資　料

資料-1　調査団員・氏名

資料１　調査団員・氏名

（1）　基本設計調査

No	氏名	担当分野	所属
1	山形　茂生	総括	独立行政法人国際協力機構 ナイジェリア事務所　所長
2	村上　淳	計画管理	独立行政法人国際協力機構 無償資金協力部 業務第３グループ 水資源・環境チーム
3	吉田　健次	業務主任／地下水開発／組織強化	八千代エンジニヤリング㈱
4	石川　次男	水理地質／物理探査	三井金属資源開発株式会社
5	谷津　哲夫	機材・調達計画／積算	八千代エンジニヤリング㈱
6	清水　清	社会条件調査／運営維持管理	八千代エンジニヤリング㈱

（２）　基本設計概要説明調査

No	氏名	担当分野	所属
1	美馬　巨人	総括	独立行政法人国際協力機構 ナイジェリア事務所　所長
2	吉田　健次	業務主任／地下水開発／組織強化	八千代エンジニヤリング㈱
3	谷津　哲夫	機材・調達計画／積算	八千代エンジニヤリング㈱

資料-2　調査行程

資料２　調査日程

（1）　基本設計調査

			官団員		コンサルタント団員			
日順	月日	曜日	調査団長（山形）	計画管理（村上）	業務主任/地下水開発（吉田）	水理地質/物理探査（石川）	社会条件調査/運営維持管理（清水）	機材・調達計画/積算（谷津）
1	12/2	土			成田−ロンドン			
2	12/3	日		成田ーロンドン	ロンドン − アブジャ, 調査準備, 再委託の検討(物理探査、社会条件)			
3	12/4	月	大使館、JICA, NPC表敬					
4	12/5	火	FMWR表敬, FMWRとの協議					
5	12/6	水	移動（アブジャーダマツル）、ヨベ州水資源省表敬					
6	12/7	木	RUWASA,表敬 RUWASAとの協議			RUWASA表敬, 既存井戸データ収集、解析	RUWASA表敬, 再委託委託準備	
7	12/8	金	RUWASAとの協議			現地調査準備、現地採択準備、データ収集	現地調査準備、データ収集	
8	12/9	土	現地調査			現地調査・資料収集	現地調査・資料収集	
9	12/10	日	移動（ダマツルーアブジャ）			データ整理		
10	12/11	月	M/D署名, 大使館、JICA 報告			現地調査・データ収集	現地調査・データ収集	
11	12/12	火		アブジャ −ロンドン	データ収集（FMWR）	現地調査・データ収集	現地調査・データ収集	
12	12/13	水		ロンドン −成田	移動（アブジャーイバダン）	現地調査・データ収集	現地調査・データ収集	
13	12/14	木			WATSON事務所訪問・現地調査（オヨプロジェクト）	現地調査・データ収集	現地調査・データ収集	
14	12/15	金			現地調査（オヨプロジェクト）	RUWASAとの打ち合わせ・資料収集		
15	12/16	土			現地調査（オヨプロジェクト）	データ収集・整理	現地調査・資料収集	成田ーロンドン
16	12/17	日			移動（イバダンーアブジャ）	データ整理		ロンドンーアブジャ
17	12/18	月			移動（アブジャーダマツル）	現地調査・データ収集	現地調査・データ収集	移動（アブジャーダマツル）
18	12/19	火			現地調査(掘削技術の検討)	現地調査・データ収集	現地調査・データ収集	現地調査（機材・資材）
19	12/20	水			現地調査(掘削技術の検討)	現地調査・データ収集	現地調査・データ収集	現地調査（機材・資材）
20	12/21	木			UNICEFとの打ち合わせ	現地調査・データ収集	UNICEFとの打ち合わせ	現地調査（機材・資材）
21	12/22	金			RUWASAとの打ち合わせ・団内打ち合わせ			現地調査（機材・資材）・団内打ち合わせ
22	12/23	土			現地調査			市場調査
23	12/24	日			調査結果の整理	資料・調査結果の整理、解析作業	資料・調査結果の整理	現地調査（機材・資材）
24	12/25	月			移動(ダマツル − アブジャ)			
25	12/26	火			追加資料収集、フィールドレポート作成			市場・調達調査、フィールドレポート作成
26	12/27	水			追加資料収集、フィールドレポート作成			
27	12/28	木			大使館、JICA 報告			
28	12/29	金			フィールドレポート説明、水資源省との打ち合わせ			
29	12/30	土			アブジャーロンドン			
30	12/31	日			ロンドンー成田			

（２） 基本設計概要説明調査

			官団員	コンサルタント	
日順	月日	曜日	総括 （美馬）	業務主任/地下水開発 （吉田）	機材・調達計画/積算 （谷津）
1	16-May	水		移動（東京→ロンドン）	
2	17-May	木		移動（ロンドン→アブジャ） 連邦水資源省に概要書説明	
3	18-May	金	EOJ, NPC表敬、JICAナイジェリア事務所打合せ、連邦水資源省との協議		
4	19-May	土	移動（アブジャ→ダマツル）、ヨベ州水資源省、RUWASA表敬		
5	20-May	日	相手側分担事業の確認、RUWASAへ概要書説明、協議、UNICEFとの協議		
6	21-May	月	移動（ダマツル→アブジャ）		
7	22-May	火	団内協議、ドナー向けのプロジェクト資料作成		
8	23-May	水	連邦水資源省、NPCとミニッツ協議		
9	24-May	木	ミニッツ署名、JICA事務所、大使館報告、村落給水関連ドナー向けの説明		
10	25-May	金		補足調査、資料収集、データ整理	
11	26-May	土		移動（アブジャ→ロンドン） 移動（ロンドン→東京）	
12	27-May	日		東京着	

資料-3　関係者(面会者)リスト

資料 3　関係者リスト
（基本設計時）

機関・所属		氏名
連邦水資源省（Federal Ministry of Water Resources / FMWR）		
Director of Department of Water Supply & Quality Control		Engr. M. A. K. Abubakar
Deputy Director of Rural Water Supply		Mr. Akin Aletan
Assistant Director of Rural Water Supply		Mr. Adetungi Idown
国家計画庁（National Planning Commission / NPC）		
Director of Department for International Sector and Development Cooperation		Mr. E.P. Odiachi
Assistant Chief Planning Officer		Mr. Nwozuzu Samuel
ヨベ州地方給水衛生局（Rural Water Supply and Sanitary Agency / RUWASA）		
General Manager		Engr. Shuaibu Musa
Director of Rural Water Supply		Mr. Idriss F. Dauda
Director of Sanitation		Mr. Hamidu M. Alhi
Director of Planning Research and Statistics		Mr. Musa Lagide
Inspector of Principal Community Development		Mr. Al Haji Abba
Officer of Community Development		Mr. Dauda Abatcha
Water Analyst		Mr. Saidu Idi mamman
Chief Hydrogeologist		Mr. Abakar Bake
ヨベ州水公社（Yobe State Water Corporation / YSWC）		
General Manager		Dr. A. G. Iliya
UNICEF (United Nations International Children's Fund)		
Consultant of UNICEF in Jigawa State		Mr. Uba Lawal
郡政府（Local Government Authority/LGA）		
A. Bade	Chairman	Mr. Al Haji Gafo Maizasu Bizi
B. Bursari	Deputy Head of Agriculture	Mr. Kallan Dabuwa Dapct
C. Damaturu	Accountant, Works Department	Mr. Ali Mohammed Bollo
D. Fika	Deputy Head of Administration	Mr. Ajiya Gimbh Genk
	Head of Treasure	Mr. Abdullahi M. Daya
E. Fune	Head of General Administration	Mr. M.Adamn Buhama Sani

機関・所属		氏名
F. Karasuwa	Principal Personnel Assistant II	Mr. Mohd Usman Kawata
G. Machina	Director Personnel Management	Mr. Al Haji Gaba Bogo
	Head of Treasury Department	Mr. Al Haji Galadima Bukar
H. Nguru	Secretary	Mr. Al Haji Al Makinta
	Assist. Head of Works	Mr. Hamma Gana
I. Nangere	Principal Personnel Assistant I	Mr. Yusup Mamman Tikau
J. Potiskum	Staff Officer	Mr. Adamn Mohammed K.G
K. Geidam	Works Department	Mr. Abdullah Abba
L. Gulani	Head of Works	Mr. Wakic Maidaca Bularafd
M. Gujba	Chairman	Mr. Goni Ali Gujuba
	Secretary	Mr. Al Haji Kolomi Ali Gano
N. Jakusko	Chairman	Mr. Al Haji Saleh Kagama
O. Tarmuwa	Permanent Secretary	Mr. Mai Al Haji Usman
	Director Personnel Management	Mr. Bayem Mohiel Shanwa
P. Yusufari	Chairman	Mr. Al Haji Uygni
	Secretary Head of Water	Mr. Al Haji Uygni
Q. Yunusari	Director Personnel Management	Mr. Al Haji Ibrahim Tosia
	Works Department	Mr. Margwami Kujariry
在ナイジェリア日本国大使館		
書記官		山内　氏
JICA ナイジェリア事務所		
所長		山形　氏
所員		天津　氏

（基本設計概要説明時）

機関・所属	氏名
連邦水資源省（Federal Ministry of Water Resources / FMWR）	
Director of Department of Water Supply & Quality Control	Engr. M. A. K. Abubakar
Deputy Director of Rural Water Supply	Mr. Akin Aletan
Assistant Director of Rural Water Supply	Mr. Adetungi Idown
国家計画庁（National Planning Commission / NPC）	
Director of Department for International Sector and Development Cooperation	Mr. E.P. Odiachi
Assistant Chief Planning Officer	Mr. Nwozuzu Samuel
ヨベ州地方給水衛生局（Rural Water Supply and Sanitary Agency / RUWASA）	
General Manager	Engr. Shuaibu Musa
Director of Rural Water Supply	Mr. Idriss F. Dauda
Director of Sanitation	Mr. Hamidu M. Alhi
Director of Planning Research and Statistics	Mr. Musa Lagide
Inspector of Principal Community Development	Mr. Al Haji Abba
Officer of Community Development	Mr. Dauda Abatcha
Water Analyst	Mr. Saidu Idi mamman
Chief Hydrogeologist	Mr. Abakar Bake
UNICEF (United Nations International Children's Fund)	
Consultant of UNICEF in Yobe State	Mr. Baffa Buhari
在ナイジェリア日本国大使館	
書記官	山内　氏
書記官	押野　氏
JICA ナイジェリア事務所	
所長	美馬　氏
所員	天津　氏

資料-4　討議議事録（M/D）

MINUTES OF DISCUSSIONS

ON THE BASIC DESIGN STUDY
ON THE PROJECT FOR
THE SUPPLY OF EQUIPMENTS FOR GROUNDWATER EXPLOITATION TOWARDS POTABLE WATER SUPPLY AND HEALTH DELIVERY IN YOBE STATE IN THE FEDERAL REPUBLIC OF NIGERIA

Based on the results of the Preliminary Study, the Government of Japan has decided to conduct a basic design study on the Supply of Equipments for Groundwater Exploitation towards Portable Water Supply and Health Delivery in Yobe State (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the Federal Republic of Nigeria (hereinafter referred to as "Nigeria") the Basic Design Study Team (hereinafter referred to as "the Team") which is dispatched by the Grant Aid Management Department, JICA headquarters and is scheduled to stay in the country from December 3rd to December 30th, 2006.

The Team held discussions with the concerned officials of the Government of Nigeria, and conducted a field survey at the study site.

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

Abuja, 11 December 2006

Mr. Shigeo Yamagata
Resident Representative
Nigeria Office
Japan International Cooperation Agency
Japan

Engr. M.A.K. Abubakar, MFR, FNSE
Director
Water Supply and Water Quality
Federal Ministry of Water Resources
Federal Republic of Nigeria

Mr. U. S. Nwozuzu
Assistant Chief Planning Officer
International Sector Development Cooperation
National Planning Commission
Federal Republic of Nigeria

Engr. Shuaibu Musa, MNSE
General Manager
Rural Water Supply and Sanitation Agency
Ministry of Water Resources
Yobe State, Federal Republic of Nigeria

ATTACHMENT

1. Objective

The Objective of the Project is the improvement of water supply and sanitation in Yobe state through provision of equipment and materials necessary for construction of hand pump boreholes.

2. Project sites

The Project sites requested by the Nigerian side are located at the 17 (Seventeen) Local Government Areas in Yobe State as shown in Annex-1.

3. Responsible and Implementing Agencies

3-1 The responsible organization for the Project is the Federal Ministry of Water Resources (FMWR).

3-2 The implementing organization of the Project is Yobe State Rural Water Supply and Sanitation Agency (RUWASA).

4. Items Requested by the Government of Nigeria

After discussions between the Nigerian side and the Team, the items described in Annex-2 were finally requested by the Government of Nigeria.
Both sides confirmed that the appropriateness of the request shall be assessed in accordance with the further studies and analysis in Japan and the final components of the Project shall be decided by the Japanese side after the assessment.

5. Japan's Grant Aid System

The Nigerian side understood Japan's Grant Aid system and the necessary measures to be taken by the Government of Nigeria as explained by the Team and described in Annex-3, for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Schedule of the Study

6-1 The consultants of the Team will proceed to carry out further studies such as interviews/surveys on socio-economy, hydrogeological investigation, existing borehole survey, management condition of the existing machinery and equipment and so on, in Nigeria until December 30, 2006.

6-2 The JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around May 2007.

6-3 In case that the contents of the draft report are accepted in principle by the Nigerian side, JICA will proceed to complete the final report and send it to the Nigerian side around August 2007.

7. Other Relevant Issues

The following issues were discussed and confirmed by both sides.

(1) Responsibility of each Organization concerning the Project

The FMWR shall collaborate with National Planning Commission and other Federal bodies to facilitate the implementation of the Project in such areas as exemption from taxes and so on, while the Yobe RUWASA shall take responsibility of operation and maintenance of facilities and equipment and borehole construction through mobilization of Local Government Areas.

(2) Rural Water Supply in Yobe State

Yobe RUWASA has a plan to improve the water supply coverage in Yobe state from 47% in 2005 to 75% by 2009. In order to attain above mentioned goal, Yobe RUWASA will implement construction of 52 mechanized boreholes, 220 hand pump boreholes and 200 cement open wells.

(3) Usage of Procured Equipments and Materials

Procured equipments and materials are to be used for the construction of 100 (one hundred) hand pump boreholes as a part of the implementation for rural water supply plan of RUWASA mentioned in 7 (2).

(4) Responsibilities with regard to the Borehole Construction

Both sides agreed that the construction work of the hand pump boreholes shall be executed by the Nigerian side with its full responsibility. Furthermore, it was agreed as follows that:

- The number of boreholes to be constructed by the Nigerian side using materials to be procured by the Japanese side would be confirmed by both sides based on the capability of Yobe RUWASA, referring to the result of the hydrogeological investigation and socio-economic survey in the Basic Design Study.

  However, the construction period of the Project is put at 2 (two) years after deliveries of equipment and materials from the view points of deterioration and proper management.

- The Nigerian side shall secure budget for the Project timely and submit monthly report of progress of the construction work to the Japanese side.

(5) Equipment and Materials requested for Procurement

Both sides agreed that the necessity of the equipment and materials requested by the Nigerian side as stated in Annex-3 shall be examined from the view points of purpose of use, future project plan, technical and budgetary availability for operation and maintenance, conditions of the existing equipment, etc. The type, quantity and specification of these equipment and materials shall be determined on the minimum required and the easiest operation level.

(6) Screening of Sites for Borehole Construction

The list of the candidate sites for borehole construction is shown in Annex-4.
Both sides agreed that the sites of 100 (One Hundred) boreholes from the list are to be examined taking into consideration criteria below;

- suitability for hand pump borehole (shallow water level and drilling depth)
- demographic condition

- assistance from Local Government Areas
- existing water facilities
- accessibility
- hydrogeological conditions
- water quality (applying WHO guidelines)
- capacity for operation and maintenance of the facilities at community level
- willingness to pay for operation and maintenance of water supply facilities by community
- absence of water projects by other donors
- sanitation and hygienic conditions

Among the criteria, emphasis would be placed on demographic condition, suitability for hand pump borehole and existing water facilities. And number of drilling sites will be selected in the Basic Design Study in consideration of RUWASA's capacity.

(7) Operation and Maintenance of Facilities, Equipment and Materials

The water supply facilities constructed by the Nigerian side shall be properly operated and maintained by the respective communities and Local Government Areas with support by Yobe RUWASA. The equipment and materials requested by the Nigerian side shall be properly operated and maintained by Yobe RUWASA.

(8) Utilization Plan for Procured Drilling Rig

RUWASA Submitted the action plan which is shown in Annex-5 to drill boreholes from 2005 to 2014 and explained the utilization plan for procured drilling rig in the action plan. Both sides confirmed that the number of boreholes RUWASA intends to drill the boreholes for hand pump by procured drilling rigs for this project is 50 in 2008 and 2009, 54 in 2009, 70 in 2010, and 64 in 2011.

(9) Budgetary Allocation for the Project by the Nigerian side

The concrete amount of budget to be born by the Nigerian side for the Project including operation and maintenance cost shall be assessed through the study and analysis in Japan.
The Nigerian side accepted that appropriate budgetary allocation will be put in place to meet the assistance from the Japanese side.
Thus the Nigerian side gave assurance that adequate fund will be provided for the Project except for those materials to be procured by the Japanese side.
The progress of the budgetary allocation and the total project cost to be born by the Nigerian side shall be confirmed by both sides when the draft final report of the Project will be discussed.

(10) Storage for Construction Materials

The materials for the construction work requested by Nigerian side would be properly stored by Yobe RUWASA and the recipient Local Government Areas with support by Yobe RUWASA. The Nigerian side shall make preparation for adequate stores to keep the materials before the commencement of the Project. Both sides agreed that the arrangement of proper storage for the materials should be confirmed when the draft final report of the Project will be discussed.

(11) Technical Assistance

The Nigerian side requested technical cooperation of dispatch of expert(s), training for

staff of RUWASA and technical assistance as soft component in this project.

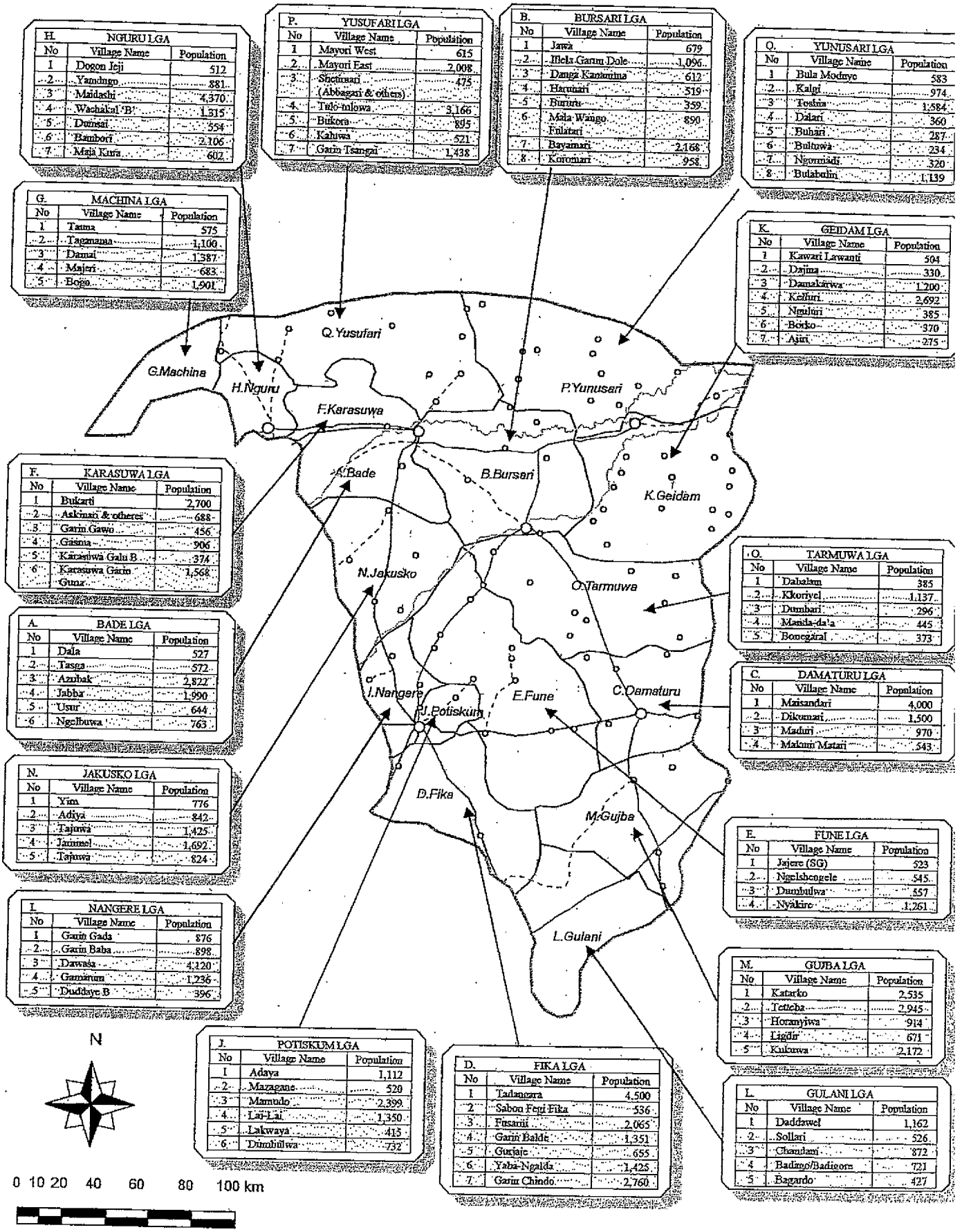
(12) Overlapping with other project

Nigerian side explained that this project would not be overlapped with any other project supported by the other donor agencies, NGO and Nigerian official organization(s).

(13) Safety and Security

The Nigerian side agreed to take measures to secure the safety of the member of the Team.

Annex-1



H.	NGURU LGA	
No	Village Name	Population
1	Dogon Jeji	512
2	Yamdingo	881
3	Maidashi	4,370
4	Wachakal 'B'	1,315
5	Dumsai	554
6	Bambori	2,106
7	Maja Kura	602

P.	YUSUFARI LGA	
No	Village Name	Population
1	Mayori West	615
2	Mayori East	2,008
3	Shettimari (Abbagari & others)	475
4	Tulo-tulowa	3,166
5	Bukora	895
6	Kaluwa	521
7	Garin Tsangai	1,438

B.	BURSARI LGA	
No	Village Name	Population
1	Jawa	679
2	Illela Garin Dole	1,096
3	Danga Kantamina	612
4	Harunari	519
5	Burutu	359
6	Mala Wango Fulatari	890
7	Bayamari	2,168
8	Koromari	958

O.	YUNUSARI LGA	
No	Village Name	Population
1	Bula Modmye	583
2	Kalgi	974
3	Toshia	1,584
4	Dalari	360
5	Buhari	287
6	Bultuwa	234
7	Ngomadi	320
8	Bulabulin	1,139

G.	MACHINA LGA	
No	Village Name	Population
1	Tama	575
2	Tagamana	1,100
3	Damai	1,387
4	Majeri	683
5	Bogo	1,901

K.	GEIDAM LGA	
No	Village Name	Population
1	Kawari Lawanti	504
2	Dajina	330
3	Damakarwa	1,200
4	Kelluri	2,692
5	Ngulüri	385
6	Boiko	370
7	Ajiri	275

F.	KARASUWA LGA	
No	Village Name	Population
1	Bukarti	2,700
2	Askinari & otheres	688
3	Garin Gawo	456
4	Gasima	906
5	Karasuwa Galu B	374
6	Karasuwa Garin Gunz	1,568

O.	TARMUWA LGA	
No	Village Name	Population
1	Dabalam	385
2	Kkoriyel	1,137
3	Dumbari	296
4	Manda-da'a	445
5	Bonegaral	373

A.	BADE LGA	
No	Village Name	Population
1	Dala	527
2	Tasga	572
3	Azubak	2,822
4	Jabba	1,990
5	Usur	644
6	Ngelbuwa	763

C.	DAMATURU LGA	
No	Village Name	Population
1	Maisandari	4,000
2	Dikomari	1,500
3	Maduri	970
4	Makuri Matari	543

N.	JAKUSKO LGA	
No	Village Name	Population
1	Yim	776
2	Adiya	842
3	Tajuwa	1,425
4	Jaminel	1,692
5	Tajuwa	824

E.	FUNE LGA	
No	Village Name	Population
1	Jajere (SG)	523
2	Ngelshengele	545
3	Dumbulwa	557
4	Nyakire	1,261

I.	NANGERE LGA	
No	Village Name	Population
1	Garin Gada	876
2	Garin Baba	898
3	Dawasa	4,120
4	Gamarum	1,236
5	Duddaye B	396

M.	GUJBA LGA	
No	Village Name	Population
1	Katarko	2,535
2	Tetteba	2,945
3	Horamjiwa	914
4	Ligdir	671
5	Kukuwa	2,172

J.	POTISKUM LGA	
No	Village Name	Population
1	Adaya	1,112
2	Mazagane	520
3	Mamudo	2,399
4	Lai-Lai	1,350
5	Lakwaya	415
6	Dimbulwa	732

D.	FIKA LGA	
No	Village Name	Population
1	Tadanzara	4,500
2	Sabon Fegi Fika	536
3	Fusami	2,065
4	Garin Baldi	1,351
5	Gujaje	655
6	Yaba-Ngalda	1,425
7	Garin Chindo	2,760

L.	GULANI LGA	
No	Village Name	Population
1	Daddawel	1,162
2	Sollari	526
3	Chandari	872
4	Badigo/Badigore	721
5	Bagardo	427

Project Site

Annex 2

ITEMS REQUESTED BY THE YOBE STATE GOVERNMENT OF NIGERIA

List of Equipment and Materials Requested

No.	Items	Features	Quantity
1	Drilling Rig	(1) Drilling Rig Hydraulically powered machine applicable to air/mud rotary drilling and down the hole drilling. Maximum capability to drill approximately 200m to 250m	2 units
		(2) Standard Accessories and tools for Rig	2 lots
2	Compressor	(1) With air delivery of 350~500liters/s and normal operating pressureof 11-12 bar	2 units
		(2) 6 or 10 wheel diesel engine truck sspecially using for Compressor	2 units
3	Vehicle	(1) 4×4 Truck with 6 ton Crane	2 units
4	Geophysical and Topographical Survey/ Research Equipment etc.	(1) Electromagnetic Survey Instrument	2 sets
		(2) Electric Resistively Survey Instrument	2 sets
		(3) Electric Logging Instrument	2 sets
		(4) Water Level Indicator	4 units
		(5) GRS Instrument	4 units
5	Water Testing Kit	(1) Spectrophotometer Test Kit	1 unit
		(2) Water Quality Analysis Equipment	2 sets
		(3) Distillation Machine	1 unit
		(4) Chemical and Bacteriological Reagents	1 lot
6	Hand pumps and Tools	(1) Hand pumps for deep wells	100 units
		(2) Operation and Maintenance Tools	1 lot
7	Casing and Screen Pipes	(1) Casing pipes (PVC) 4″ ϕ Casing pipes (PVC) 4″ ϕ	100 sets
		(2) Screen pipes (PVC) 4″ ϕ Screen pipes (PVC) 8″ ϕ	100 sets

JAPAN'S GRANT AID

2.1 Japan's Grant Aid Scheme

The Grant Aid scheme provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

(1) Grant Aid Procedures

Japan's Grant Aid Program is executed through the following procedures:

• Application	(Request made by a recipient county)
• Study	(Basic Design Study conducted by JICA)
• Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
• Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

Firstly, the application or a request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for the Grand Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Scheme, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes (E/N) signed by the Governments of Japan and the recipient country.

Finally, for the smooth implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

(2) Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereafter referred to as "the Study") conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

i) Confirmation of the background, objectives, and benefits of the requested Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
ii) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
iii) Confirmation of items agreed upon by both parties concerning the basic concept of the Project.
iv) Preparation of a Basic Design of the Project,
v) Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the

contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure it's self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is (are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

(3) Japan's Grant Aid Scheme

1) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

2) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consulting firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as natural disaster, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

3) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

4) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

5) Undertakings required to the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

i) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
ii) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
iii) To secure buildings prior to the procurement in case the installation of the equipment.
iv) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
v) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
vi) To accord Japanese nationals, whose services may be required in connection with the supply of the products and services under the Verified contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

6) "Proper Use"

The recipient country is required to operate and maintain the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

7) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

8) Banking Arrangement (B/A)

a) The Government of the recipient country or it's designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of the recipient country or it's designated authority.

