32	M/M	20	640	
		Instructor for platform construction (1person x 6.7M)	6.7	M/M	20	134	
		Instructor for iron removal device (1person x 1M)	1	M/M	20	20	
		Fuel/expendable	1	LS	2,000	2,000	
	sub-total					6,029	740,663
	Workshop	Workshop crew (2persons x 13 M)	26	M/M	20	520	
		Fuel/expendable	1	LS	500	500	
		sub-total					1,020
	Rural road	Rehabilitation of rural road in flooding area	1	LS	2,000	2,000	245,700
		Commissions for Japanese foreign exchange bank	1	LS		3,684	452,600