9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

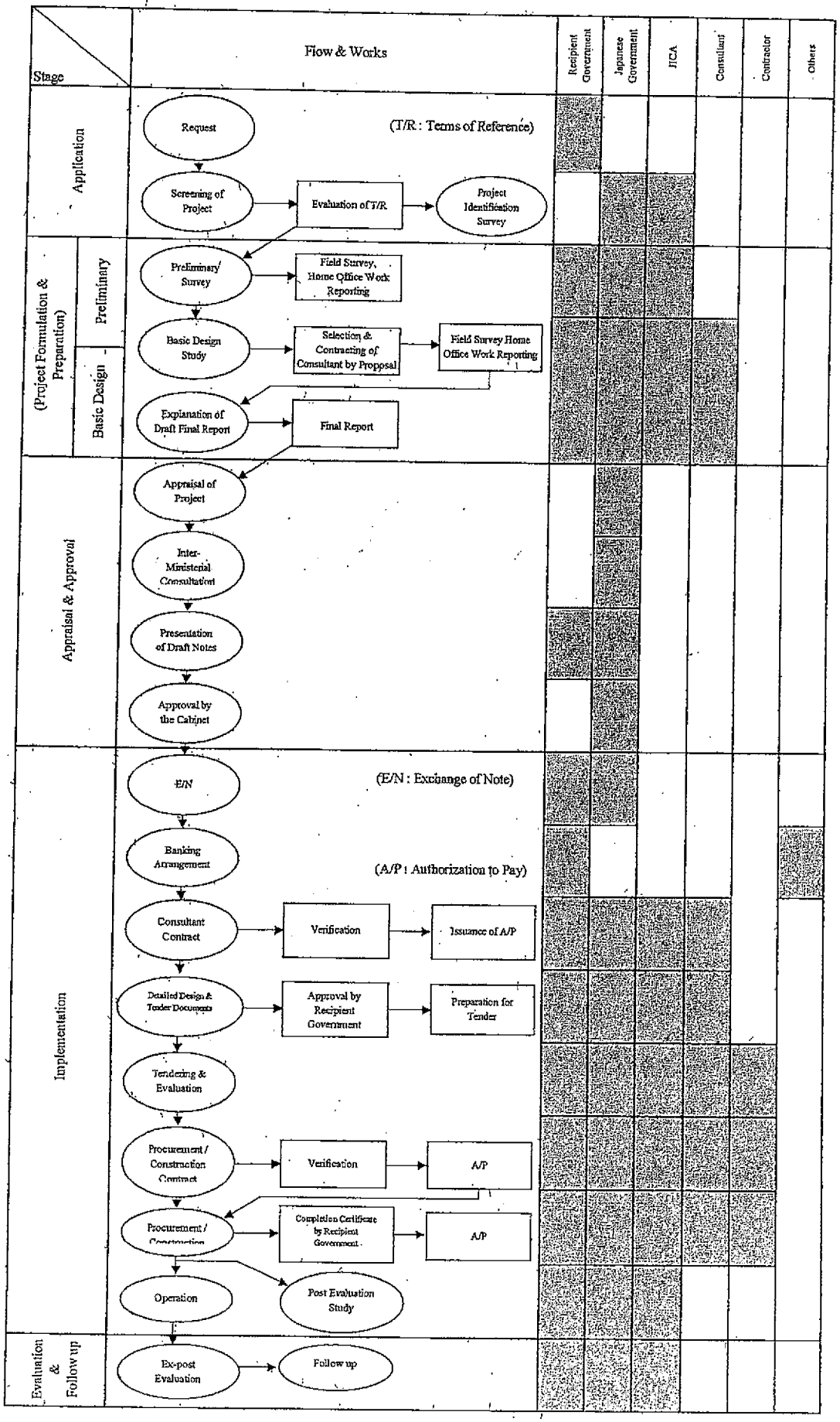
2.2 Grant Aid Procedures

(1) Flowchart of Japan's Grant Aid Procedures
Refer to Figure.

(2) Major Undertaking to be taken by Each Government

Refer to Table.

Figure Flowchart of Japan's Grant Aid Procedures



Annex-3

Major Undertakings to be Taken by Each Governments

No.	Items	To be Covered by Grant Aid	To be Covered by Recipient Side
1	To bear the following commissions to the Japanese bank for the backing services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
2	To ensure unloading and customs clearance at port of disembarkation in the recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
3	To accord Japanese nationals, whose services may be required in connection with the supply of the products and the services under the verified contact, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
4	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts		●
5	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		●

B/A : Banking Arrangement

A/P : Authorization to Pay

Target Villages

ID/ No	LGA	Village/Ward	Population	No. of Requested Boreholes
A-1	BADE	Dala	527	1
A-2	BADE	Tasga	572	1
A-3	BADE	Azubak	2,822	1
A-4	BADE	Jabba	1,990	1
A-5	BADE	Usur	644	1
A-6	BADE	Ngelbuwa	763	1
B-1	BURSARI	Jawa	679	1
B-2	BURSARI	Illela Garun Dole	1,096	1
B-3	BURSARI	Danga Kanamma	612	1
B-4	BURSARI	Harunari	519	1
B-5	BURSARI	Bururu	359	1
B-6	BURSARI	Mala Wango Fulatari	890	1
B-7	BURSARI	Bayamari	2,168	1
B-8	BURSARI	Koromari	958	1
C-1	DAMATURU	Maisandari	4,000	1
C-2	DAMATURU	Dikumari	1,500	1
C-3	DAMATURU	Maduri	970	1
C-4	DAMATURU	Makum Matari	543	1
D-1	FIKA	Tadangara	4,500	1
D-2	FIKA	Sabon Fegi Fika	536	1
D-3	FIKA	Fusarni	2,065	1
D-4	FIKA	Garin Balde	1,351	1
D-5	FIKA	Gurjaje	655	1
D-6	FIKA	Yaba-Ngalda	1,425	1
D-7	FIKA	Garin Chindo	2,760	1
E-1	FUNE	Jajere (SG)	523	1
E-2	FUNE	Ngelshengele	545	1
E-3	FUNE	Dumbulwa	557	1
E-4	FUNE	Nyakire	1,261	1
F-1	KARASUWA	Bukarti	2,700	1
F-2	KARASUWA	Askinari & otheres	688	1
F-3	KARASUWA	Garin Gawo	456	1
F-4	KARASUWA	Gasma	906	1
F-5	KARASUWA	Karasuwa Galu B	374	1
F-6	KARASUWA	Karasuwa Garin Guna	1,568	1
G-1	MACHINA	Tauna	575	1
G-2	MACHINA	Taganama	1,100	1
G-3	MACHINA	Damai	1,387	1
G-4	MACHINA	Majeri	683	1
G-5	MACHINA	Bogo	1,901	1
H-1	NGURU	Dogon Jeji	512	1
H-2	NGURU	Yamdugo	881	1
H-3	NGURU	Maidashi	4,370	1
H-4	NGURU	Wachakal 'B'	1,315	1
H-5	NGURU	Dumsai	554	1
H-6	NGURU	Bambori	2,106	1
H-7	NGURU	Maja Kura	602	1
I-1	NANGERE	Garin Gada	876	1
I-2	NANGERE	Garin Baba	898	1
I-3	NANGERE	Dawasa	4,120	1

Annex-4

ID/ No	LGA	Village/Ward	Population	No. of Requested Boreholes
I-4	NANGERE	Gamarum	1,236	1
I-5	NANGERE	Duddaye B	396	1
J-1	POTISKUM	Adaya	1,112	1
J-2	POTISKUM	Mazagane	520	1
J-3	POTISKUM	Mamudo	2,399	1
J-4	POTISKUM	Lai-Lai	1,350	1
J-5	POTISKUM	Lakwaya	415	1
J-6	POTISKUM	Dumbulwa	732	1
K-1	GEIDAM	Kawari Lawanti	504	1
K-2	GEIDAM	Dajina	330	1
K-3	GEIDAM	Damakarwa	1,200	1
K-4	GEIDAM	Kelluri	2,692	1
K-5	GEIDAM	Nguluri	385	1
K-6	GEIDAM	Borko	370	1
K-7	GEIDAM	Ajiri	275	1
L-1	GULUNI	Daddawel	1,162	1
L-2	GULUNI	Sollari	526	1
L-3	GULUNI	Chandam	872	1
L-4	GULUNI	Badago/Badigore	721	1
L-5	GULUNI	Bagardo	427	1
M-1	GUJBA	Katarko	2,535	1
M-2	GUJBA	Tetteba	2,945	1
M-3	GUJBA	Horanyiwa	914	1
M-4	GUJBA	Ligdir	671	1
M-5	GUJBA	Kukurwa	2,172	1
N-1	JAKUSKO	Yim	776	1
N-2	JAKUSKO	Adiya	842	1
N-3	JAKUSKO	Tajuwa	1,425	1
N-4	JAKUSKO	Jammel	1,692	1
N-5	JAKUSKO	Tajuwa	824	1
O-1	TARMUWA	Dabalam	385	1
O-2	TARMUWA	Kkoriyel	1,137	1
O-3	TARMUWA	Dumbari	296	1
O-4	TARMUWA	Manda-da'a	445	1
O-5	TARMUWA	Bonegaral	373	1
P-1	YUSUFARI	Mayori West	615	1
P-2	YUSUFARI	Mayori East	2,008	1
P-3	YUSUFARI	Shetimari (Abbagari & others)	475	1
P-4	YUSUFARI	Tulo-tulowa	3,166	1
P-5	YUSUFARI	Bukora	895	1
P-6	YUSUFARI	Kaluwa	521	1
P-7	YUSUFARI	Garin Tsangai	1,438	1
Q-1	YUNUSARI	Bula Moduye	583	1
Q-2	YUNUSARI	Kalgi	974	1
Q-3	YUNUSARI	Toshia	1,584	1
Q-4	YUNUSARI	Dalari	360	1
Q-5	YUNUSARI	Buhari	287	1
Q-6	YUNUSARI	Bultuwa	234	1
Q-7	YUNUSARI	Ngormadi	320	1
Q-8	YUNUSARI	Bulabulin	1,139	1

YOBE STATE RURAL WATER SUPPLY PLAN

Year.	Rural Population In Yobe Sate	Number of Safe Water Resources (nos)						People Access to-Safe Water In Rural Areas (nos)				Total Coverage Rate In Yobe State (%)			
		Open Cement Wells	Boreholes for mechanized pump	Borehole for Hand Pump			Total	Open Cement Wells	Boreholes for mechanized pump	Borehole for Hand Pumps	Total	Open Cement Wells	Boreholes for mechanized pump	Borehole for Hand Pumps	Total
				Amount of number	drilled by JICA rig	drilled by another rig									
2005	710, 000	320	80	220			620	64, 000	160, 000	110, 000	334, 000	9	22.5	15.5	47
2006	727, 750	370	92	250			712	74, 000	184, 000	125, 000	383, 000	10.2	25.3	17.2	52.6
2007	745, 944	420	104	280			804	84,000	208,000	140, 000	432, 000	11.3	27.9	18.8	57.9
2008	764, 592	470	118	360	60	30	948	94, 000	236, 000	180, 000	510, 000	12.3	30.9	23.5	66.7
2009	783, 707	520	132	440	50	30	1,092	104,000	264, 000	220, 000	588, 000	13.3	33.7	28.1	75
2010	803, 300	560	142	494	54	-	1, 196	112, 000	284, 000	247, 000	643, 000	14	35.5	30.8	80.4
2011	825, 792	575	153	564	70	-	1, 292	115, 000	305, 000	282, 000	702, 000	13.9	36.9	34.1	85
2012	846, 346	585	168	628	64	-	1; 379	117, 000	331; 000	314, 000	762; 000	13.8	39.09	37.08	90
2013	867, 692	-	210	810	RUWASA will plan later on the basis of the situation		1, 020	-	420,000	405, 000	825, 000	-	48.38	46.65	95.1
2014	889, 287	-	230	856			1, 088	-	460, 000	429, 281	889, 281	-	51.67	48.22	99.9
2015	YEAR 2015 IS RESERVED FOR ANY SHORTCOMINGS THAT MAY ARISE AFTER REVIEW & APPRAISAL OF THE PROJECTS AT THE END OF 2014.														

PLAN PARAMETERS:

The overall calculations / parameters is based on the following assumptions:

a) That In rural areas of Yobe state, the average consumption is 25 liter / capita/ day

b) Open cement well has an average discharge of 5000l/day covering 200 people

c) Hand pump has a discharge of 0.2litres/second i.e-8640 liters/ day covering 500 people

d) Boreholes in rural areas has an average discharge of 2.5 liters/second i.e 43, 200 liter/day covering 2000 people

NOTE

It is anticipated that JICA will provide 100 Handpumps that will contribute a total of 5.63% in 2008 and 2009

UNICEF has provided 200 boreholes that is expected to contribute a total of 11.27% to hand pumps in 2007 and 2008

WSSSRP/SRIP will also cover 4 local Governments in the state which is yet to be integrated into the master plan

Yearly increase in rural population is estimated to be 2.5%

資料 4-15

MINUTES OF DISCUSSIONS

ON THE BASIC DESIGN STUDY
ON THE PROJECT FOR
THE SUPPLY OF EQUIPMENTS FOR GROUNDWATER EXPLOITATION TOWARDS POTABLE WATER SUPPLY AND HEALTH DELIVERY IN YOBE STATE IN THE FEDERAL REPUBLIC OF NIGERIA

(EXPLANATION ON DRAFT REPORT)

In December 2006, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for the Supply of Equipments for Groundwater Exploitation towards Portable Water Supply and Health Delivery in Yobe State (hereinafter referred to as "the Project") to the Federal Republic of Nigeria (hereinafter referred to as "Nigeria") and through discussion, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult the Nigeria on the components of the draft report, JICA sent to the Nigeria the Draft Report Explanation Team (hereinafter referred to as " the Team "), which is headed by Mr. Kyojin Mima, Resident Representative, Nigeria Office, JICA, from 17th May to 26th May.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Abuja, 24 May 2007

Mr. Kyojin Mima
Leader
Draft Report Explanation Team
Japan International Cooperation Agency

Japan

Engr. M.A.K. Abubakar, MFR, FNSE
Director
Water Supply and Water Quality
Federal Ministry of Agriculture and Water Resources

Federal Republic of Nigeria

Mr. U. S. Nwozuzu
Assistant Chief Planning Officer
International Sector Development Cooperation

National Planning Commission
Federal Republic of Nigeria

Engr. Shuaibu Musa, MNSE
General Manager
Rural Water Supply and Sanitation Agency

Ministry of Water Resources
Yobe State, Federal Republic of Nigeria

ATTACHMENT

1. Components of the Draft Report

The Government of the Nigeria agreed and accepted in principle the components of the draft report explained by the Team.

2. Japan's Grant Aid scheme

The Nigerian side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of the Nigeria as explained by the Team and described in Annex-3 of the Minutes of Discussions signed by both parties on 11th December 2006.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed item and send it to the Government of Nigeria by August 2007

4. Other Relevant Issues

The following issues were discussed and confirmed by both sides.

(1) Components of the Project

Both sides agreed that the Project would be composed of the following components when the Japanese Government finally decides to implement the Project.

- Procurement of equipment and materials listed in **Annex -1.**
- "Soft Component" which is composed of 1) Technical training for construction management and 2) Strengthening of operation and maintenance system for water supply facilities.

(2) Responsibilities of the Borehole Construction Work

The Nigerian side promised that the construction work of the Project shall be executed by Nigerian side as described in ATTACHMENT 7 (4) of the Minutes of Discussions signed on 11th December 2006. Both sides agreed that the target villages for borehole construction by the Nigerian side under the Project would be eighty-nine, which are listed in **Annex-2.**
The Nigerian side promised to secure budget for the Project timely and submit monthly progress report to Japanese side. The format of progress report is shown in **Annex-3.** After the construction of eighty-nine boreholes, the Nigerian side shall continue to use a procured drilling rig along the "YOBE STATE RURAL WATER SUPPLY PLAN" in **Annex-4**

(3) Budgetary Arrangement for the Implementation of the Project

The Nigerian side agreed and promised to provide necessary budgetary allocation to cover the required amount of cost described in **Annex-5.**

(4) Storage for Construction Materials

Both sides confirmed that the construction materials delivered to Yobe RUWASA would be managed under the supervision of the General Manger of Yobe RUWASA and kept in adequate stores.

(5) Safety and Security

The Nigerian side will ensure that necessary measures are taken for the safety and security of the Japanese nationals involved in the Project.

(6) The Draft Technical Specification of the Equipment

The Team handed one copy of the draft technical specification of the equipment to the Nigerian side. Both sides agreed that this draft specification is confidential and should not be duplicated or released to any parties.

(7) Project Cost Estimation

Both sides agreed that the Project Cost Estimation, as attached in Annex-5 should never be duplicated or released to any outside parties before the signing of all the Contract(s) for the Project.

Annex 1

List of Procured Equipment and Materials

No.	Items	Features	Quantity
1	Drilling Rig	(1) Driilling Rig Hydraulically powered machine applicable to air/mud rotary drilling and down the hole drilling . Drilling capability: Not less than 100m with 6-1/4″ to 10-5/8″ borehole diameter with 4-3/4″OD drill pipe Mobilisation method: By truck mounted Truck specification: 4x4 or 6x4 (2) Standard Accessories and tools for Rig	1 unit 1 lot
2	High Pressure Air Compressor	Supply air pressure: More than 2.1MPa (=20.5kg/cm2) Supply air volume: 11.3m3/min or more Mobilisation method: By truck mounted Truck specification: 4x4 or 6x4	1 unit
3	Cargo Truck with Crane	Load capacity: More than 6.0ton Specification: 4x4, Diesel water cooling engine Length of carrier: More than 6.0m Crane capacity: 2.9ton (3.0ton)	1 unit
4	Pumping Test Equipment	(1) Submersible motor pump: Diameter of 2.5″. Discharge of 30 liters/min. 70m head (1.5kW/50Hz) (2) Engine generator: 5kVA (3) Water level meter: Measurable depth of 100m	1 set 1 set 1 set
5	Water Analysis Equipment	Measurement items: pH, DO, EC, TDS and Temperature	1 unit
6	Geophysical Survey Equipment	(1) Electrical sounding instrument: Measurable depth 100m Measuring item: Apparent resistivity and spontaneous potential Measurable range: 0.1mV- 10V Accessory : Software for interpretation Others: Applicable for logging work for 100m depth borehole (with cable and probe) (2) GPS unit Measuring items: Latitude, Longtitude, Alutitude Tolerance: 15 RMS	1 unit 1 unit
7	Hand Pump	Hand pump & maintenance kit: VLOM type, Indian Mark III Toos for repair by village level and LGA level	89 sets 1 unit
8	Casing Pipe	Materials: Un-plasticised polyvinyl chloride Dimension: Diameter of 4″ O.D. of 114.4mm, length of 3m Wall thickness: More than 5 mm Connection: Threading method	1,682 pieces
9	Screen Pipe	Materials: Un-plasticised polyvinyl chloride Dimension: Diameter of 4″ O.D. of 114.4mm, length of 3m Wall thickness: More than 5 mm Connection: Threading method Opening ratio of 3% or more	297 pieces

Annex 2 (1)

Target Villages for Borehole Construction (1)

No	ID	LGA	Village	Population in 1991	No. of Requested Boreholes	Geology	Groundwater Develoment Potential Evaluation		Social Condtion Evaluation Rank
							Estimated Drilling Depth(m)	Estimated Water Level (m)	
1	A-1	BADE	Dala	527	1	Chad	60	30	C
2	A-2	BADE	Azbak	2,822	1	〃	50	20	B
3	A-3	BADE	Usur	644	1	〃	50	20	B
4	A-4	BADE	Ngelbuwa	763	1	〃	50	20	B
5	B-1	BURSARI	Jawa	679	1	Chad	60	20	B
6	B-2	BURSARI	Illela Garun Dole	1,096	1	〃	50	20	B
7	B-3	BURSARI	Danga Kanamma	612	1	〃	55	25	B
8	B-4	BURSARI	Harunari	519	1	〃	55	25	B
9	B-5	BURSARI	Bururu	359	1	〃	50	20	B
10	B-6	BURSARI	Mala Wango Fulatari	890	1	〃	50	20	B
11	B-7	BURSARI	Bayamari	2,168	1	〃	60	30	A
12	B-8	BURSARI	Koromari	958	1	〃	55	25	B
13	B-9	BURSARI	Bonegarai	373	1	〃	55	25	B
14	C-1	DAMATURU	Maisandari	4,000	1	Chad	60	20	B
15	C-3	DAMATURU	Maduri	970	1	〃	60	15	B
16	D-1	FIKA	Tadangara	4,500	1	Gongila	70	30	B
17	D-5	FIKA	Gurjaje	655	1	Kerri-Kerri	80	35	B
18	D-6	FIKA	Yabo-Ngalda	1,425	1	Gongila	70	30	B
19	D-7	FIKA	Garin Chindo	2,760	1	〃	70	30	A
20	E-3	FUNE	Dumbulwa	557	1	Chad	55	20	C
21	E-4	FUNE	Nyakire	1,261	1	〃	60	25	B
22	F-1	KARASUWA	Bukarti	2,700	1	Chad	70	30	B
23	F-2	KARASUWA	Askinari & otheres	688	1	〃	55	25	A
24	F-3	KARASUWA	Garin Gawo	456	1	〃	50	20	B
25	F-4	KARASUWA	Gasma	906	1	〃	60	20	A
26	F-5	KARASUWA	Karasuwa Gaiu B	374	1	〃	50	15	B
27	F-6	KARASUWA	Karasuwa Garin Guna	1,568	1	〃	50	15	B
28	F-7	KARASUWA	Dogon Jeji	512	1	〃	50	15	B
29	F-8	KARASUWA	Wachakal 'B'	1,315	1	〃	60	30	B
30	G-1	MACHINA	Tauna	575	1	Chad	60	30	B
31	G-2	MACHINA	Taganama	1,100	1	〃	60	30	B
32	G-3	MACHINA	Damai	1,387	1	〃	60	30	A
33	G-4	MACHINA	Majeri	683	1	〃	60	30	B
34	G-5	MACHINA	Bogo	1,901	1	〃	60	30	A
35	H-1	NGURU	Yamdugo	881	1	Chad	55	15	B
36	H-2	NGURU	Dumsai	554	1	〃	55	15	B
37	H-3	NGURU	Bambori	2,106	1	〃	55	15	B
38	H-4	NGURU	Maja Kura	602	1	〃	55	15	B
39	I-1	NANGERE	Garin Gada	876	1	Chad	70	35	A
40	I-4	NANGERE	Gamarum	1,236	1	Kerri-Kerri	80	35	A
41	I-5	NANGERE	Duddaye B	396	1	〃	80	35	B
42	J-1	POTISKUM	Adaya	1,112	1	Kerri-Kerri	50	15	A
43	J-2	POTISKUM	Mazagane	520	1	〃	65	30	A
44	J-3	POTISKUM	Mamudo	2,399	1	〃	50	15	B
45	J-4	POTISKUM	Lai-Lai	1,350	1	〃	65	30	A
46	J-5	POTISKUM	Lakwaya	415	1	〃	65	30	B
47	J-6	POTISKUM	Dumbulwa	732	1	〃	65	30	A
48	K-1	GEIDAM	Kawari Lawanti	504	1	Chad	60	20	B
49	K-2	GEIDAM	Dajina	330	1	〃	60	20	B
50	K-3	GEIDAM	Damakarwa	1,200	1	〃	60	20	B
51	K-4	GEIDAM	Kelluri	2,692	1	〃	60	20	A
52	K-5	GEIDAM	Nguluri	385	1	〃	60	20	B
53	K-6	GEIDAM	Borko	370	1	〃	60	20	B
54	K-7	GEIDAM	Ajiri	275	1	〃	60	20	A
55	L-2	GULANI	Sollari	526	1	Fika	55	25	B
56	L-3	GULANI	Chandam	872	1	〃	50	20	A
57	L-4	GULANI	Badago/Badigore	721	1	〃	60	30	B
58	L-5	GULANI	Bagardo	427	1	〃	50	20	B

Annex 2 (2)

Target Villages for Borehole Construction (2)

ID/ No		LGA	Village	Population in 1991	No. of Requested Boreholes	Geology	Groundwater Develoment Potential Evaluation		Social Condtion Evaluation Rank
							Estimated Drilling Depth(m)	Estimated Water Level (m)	
59	M-1	GUJBA	Katarko	2,535	1	Chad	50	25	B
60	M-2	GUJBA	Daddawel	1,162	1	Fika	50	15	B
61	M-3	GUJBA	Horanyiwa	914	1	Kerri-Kerri	70	35	B
62	M-4	GUJBA	Ligdir	671	1	OlderGranite	60	30	B
63	M-5	GUJBA	Kukuwa	2,172	1	Gongila	60	30	B
64	N-1	JAKUSKO	Yin	776	1	Chad	50	20	A
65	N-2	JAKUSKO	Adiya	842	1	〃	50	20	B
66	N-3	JAKUSKO	Kajuwa	1,425	1	〃	50	20	B
67	N-4	JAKUSKO	Jammel	1,692	1	〃	50	20	A
68	N-5	JAKUSKO	Tajuwa	824	1	〃	50	20	A
69	N-6	JAKUSKO	Tasga	572	1	〃	50	20	B
70	N-7	JAKUSKO	Jabba	1,990	1	〃	60	30	B
71	O-2	TARMUWA	Koriyel	1,137	1	Chad	60	30	B
72	O-3	TARMUWA	Dumbari	296	1	〃	60	30	A
73	O-4	TARMUWA	Manda-da'a	445	1	〃	55	25	B
74	P-1	YUSUFARI	Mayori West	615	1	Chad	50	20	B
75	P-2	YUSUFARI	Mayori East	2,008	1	〃	50	20	B
76	P-3	YUSUFARI	Shetimari (Abbagari & others)	475	1	〃	50	15	A
77	P-4	YUSUFARI	Tulo-tulowa	3,166	1	〃	50	10	A
78	P-5	YUSUFARI	Bukora	895	1	〃	50	15	B
79	P-6	YUSUFARI	Kaluwa	521	1	〃	50	20	B
80	P-7	YUSUFARI	Garin Tsangai	1,438	1	〃	50	20	B
81	P-8	YUSUFARI	Maidashi	4,370		〃	50	20	B
82	Q-1	YUNUSARI	Bula Moduye	583	1	Chad	50	20	B
83	Q-2	YUNUSARI	Kalgi	974	1	〃	55	25	A
84	Q-3	YUNUSARI	Toshia	1,584	1	〃	50	20	A
85	Q-4	YUNUSARI	Dalari	360	1	〃	50	20	B
86	Q-5	YUNUSARI	Bulari	287	1	〃	50	20	B
87	Q-6	YUNUSARI	Bultuwa	234	1	〃	50	20	B
88	Q-7	YUNUSARI	Ngormadi	320	1	〃	50	20	A
89	Q-8	YUNUSARI	Bulabulin	1,139	1	〃	50	20	A

A: Higher evaluation points (12 to 15)
B: High evaluation points (8 to 11)
C: Satisfied evaluation points (5 to 7)

Format of Monthly Progress Report for Borehole Construction

ID	LGA	Community	Latitude	Longitude	Date	Depth (m)	Screen Position (m)	Yield (l/min)	S.W.L (m)	Pump Depth (m)	WASCOM	Sanitation facilities

Monthly/ Cumulative– Total

Progress	Number of Borehole	No of Pumps installed	Productive Boreholes	Abortive Boreholes	Depth (m)	Casings (m)	
						Blind	Screen

Annex -3

資料 4-22

YOBE STATE RURAL WATER SUPPLY PLAN

Year	Rural Population in Yobe Sate	Number of Safe Water Resources (nos)						People Access to Safe Water in Rural Areas (nos)				Total Coverage Rate in Yobe State (%)			
		Open Cement Wells	Boreholes for mechanized pump	Borehole for Hand Pump			Total	Open Cement Wells	Boreholes for mechanized pump	Borehole for Hand Pumps	Total	Open Cement Wells	Boreholes for mechanized pump	Borehole for Hand Pumps	Total
				Amount of number	drilled by JICA rig	drilled by another rig									
2005	710, 000	320	80	220			620	64, 000	160, 000	110, 000	334, 000	9	22.5	15.5	47
2006	727, 750	370	92	250			712	74, 000	184, 000	125, 000	383, 000	10.2	25.3	17.2	52.6
2007	745, 944	420	104	280			804	84,000	208,000	140, 000	432, 000	11.3	27.9	18.8	57.9
2008	764, 592	470	118	360	44	36	948	94, 000	236, 000	180, 000	510, 000	12.3	30.9	23.5	66.7
2009	783, 707	520	132	440	45	35	1,092	104,000	264, 000	220, 000	588, 000	13.3	33.7	28.1	75
2010	803, 300	560	142	494	50	4	1, 196	112, 000	284, 000	247, 000	643, 000	14	35.5	30.8	80.4
2011	825, 792	575	153	564	50	20	1, 292	115, 000	305, 000	282, 000	702, 000	13.9	36.9	34.1	85
2012	846, 346	585	166	628	50	14	1, 379	117, 000	331, 000	314, 000	762, 000	13.8	39.09	37.08	90
2013	867, 592	-	210	810	RUWASA will plan later on the basis of the situation		1, 020	-	420,000	405, 000	825, 000	-	48.38	46.65	95.1
2014	889, 287	-	230	856			1, 088	-	460, 000	429, 281	889, 281	-	51.67	48.22	99.9
2015	YEAR 2015 IS RESERVED FOR ANY SHORTCOMINGS THAT MAY ARISE AFTER REVIEW & APPRAISAL OF THE PROJECTS AT THE END OF 2014.														

PLAN PARAMETERS:

The overall calculations / parameters is based on the following assumptions:

a) That in rural areas of Yobe state, the average consumption is 25 liter / capita/ day

b) Open cement well has an average discharge of 5000l/day covering 200 people

c) Hand pump has a discharge of 0.2litres/second i.e 8640 liters/ day covering 500 people

d) Boreholes in rural areas has an average discharge of 2.5 liters/second i.e 43, 200 liter/day covering 2000 people

NOTE

It is anticipated that JICA will provide 100 Handpumps that will contribute a total of 5.63% in 2008 and 2009

UNICEF has provided 200 boreholes that is expected to contribute a total of 11.27% to hand pumps in 2007 and 2008

WSSSRP/SRIP will also cover 4 local Governments in the state which is yet to be integrated into the master plan

Yearly increase in rural population is estimated to be 2.5%

Annex - 4

資料 4-23

Project Cost Estimation (1)

1 Initial Cost Estimation

The total cost in the event where the Project is implemented under the Grant Aid System of the Government of Japan will be approximately Japanese Yen 371 million, and the cost burden of the two sides based on the previously given scope of works and the following estimation conditions is estimated as follows. However, the estimate cost indicated here is only a provisional value – it does not indicate the limit of the grant described in the exchanged notes – and it will be further examined when implementation of the project is reviewed. The following table shows the results of computing the rough project costs in consideration of the design conditions and implementation schedule.

(1) Cost burden of the Japanese side: approx. Japanese Yen 267 million

Estimated Total Project Cost		267 Million Yen
Expense Item		Estimated Cost
Equipment and materials	Drilling rig, Compressor, crane truck, Pumping test equipment, Water analysis equipment, Geophysical survey equipment	231 Million Yen
Detailed Design, Procurement Supervision and soft component		36 Million Yen

(2) Cost burden of the Nigerian side: approx. NGN 116 million (Yen 104 million)

1) Facilities construction cost (89 borehole constructions from 2008 to 2009):

Approx. NGN 32 million (approx. Yen 29 million)

2) Facilities construction cost (150 borehole constructions from 2010 to 2012):

Approx. NGN 28 million (approx. Yen 25 million) (2010)
Approx. NGN 28 million (approx. Yen 25 million) (2011)
Approx. NGN 28 million (approx. Yen 25 million) (2012)

(3) Estimation conditions

① Estimated on : December 2006
② Exchange rate : 1US $ =117.55 Yen
1NGN=0.906 Yen
③ Procurement period : Project shall be implemented over a single fiscal year.
④ Others : The Project will be implemented in compliance with the Grant Aid System of the Government of Japan.

2 Operation and Maintenance Cost (2)

2-1 Maintenance Cost of Procured Equipment and Materials

According to the field survey and discussion with RUWASA, the average maintenance cost of new drilling equipment per borehole including fuel and oil is about NGN 180,000. Therefore, the cost of maintenance for the equipment proposed in the Project of 89 boreholes planned over two years is estimated at about NGN 8 million/year. After completion of 89 boreholes construction, the cost of maintenance for the procured equipment from 2010 to 2012 is estimated at about NGN 9 million/year.

2-2 Maintenance Cost of Water Supply Facilities

The boreholes with hand pump to be constructed in the water supply and sanitation service by RUWASA are the standard type of the RUWASA office, i.e. Indian Mark III of VLOM (Village Level Operation and Maintenance) type. Indian Mark III has high durability under moderate maintenance and high performance, and the Nigerian side has wide experience with it. However, periodic replacement for some consumable parts will be required.

Tools required for repairing hand pump boreholes will be given to the VWESC (Village Water Environment and Sanitation Committees) when the boreholes are handed over, so there will be no need to make separate purchases. Moreover, the technology required to carry out regular inspections and parts exchanges will be passed on by the RUWASA or LGA planning and mobilization departments. Accordingly, the success of routine maintenance of the water supply facilities will depend on the bearing of costs of purchasing exchange parts and repairing pump breakdowns. As is indicated in Table 2-1, the annual maintenance cost of Indian Mark III pumps is estimated as NGN 26,500.

Table 2-1 Annual O&M Cost for One Borehole

No.	Item	Unite price	Quantity	Amount	Remarks
1	Replacement of spare parts	23,000	0.5	11,500	Once in 2 years
2	Maintenance kit	15,000	0.1	1,500	Once in 10 years
3	Cleaning of well	38,000	0.1	3,800	Once in 10 years
4	Hand pump, pipe replacement	97,000	0.1	9,700	Once in 10 years
Total		-	-	26,500	-

Assuming that the average number of beneficiaries per borehole is 360, the per capita burden works out as NGN 74 per year. According to the survey of social conditions conducted in this

study, households in villages where VWESC have been established pay approximately NGN 50 per month (NGN 600/year). Moreover, households in the villages that will install boreholes from now on replied that they can pay approximately NGN 50 per month. Other residents have proposed that payments be set according to financial ability or that lump sum payments be made during the harvest season when households have money coming in. In any case, the said amount is considered to be sufficient to carry out the necessary maintenance work. However, regarding hand pump maintenance costs that arise in cases of sudden serious breakdowns and emergencies, it will be necessary to continue levying water rights charges.

資料-5　事業事前計画表

事業事前計画表（基本設計時）

1　案件名

ナイジェリア連邦共和国　ヨベ州地方給水・衛生改善プロジェクト

2　要請の背景(協力の必要性・位置付け)

（1）当該国における問題点及び当該国政府の取り組みの現状

ナイジェリア連邦共和国（以下、「ナ」国という）の給水衛生の状況は、給水率が地方農村部で低く、浅井戸や湧水等の不衛生な水を利用せざるを得ないため、水因性疾患による被害が大きい。このような状況のもと、「ナ」国政府は、1997 年に国家開発計画「vision2010」を策定し、この中で国家基本目標のひとつとして、国民生活の基本的要求(水、食料、健康、住居および教育)の確保を設定した。これを受け、給水率の向上に関し、2007 年までに全国の給水率を 80%に改善し、2011 年までに全国民に安全な水を供給するとともに、人口 5000 人未満の村落給水では 30Lit.／人／日、水運搬距離を 250m 以内、1 給水地点あたりの受益者を 250～500 人とする目標を掲げている。

（2）協力対象地域の現状・問題点・特徴及び選定理由

本計画、要請地域であるヨベ州は、隣国ニジェールと接する北東部に位置し、最も貧困率の高い州のひとつである。「ナ」国北部では、安全な水を利用している割合が全国平均と比較して低く、ヨベ州における村落給水率も 47%に留まっている。また、住民は不衛生な水を利用し、下痢症やコレラ等の水因性疾患が蔓延する原因となっているとともに、旱魃、砂漠化の脅威にさらされている地域でもあり、安全な水の供給は緊急の課題である。

（3）上位計画との関連

本プロジェクトの上位国家開発計画としては「Vision2010」、およびこれを 2004 年に改定した「国家の繁栄に関する国家政策（NEEDS)」がある。NEEDS では、“新しいナイジェリアの創造”を国家目標とし、貧困撲滅、雇用の創造、富の構築等を重点項目としている。村落の水供給及び衛生に関係する国家政策は、1999 年に制定された「国家給水衛生政策」、2004 年に制定された「地方給水、衛生プログラム（戦略構想)」がある。この中で給水率の向上に関しては、給水率を 2003 年までに 60%、2007 年までに 80%に改善し、2011 年までに全ての国民に安全な水を供給することを目標としている。

要請は、プロジェクト対象地域の給水施設の整備と地方給水・衛生改善であり、上記の上位計画と一致している。

3　プロジェクト全体計画概要

（1）プロジェクト全体計画の目標(裨益対象の範囲及び規模)

- 裨益対象：ヨベ州地方部住民約 32,000 人(2009)
- プロジェクト終了時にはヨベ州地方部の給水施設が整備され、住民の給水衛生環境が改善される。

事業事前計画表（基本設計時）

(2) プロジェクト全体計画の成果

- RUWASA の井戸関連機材が整備される。
- ヨベ州地方部の給水施設が整備され、住民の給水衛生環境が改善される。

(3) プロジェクト全体計画の主要活動

- 井戸掘削関連機材を調達する。
- 給水施設建設資材を調達する。
- 技術訓練を実施する。
- 調達資機材を用いてヨベ州地方部の給水施設建設を実施する。

(4) 投入（インプット）

- 日本側（＝本案件）：無償資金協力 2.64 億円
- 相手国側: 給水施設建設に係る人件費、消耗費などの経費：0.29 億円

(5) 実施体制

実施機関：ヨベ州水資源省　地方給水衛生公社(RUWASA)

主管官庁：連邦水資源省(FMWR)　給水・水質管理部

4　無償資金協力案件の内容

(1) サイト

ナイジェリア連邦共和国ヨベ州

(2) 概要

- ヨベ州地方部の給水施設建設に必要な資機材の調達。
- RUWASA 職員を対象とした、工事運営管理・給水施設維持管理体制強化に関する技術指導。

(3) 相手国側負担事項：

- ヨベ州地方部の給水施設建設

(4) 概算事業費

- 2.93 億円（無償資金協力約 2.64 億円、「ナ」国側負担約 0.29 億円）

(5) 工期

- 詳細設計･入札・工場製作・検査・輸送期間を含め約 14 ヶ月（予定）

事業事前計画表（基本設計時）

（6）貧困、ジェンダー、環境及び社会面の配慮

・ 特になし。

5 外部要因リスク（プロジェクト全体計画の目標の達成に関するもの）

・ 特になし。

6 過去の類似案件からの教訓の活用

・ 特になし

7 プロジェクト全体計画の事後評価に係る提案

（1）プロジェクト全体計画の目標達成を示す成果指標

	2006 年	2009 年（目標）
調達リグによる給水施設の建設数	0	89
計画対象 89 村落での安全な水を得ることができる人口	0	32,000

（2）その他の成果指標：

特になし

（3）評価のタイミング

・ 2009 年以降（89 本井戸掘削終了後（2009 年））

資料-6　参考資料/入手資料リスト

収 集 資 料 リ ス ト

番号	資料の名称	形態	版型	ﾍﾟｰｼﾞ数	ｵﾘｼﾞﾅﾙ・ｺﾋﾟｰの別	部数	収集先名称又は発行機関
P	**政策、組織**						
P-1	Yobe State of Nigeria Gazette(RUWASA設立の趣旨、機能)	図書	A4		コピー	1	RUWASA
P-2	Yobe State Rural Water Supply and Sanitation Agency Comprehensive Staff List	書類	A4		コピー	1	RUWASA
P-3	Organizaition Charts of Ministry of Water Resources (Yobe State)	書類	A4		コピー	1	RUWASA
P-4	Yobe State Rural Water Supply Plan	書類	A4		コピー	1	RUWASA
P-5	Water Supply and Sanitation Sector Reform Programme (WSSSRP)	書類	A4		コピー	1	EU
P-6	Quaternary Budget Sheet (2002-2006) for Yobe RUWASA	書類	A4		コピー	1	RUWASA
P-7	Schedule of Dutiez for RWS Division, FMWR	書類	A4		コピー	1	FMWR
P-8	Organizaition Charts of Federal Ministry of Water Resources	書類	A4		コピー	1	FMWR
E	**社会条件・経済**						
E-1	Location Map of Requested 100 Villages	図面	A1		コピー		RUWASA
E-2	Revised List of Requested 100 Villages	書類	A4		コピー		RUWASA
N	**自然条件等**						
N-1	GEOLOGICAL MAP OF YOBE STATE	書類	A4		コピー	1	RUWASA
N-2	REPORT ON SKELETAL AND DENTAL FLUOROSIS PROBLEM IN AJARI/PAWARI WARDS, DAMATURU, YOBE STATE	書類	A4		コピー	1	YOBE STATE WATER CORPORATION
N-3	RWSULTS OF FLUORIDE AND CALCIUM LEVELS IN DAMATURU BOREHOLES METROPOLIS	書類	A4		コピー	1	YOBE STATE WATER CORPORATION
N-4	WHO Drinking Water Quality Guidelines (1993)	書類	A4		コピー	1	RUWASA
N-5	GEOLOGY OF YOBE STATE	書類	A4		コピー	1	RUWASA
N-6	HYDROGEOLOGY OF YOBE STATE	書類	A4		コピー	1	RUWASA
W	**給水関連**						
W-1	Handpump Manual (Afridev)	図書	A4		コピー	1	RUWASA
W-2	Handpump Manual (India Mark-II)	図書	A4		コピー	1	RUWASA
W-3	Water Supply Project List by Chad Basin Project	図書	A4		コピー	1	RUWASA
W-4	WSSSR, SRIP workshop paper	書類	A4		コピー	1	RUWASA
W-5	Drilling Cost by RUWASA and Private Sector	書類	A4		コピー	1	RUWASA
W-6	Mothly Progress Report (Oyo Project)	書類	A4		コピー	1	Oyo WATSAN Project
W-7	Pre Intervention Survey Form	書類	A4		コピー	1	Oyo WATSAN Project
W-8	Oyo WATSAN Information Brochure	書類	A4		コピー	1	Oyo WATSAN Project
W-9	Operation Maintenace and Management of Equipment in Oyo State	書類	A4		コピー	1	FMWR

収 集 資 料 リ ス ト

番号	資料の名称	形態	版型	ﾍﾟｰｼﾞ数	ｵﾘｼﾞﾅﾙ・ｺﾋﾟｰの別	部数	収集先名称又は発行機関
C	**ナイジェリア規格**						
C-1	General Requirements for Deep Well Hand Pump (RUWASAN 1) for Rural Water Supply	図書	A4		コピー	1	Standard Organization of Nigeria
C-2	General Requirements for Deep Well Hand Pump (RUWASAN 2) for Rural Water Supply	図書	A4		コピー	1	Standard Organization of Nigeria

資料-7　物理探査結果

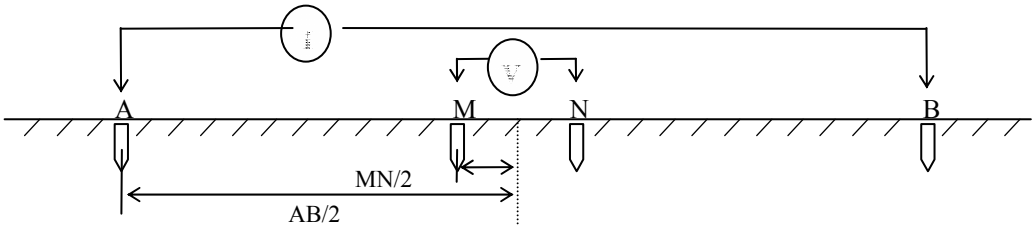
資料 7　物理探査結果

１．実施目的

対象地域の水理地質状況の把握と、標準井戸仕様を決定するために物理探査（電気探査）を実施した。物理探査対象村落は、対象村落 100 村落の中から 10 村落を選定した。測点位置図並びに各測定位置の詳細図を図 2 及び図 3 に示す。選定した村落は、既存井戸データを補完する目的の他に、地質の複雑なヨベ州中央部から南部地域を重点とした。なお、物理探査は現地再委託によって現地業者に委託し、解析は調査団水理地質担当者が実施した。

２．探査方法

物理探査は垂直電気探査とし、地表下の水平な層状の地下構造を探査する方法である。本調査ではシュランベルジャー法の電極配置を採用した(図 1)。電流電極と電位電極の電極間隔が小さければ見掛比抵抗値は浅い部分の構造を反映し、大きければ深部の構造も含む値になる。したがって、電極間隔を変えて一連の測定を行い、電極間隔の関数として見掛比抵抗(ρ a)を求めれば地下構造の解析が可能となる。シュランベルジャー法は、測線上に設けた外側の 2 箇所の電流電極(A、B)に送電し、その内側に設けた一対の電位電極(M、N)で電位差を測定する。それぞれの電極間隔に対応した ρ a を求めた。電流電極間隔(AB/2)と電位電極間隔(MN/2)との組合せを表 1 に示す。



$\rho a=\pi/4\times((AB^2-MN^2)/MN)\times(V/I)$、 ρ a=見掛比抵抗(ohm-m)

I：AB 間の送信電流(A)、V：MN 間の測定電圧(V)、AB：電流電極、MN：電位電極

図 1　シュランベルジャー法の電極配置

表 1　電流電極及び電位電極間隔の組合せ

(AB/2)	1	1.5	2	2.5	3	4	5	6.5
(MN/2)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
(AB/2)	8	10	13	16	20	25	30	40
(MN/2)	0.2/1.5	0.2/1.5	1.5	1.5	1.5	1.5	1.5	1.5
(AB/2)	50	65	80	100	130	160	200	－
(MN/2)	1.5	1.5	1.5/16	1.5/16	16	16	16	－

３．測定装置

測定に使用した物理探査測定装置及び測定機器の仕様は以下のとおりである。

探査機器：　ABEM 製　テラメター　SAS300C

流電電流：　0.2-500mA

探査深度：　AB/2=200m

解析方法：　水平多層構造自動解析ソフト

４．解析結果

測定は、下記のようにヨベ州南部の 7 LGA、10 村落に対し各 2 点測定の合計 20 点である。

表２　物理探査地区および測点数

LGA	地区名	地質分布	測点数
ダマツル	MADORI	チャド層	2
フィカ	GARIN BALDE	ゴンベ砂岩層	2
フネ	NGELSHENGELE	チャド層	2
フネ	NYAKIRE	チャド層	2
ナンゲレ	GAMARAM	チャド層	2
ポティスクム	LAI-LAI	ケリケリ層	2
グジバ	DADDAWEL	砂岩層	2
グジバ	LIGDIR	砂岩層	2
グジバ	KATARKO	チャド層	2
タルムア	DUMBARI	チャド層	2
	合計		20

測定された見掛比抵抗の範囲は、5～9,820（ohm-m）である。測定データを表３に、解析結果を表４に示す。解析結果の表は、左欄から LGA 名、村落名、地質分布、測点番号、座標値（GPS による測定値）、解析項目（比抵抗、層厚、地表下深度）、各層の値を示す。各層の色分けは、黄色は表土層・風化層、水色は想定される帯水層、ねずみ色は乾燥した地層・岩盤を示す。

解析された比抵抗構造は２～６層構造を示し、全体の 75%が３～４層構造を示す。このうち 18 測点では地下水の存在を示唆する低比抵抗値として解析された。地下水の推定深度は 10m～100m の範囲にあり、特に地下水が深度 100m 付近と深く推定される地域は、フネ、ポティスクム、グジバ、タルムアである。

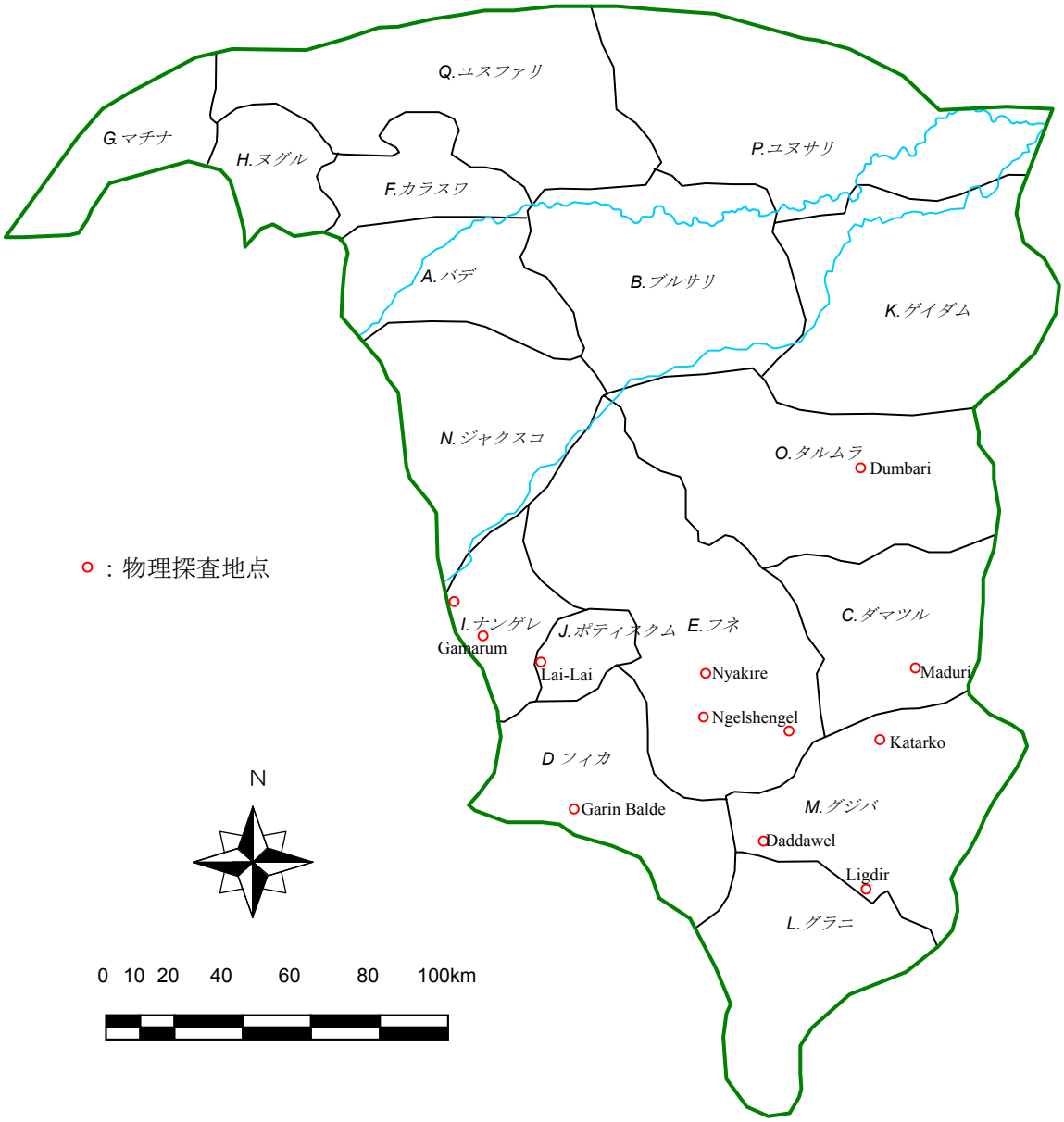
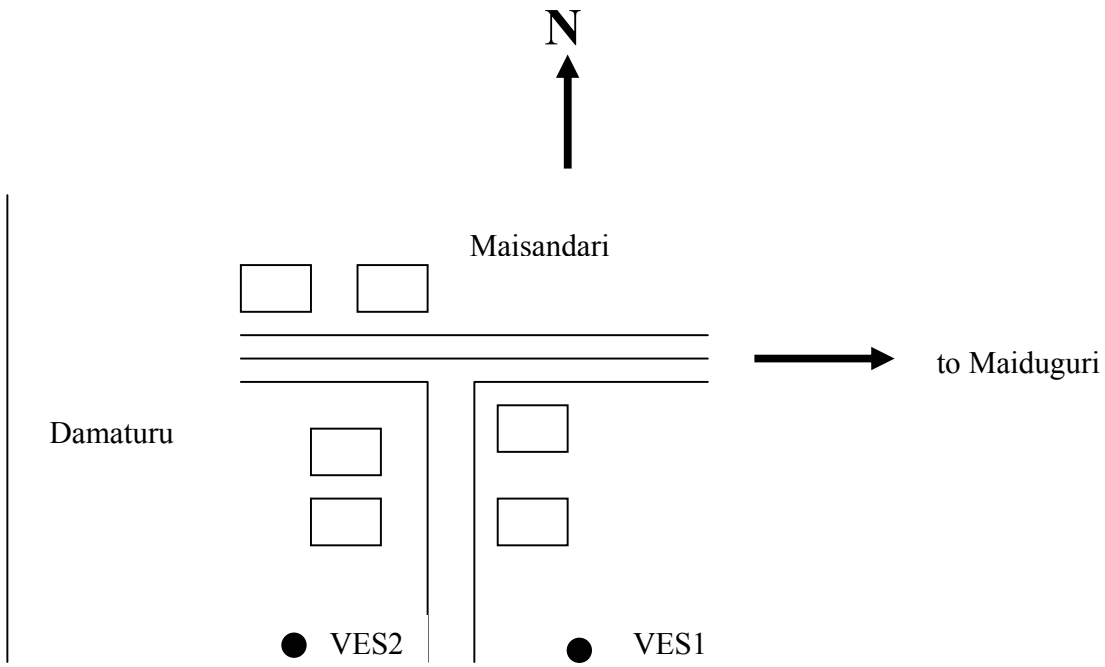


図 2　物理探査測定点位置図

図 3　物理探査測定位置の詳細図

MADORI



GARIN BALDE

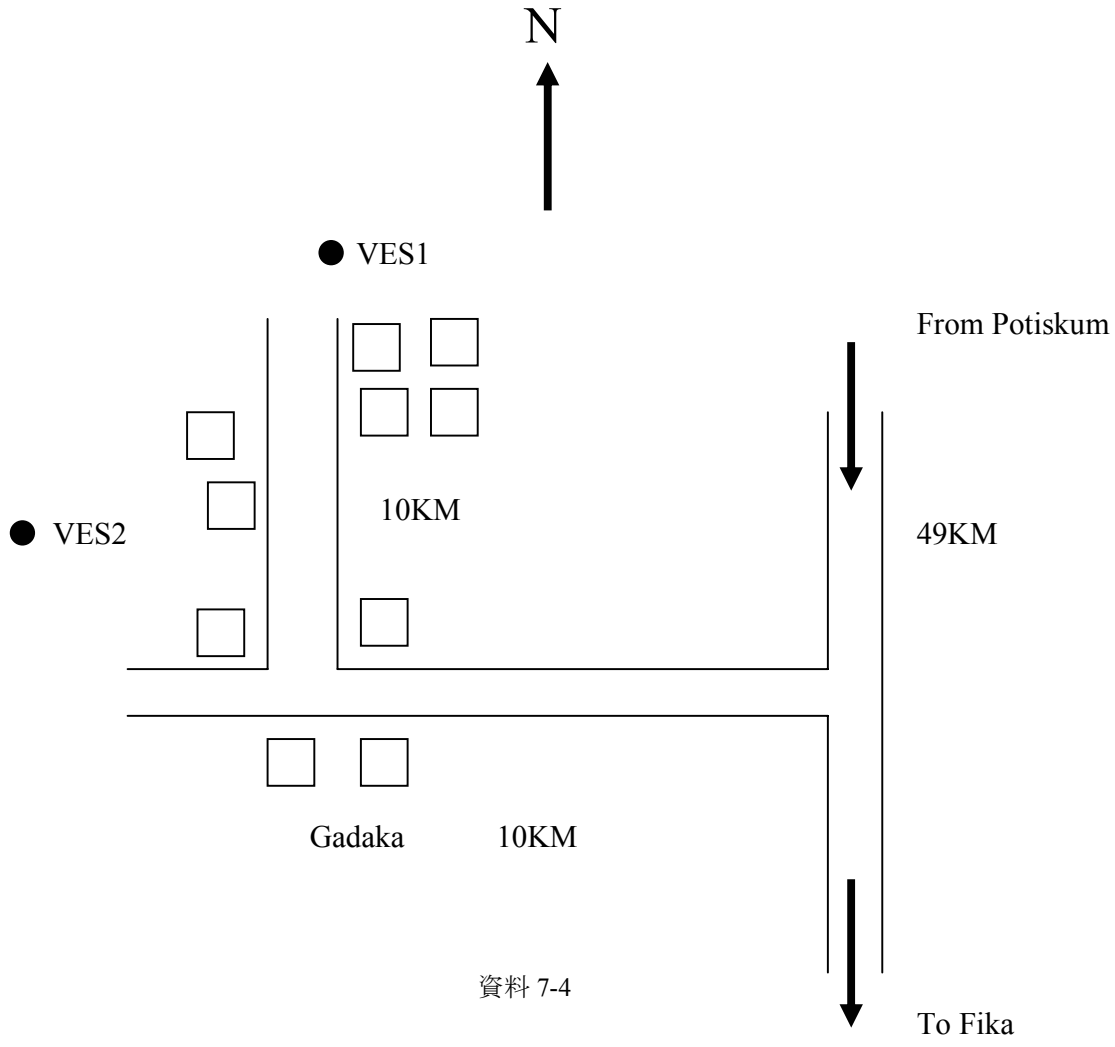


図 3　物理探査測定位置の詳細図

NGELSHEGELE

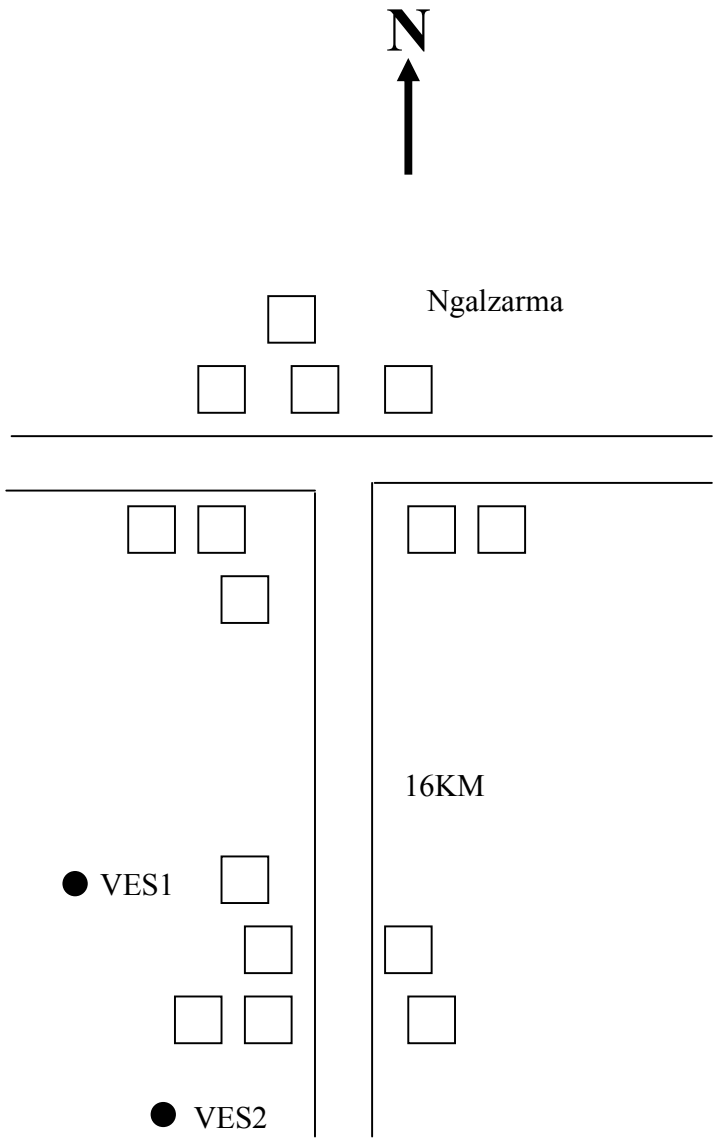


図 3　物理探査測定位置の詳細図

NYAKIRE

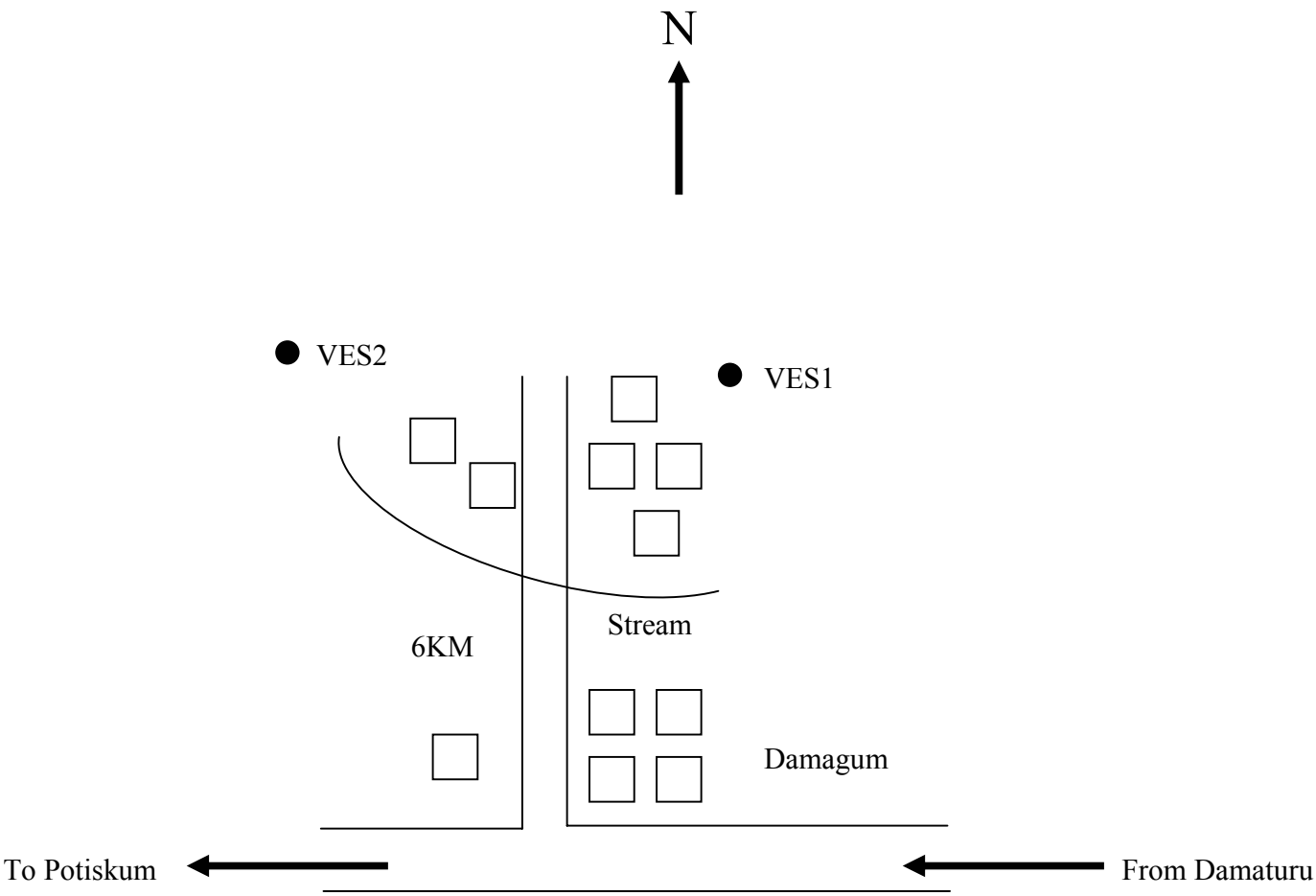


図 3　物理探査測定位置の詳細図

GAMARAM

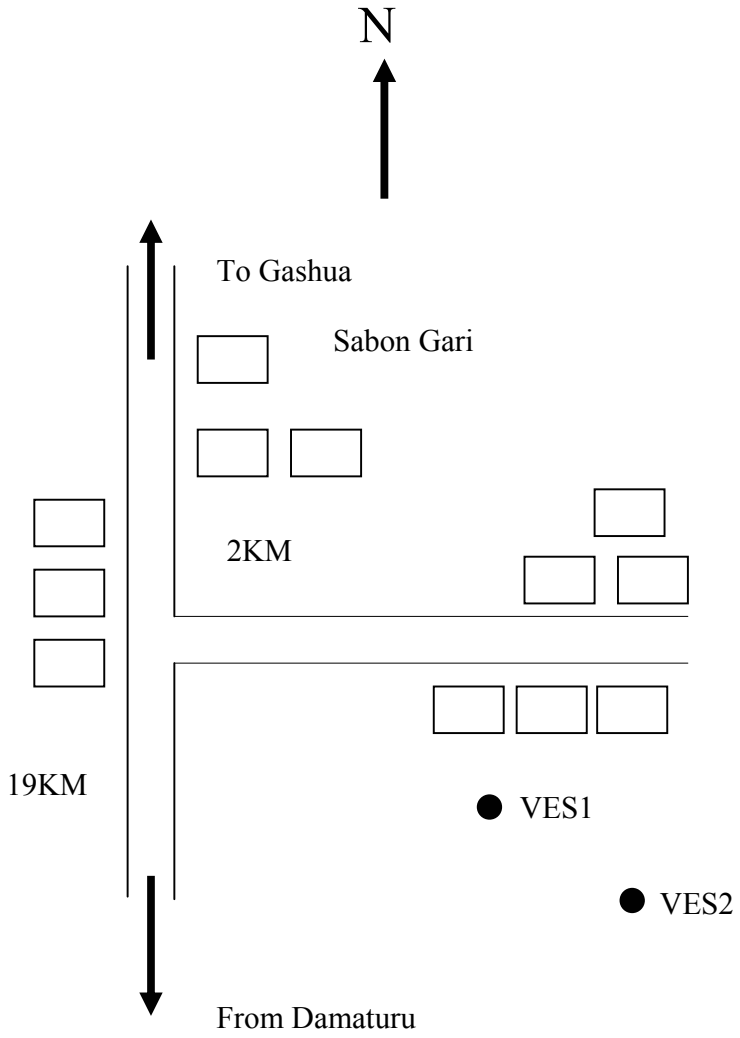


図 3　物理探査測定位置の詳細図

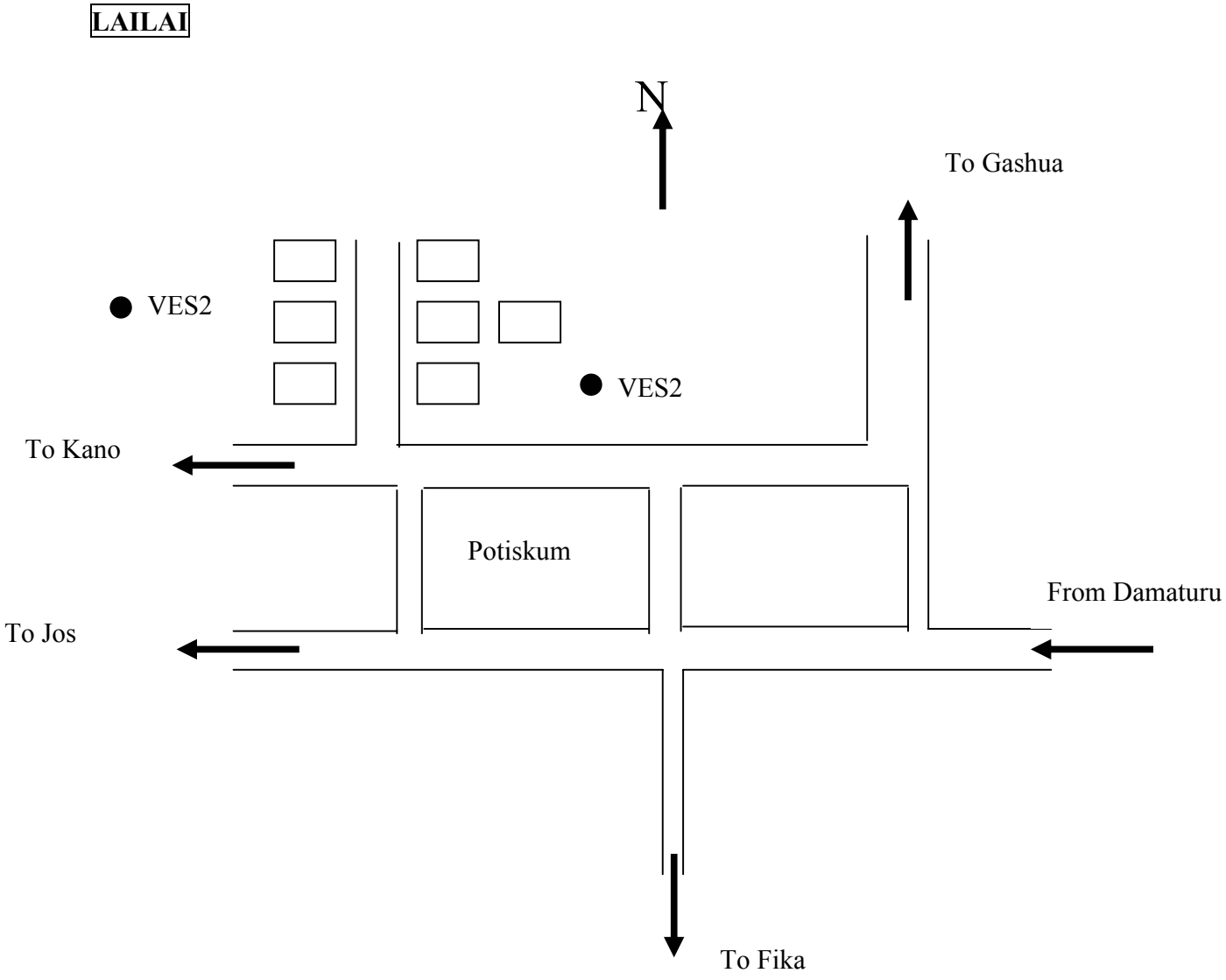


図 3　物理探査測定位置の詳細図

DADDAWEL

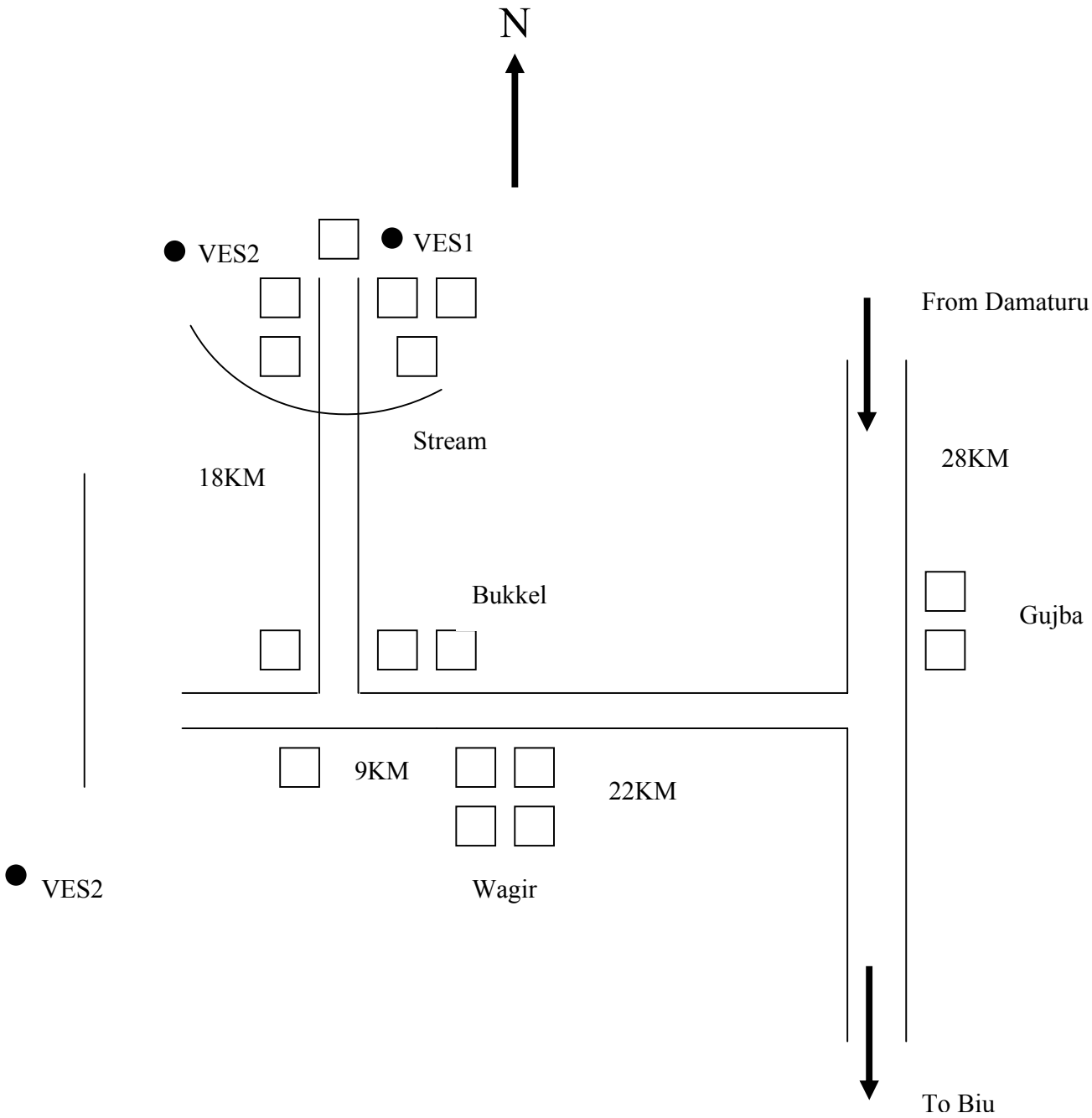


図 3　物理探査測定位置の詳細図

LIGDIR

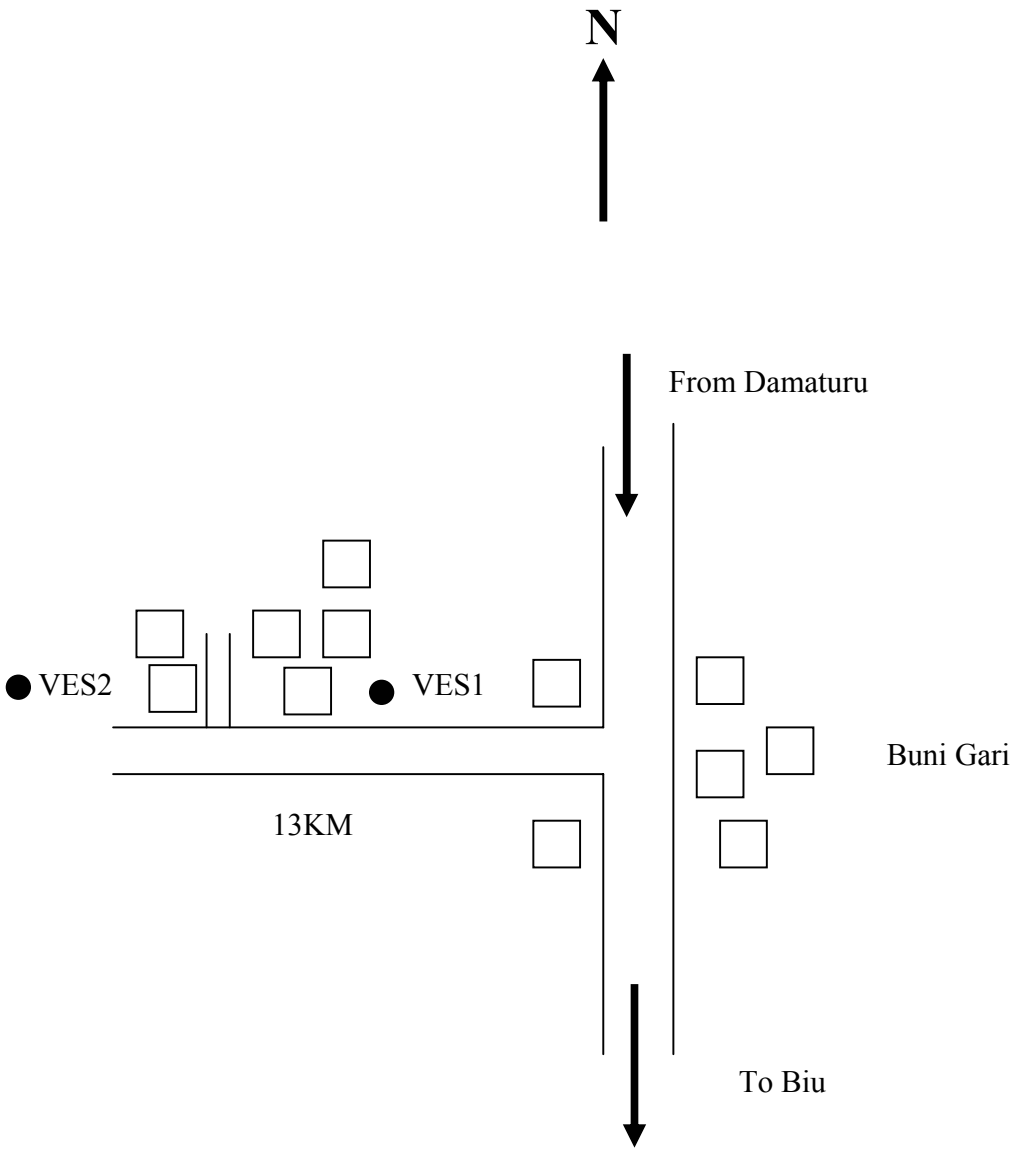
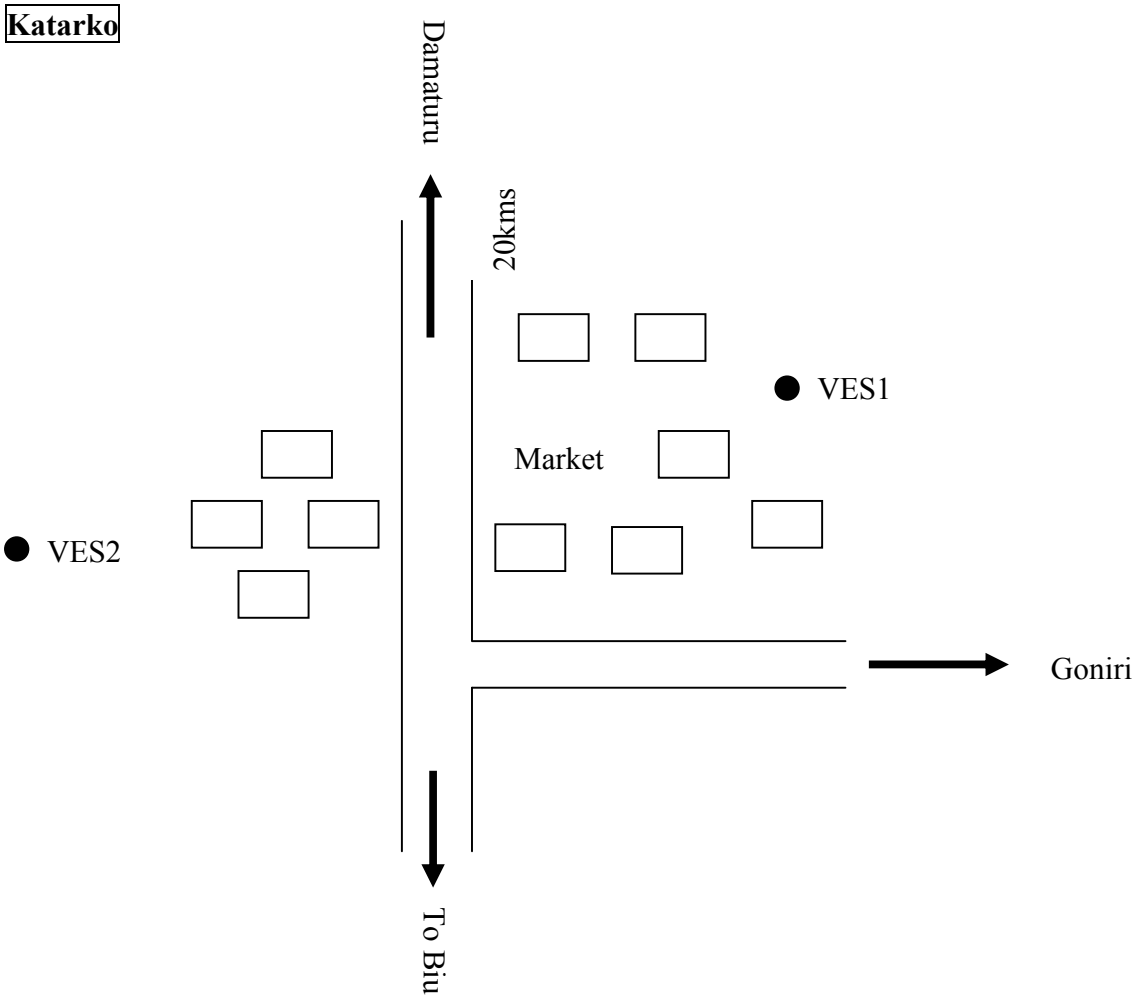
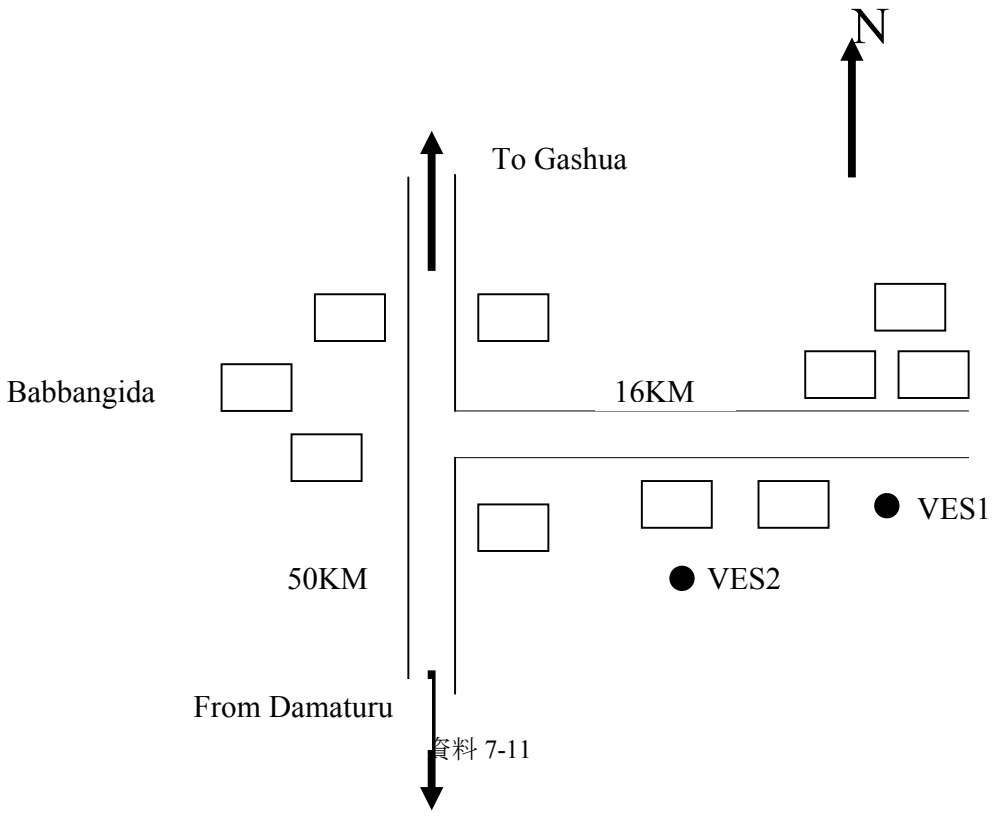


図 3　物理探査測定位置の詳細図

Katarko



DUMBARI



DAMATURU MADORI

MADORI1 SCHL 0.000 0.000 1 1200871.000 1143845.000

JICA Dec,2006
YOBE STATE 1
FEDERAL REPUBLIC NIGERIA 1
WATERSUPPLY & HEALTH DELIVERY ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	926.0000
2	1.5000	546.0000
3	2.0000	481.0000
4	2.5000	335.0000
5	3.0000	239.0000
6	4.0000	165.0000
7	5.0000	78.0000
8	6.5000	66.0000
9	8.0000	62.0000
10	10.0000	71.0000
11	8.0000	42.0000
12	10.0000	45.0000
13	13.0000	53.0000
14	16.0000	65.0000
15	20.0000	72.0000
16	25.0000	83.0000
17	30.0000	80.0000
18	40.0000	72.0000
19	50.0000	78.0000
20	65.0000	106.0000
21	80.0000	60.0000
22	100.0000	42.0000
23	80.0000	60.0000
24	100.0000	38.0000
25	130.0000	33.0000
26	160.0000	25.0000
27	200.0000	36.0000

MADORI2 SCHL 0.000 0.000 1 1200879.000 1143857.000

JICA Dec,2006
YOBE STATE 2
FEDERAL REPUBLIC NIGERIA 1
WATERSUPPLY & HEALTH DELIVERY ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	879.0000
2	1.5000	538.0000
3	2.0000	430.0000
4	2.5000	320.0000
5	3.0000	198.0000
6	4.0000	158.0000
7	5.0000	80.0000
8	6.5000	67.0000
9	8.0000	61.0000
10	10.0000	61.0000
11	8.0000	38.0000
12	10.0000	38.0000
13	13.0000	43.0000
14	16.0000	53.0000
15	20.0000	69.0000
16	25.0000	71.0000
17	30.0000	69.0000
18	40.0000	63.0000
19	50.0000	65.0000
20	65.0000	85.0000
21	80.0000	56.0000
22	100.0000	37.0000
23	80.0000	51.0000
24	100.0000	36.0000
25	130.0000	30.0000
26	160.0000	23.0000
27	200.0000	30.0000

FIKA GARIN BALDE

GARINBA1 SCHL 0.000 0.000 1 1108646.000 1116989.000

JICA Dec,2006
YOBE STATE 1
FEDERAL REPUBLIC NIGERIA 1
WATERSUPPLY & HEALTH DELIVERY ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	9817.0000
2	1.5000	5898.0000
3	2.0000	5130.0000
4	2.5000	3523.0000
5	3.0000	2919.0000
6	4.0000	1718.0000
7	5.0000	945.0000
8	6.5000	479.0000
9	10.0000	264.0000
10	8.0000	396.0000
11	10.0000	397.0000
12	13.0000	333.0000
13	16.0000	313.0000
14	20.0000	356.0000
15	25.0000	636.0000
16	40.0000	301.0000
17	50.0000	1177.0000
18	65.0000	1605.0000
19	80.0000	3216.0000
20	100.0000	2659.0000
21	80.0000	802.0000

22	100.0000	843.0000
23	130.0000	1046.0000
24	160.0000	649.0000
25	200.0000	1483.0000

GARINBA2 SCHL 0.000 0.000 1 1108646.000
1116989.000

JICA
YOBE STATE
FEDERAL REPUBLIC NIGERIA
WATERSUPPLY & HEALTH DELIVERY
Dec,2006
2
1
ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	7374.0000
2	1.5000	5150.0000
3	2.0000	3776.0000
4	2.5000	2871.0000
5	3.0000	3542.0000
6	4.0000	4775.0000
7	5.0000	3066.0000
8	6.5000	780.0000
9	8.0000	498.0000
10	10.0000	398.0000
11	8.0000	359.0000
12	10.0000	267.0000
13	13.0000	194.0000
14	16.0000	191.0000
15	20.0000	240.0000
16	25.0000	288.0000
17	30.0000	305.0000
18	40.0000	167.0000
19	50.0000	471.0000
20	80.0000	724.0000
21	80.0000	361.0000
22	100.0000	412.0000
23	130.0000	492.0000
24	160.0000	595.0000
25	200.0000	472.0000

FUNE NGELSHENGELE
NGELSHE1 SCHL 0.000 0.000 1 1136131.000 1132986.000

JICA
YOBE STATE
FEDERAL REPUBLIC NIGERIA
WATERSUPPLY & HEALTH DELIVERY
Dec,2006
1
1
ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	78.0000
2	1.5000	64.0000
3	2.0000	53.0000
4	2.5000	50.0000
5	3.0000	46.0000
6	4.0000	43.0000
7	5.0000	38.0000
8	6.5000	38.0000
9	8.0000	32.0000
10	10.0000	20.0000
11	8.0000	30.0000
12	10.0000	23.0000
13	13.0000	13.0000
14	16.0000	6.0000
15	20.0000	9.0000
16	25.0000	16.0000
17	30.0000	7.0000
18	40.0000	5.0000
19	80.0000	7.0000
20	80.0000	6.0000
21	100.0000	10.0000
22	130.0000	16.0000
23	160.0000	25.0000
24	200.0000	39.0000

NGELSHE2 SCHL 0.000 0.000 1 1136184.000
1132861.000

JICA
YOBE STATE
FEDERAL REPUBLIC NIGERIA
WATERSUPPLY & HEALTH DELIVERY
Dec,2006
2
1
ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	72.0000
2	1.5000	62.0000
3	2.0000	47.0000
4	2.5000	40.0000
5	3.0000	33.0000
6	4.0000	28.0000
7	5.0000	25.0000
8	6.5000	22.0000
9	8.0000	24.0000
10	10.0000	23.0000
11	8.0000	23.0000
12	10.0000	20.0000
13	13.0000	19.0000
14	16.0000	16.0000
15	20.0000	16.0000
16	25.0000	14.0000
17	30.0000	13.0000
18	80.0000	11.0000
19	100.0000	14.0000
20	130.0000	16.0000
21	160.0000	12.0000

22	200.0000	31.0000

FUNE NYAKERE

NYAKIRE1 SCHL 0.000 0.000 1 1118797.000 1143130.000

JICA — Dec, 2006
YOBE STATE — 1
FEDERAL REPUBLIC NIGERIA — 1
WATERSUPPLY & HEALTH DELIVERY — ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	951.0000
2	1.5000	717.0000
3	2.0000	499.0000
4	2.5000	330.0000
5	3.0000	281.0000
6	4.0000	213.0000
7	5.0000	139.0000
8	6.5000	114.0000
9	8.0000	113.0000
10	10.0000	117.0000
11	8.0000	90.0000
12	10.0000	90.0000
13	13.0000	88.0000
14	16.0000	77.0000
15	20.0000	92.0000
16	25.0000	110.0000
17	30.0000	87.0000
18	40.0000	112.0000
19	50.0000	120.0000
20	65.0000	146.0000
21	80.0000	208.0000
22	100.0000	21.0000
23	80.0000	139.0000
24	100.0000	77.0000
25	130.0000	32.0000
26	160.0000	25.0000
27	200.0000	39.0000

NYAKIRE2 SCHL 0.000 0.000 1 1118762.000 1143074.000

JICA — Dec, 2006
YOBE STATE — 2
FEDERAL REPUBLIC NIGERIA — 1
WATERSUPPLY & HEALTH DELIVERY — ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	444.0000
2	1.5000	316.0000
3	2.0000	240.0000
4	2.5000	223.0000
5	3.0000	205.0000
6	4.0000	164.0000
7	5.0000	137.0000
8	6.5000	117.0000
9	8.0000	102.0000
10	10.0000	86.0000
11	8.0000	94.0000
12	10.0000	106.0000
13	13.0000	78.0000
14	16.0000	81.0000
15	20.0000	90.0000
16	25.0000	108.0000
17	30.0000	118.0000
18	40.0000	120.0000
19	50.0000	70.0000
20	65.0000	40.0000
21	80.0000	72.0000
22	100.0000	86.0000
23	160.0000	100.0000
24	200.0000	78.0000

NANGER GAMARAM

GAMARAM1 SCHL 0.000 0.000 1 1105201.000
1150243.000

JICA — Dec, 2006
YOBE STATE — 1
FEDERAL REPUBLIC NIGERIA — 1
WATERSUPPLY & HEALTH DELIVERY — ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	654.0000
2	1.5000	534.0000
3	2.0000	654.0000
4	2.5000	525.0000
5	3.0000	484.0000
6	4.0000	424.0000
7	5.0000	317.0000
8	6.5000	271.0000
9	10.0000	204.0000
10	8.0000	107.0000
11	10.0000	163.0000
12	8.0000	104.0000
13	13.0000	43.0000
14	16.0000	21.0000
15	20.0000	11.0000
16	25.0000	17.0000
17	30.0000	20.0000
18	40.0000	18.0000
19	50.0000	18.0000
20	65.0000	22.0000
21	80.0000	13.0000
22	100.0000	21.0000

23	80.0000	24.0000
24	100.0000	39.0000
25	130.0000	56.0000
26	160.0000	32.0000

GAMARAM2 SCHL 0.000 0.000 1 1105323.000 1150280.000

JICA — Dec, 2006
YOBE STATE — 2
FEDERAL REPUBLIC NIGERIA — 1
WATERSUPPLY & HEALTH DELIVERY — ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	1546.0000
2	1.5000	1555.0000
3	2.0000	1556.0000
4	2.5000	1519.0000
5	3.0000	1428.0000
6	4.0000	1168.0000
7	5.0000	908.0000
8	6.5000	720.0000
9	10.0000	442.0000
10	8.0000	231.0000
11	10.0000	445.0000
12	8.0000	218.0000
13	13.0000	73.0000
14	16.0000	11.0000
15	20.0000	19.0000
16	25.0000	20.0000
17	30.0000	8.0000
18	40.0000	13.0000
19	50.0000	42.0000
20	65.0000	31.0000
21	80.0000	40.0000
22	100.0000	73.0000
23	80.0000	11.0000
24	100.0000	11.0000
25	130.0000	8.0000
26	160.0000	20.0000
27	200.0000	4.0000

POTISKUM LAI LAI

LAILAI1 SCHL 0.000 0.000 1 1102836.000 1143355.000

JICA — Dec, 2006
YOBE STATE — 1
FEDERAL REPUBLIC NIGERIA — 1
WATERSUPPLY & HEALTH DELIVERY — ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	1021.0000
2	1.5000	729.0000
3	2.0000	707.0000
4	2.5000	713.0000
5	3.0000	705.0000
6	4.0000	603.0000
7	5.0000	534.0000
8	6.5000	533.0000
9	10.0000	494.0000
10	10.0000	474.0000
11	8.0000	464.0000
12	13.0000	480.0000
13	16.0000	516.0000
14	20.0000	517.0000
15	25.0000	586.0000
16	30.0000	639.0000
17	40.0000	666.0000
18	50.0000	656.0000
19	65.0000	703.0000
20	80.0000	764.0000
21	100.0000	744.0000
22	80.0000	712.0000
23	100.0000	594.0000
24	200.0000	581.0000

LAILAI2 SCHL 0.000 0.000 1 1102973.000 1143319.000

JICA — Dec, 2006
YOBE STATE — 2
FEDERAL REPUBLIC NIGERIA — 1
WATERSUPPLY & HEALTH DELIVERY — ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	8445.0000
2	1.5000	7047.0000
3	2.0000	6479.0000
4	2.5000	4782.0000
5	3.0000	3115.0000
6	4.0000	3188.0000
7	5.0000	1994.0000
8	6.5000	1989.0000
9	8.0000	894.0000
10	10.0000	778.0000
11	13.0000	662.0000
12	16.0000	678.0000
13	20.0000	826.0000
14	25.0000	795.0000
15	30.0000	840.0000
16	40.0000	1047.0000
17	50.0000	1415.0000
18	65.0000	1070.0000
19	80.0000	549.0000
20	100.0000	603.0000

21	130.0000	409.0000
22	160.0000	398.0000
23	200.0000	546.0000

GUJBA DADDAWEL

DADDAWE1 SCHL 0.000 0.000 1 1135441.000 1117247.000

JICA — Dec,2006
YOBE STATE — 1
FEDERAL REPUBLIC NIGERIA — 1
WATERSUPPLY & HEALTH DELIVERY — ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	583.0000
2	1.5000	527.0000
3	2.0000	385.0000
4	2.5000	337.0000
5	3.0000	279.0000
6	4.0000	186.0000
7	5.0000	102.0000
8	6.5000	64.0000
9	8.0000	42.0000
10	10.0000	27.0000
11	8.0000	46.0000
12	10.0000	28.0000
13	13.0000	18.0000
14	16.0000	15.0000
15	20.0000	13.0000
16	25.0000	12.0000
17	30.0000	13.0000
18	40.0000	12.0000
19	50.0000	10.0000
20	100.0000	19.0000
21	80.0000	8.0000
22	100.0000	10.0000
23	130.0000	13.0000
24	160.0000	10.0000
25	200.0000	12.0000

DADDAWE2 SCHL 0.000 0.000 1 1135316.000 1117507.000

JICA — Dec,2006
YOBE STATE — 2
FEDERAL REPUBLIC NIGERIA — 1
WATERSUPPLY & HEALTH DELIVERY — ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	370.0000
2	1.5000	188.0000
3	2.0000	82.0000
4	2.5000	43.0000
5	3.0000	43.0000
6	4.0000	47.0000
7	5.0000	25.0000
8	6.5000	25.0000
9	8.0000	95.0000
10	10.0000	119.0000
11	8.0000	65.0000
12	10.0000	81.0000
13	13.0000	91.0000
14	16.0000	104.0000
15	20.0000	116.0000
16	25.0000	125.0000
17	30.0000	120.0000
18	40.0000	120.0000
19	50.0000	97.0000
20	100.0000	66.0000
21	100.0000	141.0000
22	130.0000	108.0000
23	160.0000	249.0000

GUJBA LIGDIR

LIGDIR1 SCHL 0.000 0.000 1 1155770.000 1108709.000

JICA — Dec,2006
YOBE STATE — 1
FEDERAL REPUBLIC NIGERIA — 1
WATERSUPPLY & HEALTH DELIVERY — ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	28.0000
2	1.5000	32.0000
3	2.0000	36.0000
4	2.5000	42.0000
5	3.0000	48.0000
6	4.0000	58.0000
7	5.0000	67.0000
8	6.5000	75.0000
9	8.0000	50.0000
10	10.0000	39.0000
11	8.0000	31.0000
12	10.0000	70.0000
13	13.0000	62.0000
14	16.0000	21.0000
15	20.0000	33.0000
16	25.0000	34.0000
17	30.0000	26.0000
18	40.0000	33.0000
19	50.0000	26.0000
20	65.0000	40.0000
21	80.0000	27.0000
22	100.0000	32.0000

LIGDIR2 SCHL 0.000 0.000 1 1155608.000 1108681.000
JICA Dec, 2006
YOBE STATE 2
FEDERAL REPUBLIC NIGERIA 1
WATERSUPPLY & HEALTH DELIVERY ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	12.0000
2	1.5000	12.0000
3	2.0000	11.0000
4	2.5000	12.0000
5	3.0000	13.0000
6	4.0000	15.0000
7	5.0000	12.0000
8	6.5000	31.0000
9	8.0000	20.0000
10	10.0000	24.0000
11	8.0000	25.0000
12	10.0000	16.0000
13	16.0000	27.0000
14	20.0000	25.0000
15	30.0000	19.0000
16	40.0000	17.0000
17	50.0000	26.0000
18	65.0000	44.0000
19	80.0000	67.0000

GUJBA KATARKO
KATARK01 SCHL 0.000 0.000 1 1155189.000 1133921.000
JICA Dec, 2006
YOBE STATE 1
FEDERAL REPUBLIC NIGERIA 1
WATERSUPPLY & HEALTH DELIVERY ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	1024.0000
2	1.5000	999.0000
3	2.0000	355.0000
4	2.5000	238.0000
5	3.0000	177.0000
6	4.0000	124.0000
7	5.0000	123.0000
8	6.5000	189.0000
9	8.0000	136.0000
10	10.0000	102.0000
11	8.0000	99.0000
12	10.0000	54.0000
13	13.0000	23.0000
14	16.0000	69.0000
15	20.0000	229.0000
16	25.0000	20.0000
17	30.0000	85.0000
18	40.0000	351.0000
19	50.0000	262.0000
20	65.0000	177.0000
21	80.0000	34.0000
22	100.0000	105.0000
23	80.0000	27.0000
24	130.0000	219.0000
25	160.0000	127.0000
26	200.0000	47.0000

KATARK02 SCHL 0.000 0.000 1 1155889.000
1133444.000
JICA Dec, 2006
YOBE STATE 2
FEDERAL REPUBLIC NIGERIA 1
WATERSUPPLY & HEALTH DELIVERY ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	134.0000
2	1.5000	51.0000
3	2.0000	33.0000
4	2.5000	31.0000
5	3.0000	29.0000
6	4.0000	31.0000
7	5.0000	34.0000
8	6.5000	42.0000
9	8.0000	52.0000
10	10.0000	63.0000
11	8.0000	45.0000
12	10.0000	56.0000
13	13.0000	67.0000
14	16.0000	78.0000
15	20.0000	73.0000
16	25.0000	104.0000
17	30.0000	101.0000
18	40.0000	100.0000
19	50.0000	71.0000
20	65.0000	58.0000
21	80.0000	74.0000
22	80.0000	30.0000
23	100.0000	29.0000
24	130.0000	16.0000
25	160.0000	25.0000
26	200.0000	39.0000

TARUMUWA DUMBARI
DUMBARI1 SCHL 0.000 0.000 1 1152663.000
1214146.000
JICA Dec, 2006

YOBE STATE 1
FEDERAL REPUBLIC NIGERIA 1
WATERSUPPLY & HEALTH DELIVERY ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	239.0000
2	1.5000	212.0000
3	2.0000	158.0000
4	2.5000	147.0000
5	3.0000	83.0000
6	4.0000	39.0000
7	5.0000	22.0000
8	6.5000	10.0000
9	8.0000	16.0000
10	10.0000	18.0000
11	8.0000	17.0000
12	10.0000	13.0000
13	13.0000	6.0000
14	16.0000	8.0000
15	20.0000	10.0000
16	25.0000	10.0000
17	30.0000	7.0000
18	40.0000	60.0000
19	50.0000	52.0000
20	65.0000	111.0000
21	80.0000	127.0000
22	100.0000	94.0000
23	100.0000	66.0000
24	130.0000	26.0000
25	160.0000	30.0000
26	200.0000	12.0000

DUMBARI2 SCHL 0.000 0.000 1 1153381.000 1214229.000
JICA Dec,2006
YOBE STATE 2
FEDERAL REPUBLIC NIGERIA 1
WATERSUPPLY & HEALTH DELIVERY ABEM SAS 300C

No.	SPACING	RHO-A
1	1.0000	538.0000
2	1.5000	437.0000
3	2.0000	387.0000
4	2.5000	311.0000
5	3.0000	237.0000
6	4.0000	126.0000
7	5.0000	95.0000
8	6.5000	61.0000
9	8.0000	62.0000
10	10.0000	14.0000
11	8.0000	26.0000
12	10.0000	17.0000
13	13.0000	14.0000
14	20.0000	18.0000
15	25.0000	10.0000
16	30.0000	17.0000
17	40.0000	169.0000
18	50.0000	76.0000
19	65.0000	88.0000
20	80.0000	54.0000
21	80.0000	13.0000
22	100.0000	19.0000
23	130.0000	16.0000
24	160.0000	25.0000

表 4　解析結果

: overburden,weathered layer
: dry layer, base rock
: low resistivity layer
(groundwater potential)

(1/2)

LGA	Village	Geology	No.	coordinates	Parameter	Layers					
						L1	L2	L3	L4	L5	L6
DAMATURU	MADORI	CHAD	1	N11°43′ 50.7″	Resistivity(Ohm-m)	490	22.8	261	6.4	121	
				E12°00′ 52.3″	Thickness(m)	1.1	4.7	12	34.3	-	
					Depth(m)	1.1	5.8	17.8	52.1	-	
			2	N11°43′ 51.4″	Resistivity(Ohm-m)	490	22.8	203	5.8	38.9	
				E12°06′ 52.7″	Thickness(m)	1.1	6.2	13.8	23.5	-	
					Depth(m)	1.1	7.3	21.1	44.6	-	
FIKA	GARIN BALDE	GOMBE SANDSTONE	1	N11°16′ 59.3″	Resistivity(Ohm-m)	3668	87.2	108000			
				E11°08′ 38.8″	Thickness(m)	1.4	12.3	-			
					Depth(m)	1.4	13.7	-			
			2	N11°16′ 59.9″	Resistivity(Ohm-m)	2025	103	799			
				E11°08′ 38.8″	Thickness(m)	1.9	23.5	-			
					Depth(m)	1.9	25.4	-			
FUNE	NGELSHENGELE	CHAD	1	N11°32′ 59.2″	Resistivity(Ohm-m)	58.3	5.6	548			
				E11°36′ 07.9″	Thickness(m)	3.6	48.0	-			
					Depth(m)	3.6	51.6	-			
			2	N11°32′ 51.7″	Resistivity(Ohm-m)	56.6	16.2	68.8			
				E11°36′ 11.0″	Thickness(m)	1.3	145	-			
					Depth(m)	1.3	146	-			
	NYAKIRE	CHAD	1	N11°43′ 07.8″	Resistivity(Ohm-m)	2670	251	677	21.8		
				E11°18′ 47.8″	Thickness(m)	1.1	5.5	20.1			
					Depth(m)	1.1	6.6	26.7	-		
			2	N11°43′ 04.4″	Resistivity(Ohm-m)	428	84.3	426	28.3	130	
				E11°18′ 45.7″	Thickness(m)	1.6	8.5	3.4	22.6	-	
					Depth(m)	1.6	10.1	13.5	36.1	-	
NANGERE	GAMARAM	CHAD	1	N11°50′ 14.6″	Resistivity(Ohm-m)	838	27.2	62.2			
				E11°05′ 12.1″	Thickness(m)	3.3	50.1	-			
					Depth(m)	3.3	53.4	-			
			2	N11°50′ 16.8″	Resistivity(Ohm-m)	240	0.9	61.9	2.1		
				E11°05′ 19.4″	Thickness(m)	3.0	8.9	37.0	-		
					Depth(m)	3.0	11.9	48.9	-		

LGA	Village	Geology	No.	coordinates	Parameter	Layers					
						L1	L2	L3	L4	L5	L6
POTISKUM	LAI-LAI	KERRI-KERRI	1	N11°43′ 21.3″	Resistivity(Ohm-m)	705	356	770	546		
				E11°02′ 50.2″	Thickness(m)	1.2	11.8	34.1	-		
					Depth(m)	1.2	13.0	47.1	-		
			2	N11°43′ 19.1″	Resistivity(Ohm-m)	6956	506	3066	172	1694	
				E11°02′ 58.4″	Thickness(m)	1.9	8.6	11.9	60.4	-	
					Depth(m)	1.9	10.5	22.4	82.8	-	
GUJBA	DADDAWEL	SANDSTON	1	N11°17′ 14.8″	Resistivity(Ohm-m)	248	6.8	47.9			
				E11°35′ 26.5″	Thickness(m)	2.0	76.4	-			
					Depth(m)	2.0	78.4	-			
			2	N11°17′ 30.4″	Resistivity(Ohm-m)	1185	13.5	398	62.8	332	
				E11°35′ 19.0″	Thickness(m)	0.5	0.7	22.4	46.8	-	
					Depth(m)	0.5	1.2	23.6	70.4	-	
	LIGDIR	SANDSTON	1	N11°08′ 42.5″	Resistivity(Ohm-m)	34.8	139	23.3	37.6		
				E11°55′ 46.2″	Thickness(m)	0.5	2.8	19.5	-		
					Depth(m)	0.5	3.3	22.8	-		
			2	N11°08′ 40.9″	Resistivity(Ohm-m)	7.5	76.1	7.5	464		
				E11°55′ 36.5″	Thickness(m)	3.0	4.6	10.0	-		
					Depth(m)	3.0	7.6	17.6	-		
	KATARKO	CHAD	1	N11°33′ 55.3″	Resistivity(Ohm-m)	832	54.1	181			
				E11°55′ 11.3″	Thickness(m)	0.6	34.1	-			
					Depth(m)	0.6	34.7	-			
			2	N11°33′ 26.6″	Resistivity(Ohm-m)	72.8	3.6	96.1	4.5	156	
				E11°55′ 53.3″	Thickness(m)	0.6	1.2	13.0	21.8	-	
					Depth(m)	0.6	1.8	14.8	36.6	-	
TARUMUWA	DUMBARI	CHAD	1	N12°14′ 08.8″	Resistivity(Ohm-m)	152	5.6	191	4.1		
				E11°52′ 37.8″	Thickness(m)	1.1	8.8	25.1	-		
					Depth(m)	1.1	9.9	35.0	-		
			2	N12°14′ 13.7″	Resistivity(Ohm-m)	125	1.5	234	5.1		
				E11°53′ 22.9″	Thickness(m)	2.0	6.0	24.7	-		
					Depth(m)	2.0	8.0	32.7	-		

資料-8　既存井戸調査結果

資料 8　既存井戸調査

１．調査目的

対象地域の既存井戸の実態についての調査を行い、既存井戸の実態の把握と、井戸掘削計画における井戸の標準仕様の決定に資する目的で既存井戸調査を行った。

２．調査内容

既存井戸調査は各 LGA にて実施し、その調査箇所数は 50 箇所である。その位置図を図 1 に示す。井戸の形態は、動力式深井戸あるいはハンドポンプ付き深井戸、浅井戸（セメント井戸)、オープンウエル等である。

調査項目は、井戸位置（GPS による位置測定)、井戸仕様（掘削年月、深度、孔径、スクリーン位置)、静水位、帯水層、周辺地質、水源、既存井戸本数などである。調査結果を表 3 に示す。下表 1 は、調査結果のうちの深層地下水より取水している深井戸及びハンドポンプ付き深井戸についてまとめたものである。

表 1　既存井戸状況調査の概要

ID/No.	LGA	掘削深度(m)	静水位(m)	帯水層
A	バデ	30-96	15-20	チャド層
B	ブルサリ	90-160	25-30	チャド層
C	ダマツル	150	40	チャド層
D	フィカ	180-600	40	ゴンベ砂岩層,
E	フネ	170-263	40-50	チャド層
F	カラスワ	55-120	30	チャド層
G	マチナ	45-125	20	チャド層
H	ヌグル	35-45	15	チャド層
I	ナンゲレ	60-90	30-40	チャド層
J	ポティスクム	40-100	15-30	ケリケリ層
K	ゲイダム	64	20	チャド層
L	グラニ	90-115	15-30	砂岩層,基盤岩
M	グジバ	67	30	チャド層, 砂岩層、基盤岩
N	ジャクスコ	66-120	25-40	チャド層
O	タルムワ	150	30	チャド層
P	ユスファリ	30-94	15	チャド層
Q	ユヌサリ	90	20	チャド層
	全　体	30-600	15-50	―

３．調査結果

各井戸の状況は以下のとおりである。

① 既存井戸の現状

各村落の井戸は、半分以上の村落で放棄されていた。その理由は、動力式深井戸については、発電機あるいはポンプの故障、ガソリンを購入する資金が調達できない、電気が満足に送電されず発電機が利用できないなどである。また、ハンドポンプについては、主にポンプの部品が破損したり損失により部品が調達できないことによる。これらの理由により、放置した状態が多く認められた。水量は、乾期でも地下水の低下は認められても殆どの村落で涸れることがなく、一年を通じて生活用水は入手可能とのことである。

② 掘削深度

井戸掘削深度の範囲は30m～600m(浅井戸を除く)である。ヨベ州北部の掘削深度は30m～160m、南部は 60m～600m と北部で全体的に浅く南部で深い。特に FIKA、FUNE の掘削深度が深くなっている。

③ 地下水位

地下水位の深度範囲は 15m～50m である。北部は 15m～30m、南部は 15m～50m と南部が北部よりも全体的に深い。地下水位が深ければ掘削深度も深くなり、地下水位と掘削深度との相関が認められる。

4．既存井戸資料の分析

過去に実施された深井戸の資料を表 4 に示す。これらの資料を基に、対象地域の掘削深度・静水位・揚水量などをまとめたものを表 2 に示す。

表 2　既存井戸の概要(1960 年～2005 年)

ID/No.	LGA	井戸数	深度(m)	スクリーン位置(m)		静水位(m)	揚水量(Lit/s)
A	バデ	22	60.61	39.93	44.88	22.15	3.44
B	ブルサリ	3	119.00	66.50	73.00	10.40	3.50
C	ダマツル	41	163.36	112.90	121.79	51.23	3.74
D	フィカ	6	193.55	174.71	186.29	62.93	2.68
E	フネ	38	131.77	93.66	110.38	43.77	3.31
F	カラスワ	14	92.17	47.59	56.32	13.98	3.13
G	マチナ	8	77.46	50.42	65.05	29.50	2.43
H	ヌグル	42	63.35	51.24	59.12	14.15	4.03
I	ナンゲレ	7	80.33	63.00	70.33	54.00	2.60
J	ポティスクム	21	115.71	83.00	92.00	30.61	5.78
K	ゲイダム	7	117.33	73.65	82.65	20.00	4.78
L	グラニ	4	169.38	110.50	116.50	25.00	4.00
M	グジバ	29	121.94	97.01	104.46	50.65	2.38
N	ジャクスコ	21	151.42	89.99	108.38	20.08	3.04
O	タルムア	5	138.63	77.75	80.50	60.00	3.00
P	ユスファリ	3	84.00	56.00	66.33	15.55	2.60
Q	ユヌサリ	2	92.00	43.50	48.00	－	2.00
	合計	273	1972.00	1331.36	1485.99	525.04	56.45
	平均	－	116.00	78.32	87.41	32.81	3.32

① 井戸掘削深度

既存井戸の掘削深度は、州北部で 100m 以浅、州南部で 100m 以深である。特に掘削深度がフィカで平均 200m と最も深い。

② 地下水位

地下水位の深度は、北部で 10m～30m、南部は 30m～60m であり、特に、地下水位が 40m 以深の地域はナンゲレ、フネ、タルムワ、ダマツル、グジバ、フィカである。

③ 揚水量

既存井戸データは主に動力式深井戸である。この深井戸の成功井戸の条件として、揚水量が 1Lit./s 以上としている。揚水量は 0.25Lit./s～15Lit./s の範囲にあり、揚水量の平均は 3Lit./s で、おおむね問題が無いと考えられる。

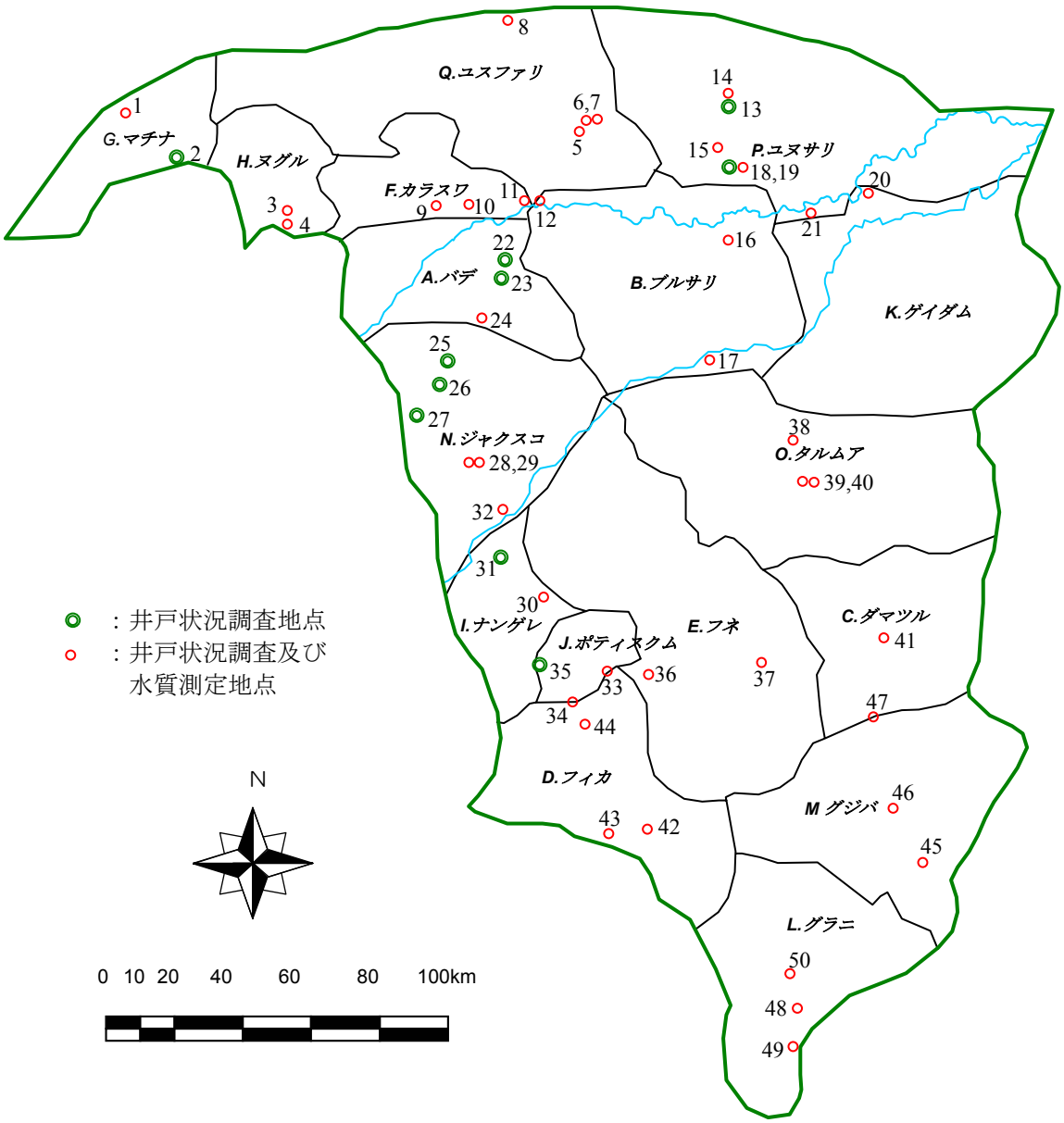


図 1　既存井戸調査位置図

表 3　既存井戸調査結果（1/2）

Location No.	Water quality analysis	LGA	Village	Well	Sealing condition	Drilling year	Well deph	Drilling diameter	Casing diameter (inch)	Screen position (m)	Static Water Level(m)	Aquifer	Water resorce	Remarks
1	○	MACHINA	MACHINA	Borehole	Sealed	1984	125	8inch	6inch	112-121	20	Chad	BH about 4km away Many Sement well	Basement from 45m depth Sementwell =S.W.L15m
2	—	MACHINA	LAMIS	Hund well	Open	-	45	-	-	-	-	Chad	-	-
3	○	NGURU	KULO GANDE	Hand Pump	Sealed	1/5/00	35	6inch	4inch	30	15	Chad	40 BH Many Hund pump	There is water all the year round
4	○	NGURU	GLA LOCAL GOV.SECRET	Hand Pump	Sealed	18/5/05	45	6inch	4inch	35-41	15	Chad		
5	○	YUSUFARI	YUSUFARI TOWN	Hand Pump	Sealed	16/10/06	30	6inch	4inch	20-26	15	Chad		
6	○	YUSUFARI	BULTUMARI-YUSUFARI TOWN	Hand Pump	Sealed	2006	30	6inch	4inch	20-26	15	Chad	9 Motor BH 6 HP 4Tube well	
7	○	YUSUFARI	IAWANTI	Borehole	Sealed	13/3/99	94	9 5/8inch	6inch	80-89	15	Chad		
8	○	YUSUFARI	TULO-TULOWA	Cementwell	Open	1992	8.25	-	1.2m	-	8.25	Chad	1 BH(broken down) 2 HP(broken down) 7 Sement well	
9	○	KARASUWA	NGELSHOND-JAJIMAJI	Borehole	Sealed	2004	55	8inch	6inch	50	30	Chad	5 Motor BH	There is water all the year round
10	○	KARASUWA	BUKARTI	Borehole	Sealed	2004	120	8inch	6inch	100-113	30	Chad		
11	○	BADE	GASHUA	Hand Pump	Sealed	2001	30	6inch	4inch	20-26	15	Chad	many Motor BH	
12	○	BADE	GASHUA CENTRAL MOSQUE	Borehole	Sealed	1996	96	4inch	3inch	80-89	20	Chad		kidney(40-50 ages)
13	—	YUNUSARI	MAINARI(BULA JUWULLO)	OpenWell	Open	-	-	-	-	-	15		2 open well	dry up in dryseason
14	○	YUNUSARI	YUNUSARI TOWN MARKET SQUARE	Borehole	Sealed	2002	90	8inch	6inch	78	20	Chad	5Motor BH(broken down 1MBH) 3HP(broken down) many Sement well	Sementwellの S.W.L15m-20m There is water all the year round
15	○	YUNUSARI	JAJJAWARI	Cementwell	Open	2005	25.5	1.2m	-	-	25-30	Chad	1 Sement well	Geological formation:Clay→Sand
16	○	BURSARI	BAYAMARI	Borehole	Sealed	1997	90	9 5/8inch	6inch	80-86	25-30	Chad	3BH 1Hund pump(broken down) 4Sementwell	There is water all the year round
17	○	BURSARI	DAPCHI	Borehole	Sealed	19/9/97	160	6inch	4inch	150	25-30	Chad	1Solar BH 2Moter BH(broken down 1BH) 5Shallowwell	
18	○	BURSARI	KAKANDERI	OpenWell	Open	-	-	-	-	-	25-30		many open well	
19	—	BURSARI	KAKANDERI	Cementwell	Open	-	21	1.2m	-	-	-	Chad	3 Sement well	Water decreases in dryseasone
20	○	GEIDAM	HOSPITAL	Hand Pump	Sealed	1997	64	6inch	4inch	38-62	20	Chad	4MoterBH(broken down 3BH) 1Hund punp	There is water all the year round
21	○	GEIDAM	KELLURI	OpenWell	Open	2001	22	1.2m	1.2m	-	20	Chad	1 BH(broken down) 1 open well	dry up in about February. open well depth more than 30m(water is all season)
22	—	JAKUSKO	GASAMU	Borehole	Sealed	-	90	-	-	-	30-40	-	1Moter BH	average S.W.L 30m-40m There is water all the year round
23	—	JAKUSKO	GARINMALLAM	Cementwell	Open	-	53	-	-	-	25-30	-		average S.W.L 25m-30m There is water all the year round
24	○	JAKUSKO	GIRGIR	Hand Pump	Sealed	1980	113	5inch	4inch	87-106	25	Chad	3Moter BH(depth 204m、pump position 72m) 1Hund pump	average S.W.L 30m There is water all the year round
25	—	JAKUSKO	LAFIARI	Borehole	Sealed	-	80	-	-	-	30-40	-		average S.W.L 30m-40m There is water all the year round
26	—	JAKUSKO	BAYAM	Cementwell	Open	-	45	-	-	-	30	-	2Motor BH(broken down 1MBH) Many Hund dug well	average S.W.L 30m There is water all the year round
27	—	JAKUSKO	JAKUSKO	Borehole	Sealed	-	66	-	-	-	-	-	5 Motor BH(broken down 2MBH、pump position 30m) 0 HP many Hund dug well	There is water all the year round
28	○	JAKUSKO	BUDUWA	Borehole	Sealed	2005	120	8inch	6inch	80-90	30	Chad	2 Motor BH many Hund dug well	It doesn't have an influence on the body by fluorine
29	○	JAKUSKO	BUDUWA	OpenWell	Open	1974	25	1.2m	-	-	20-25	Chad		average S.W.L 20m-25m There is water all the year round
30	○	NANGERE	NANGERE(OLD)	Borehole	Sealed	6/99	90	8inch	6inch	80-86	30	Kerri-Kerri	2 Moter BH many Hund dug well	depth 90m、pump position 70m average S.W.L 40m
31	—	NANGERE	DAWASA	Borehole	Sealed	-	90	-	-	-	40	-	1Moter BH many Hund dug well	average S.W.L 40m There is water all the year round
32	○	NANGERE	GARINGADA	Hand Pump	Sealed	1998	60	40mm	4inch	50-56	30	Chad	1Motor BH(broken down) 1HP many Hund dug well	average S.W.L 20m There is water all the year round

表 3　既存井戸調査結果（2/2）

Location No.	Water quality analysis	LGA	Village	Well	Sealing condition	Drilling year	Well deph	Drilling diameter	Casing diameter (inch)	Screen position (m)	Static Water Level(m)	Aquifer	Water resorce	Remarks
33	○	POTISKUM	GARIN BENGEL	Hand Pump	Sealed	1998	40	-	4inch	30-36	15	Kerri-Kerri	1 BH(broken down generater) 1 Hand pump many Hund dug well	There is water all the year round
34	○	POTISKUM	BADEJO	Hand Pump	Sealed	1998	70	6inch	4inch	60-66	30	Kerri-Kerri	0 BH 1Hund pump many Hund dug well	depth 80m-90m
35	—	POTISKUM	POTISKUM URBAN WATER SUPPLY	Borehole	Sealed	-	100	-	-	-	-	Kerri-Kerri	4Motor BH	depth 80m-120m
36	○	FUNE	DAMAGUM	Borehole	Sealed	2004	170	8inch	6inch	143-161	40	Kerri-Kerri	7 Moter BH (broken down 2BH) many Hund well	S.W.L is very shallow. Geological formation:Kerri-Kerri→Fika
37	○	FUNE	NGELZARMA	Borehole	Sealed	-	263	8inch	6inch	165-171 212-218 223-229	40-50	Kerri-Kerri	3Moter BH	depth 460m、263m、260m S.W.L40m-50m There is water all the year round Hand pump unacceptable (S.W.L is to low)
38	○	TARMUWA	LANTAIWA	Cementwell	Open	1990	86	1.2m	-	-	30	Chad	1Motor BH 2Sement well	Moter BH depth 120m、 pump position 102m There is water all the year round
39	○	TARMUWA	BABANGIDA	Borehole	Sealed	15/1/06	152	8inch	6inch	140-149	30	Chad/ Basement	4 Motor BH 5 Sement well	There is water all the year round. It doesn't have an influence on the body by fluorine.
40	○	TARMUWA	BABANGIDA	Borehole	Sealed	1970	150	6inch	4inch	138-147	30	Chad/ Basement		
41	○	DAMATURU	BABBAN TSANGAYA WARD	Borehole	Sealed	01/06/04	150	8inch	6inch	138-147	40	Chad	many Moter BH	It doesn't have an influence on the body by fluorine
42	○	FIKA	FIKA	OpenWell	Open	1992	10	1.2m	-	-	-	Unconformity Fika shale	2 Moter BH(broken down pump and starter) 0 Hund pump many Hund dug well	Moter BH average depth 600m、 Aquifer about 520m
43	○	FIKA	GADAKA	Borehole	Sealed	1983	180	6inch	4inch	160-172	40	Gombe Sandston	4 Motor BH many Hund dug well	Moter BH average depth 120m S.W.L 30m-40m There is water all the year round
44	○	FIKA	GASHAKA	Borehole	Sealed	09/79	180	6inch	4inch	165-174	40	Kerri-Kerri	1 BH 5 Hund dug well	depth 200m pump position 120m S.W.L 30m-40m
45	○	GUJBA	BUNIGARI GOVERNMENT GIRLS SECONDARY SCHOOL	Hand Pump	Sealed	2006	67	10inch	4inch	60-67	30	-	1Hund pump	Basement is in the deeper than 10m
46	○	GUJBA	GARINMALLAMADAMU	Pond	-	-	-	-	-	-	30-40	-	Pond (no source of water)	both human and animalmake dry up in about February.
47	○	GUJBA	KATARKO	Cementwell	Open	31/03/05	15	0.85m	-	-	-	Chad	1 Moter BH (broken down generater) 1 Hund pump (broken down) 6 Sement well	Geology is Sedimentary The southern part is Basement from here BH S.W.L40m
48	○	GULANI	TETEBA	Borehole	Sealed	2002	115	9inch	6inch	102-111	40	Alluvial Deposit	1BH	There is water all the year round
49	○	GULANI	GULANI	OpenWell	Open	2002	2	1.2m	-	-	-	-	1 Moter BH (broken down pump) 14 open dug well	There is water all the year round Water level is shallower than 10m
50	○	GULANI	BARA	Borehole	Sealed	21/4/99	90	8inch	6inch	80-86	30	Basement	1 Moter BH 2 BH(Abortive)	Alternative 50m-80m

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N - E		Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
BADE	1	SUGUM				82.00		55.00	67.00	12.00	4.00
	2	GASHUA				100.00		40.00	46.00	12.00	4.00
	3	JIGAWA				26.60				12.00	3.00
	4	GASHUA				68.00		60.00	66.10		2.50
	5	GASHUA				65.00		55.80	61.90		3.80
	8	ー				37.50		28.70	34.70		2.50
	11	GWIO KURA	12°40′ 35″	11°04′ 05″		33.80		24.10	25.90	9.94	0.70
								30.00	31.70		
	12	KURNAWA	12°42′ 38″	11°13′ 47″		34.90		25.80	29.60	10.30	3.00
	13	GASHUA	12°15′ 27″	11°01′ 47″	335	35.10		28.20	31.90	18.35	15.00
	14	GASHUA	12°52′ 20″	11°01′ 56″	335	32.30		28.30	32.00	18.30	8.00
	15	GASHUA	12°52′ 18″	11°02′ 02″	335	35.10		28.30	31.80	18.30	1.50
	16	GWIO KURA	12°40′ 35″	11°04′ 05″		34.10		11.90	12.80	30.30	2.50
								29.70	31.50		
	17	GWIO KURA	12°40′ 35″	11°04′ 05″		42.10		11.80	13.60	38.60	0.25
								28.70	29.60		
	20	GASHNGURU				107.70		86.30	88.40	46.00	4.60
	21	MILE5						71.30	80.50	27.90	3.00
	22	DEPANDE						30.80	36.30	30.65	2.00
	26	GARIN K						18.30	23.80	29.31	3.00
	27	MILE 29				121.90		55.50	57.60	42.40	1.00
	28	GASHUA EXP.WELL				100.00					
	29	DAGONA				13.70				9.60	2.00
	34	DUMSAI						49.54	58.79	10.60	2.50
	35	B121						49.00	54.00		
								63.00	67.00		
sub-total	22	ー	ー	ー	ー	969.80	ー	758.64	852.69	376.55	68.85
average		ー	ー	ー	ー	60.61	ー	39.93	44.88	22.15	3.44
BURSARI	1	KUCHI KUCHIRI				124.00		91.00	94.00	8.00	4.50
	2	JULLURI				138.00		42.00	52.00	12.80	2.50
								60.00	63.00		
	3	BAYAMARI	12°45′ 55″	11°30′ 26″	336	95.00					
sub-total	3	ー	ー	ー	ー	357.00	ー	133.00	146.00	20.80	7.00
average		ー	ー	ー	ー	119.00	ー	66.50	73.00	10.40	3.50
DAMATURU	1	ABUJA LAYOUT				148.19		119.60	122.60	46.00	
	2	MANGARI				154.00		116.95	119.95	72.00	3.00
								143.00	149.00		
	3	DAMATURU ADP HQTR				158.00		137.00	155.00	64.00	
	5	FED. POLYTECHNIC				146.76		125.99	137.99	68.60	
	6	DAMATURU				159.00		110.00	116.00	51.35	5.00
								122.00	131.00		
								134.00	137.00		
	7	SASAWA				124.00		78.00	90.00		
	8	DAMATURU COMM'S	11°44′ 03″	11°59′ 13″	388	140.50	137.00	121.00	133.00		

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N	Co-ordinate E	Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
	9	NAYINAWA				140.19		48.00	54.00	46.00	4.00
								77.07	83.07		
								104.08	110.08		
								134.19	137.19		
	10	ALAJIRI				134.00		109.00	115.00		5.00
								122.00	128.00		
	13	GONI MAITARIMMATARI				193.90		158.20	176.20	66.86	3.00
	14	MALUMTI				125.30				39.50	2.14
	15	DAMA KUSU				149.00		80.40	86.66	48.36	3.00
								119.00	124.97		
								130.73	135.52		
	16	DAMATURU TOWN				172.00		105.00	111.00	43.00	6.00
								126.00	132.00		
								152.00	158.00		
	17	STATE LOW COST DAMATURU				129.00		102.00	108.00	43.00	3.00
								111.00	123.00		
	18	GSSS DAMATURU				149.50		110.00	115.90	40.00	2.00
								121.80	133.00		
	20	AJIRI				200.00		48.80	62.80		3.00
	21	KABANI NAWANTI				199.00		135.00	147.00		2.00
	22	DAMATURU (A)				142.00		108.00	120.00		
	23	DAMATURU (B)				142.27		117.86	130.53		3.00
	24	JABA				190.00		78.00	84.00	29.80	3.00
	25	7/DA				190.72		112.57	127.59	88.48	4.00
								163.00	175.00		
	26	8/DA				176.00		137.00	149.00	46.25	4.00
	27	1/DA				252.00		243.64	195.34	47.56	5.00
	28	2/DA				284.00		137.64	195.34	44.42	6.00
	29	HOSING ESTATE				140.00		64.00	70.00		
								128.00	134.00		
	30	KUKARETA				80.00		64.00	70.00		
	31	PKM ROAD (Ytr)				126.00		114.00	126.00		
	32	KM 13 Ⅰ				144.00	141.00	108.00	111.00		
								123.00	132.00		
	33	KM 13 Ⅱ				150.00	147.12	123.00	134.00		
	34	SALLARI				108.00		98.00	105.00		
	35	STADIUM	10°44′ 37″	11°59′ 28″	392	138.00		123.00	135.00		
	36	FED.POLY DAMATURU				180.00	143.05	128.05	140.05	55.60	
	37	MAFA				200.71	200.00	185.30	194.95	28.80	4.00
	38	GOV.S HOUSE	11°43′ 47″	11°58′ 49″	392	150.00		133.00	145.00	42.00	5.00
	38	YOBE MO	11°44′ 36″	11°58′ 34″	390	153.00	147.00	132.00	144.00	56.00	5.00
	39	MARFA KALAM				412.00				59.58	2.20
	ー	ALAJIRI				136.00		109.00	115.00		
								122.00	128.00		

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N	Co-ordinate E	Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
								131.00	136.00		
	—	GOVERNMENT HOUSE				133.00		118.00			
	—	BINDIGARI Ⅰ・Ⅱ				136.00		109.00	115.00		
						175.00		127.00	133.00		
	—	NGAR BUSH HOUSE				150.00		133.00	145.00		
	—	PAYINAWA				150.00		135.00	147.00		
sub-total	41	—	—	—	—	6861.04	—	4516.00	4749.90	1127.16	82.34
average		—	—	—	—	163.36	—	112.90	121.79	51.23	3.74
FIKA	1	KUKAWA				162.12		117.64	121.64	114.00	1.50
	2	GODOWOLE				110.00		88.00	106.00	40.00	
	3	DUMBULWA				168.00	164.00	138.00	141.00	30.00	4.00
								144.00	147.00		
								156.00	162.00		
	4	FIKA MAIN TOWN	11°17′ 14″	11°18′ 16″	385	493.00	487.83	457.93	481.83		
	5	DAUYA GADAKA				102.00		72.00	81.00		
	—	GASHINGA	11°18′ 30″	11°07′ 30″		126.16				67.70	2.54
sub-total	6	—	—	—	—	1161.28	—	873.57	931.47	251.70	8.04
average		—	—	—	—	193.55	—	174.71	186.29	62.93	2.68
FUNE	1	BINDIGI				134.00		102.00	105.00	93.00	3.00
								121.00	127.00		
	2	MASHIO				151.00		137.00	148.00	130.00	4.00
	3	DOGON KUKA	11°39′ 48″	11°25′ 10″	427	88.00		72.00	84.00	38.00	2.75
	4	SHANGA				100.00		66.00	75.00		4.00
	5	NGELZARMA	11°40′ 39″	11°57′ 20″		249.50		165.56	171.66	81.00	2.00
								212.05	218.15		
								223.81	229.91		
	6	KORAWANOGA						254.00	260.00	72.00	3.00
								282.74	288.84		
								294.50	300.60		
	7	FUNE						141.25	147.35	77.00	12.00
								153.00	158.00		
								164.75	170.85		
	8	BABURAM						223.00	235.00	40.50	3.00
	9	TELLO						91.00	94.00	24.00	2.50
								99.00	105.00		
								113.00	116.00		
	10	DAURA				76.00					
	11	KAYERI						58.50	64.50	15.00	5.70
	12	DAMAGUM				189.00					4.00
	13	DAMAGUM	11°41′	11°20′		60.40		43.60	44.20	7.40	2.00
								49.20	51.10		
								53.00	54.90		
	14	DAMAGUM	11°41′ 05″			48.40		38.40	42.20	11.10	3.00

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N	Co-ordinate E	Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
								46.30	48.20		
	15	DAMAGUM				198.00		18.20			2.00
	16	DAMAGUM				164.50		18.20			2.00
	17	NGELZARMA				245.40		24.20			2.20
	18	NGELZARMA				248.80		18.30		81.00	2.00
	19	NGELZARMA	11°43′	11°36′		74.70		12.00	13.90	24.40	2.20
								41.30	43.20		
								67.10	69.60		
								70.70	72.60		
	20	NGELZARMA	11°40′ 30″	11°37′ 20″		76.00		50.50	52.30	24.70	2.00
								64.60	66.50		
								68.20	70.10		
	21	DAMAGUM				90.00		79.60	85.60	20.10	4.60
	22	DAMAGUM				31.60		26.00	28.80	8.84	
	23	NGAROHO				32.90		27.30	29.00	16.50	3.80
								31.00	31.70		
	24	BORNO KOJO				71.60		64.60	70.70	30.50	
	25	KOLLERE				70.40		63.70	69.80	7.30	1.90
	26	DAURA				356.00					
	27	ALAGARNO				91.44					4.60
	28	KAFAYE				69.50		63.70	66.75		3.03
	29	SHANGA Ⅱ				105.00	102.00	78.00	81.00	35.00	3.00
								93.00	99.00		
	30	BINDIGI				164.00	130.00	102.00	105.00		
								121.00	125.00		
	31	NGELZARMA				246.43		165.00	168.00		
								180.00	183.00		
								201.00	204.00		
								225.00	228.00		
								234.00	237.00		
								237.00	240.00		
	32	DOGON KUKA	11°40′ 04″	11°24′ 52″	326		91.96	90.38	114.42	38.25	3.00
	33	MILES 5	11°40′ 52″	11°40′ 05″	419		236.27	233.85	263.94	91.56	3.00
	34	NGELZARMA Ⅰ					249.00	165.00	171.00		
								212.00	218.00		
								223.00	229.00		
	35	NGELZARMA II					243.00	165.00	168.00		
								177.00	180.00		
								192.00	195.00		
								201.00	204.00		
								225.00	228.00		
								234.00	240.00		
	36	MASHIO I					140.00	131.00	137.00		
	37	MASHIO II				134.00	126.00	102.00	105.00		

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N - E		Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
								117.00	123.00		
	—	JAJERE	11°54′	11°22′	480	123.00				39.50	2.50
sub-total	38	—	—	—	—	3689.57	—	3090.84	3201.12	1006.65	92.78
average		—	—	—	—	131.77	—	93.66	110.38	43.77	3.31
KARASUWA	1	KARASYWA GULLU						35.60	41.50	18.00	3.40
	2	KARASUWA						45.00	62.00		4.00
								119.70	125.40		
	3	KARASUWA				67.00		48.86	59.00	15.10	3.00
	4	KARASUWA				138.00		45.60	62.70	11.60	4.00
								117.70	125.40		
	5	KARASUWA						46.86	59.00	15.10	3.00
	6	MIRWA						10.05	16.13		1.50
	8	GASHUA ROAD						55.50	57.60		1.50
	9	GASHUA ROAD						86.30	88.40		3.60
	8	GARIN RAFI								10.00	2.00
	9	ZAJI MAJI						57.00	68.00		4.00
								74.00	79.00		
								85.00	91.00		
	5'	JAJIMAJI						57.00	68.00		4.00
	14	JAJIMAJI				84.04		34.90	40.99	6.00	3.50
	15	JAJIMAJI				91.99		34.99	41.08	12.00	2.50
	30	BUKARTI	12°53′ 37″	10°54′ 39″	343	79.80		61.00	67.80	24.00	3.80
sub-total	14	—	—	—	—	460.83	—	618.66	732.20	111.80	43.80
average		—	—	—	—	92.17	—	47.59	56.32	13.98	3.13
MACHINA	1	DAMAI				92.83		79.42	85.45	40.00	4.00
	2	KANGARWA				83.00		60.00	78.00		
	3	MACHINA				67.00		45.00	51.28	30.40	1.50
	4	DOLI MACHINA				67.00		53.15	59.23	40.70	1.30
	5	DOLI MACHINA						19.95			1.20
	6	MACHINA									
	7	MACHINA						45.00	51.28	30.40	1.50
	8	MACHINA								6.00	5.10
sub-total	8	—	—	—	—	309.83	—	302.52	325.24	147.50	14.60
average		—	—	—	—	77.46	—	50.42	65.05	29.50	2.43
NGURU	1	TSOHON NGURU	12°53′ 04″	10°27′ 12″	353	82.48		56.00	59.00		6.00
								76.86	79.86		
	2	NGURU				80.00					
	3	MATSENA				67.00		45.00	51.28	30.40	1.50
	4	TULOTU						163.50	175.50		1.00
								74.00	79.00		
	6	YAKUBARI						54.00	66.00		
								85.00	91.00		
	7	NGURU				46.30		48.80	54.90		0.25
	8	NGURU				46.40					

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N	Co-ordinate E	Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
	9	MIRWA				59.00		10.05	16.13		1.50
	10	MARIMARI				63.00		44.73	50.87	9.00	3.00
								47.66	55.70		
	11	MAORI				76.00		13.00	25.16	4.60	1.20
	12	MALAWI				55.00		41.75	47.83	25.00	1.50
	13	TANGAMARAM				100.70		89.65	95.73	42.00	0.70
	16	KUNGANAMA				50.60		50.30	56.40		
	17	MBORI						111.00	131.00	19.00	
	18	KIRIRAM						107.00	127.00		
	19	MAORI						13.00	25.16	4.60	1.20
	20	GASHUA KANO ROAD						41.49	47.57	7.35	8.00
								54.07	60.15		
	21	PIRAMO OILMILL						39.27	46.02	5.50	8.00
								58.22	62.22		
	22	PIRAMO OILMILL						32.15	44.80	7.90	7.00
	23	PIRAMO OILMILL						43.13	49.21	7.60	8.00
	24	MASAKURA						42.00	51.00	6.00	7.50
	25	GUMSI				45.50		36.42	42.50		
	26	MAIMALAM				61.46		49.66	55.70		
	27	GUSHUA ROAD M37				61.30		55.50	57.60		1.90
	28	GUSHUA ROAD M"				61.00		86.30	88.40		4.60
	29	MGURU ABBATOIR				61.00		48.50	56.70	9.10	1.90
	31	MASKAN DAURI				33.10		25.80	27.60	11.00	1.25
	32	YAKUBARI						54.20	66.40	12.73	2.50
	33	FALIMURAMI									
	36	NGURU						44.20	51.80	32.00	6.70
	37	SABON GARI						31.00	44.00	6.00	
								49.00	52.00		
								57.00	60.00		
	38	AFONIRI						42.00	51.00		
	39	SABON GARI						49.00	58.00		5.10
								63.00	66.00		
								71.00	74.00		
								79.00	82.00		
	40	MILE 33 GASHA ROAD				70.10		60.00	62.20		4.40
	41	NGURU NESTLE				48.80		44.50	48.80		12.10
	42	NGURU GRAZING				51.82				28.16	3.20
	43	NGURU EXP. WELL				80.00				9.00	6.00
	—	ABBATOIR				55.50		46.00	48.20		4.40
	—	MGURU GASHU ROAD M26				62.50		56.40	58.50		2.50
	—	MGURU GASHU ROAD M29				115.80		55.50	57.60		1.00
	—	NGURU				55.47		20.00	40.00	6.00	4.40
	—	NGURU				57.30		45.11	51.82		6.60
sub-total	42	—	—	—	—	1647.13	—	1895.91	2187.38	282.94	124.90

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N	Co-ordinate E	Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
average		ー	ー	ー	ー	63.35	ー	51.24	59.12	14.15	4.03
NANGERE	1	DAZIGAU				69.00		57.00	68.00	48.00	2.20
	2	DAZIGAU				82.00		57.00	65.00		
	ー	NANGERE (OLD)	11°50′ 04″	11°04′ 05″	392	90.00					
	ー	NANGERE (NEW)	11°39′ 14″	11°42′ 15″	400						
	ー	DAWASA	11°59′ 41″	11°57′ 04″	375						
	ー	BRAMO NEAR POTISKUM	11°45′ 10″	11°05′ 35″	415						
	ー	ー						75.00	78.00	60.00	3.00
sub-total	7	ー	ー	ー	ー	241.00	ー	189.00	211.00	108.00	5.20
average		ー	ー	ー	ー	80.33	ー	63.00	70.33	54.00	2.60
POTISKUM	1	DOROWA				78.00		60.00	72.00		4.00
	2	1.POTISKUM				46.30				22.00	6.00
	3	2.POTISKUM				46.30				22.00	
	4	3.POTISKUM				45.39				24.06	6.00
	5	CATERING REST HOUSE				46.39				20.27	6.00
	6	HOSPITAL				47.10				17.88	4.00
	7	BRIDGE				48.63				37.15	
	8	FILINIDI				89.00				44.99	10.00
	9	T･C ①				47.44				24.78	8.00
	10	T･C ②				44.99				26.11	6.00
	11	TANK SIDE ①				89.00				44.00	8.00
	12	TANK SIDE ②				100.00				24.78	6.00
	13	ARMY				47.44				24.78	3.00
	14	NASSARAWA				305.00				29.90	4.00
	15	KWATA				246.00				29.00	6.00
	16	GARIN MAJE				152.00					4.00
	17	PKM EXPLORATORY WELL				80.00	71.50				10.00
	18	ANGWAN BEDU				79.00	78.00	61.00	64.00		
								70.00	76.00		
	19	DAKASKU ALARABA				418.00				70.10	3.84
	20	JUMMA YENDIAKI				229.00				27.92	3.50
	21	YAMBEL				145.00	142.00	128.00	140.00		
sub-total	21	ー	ー	ー	ー	2429.98	ー	249.00	276.00	489.72	98.34
average		ー	ー	ー	ー	115.71	ー	83.00	92.00	30.61	5.78
GEIDAM	1	GUMSA	12°53′ 56″	11°56′ 43″	333	98.00				10.00	
	2	ALAJIRI				73.00				16.00	6.00
	3	KAWURI	12°54′ 51″	11°56′ 11″	315		89.50			14.00	6.00
	4	GEIDAM				80.00	62.25				
	5	KALGERI				179.00				24.90	5.05
	9	JAJERI				184.00				35.12	2.07
	10	AWASAI				90.00	85.65	73.65	82.65		
sub-total	7	ー	ー	ー	ー	704.00	ー	73.65	82.65	100.02	19.12
average		ー	ー	ー	ー	117.33	ー	73.65	82.65	20.00	4.78
GULANI	1	NJIBULWA				201.00	200.00	146.00	149.00		

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N - E		Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
								185.00	197.00		
	2	RUHU				86.50		75.00	84.00	15.00	4.00
	3	TETEBA	10°49′ 48″	11°43′ 36″	339	270.00				40.00	5.00
	4	BARA	10°56′ 45″	11°41′ 59″	316	120.00				20.00	3.00
sub-total	4	－	－	－	－	677.50	－	221.00	233.00	75.00	12.00
average		－	－	－	－	169.38	－	110.50	116.50	25.00	4.00
GUJBA	1	KADAURI				84.00	83.00	74.00	80.00		1.50
	2	WAGIR/NYAKIRE	11°31′ 39″	10°00′ 43″	120	143.00		57.00	60.00	5.00	2.00
								66.00	69.00		
								87.00	90.00		
								134.00	140.00		
	3	MALAM KURIA	11°26′ 17″		270	147.00		31.70	37.70	40.00	5.50
								64.96	67.76		
	4	GOTALA KUOBKARI				100.00		95.00	90.00		3.00
								97.82	102.16		
	5	UNGUWAN ISATALALA				81.00		66.00	88.00	63.00	
	6	FULATARI WARD	11°16′ 33″	10°00′ 35″	462	84.00		69.00	81.00		
	7	NGURBURWA				318.00		273.07	279.07	50.10	3.50
								290.39	296.39		
								324.40	330.40		
	8	BUNI YADI				93.00		69.00	81.00		
	9	ISATALALA				84.00		66.00	78.00	61.80	
	10	GONIRI						328.00	335.00		1.60
	11	BUNI YADI RAILWAY									2.50
	12	GUJBA TOWN						298.00	322.00		3.20
	13	BUNI GARI						34.00	39.00		2.50
	14	BUNI YADI						72.00	82.00		1.00
	15	GOTALA						64.00	76.00		1.00
	16	DADINGEL						52.00	58.00		1.00
	17	GARIN ITACE						127.00	133.00		1.50
	18	GOTALA－KUNDILIARI				160.00		84.00	90.00	84.00	
								96.16	102.16		
	19	BULTURAM KURA				73.18	72.73	61.23	70.23		
	20	BUNI YADI EXPLOREATRY WELL				84.00					
	21	GOVERNER'S FARM GONIRI Ⅰ				80.00		24.00	27.00		
								63.00	66.00		
	22	GOVERNER'S FARM GONIRI Ⅱ				96.00		69.00	72.00		
	23	GONIRI(MTI)				84.40					
	24	NGBURWA				318.02		224.40	230.40		3.50
								273.07	279.07		
								290.39	296.39		
	25	2ND GORORI				81.25		16.00	21.00		
								26.00	29.00		
								44.00	59.25		

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N - E		Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
								65.50	74.50		
	26	KADAURI				84.00	83.00	74.00	78.00		
	27	BULTURAM Ⅰ					72.00	61.50	69.50		
	28	NYAKIRE					143.00	57.00	60.00		
								61.00	64.00		
								84.00	90.00		
								137.00	140.00		
	29	BUNI YADI					80.20	75.35	78.10		
sub-total	29	ー	ー	ー	ー	2194.85	ー	2522.25	2716.00	303.90	33.30
average		ー	ー	ー	ー	121.94	ー	97.01	104.46	50.65	2.38
JAKUSKO	2	KAGAMU				60.00		30.00	55.00	14.00	1.67
	3	KARAGE				80.00		66.69	59.69	18.00	
	4	DUMBARI				100.00		63.00	78.00	14.00	2.00
	5	JAKUSKO	12°22′ 11″	10°41′ 23″		107.80					3.00
	6	KAGAMU				90.00		73.00	82.00		
	7	NEAR BURKEL				235.00					1.67
	8	DACHIA				439.64	375.14	41.04			2.80
	9	GIRGIR				298.89		39.83			3.00
	10	JAKUBARI				72.65		54.20	66.40	12.73	2.50
	11	JAKUSKO GRAZING				250.00		320.00	340.00		3.80
	12	BUDUWA GRAZING				310.00		280.00	300.00		3.80
	13	GIRGIR	12°53′ 50″	10°55′ 33″		84.00		78.00	82.00		
	14	JAKUSKO	12°22′ 11″	10°41′ 23″		96.84		83.43	89.50	24.90	3.00
	15	GIRGIR	12°33′ 55″	10°55′ 03″		113.40		87.80	106.01	27.95	3.00
	16	LAFIYA LOI－LOI				97.07		96.00	110.00		2.80
	17	BAYAM				224.00				22.50	3.51
	18	SAMINAKA				150.00				27.02	4.20
	19	JAKUSKO				137.00	106.80				3.00
	9'	JAKUSKO	12°22′ 11″	10°41′ 23″		29.90		25.40	27.00		3.00
	10'	JAKUSKO	12°22′ 11″	10°41′ 23″		32.60		11.50	13.30		3.00
	30	ー				171.00				19.60	5.00
sub-total	21	ー	ー	ー	ー	3179.79	ー	1349.89	1408.90	180.70	54.75
average		ー	ー	ー	ー	151.42	ー	89.99	108.38	20.08	3.04
TARMUWA	1	SHEKAU				132.00		112.00	105.00	60.00	3.00
								121.00	127.00		
	2	BABBAN GIDA	12°06′ 29″	11°45′ 45″	220	156.00		38.00	41.00	62.10	
								48.00	51.00		
								51.00	54.00		
								145.00	151.00		
	3	LANTAIWA	12°16′ 10″	11°43′ 58″		145.50					
	4	GAREJE					135.00	124.00	133.00		
	5	JUMBAN				121.00		37.00	43.00		
								109.00	111.00		

表4. 深井戸データ (1960 - 2005)

LGA	S/N0.	Location/ Villege	Co-ordinate N - E		Elevetion (m)	Total Depth Drilled(m)	Total Depth Casing(m)	Screen Position(m)		Static Water Level(m)	Approx Discharg (L/S)
sub-total	5	—	—	—	—	554.50	—	311.00	322.00	122.10	3.00
average		—	—	—	—	138.63	—	77.75	80.50	61.05	3.00
YUSUFARI	1	SUNOMARI				90.00		51.00	54.00	12.00	2.20
								60.00	66.00		
	2	YUSUFARI				82.00	76.00	57.00	75.00		
	3	YUSUFARI				80.00		60.00	70.00	19.10	3.00
sub-total	3	—	—	—	—	252.00	—	168.00	199.00	31.10	5.20
average		—	—	—	—	84.00	—	56.00	66.33	15.55	2.60
YUNUSARI	1	TOSHIA				100.00		60.00	66.00		2.00
								69.00	75.00		
	2	BUHARI				84.00	81.00	27.00	30.00		
								56.00	59.00		
								75.00	78.00		
sub-total	2	—	—	—	—	184.00	—	87.00	96.00	—	2.00
average		—	—	—	—	92.00	—	43.50	48.00	—	2.00

資料-9　水質調査結果

資料 9. 水質調査結果

１．調査目的

各村落の地下水の水質を把握するために、既存井戸調査と並行して採水現場での簡易水質検査を実施した。調査項目は、水温、色度、電気伝導度、PH、濁度、味、臭気、鉄、フッ素、マンガン、硝酸、大腸菌類、アンモニアの 13 項目である。このうち、鉄、フッ素、マンガン、硝酸、大腸菌類、アンモニアの６項目はパックテストにより測定を行った。簡易水質試験は、深井戸、浅井戸、溜め池などで実施し、水質試験数は 40 箇所である。調査地点位置は既存井戸調査位置図に示している。現地にて簡易測定した結果を表 2 に、この検査結果をまとめたものを下表 1 に示す。

表 1　水質検査結果

No.	項目名	水質基準(WHO)	検査結果の範囲（全井戸）	検査結果の範囲（深井戸）	検査結果の範囲（浅井戸・他）
1	水温	－	23.9～35.3 度	－	－
2	色度	－	無色～褐色	－	－
3	電気伝導度(mS/m)	－	2.4～90（平均 25.5）	2.4～58（平均 22.4）	11.6～90（平均 35.1）
4	ｐH	－	5.0～7.8（平均 6.8）	5.0～7.8（平均 6.7）	5.4～7.6（平均 6.8）
5	濁度	－	透明～濁度	－	－
6	味	異常でない	無し～鉄分	－	－
7	臭気	－	無し～家畜の臭い	－	－
8	鉄(mg/Lit.)	0.3	0～5.0（平均 0.4）	0～4.0（平均 0.4）	0～5.0（平均 0.6）
9	フッ素(mg/Lit.)	1.5	0～1.5（平均 0.3）	0～1.5（平均 0.3）	0～1.2（平均 0.3）
10	マンガン(mg/Lit.)	0.1	0～1.0（平均 0.1）	0～1.0（平均 0.1）	0～1.0（平均 0.1）
11	硝酸(mg/Lit.)	10	0～<45.0（平均 11.4）	0～<45.0（平均 8.0）	0～<45.0（平均 21.4）
12	大腸菌類(mg/Lit.)	不検出	0～10 以上	0～10 以上	0～10 以上
13	アンモニア(mg/Lit.)	0.5	0～0.5（平均 0.1）	0～0.5（平均 0.1）	0～0.2（平均 0.1）

２．検査結果

- パックテストによる水質検査の結果、特に水質基準値を超えていた項目は鉄、硝酸、マンガン及び大腸菌類である。
- 鉄は、ヨベ州南部のフィカ、グジバ、グラニで水質基準値 0.3mg/Lit.以上を示し、グジバ LGA の GARINMALLAMADAMU の溜め池（この村の主水源）で 5mg/Lit.を示した。フィカ LGA の GASHAKA の深井戸では 4mg/Lit.を示した。
- 硝酸については、20mg/Lit.以上の地域は州北部のマチナ、ヌグル、ユスファリ、ユヌサリ、バデ、ブルサリ、ゲイダムなどである。これらの集落の付近では、牧畜あるいは田畑に使われる肥料が地下水に浸透したものと考えられる。この他に、生活廃水や糞便による地下水汚染が広く進行しているものと推定できる。
- マンガンについては、一部の地域で水質基準値を上回る結果が認められた。
- フッ素については 1.5mg/Lit.以下の値が 16 地点で認められ、特にジャクスコ、タルムア、ダマツル地域で水質基準値 1.5mg/Lit.に近い値を示した。
- 大腸菌類については、一部の深井戸でも認められたが、主に浅井戸、セメントウエルで検出された。これは井戸が密閉されていないため、家畜の糞尿が井戸に直接流れ込み、水質を悪化させていることが原因である。

- その他として、電気伝導度は基準値より高い。電気伝導度が高いということで健康への影響はないが、何らかの物質が混入していることであり、その物質が健康への影響の大きいかは不明である。
- pH は約 7 と中性である。参考に、日本の水道基準の pH は 5.8～8.5 である。

表2.既存井戸の水質分析

Location No.	LGA	Village	Well	Latitude			Logitude			Elevation(m)	Geology	Temperature	Smel	Teste	Color	EC (mS/m)	pH	Fe (mg/l)	F (mg/l)	Mn (mg/l)	No3 (mg/l)	Coliform (Nos/ml)	NH4 (mg/l)
1	MACHINA	MACHINA	Borehole	13	8	19	10	2	59	352	Chad/Basement	27.4	No	No	Clear	36.8	7.5	0	0.4	0	20	0	0
3	NGURU	KULO GANDE	Hand Pump	12	53	6	10	27	6	360	Chad	29.4	No		Clear	5.7	7	0.7	0	0	<45	0	0.2
4	NGURU	GLA LOCAL GOV.SECRET	Hand Pump	12	52	15	10	26	48	350	Chad	27.2	No	No	Clear	32.7	7.0	0.5	0	0	0	0	0.2
5	YUSUFARI	YUSUFARI TOWN	Hand Pump	13	3	46	11	10	17	341	Chad	30.3	No	No	Clear	13.6	7.2	0	0.2	0	<45	0	0
6	YUSUFARI	BULTUMARI-YUSUFARI TOWN	Hand Pump	13	4	16	11	10	30	344	Chad	31.3	No	No	Clear	13.9	6.6	0	0	0	30	0	0
7	YUSUFARI	IAWANTI	Borehole	13	4	22	11	10	28	344	Chad	30.5	No	No	Clear	9.4	7.1	0	0	0	1.5	0	0
8	YUSUFARI	TULO-TULOWA	Cementwell	13	22	11	11	0	29	347	Chad	29	No	No	Clear	85.3	6.9	0	0	0	<45	0	0.2
9	KARASUWA	NGELSHOND-JAJIMAJI	Borehole	12	54	14	10	48	8	346	Chad	29.3	No	No	Clear	16.7	7.3	0	0	0	0	0	0
10	KARASUWA	BUKARTI	Borehole	12	53	49	10	54	38	343		27.5	No	No	Clear	13.5	7.2	0	0	0	0	5	0
11	BADE	GASHUA	Hand Pump	12	52	28	11	2	42	341	Chad	30.4	No	No	Clear	46.4	6.3	1	0	1	<45	0	0.2
12	BADE	GASHUA CENTRAL MOSQUE	Borehole	12	52	18	11	2	36	345	Chad	29.9	No	No	Clear	20	7	0	0	0	5	3	0
14	YUNUSARI	YUNUSARI TOWN MARKET SQUARE	Borehole	13	9	11	11	32	24	326	Chad	30.5	No	No	Clear	26.3	7.3	0.3	0	0	1.8	many	0
15	YUNUSARI	JAJJAWARI	Cementwell	13	1	6	11	33	7	341	Chad	29.8	No	No	Clear	39	7.3	0	0	0	<45	many	0
16	BURSARI	BAYAMARI	Borehole	12	46	15	11	30	42	330	Chad	32	No	No	Clear	21.8	6.6	0	0	0	0	0	0
17	BURSARI	DAPCHI	Borehole	12	29	58	11	30	24	340	Chad	23.9	No	Iron	Clear	17.7	6.8	3	0.6	0	0	1	0.2
19	BURUSARI	KAKANDERI	Cementwell	12	58	13	11	32	13	341	Chad	29.8	No	A little	ittle cru	90	6.9	0	0	0	<45	many	0
20	GEIDAM	HOSPITAL	Hand Pump	12	53	44	11	55	12	338	Chad	29	No	No	Clear	19.3	6.7	0	0	1	0	many	<0.2
21	GEIDAM	KELLURI	OpenWell	12	50	40	11	45	12	340	Chad	30.2	No	No	ot so cle	40.4	6.8	0	0	0	45	many	0.1
24	JAKUSKO	GIRGIR	Hand Pump	12	34	2	10	55	24	346	Chad	29	No	No	Clear	17.55	6.9	0.8	0	0	0	0	0.1
28	JAKUSKO	BUDUWA	Borehole	12	12	31	10	52	42	368	Chad	31	No	No	Clear	11.84	7.2	0	1.2	0	0	0	0
29	JAKUSKO	BUDUWA	OpenWell	12	12	16	10	52	37	370	Chad	29.8	No	No	Clear	14.87	7.0	0	1.2	0	1.5	1	0.1
30	NANGERE	NANGERE(OLD)	Borehole	11	52	17	11	4	12	392	Kerri-Kerri	29.1	No	No	Clear	2.85	6.3	0	0	0	1	0	0.1
32	NANGERE	GARINGADA	Hand Pump	12	5	28	10	56	14	366	Chad	29.7	Fe smell	No	Clear	18.9	6.6	2	0.6	0	0	many	0.2
33	POTISKUM	GARIN BENGEL	Hand Pump	11	40	29	11	14	19	472	Kerri-Kerri	30	No	No	Clear	2.4	5.0	<0.2	0.2	<0.5	2	4	<0.2
34	POTISKUM	BADEJO	Hand Pump	11	39	35	11	6	5	443	Kerri-Kerri	29.8	No	No	Clear	6.6	5.3	0	0	0	20	0	0.1
36	FUNE	DAMAGUM	Borehole	11	40	55	11	19	44	422	Kerri-Kerri	35.2	No	No	Clear	16.3	6.1	0.3	0	0	0	2	0.1
37	FUNE	NGELZARMA	Borehole	11	41	15	11	37	21	411	Kerri-Kerri	35.3	No	No	Clear	57.7	7.2	0.2	0.2	0	0	2	0.3
38	TARMUWA	LANTAIWA	Cementwell	12	16	14	11	44	2	360	Chad	29.8	No	A little	Colloded	25.3	6.9	0	0.4	0	20	many	0
39	TARMUWA	BABANGIDA	Borehole	12	10	4	11	46	23	359	Chad/Basement	31.8	No	No	Clear	29.8	6.9	0	1.5	0	0	0	0
40	TARMUWA	BABANGIDA	Borehole	12	9	23	11	46	21	359	Chad/Basement	31.4	No	No	Clear	29.9	7.2	0	1.5	0	0	0	0

表2.既存井戸の水質分析

Location No.	LGA	Village	Well	Latitude			Logitude			Elevation(m)	Geology	Temperature	Smel	Teste	Color	EC (mS/m)	pH	Fe (mg/l)	F (mg/l)	Mn (mg/l)	No3 (mg/l)	Coliform (Nos/ml)	NH4 (mg/l)
41	DAMATURU	BABBAN TSANGAYA WARD	Borehole	11	45	11	11	57	38	364	Chad	28.1	No	No	Clear	26.7	6.8	0	1.3	0	5	0	0
42	FIKA	FIKA	OpenWell	11	17	27	11	18	15	376	Fika shale	29.8	No	No	Clear	18.5	6.8	0	0	0	1.5	many	0.1
43	FIKA	GADAKA	Borehole	11	17	23	11	13	10	365	Gombe sandstone	31.6	No	No	Clear	8.0	5.1	0	0	0	2	4	0
44	FIKA	GASHAKA	Borehole	11	34	2	11	9	42	477	Kerri-Kerri	29.1	Fe smell	slight tes	Brown	18.8	6.5	4	0.6	0	0	1	0.5
45	GUJBA	BUNIGARI GOVERNMENT GIRLS SECONDARY SCHOOL	Hand Pump	11	12	3	12	1	30	454	Basement	28.7	No	No	Clear	38	6.8	0.3	0.5	0	1	0	0.1
46	GUJBA	GARINMALLAMADAMU	Pond	11	19	59	11	58	35	447	-	28.8	Animal dung	No	Brown	11.6	7.6	5	0	0	0	many	0.2
47	GUJBA	KATARKO	Cementwell	11	33	48	11	54	58	391	Sedimentary/Basement	30	No	No	Clear	12.8	6.4	0	0	0	0.5	many	0.1
48	GULANI	TETEBA	Borehole	10	49	0	11	43	35	304	Sedimentary	31.5	No	No	Clear	38.5	7.8	0	0	0	0	0	0.1
49	GULANI	GULANI	OpenWell	10	43	23	11	41	19	320	Sedimentary/Basalt	25.5	No	No	Clear	13.4	5.4	1	1	1	10	7	0
50	GULANI	BARA	Borehole	10	56	19	11	40	51	315	Alternation Limestone/Sandstone/Clay	30.9	No	No	Clear	52.8	7.1	0	0.1	0	15	0	0

資料-10　社会状況調査結果

資料 10　社会条件調査結果

1. 調査の概要

本件計画対象地域における社会条件に関して、下記 3 項目の調査を実施した。

1) 村落調査
2) 世帯調査
3) 詳細調査

調査方法として、村落調査及び世帯調査は、先ず添付資料 1 に示す英語版アンケート用紙（質問表）を準備し、RUWASA にて内容確認した後、カンターパート及び LGA 職員が事前に回答者として選定した村落代表者及び代表世帯に、直接現地語でヒヤリングを行った。

詳細調査については現地再委託業務にて、RUWASA が選定した村落に対し、詳細なインタビュー調査を実施した。

調査方法の概要及び主な調査内容は表 1 に示すとおり。

表 1　　社会条件調査の項目・方法・内容

調査項目	調査方法概要	主な調査内容
村落調査	＜アンケート調査＞ 17LGA 経由 100 村落の代表者にヒヤリングを実施。	既存の給水施設の状況、保険・衛生状況、給水設備の維持管理体制、維持・管理費用等
世帯調査	＜アンケート調査＞ 17LGA 経由各村落 2 世帯、合計 200 世帯にヒヤリングを実施。	家庭経済状況、水利用の実体、衛生意識、給水設備の維持・管理に対する意識等
詳細調査*	＜インタビュー調査＞ ソフトコンポーネント実施対象予定の 5 村落対し実施。	既存の給水施設の状況、保険・衛生状況、給水設備の維持管理体制、維持・管理費用、住民の参加意思、経済状況、女性の活動状況等

２．調査日程

村落調査と世帯調査は表 2 に示すごとく同村落に同日に、詳細調査は表 3 示すごとく前記調査と並行して再委託業務にて実施した。

３．村落調査・世帯調査結果

(1) 最終調査対象村落

表 2 の備考欄に示すごとく、8 村落において管轄 LGA が要請時から変更されており、その内容に基く最終調査対象村落リストを添付資料 2 に示す。

(2) 村落総人口

要請 100 村落の人口は村落代表者からの聴き取り値によると、要請書記載の 1991 年統計値 116,000 人から、約 3 倍の 350,000 人に増加していた。これは 15 年間の平均年間人口増加率にすると約 8%に相当するので若干過剰評価と考えられるので、2005 年実施の統計調査値の公表を待ち確認することとしたい。

表 2　社会条件調査日程（村落調査・世帯調査）

月日		番号	LGA		調査	村落数			備考
			記号	名称	方法	要請	質問	回答	（所轄 LGA の変更）
2006 年 12 月 11 日	月	①	O	タルムア	A	5	4	4(12 月 11 日)	O-5→ブルサリ
		②	B	ブルサリ	C	8	8	8(12 月 19 日)	
2006 年 12 月 12 日	火	③	K	ゲイダム	A	7	7	7(12 月 12 日)	
		④	Q	ユヌサリ	A	8	8	8(12 月 12 日)	
2006 年 12 月 14 日	木	⑤	A	バデ	C	6	4	4(12 月 19 日)	A2,4→ジャクスコ
		⑥	F	カラスワ	C	6	6	6(12 月 19 日)	
		⑦	H	ヌグル	B	7	4	4(12 月 14 日)	H-1,4→カラスワ
									H-3→ユスファリ
2006 年 12 月 15 日	金	⑧	N	ジャクスコ	C	5	5	5(12 月 19 日)	
2006 年 12 月 18 日	月	⑨	E	フネ	C	4	4	4(12 月 20 日)	
		⑩	D	フィカ	A	6	6	6(12 月 18 日)	
		⑪	J	ポティスクム	A	7	7	7(12 月 18 日)	
2006 年 12 月 19 日	火	⑫	I	ナングレ	B	5	3	3(12 月 19 日)	
					C		2	2(12 月 21 日)	
		⑬	C	ダマツル	C	4	4	4(12 月 24 日)	
2006 年 12 月 20 日	水	⑭	M	グジバ	C	5	5	5(12 月 23 日)	M-2→グラニ
		⑮	L	グラン	C	5	5	5(12 月 23 日)	L-1→グジバ
2006 年 12 月 21 日	木	⑯	G	マチナ	A	5	5	5(12 月 21 日)	
2006 年 12 月 22 日	金	⑰	P	ユスファリ	A	7	7	7(12 月 22 日)	
						100	94	94	

A:LGA オフィスにてヒヤリング
B:村落にてヒヤリング
C:LGA 職員による後日ヒヤリング

表 3　　社会条件調査日程（詳細調査）

月日		番号	調査村落		
			記号	LGA 名	村落名
2006 年 12 月 14 日	木	①	C-2	ダマツル	Dikmari
2006 年 12 月 15 日	金	②	N-4	ジャクスコ	Jammel
2006 年 12 月 16 日	土	③	D-6	フィカ	Ngalada
2006 年 12 月 17 日	日	④	L-3	グラニ	Chandam
2006 年 12 月 18 日	月	⑤	B-7	ブルサリ	Buyamari

(3) 水源の使用状況

村落調査結果によると、雨期と乾季とでは若干異なるが表 4 に示す水源が使用されており、ポンプ付井戸の設置率は約 20%である。

表 4　　村落における水源の使用割合

No.	種類	雨期	乾期
1.	ポンプ付井戸	22%	16%
2.	オープン井戸	47%	57%
3.	池	6%	5%
4.	川	14%	5%
5.	雨水	11%	0%
.6	その他	0%	1%
	計	100%	100%

(4)　生活上の問題点

各村落及び各世帯が直面している生活上の問題は表 5 に示すごとく、水・衛生問題が最も多い。

表 5　村落・世帯における生活上の問題点

調査	問題点提起の割合（%）					
	水･衛生	家計	教育	健康	他	計
村落調査	40	16	14	28	2	100
世帯調査	38	28	11	21	2	100

(5)　水・衛生上の問題点の内容

水・衛生上の問題点の内容は多い順に示すと、以下のとおりである。

村落としての認識		世帯としての認識
1)　乾期の給水源水量が少ない。（22%）	———	1)　乾期の給水源水量が少ない。（27%）
2)　同じ井戸を多くの人が使用する。（21%）	———	2)　同じ井戸を多くの人が使用する。（22%）
3)　水源が遠い。（18%）	———	3)　水源が遠い。（22%）
4)　子供が病気になる。（10%）	———	4)　子供が病気になる。（11%）
5)　水質が悪い。（色＞味＞臭）（10%）	×	5)　雨期でも給水源の水量が少ない。（6%）
6)　雨期でも給水源の水量が少ない。（8%）	×	6)　水質が悪い。（色＞味＞臭）（5%）
7)　下水処理が粗末（4%）	———	7)　下水処理が粗末（2%）
8)　その他（7%）	———	8)　その他（5%）

(6) 過去 1 年間に発生した病気の種類

過去 1 年間に発生した病気の種類の割合は表 6 に示すごとく、村落及び世帯ともマラリアが最も多い。

表 6　　村落・世帯における過去 1 年間の発生した病気の割合

調査	病気の発生割合（%）							
	コレラ	ギアナウォーム	マラリア	下痢	腸チフス	赤痢	他	計
村落調査	11	1	45	15	18	4	6	100
世帯調査	15	1	47	11	13	5	8	100

４．詳細調査結果

ソフトコンポーネントによる技術支援実施を考慮して、ダマツル市近郊の 5LGA に対しハンドポンプ付井戸が設置されている 1 村落を選定し（表 3 参照)、社会条件詳細調査を実施した。

その調査結果を以下に述べる。

（1）　人口構成

詳細調査を行った 5 村の平均人口構成は表 7 に示すごとく、平均村落人口約 3,200 人、平均家族構成は 11～12 人であった。

表 7　　村落の平均人口構成

No.	項目		平均人数
1.	平均村落人口	男性	1,356　(42%)
		女性	1,842　(58%)
		計	3,198　(100%)
2.	平均家族構成	夫	1
		妻	2
		子供	8～10
		計	11～13

（2）　村落における施設整備状況

調査 5 村落における施設の整備状況を表 8 に示す。

表 8　　5 村落における施設の整備状況（設置数）

分類	施設	B-7 Bursari-Bayamari	C-2 Damaturu-Dukumari	D-6 Fika-Ngalda	L-3 Gulani-Chamdam	N-4 Jakusko-Jammel
給水施設	セメントウェル	6	2	80	15	3
	ハンドポンプ井戸	1	2	2	-	-
	動力ポンプ井戸	3	1	-	-	1
	水洗い井戸	-	-	4	-	-
医療施設	薬局	-	-	1	1	1
	診療所	1	-	-	-	-
教育施設	小学校	1	1	1	1	1
	上映センター	1	-	1	1	1
公共施設	道路	1	1	1		1
	ごみ収集センター	-	-	-	-	-
	公衆トイレ	-	-	-	-	-
商業施設	銀行			-	-	-
	マーケット	1	-	1	-	-
	発電設備	1	-	1	-	-

（3）　村落での生活上の問題点

各村落における生活上の問題は表 9 に示すごとく、一に水・衛生問題、二に健康問題、三に経済問題である。

表 9　　5 村落における生活上の問題点

問題点	水･衛生	経済	教育	健康	道路	下水	電気	農業	計
割合（%）	38	20	5	24	7	2	2	2	100

（4）　水・衛生上の問題点

上記水・衛生上の問題点の内容は多い順に示すと以下のとおりである。

1) 水源が遠い。（19%）
2) 水質が悪い。（19%、色＞味＞臭）
3) ハンドポンプの故障。（19%）
4) 乾期の給水源水量が少ない。（17%）
5) トイレが少ない。（9%）
6) 同じ井戸を多くの人が使用する。（4%）
7) 家が汚い。（4%）
8) 雨期でも給水源の水量が少ない。（2%）
9) 多くの子供が病気になる。（2%）
10) 多くの大人も病気になる。（2%）
11) 下水処理が粗末（1%）
12) その他（2%）

(5)　水使用量および入手・保管法

世帯人数 8～10 人の家族で、1 日当たり 120～240 リッターの水を使用するが、それらの水は表 10 に示すごとく主に子供が学校に行く前と帰宅後に、小型プラスチック容器にて持ち帰り、蓋付土壺に保管している。

表 10　　各世帯における水入手者の割合

水入手者	大人		子供		その他	計
	男性	女性	男の子	女の子	購入	
割合（%）	18	16	27	27	12	100

(6)　村落給水・衛生委員会（VWESC）への参画

本調査においては、ブルサリ i LGA の Bayamari 村落内のコミュニティにのみ VWESC が設立・運営されていたが、他の村落（コミュニティ）においても表 11 に示すごとく VWESC の必要性を認識しており、ハンドポンプ設置時には設立する意思を持っている。

表 11　　村落給水・衛生委員会（VWESC）の設立・運営状況

VWESC	運営されている	存在していた	設立する予定	計
割合（%）	16	4	80	100

また、住民は費用負担として、設立時に 100～200 ナイラ、維持管理費用として月額 30～100 ナイラを支払うことを考えている。

(7)　子供達の衛生観念

子供達は表 12 に示すごとく手を洗うことが衛生上最も必要であると考えている。

表 12　　子供達の衛生観念

衛生観念	手洗いの励行	周囲整理整頓清掃	定期的な入浴	健康維持管理	トイレの使用	食料･水の衛生保存	計
割合（%）	40	21	15	13	8	3	100

なお、上記事項は先生から教えられた生徒の割合は 70%、両親からは 30%であった。また、Ngalda 村以外は学校にしかトイレがなく、ほとんどの生徒が藪の中で用をたしている。

５．ハンドポンプ設置に対する社会条件の適応性

100 村落の社会条件は現地調査の結果全てハンドポンプ設置に適応していることを確認したが、敢えて適応の程度を以下の評価（評点）で 3 ランクに分け、ハンドポンプ設置村落選定の参考データとした。

(1) 評価項目と評価点

1) 村落の井戸による給水率

0～35%：3 点、36～75%：2 点、75%超：1 点

なお、給水率は以下の計算による。

給水率（%）＝（既存井戸数 x 250 人）÷村落人口（人）

2) 主水源の村落中心からの距離

1,500m 以上 3 点、500m 以上 1,500m 未満：2 点、500m 未満：1 点

3) 水・衛生に対する村落の問題意識

非常にある（3 項目選択）：3 点、かなりある（2 項目選択）：2 点：普通（1 項目選択）：1 点

4) 運営維持管理体制

VWESC が運営されている：3 点、VWESC を設立する予定である：2 点：検討中：1 点

5) 管轄 LGA の村落管理能力*

優れている：3 点、良い：2 点：通常：1 点

注）*今回の村落社会条件調査においての管理実態から評価する。

（2）社会条件の適応性ランク分け

上記評価点の合計により、社会条件の適応性を表 13 に示すごとく 3 ランクに分け、評価を行った。村ごとのランクは添付村落リストに示す。

表 13　　村落の社会条件の適応性ランク

合計評価点	15～12	11～8	7～5	合計
ランク	A	B	C	
村落数	27	70	3	100

６．まとめ

本社会条件調査を通して、下記事項が確認できた。

1) 調査対象 100 村落での生活上の最大の問題点は「水・衛生」に関するものである。
2) その「水・衛生」問題での最大の関心は「乾期の給水源水量が少ない」ことである。
3) 上記状況より、100 村落ともハンドポンプ式給水施設建設を切望している。
4) また、同施設の運営・維持管理に関する社会条件の適応性は、村落によって多種の差はあるものの特に問題はない。
5) 以上より、社会条件の観点からは要請の必要性は十分であり、要求内容は妥当であると言える。

添付資料 1

Village Survey to village representative

Village No._____ Village name_____ LGA_____

Enumerator_____ Respondent_____ (Respondent's) Position_____

A : Basic Questions

A1. Village Population: Total_____ / male (_____), female (_____)

A2. Total number of households:_____

A3. How are people getting income mainly by?

a. Agriculture b. Livestock c. Fishery d. Sale other item e. Labor work

f. Other ( )

A4. How much of average income can people get?

N _____/month

A5. How much products do people sell per year for income?

Agricultural products :

a-1. Yam (_____ /year) a-2. Maize (_____ /year)

a-3. Beans (_____ /year) a-4. Other : _____ (_____ /year)

Livestock products :

b-1. Chicken (_____ /year) b-2. Cow (_____ /year)

b-3. Goat (_____ /year) b-4. Other : _____ (_____ /year)

Fishery products :

c-1. Fresh water fish (_____ /year) c-2. Other: _____ (_____ /year)

Main sales Item :

d-1. Charcoal (_____ /year) d-2. Other: _____ (_____ /year)

A6. How much do people spend per month?

Average: N _____ /month

A7. How much do people spend for;

a. Food: N _____ /month

b. Clothes: N _____ /month

c. Water-related issues/matters (O&M, Buy Water, Jelly can, etc) N _____ /month

d. Sanitation and hygiene-related issues/matters (latrine construction, etc) N _____ /month

e. Health-related issues/matters (medicine, hospital, etc) N _____ /month

A8. Where do people buy necessities?

a. Rural Market b. City Market c. Peddler d. Other ( )

A9. What are the problems that people in village are facing every day?

a. Water & Sanitation b. Financial problem c. Education d. Health care

e. Other ( )

A10. What kind of Water & Sanitation problem does the village have?

(Circle (○) the ones that apply. Worst 3 problems)

a. Water source is too far

b. Little water in dry season

c. Little water as resource even in rainy season

d. Water quality is bad → d-1. Smell d-2. Color d-3. Taste d-4. Other ( )

e. Too many people use the same water resource

f. Poor water drainage

g. Be broken/stolen Hand pump

h. Many children are usually sick → (Ex. : _____)

i. Many adults are usually sick → (Ex. : _____)

j. Latrine: None/Too few

k. No clean clothes

l. No clean water-drawing containers

m. No clean house/compounds

n. Other ( )

B. Questions about Health Condition

B1. What kind of diseases did your village have for the last one year?

a. Cholera b. Guinea worm c. Malaria d. Diarrhea e. Typhoid

f. Dysentery g. Other ( )

B2. What are the causes of the diseases?

a. Dirty water b. Irregular weather c. Bad people d. Unsanitary food

e. Other ( )

B3. How did people cure the diseases?

a. Self treatment b. Local doctor c. Mosque/Church d. Hospital

e. No treatment f. Other ( )

B4. How the people can prevent diseases?

a. Clean water b. Good sanitary condition c. Good medicine

d. Other ( )

B5. Where do you think the patients should be treated?

a. Hospital b. Mosque/Church c. Local clinic d. Traditional treatment

e. Specialist of water-born diseases f. Other ( )

B6. What kinds of Medical facilities are in the village? (Please write the numbers.)

a. Hospitals_____ b. Clinics_____ c. Dispensaries _____

d. Health Center_____ e. Drug Shops_____ f. Traditional Doctors_____

C. Questions about Water Supply

C1. What is the main drinking water source in rainy season?

a. Borehole b. Dug Well c. Pond d. Stream/River

e. Rain Water f. Other ( )

C2. How far is a main water source from center of village in rainy season?

a. 200m b. 500m c. 1000m d. 1500m e. 2000m

f. Over 2000m

C3. How is the water quality of main source in rainy season? If "Bad", please choose the reason.

a. Good b. OK c. Bad → 1. Water amount 2. Color 3. Smell 4. Taste

C4. What is the main drinking water source in dry season?

a. Borehole b. Dug Well c. Pond d. Stream/River

e. Rain Water f. Other ( )

C5. How far is the main water source from center of Village in dry season?

a. 200m b. 500m c. 1000m d. 1500m e. 2000m

f. Over 2000m

C6. How is the water quality of main resource in dry season?

a. Good b. OK c. Bad → 1. Water amount 2. Color 3. Smell 4. Taste

C7. What kind of facility do people use to carry the water from water source?

a. Jelly can b. Plastic Bucket/Bowl c. Clay pot d. Calabash

e. Iron Pail f. Other ( )

C8. What kind of facility do people use to store the water?

a. Drum b. Plastic Container c. Clay Pot d. Clay pots fitted with taps

e. Buckets fitted with taps f. Calabash g. Other ( )

C9. How do people treat the water before drinking?

a. Boil b. No treatment c. Other ( )

D. Questions about Water & Sanitation/Hygiene

D1. Is there household or public latrine in the Village? a. Yes b. No

D2. What type of household latrine or public use latrine is in the village?

a. Traditional Pit Latrine b. Improved Traditional Pit Latrine

c. Ventilated Improved Pit Latrine d. Other ( )

D3. How do people dispose of the excreta from the facilities?

a. Bush b. Stream/River c. Pit latrine d. Gutter

e. Court yard/House surrounding f. Other ( )

D4. Do people wash their hands after using the latrine?

a. Yes b. No

D5. What type of ownership of latrine is preferred in your village?

a. Village ownership b. Private ownership c. Private compound ownership (Group)

d. Other ( )

D6. Would you be willing to build a public latrine?

a. Yes b. No

D7. (If yes) How much would you contribute for construction of the latrine?

a. less than N100 b. less than N200 c. less than N300

d. less than N400 e. less than N500 f. over N500

D8. (If No) Why would you not support a public latrine?

a. No money to contribute b. No interest c. Former efforts

d. Government responsibility e. Other ( )

D9. Do people wash their hands before eating?

a. Yes b. No

E. Questions about Public Participation

E1. Did/Does village have VWESC (Village Water & Environment Sanitation Committee)?

a. Yes, It was organized in (When _____) and still exists.

b. Yes, It was organized in (When _____) but dose not exist now.

c. No, but it will be organized in (When _____).

d. No, it will not be organized.

E2. (If "a") How much money does household pay as an initial contribution?

a. about N100 b. about N200 c. about N300 d. about N400

e. about N500 f. over N500 g. None h. don't know

i. donate (labor, material, etc)

E3. (If "a") Did/Does people pay money regularly for O&M?

a. Yes b. No

E4. (If "Yes") How much money did/does each household pays regularly for Water cost (O&M) per month?

a. about N20 b. about N30 c. about N40 d. about N50

e. about N60 f. about N100 g. over N100 h. None

i. don't know j. donate (labor, material, etc)

E5. (If "b") Why does VWESC not exist?

a. No money to O&M b. No knowledge for O&M c. No service from LGA

d. Other ( )

E6. (If "c") How much money will household pay as an initial contribution?

a. about N100 b. about N200 c. about N300 d. about N400

e. about N500 f. over N500 g. None h. don't know

i. donate (labor, material, etc)

E7. (If "c") How often will each household pay the water cost (O&M)?

a. Monthly b. weekly c. When boreholes brake

d. Other ( )

E8. (If "c") How much money will each household pay regularly for Water cost (O&M) per month?

a. about N20 b. about N30 c. about N40 d. about N50

e. about N60 f. about N100 g. over N100 h. None

i. don't know j. donate (labor, material, etc)

E9. (If "d") Why will you not have VWESC?

a. No money to contribute b. No interest c. Former efforts

d. Government responsibility e. Other ( )

E10. (If money will be/is collected regularly) Who does/will collect the money for VWESC?

a. Village Chairman b. VWESC leader c. Accouter of VWESC

d. Other ( )

E11. (If money will be/is collected regularly) Who does/will keep the money for VWESC?

a. Village Chairman b. VWESC leader c. Accouter of VWESC

d. Other ( )

E12. Does/Did the village receive service of O&M or Sanitation/hygiene Education?

a. Yes b. No

E13. (If "Yes") Who did/does support to Village?

a. LGA b. State Government c. NGO d. Other ( )

F. Questions about Others

F1. Do you have projects by other donor or NGO?

a. Yes b. No

F2. (If "Yes") What kind of project?

a. Water supply & Sanitation b. Education c. Health

d. Infrastructure (Ex. Road construct) e. Other ( )

F3. (If "Yes") Who is operation the project?

a. UNICEF b. NGO ( ) c. Other ( )

Household Survey to village residents

Village No._____ Village name_____ LGA_____

Enumerator _____ Respondent _____ Age _____

Sex: 1. Female 2. Male

A : Basic Questions

A1. Household Composition (number):

Total _____ / Male ( ), Female ( ) / Boys ( ), Girls ( )

A2. What kind of problems does your family have?

a. Water & Sanitation b. Low Income c. Education d. Health care

e. Other ( )

A3. How are you getting income mainly by?

a. Agriculture b. Livestock c. Fishery d. Sale other item

e. Labor work f. Other ( )

A4. How much of average income can you get?

N _____ /month

A5. How much products do you sell per year for income?

Agricultural products :

a-1. Yam (_____ /year) a-2. Maize (_____ /year)

a-3. Beans (_____ /year) a-4. Other : (_____ /year)

Livestock products :

b-1. Chicken (_____ /year) b-2. Cow (_____ /year)

b-3. Goat (_____ /year) b-4. Other : (_____ /year)

Fishery products :

c-1. Fresh water fish (_____ /year) c-2. Other: (_____ /year)

Main sales Item :

d-1. Charcoal (_____ /year) d-2. Other: (_____ /year)

A6. How much does your family spend per month?

Average: N _____ /month

A7. How much does your family spend for ;

a. Food: N _____ /month

b. Clothes: N _____ /month

c. Water-related issues/matters (O&M, Buy Water, Jelly can, etc) N _____ /month

d. Sanitation and hygiene-related issues/matters (latrine construction, etc) N _____ /month

e. Health-related issues/matters (medicine, hospital, etc) N _____ /month

A8. Where does your family buy necessities?

a. Rural Market b. City Market c. Peddler d. Other ( )

A9. What kind of Water & Sanitation problem does the village have?

(Circle (○) the ones that apply. Worst 3 problems)

a. Water source is too far

b. Little water in dry season

c. Little water at the souse even in rainy season

d. Water quality is bad → d-1. Smell d-2. Color d-3. Taste d-4. Other ( )

e. Too many people use the same water resource

f. Poor water drainage

g. Be broken/stolen Hand pump

h. Many children are usually sick → (Ex. : _____)

i. Many adults are usually sick → (Ex. : _____)

j. Latrines: None/Too few

k. Not clean clothes

l. Not clean water-drawing containers

m. Not clean house/compounds

n. Other ( )

B. Questions about Health Condition

B1. What kind of diseases did your family have for the last one year?

a. Cholera b. Guinea worm c. Malaria d. Diarrhea e. Typhoid

f. Dysentery g. Other ( )

B2. What are the causes of the disease?

a. Dirty water b. Irregular weather c. Bad people d. Unsanitary food

e. Other ( )

B3. How did you cure the diseases?

a. Self treatment b. Local doctor c. Mosque/Church d. Hospital

e. No treatment f. Other ( )

B4. How can you prevent diseases?

a. Clean water b. Good sanitary condition c. Good medicine

d. Other ( )

B5. Where should the patients be treated?

a. Hospital b. Mosque/Church c. Local clinic d. Traditional treatment

e. Specialist of water-born diseases f. Other ( )

C. Questions about Water Supply

C1. What is a main drinking water source in rainy season?

a. Borehole b. Dug Well c. Pond d. Stream/River

e. Rain Water f. Other ( )

C2. How far is a main water source from your house in rainy season?

a. 200m b. 500m c. 1000m d. 1500m e. 2000m

f. Over 2000m

C3. How is the water quality of main source in rainy season?

a. Good b. OK c. Bad → 1. Water amount 2. Color 3. Smell 4. Taste

C4. What is the main drinking water source in dry season?

a. Borehole b. Dug Well c. Pond d. Stream/River

e. Rain Water f. Other ( )

C5. How far is the main water source from your house in dry season?

a. 200m b. 500m c. 1000m d. 1500m e. 2000m

f. Over 2000m

C6. How is the water quality of main resource in the dry season?

a. Good b. OK c. Bad → 1. Water amount 2. Color 3. Smell 4. Taste

C7. Who usually does fetching water for your family?

a. Males b. Female c. Boys d. Girls e. Share by Family

f. Other ( )

C8. How many liters of water do your family use per day?

a. less than 40 l b. below 80 l c. below 120 l d. below 200 l

e. below 300 l f. over 300 l

C9. What kind of facility do you use to carry the water from water source?

a. Jelly cans b. Plastic Bucket/Bowl c. Clay pot d. Calabash

e. Iron Pail f. Other ( )

C10. What kind of facility do you use to store the water?

a. Drum b. Plastic Container c. Clay Pot d. Clay pots fitted with taps

e. Buckets fitted with taps f. Calabash g. Other ( )

C11. How do you treat the water before drinking?

a. Boil b. No treat c. Other ( )

C12. How many times do you clean the water fetching facility?

a. Every day b. few times per week c. few times per month

d. never e. Other ( )

D. Questions about Water & Sanitation/Hygiene

D1. Do you have latrine in your house?

a. Yes b. No

D2. What type of latrine are you using?

a. Traditional Pit Latrine

b. Improved Traditional Pit Latrine

c. Ventilated Improved Pit Latrine

d. Other ( )

D3. How does your family dispose of the excreta from the facilities?

a. Bush b. Stream/River c. Pit latrine d. Gutter

e. Court yard/House surrounding f. Other ( )

D4. Do you wash your hands after using latrine?

a. Yes b. No

D5. What do you use to clean your hands after using the latrine?

a. Water only b. Water & leaves c. Paper & leaves

d. Water with soap e. Other ( )

D6. How many times do you usually clean your latrine?

a. Every day b. Few times per week c. Few times per month

d. Never e. Other ( )

D7. Would you be willing to build a public latrine?

a. Yes b. No

D8. (If yes) How much would you contribute?

a. less than N100 b. less than N200

c. less than N300 d. less than N400

e. less than N500 f. over N500

D9. (If No) Why would you not support a public latrine?

a. No money to contribute

b. No interest

c. Former efforts

d. Government responsibility

e. Other ( )

D10. Do you wash your hands before eating?

a. Yes b. No

E. Questions about Public Participation

E1. Did/Does your village have VWESC (Village Water & Sanitation Environment Committee)?

a. Yes, It was organized in (When _____) and still exists.

b. Yes, It was organized in (When _____) but dose not exist now.

c. No, but it will be organized in (When _____).

d. No, it will not be organized.

E2. (If "a") How much money do you pay as an initial contribution?

a. about N100 b. about N200 c. about N300 d. about N400

e. about N500 f. over N500 g. None h. don't know

i. donate (labor, material, etc)

E3. (If "a") Did/Do you pay money regularly for O&M?

a. Yes b. No

E4. (If "Yes") How much money did/do you pay regularly for Water cost (O&M) per month?

a. about N20 b. about N30 c. about N40 d. about N50 e. about N60

f. about N100 g. over N100 h. None i. don't know

j. donate (labor, material, etc)

E5. (If "b") Why do you think VWESC does not exist?

a. No money to O&M b. No knowledge for O&M c. No service from LGA

d. Other ( )

E6. (If "c") How much money will you pay as an initial contribution?

a. about N100 b. about N200 c. about N300 d. about N400

e. about N500 f. over N500 g. None h. don't know

i. donate (labor, material, etc)

E7. (If "c") How much money will you pay regularly for Water cost (O&M) per month?

a. about N20 b. about N30 c. about N40 d. about N50 e. about N60

f. about N100 g. over N100 h. None i. don't know

j. donate (labor, material, etc)

E8. (If "c") How often will you pay the water cost (O&M)?

a. Monthly b. weekly c. When boreholes brake

d. Other ( )

E9.(If "d") Why do you think you will not need VWESC ?

a. No money to contribute b. No interest c. Former efforts

d. Government responsibility e. Other ( )

E10. (If money will be/is collected regularly) Who does/will collect the money for VWESC?

a. Village Chairman b. VWESC leader c. Accouter of VWESC

d. Other ( )

E11. (If money will be/is collected regularly) Who does/will keep the money for VWESC?

a. Village Chairman b. VWESC leader c. Accouter of VWESC

d. Other ( )

E12. Does/Did the village receive service of O&M or Sanitation / hygiene Education?

a. Yes b. No

E13. (If “Yes”) Who did/does support to Village?

a. LGA b. State Government c. NGO d. Other ( )

F. Questions about Other

(Answer only women)

F1. How many times do you spend doing housework?

a. Less than 2 hrs. b. Less than 3 hrs. c. Less than 4 hrs. d. Less than 5 hrs. e. Over 5 hrs.

F2. How often do you wash your family clothes in a week?

a. Every day b. 5 times c. 4 times d. 3 times e. 3 times f. once a week

F3. How many times do you spend doing washing clothes?

a. Less than 1 hrs. b. Less than 2 hrs. c. Less than 3 hrs. d. Less than 4 hrs. e. Over 4 hrs.

(Answer only by men)

F4. Do you help in housework?

a. Yes b. No

F5. (If “Yes”) What kind of housework?

a. Repair house b. Fetching Water c. Other ( )

添付資料 2

Revised Village List

No.	ID/ No		LGA	Village	Population in 1991	Requested No.	Social Cond. Rank
	Revised	Original					
1	A-1	A-1	BADE	Dala	527	1	C
2	A-2	A-3	BADE	Azbak	2,822	1	B
3	A-3	A-5	BADE	Usur	644	1	B
4	A-4	A-6	BADE	Ngelbuwa	763	1	B
5	B-1	B-1	BURSARI	Jawa	679	1	B
6	B-2	B-2	BURSARI	Illela Garun Dole	1,096	1	B
7	B-3	B-3	BURSARI	Danga Kanamma	612	1	B
8	B-4	B-4	BURSARI	Harunari	519	1	B
9	B-5	B-5	BURSARI	Bururu	359	1	B
10	B-6	B-6	BURSARI	Mala Wango Fulatari	890	1	B
11	B-7	B-7	BURSARI	Bayamari	2,168	1	A
12	B-8	B-8	BURSARI	Koromari	958	1	B
13	B-9	O-5	BURSARI	Bonegaral	373	1	B
14	C-1	C-1	DAMATURU	Maisandari	4,000	1	B
15	C-2	C-2	DAMATURU	Dikumari	1,500	1	B
16	C-3	C-3	DAMATURU	Maduri	970	1	B
17	C-4	C-4	DAMATURU	Mallam Matari	543	1	B
18	D-1	D-1	FIKA	Tadangara	4,500	1	B
19	D-2	D-2	FIKA	Sabon Fegi Fika	536	1	A
20	D-3	D-3	FIKA	Fusami	2,065	1	B
21	D-4	D-4	FIKA	Garin Balde	1,351	1	B
22	D-5	D-5	FIKA	Gurjaje	655	1	B
23	D-6	D-6	FIKA	Yaba-Ngalda	1,425	1	B
24	D-7	D-7	FIKA	Garin Chindo	2,760	1	A
25	E-1	E-1	FUNE	Jajere (SG)	523	1	B
26	E-2	E-2	FUNE	Ngelshengele	545	1	C
27	E-3	E-3	FUNE	Dumbulwa	557	1	C
28	E-4	E-4	FUNE	Nyakire	1,261	1	B
29	F-1	F-1	KARASUWA	Bukarti	2,700	1	B
30	F-2	F-2	KARASUWA	Askinari & otheres	688	1	A
31	F-3	F-3	KARASUWA	Garin Gawo	456	1	B
32	F-4	F-4	KARASUWA	Gasma	906	1	A
33	F-5	F-5	KARASUWA	Karasuwa Galu B	374	1	B
34	F-6	F-6	KARASUWA	Karasuwa Garin Guna	1,568	1	B
35	F-7	H-1	KARASUWA	Dogon Jeji	512	1	B
36	F-8	H-4	KARASUWA	Wachakal 'B'	1,315	1	B
37	G-1	G-1	MACHINA	Tauna	575	1	B
38	G-2	G-2	MACHINA	Taganama	1,100	1	B
39	G-3	G-3	MACHINA	Damai	1,387	1	A
40	G-4	G-4	MACHINA	Majeri	683	1	B
41	G-5	G-5	MACHINA	Bogo	1,901	1	A
42	H-1	H-2	NGURU	Yamdugo	881	1	B
43	H-2	H-5	NGURU	Dumsai	554	1	B
44	H-3	H-6	NGURU	Bambori	2,106	1	B
45	H-4	H-7	NGURU	Maja Kura	602	1	B
46	I-1	I-1	NANGERE	Garin Gada	876	1	A
47	I-2	I-2	NANGERE	Garin Baba	898	1	A
48	I-3	I-3	NANGERE	Dawasa	4,120	1	B
49	I-4	I-4	NANGERE	Gamarum	1,236	1	A
50	I-5	I-5	NANGERE	Duddaye B	396	1	B

No.	ID/ No		LGA	Village	Population in 1991	Requested No.	Social Cond. Rank
	Revised	Original					
51	J-1	J-1	POTISKUM	Adaya	1,112	1	A
52	J-2	J-2	POTISKUM	Mazagane	520	1	A
53	J-3	J-3	POTISKUM	Mamudo	2,399	1	B
54	J-4	J-4	POTISKUM	Lai-Lai	1,350	1	A
55	J-5	J-5	POTISKUM	Lakwaya	415	1	B
56	J-6	J-6	POTISKUM	Dumbulwa	732	1	A
57	K-1	K-1	GEIDAM	Kawari Lawanti	504	1	B
58	K-2	K-2	GEIDAM	Dajina	330	1	B
59	K-3	K-3	GEIDAM	Damakarwa	1,200	1	B
60	K-4	K-4	GEIDAM	Kelluri	2,692	1	A
61	K-5	K-5	GEIDAM	Nguluri	385	1	B
62	K-6	K-6	GEIDAM	Borko	370	1	B
63	K-7	K-7	GEIDAM	Ajiri	275	1	A
64	L-1	M-2	GULANI	Tetteba	2,945	1	B
65	L-2	L-2	GULANI	Sollari	526	1	B
66	L-3	L-3	GULANI	Chandam	872	1	A
67	L-4	L-4	GULANI	Badago/Badigore	721	1	B
68	L-5	L-5	GULANI	Bagardo	427	1	B
69	M-1	M-1	GUJBA	Katarko	2,535	1	B
70	M-2	L-1	GUJBA	Daddawel	1,162	1	B
71	M-3	M-3	GUJBA	Horanyiwa	914	1	B
72	M-4	M-4	GUJBA	Ligdir	671	1	B
73	M-5	M-5	GUJBA	Kukuwa	2,172	1	B
74	N-1	N-1	JAKUSKO	Yin	776	1	A
75	N-2	N-2	JAKUSKO	Adiya	842	1	B
76	N-3	N-3	JAKUSKO	Kajuwa	1,425	1	B
77	N-4	N-4	JAKUSKO	Jammel	1,692	1	A
78	N-5	N-5	JAKUSKO	Tajuwa	824	1	A
79	N-6	A-2	JAKUSKO	Tasga	572	1	B
80	N-7	A-4	JAKUSKO	Jabba	1,990	1	B
81	O-1	O-1	TARMUWA	Dabalam	385	1	B
82	O-2	O-2	TARMUWA	Koriyel	1,137	1	B
83	O-3	O-3	TARMUWA	Dumbari	296	1	A
84	O-4	O-4	TARMUWA	Manda-da'a	445	1	B
85	P-1	P-1	YUSUFARI	Mayori West	615	1	B
86	P-2	P-2	YUSUFARI	Mayori East	2,008	1	B
87	P-3	P-3	YUSUFARI	Shetimari (Abbagari &	475	1	A
88	P-4	P-4	YUSUFARI	Tulo-tulowa	3,166	1	A
89	P-5	P-5	YUSUFARI	Bulakura	895	1	B
90	P-6	P-6	YUSUFARI	Kaluwa	521	1	B
91	P-7	P-7	YUSUFARI	Garin Tsangai	1,438	1	B
92	P-8	H-3	YUSUFARI	Maidashi	4,370	1	B
93	Q-1	Q-1	YUNUSARI	Bula Moduye	583	1	B
94	Q-2	Q-2	YUNUSARI	Kalgi	974	1	A
95	Q-3	Q-3	YUNUSARI	Toshia	1,584	1	A
96	Q-4	Q-4	YUNUSARI	Dalari	360	1	B
97	Q-5	Q-5	YUNUSARI	Buhari	287	1	B
98	Q-6	Q-6	YUNUSARI	Bultuwa	234	1	B
99	Q-7	Q-7	YUNUSARI	Ngormadi	320	1	A
100	Q-8	Q-8	YUNUSARI	Bulabulin	1,139	1	A

A: Higher evaluation points (12 to 15), B: High evaluation points (8 to 11), C: Satisfied evaluation points (5 to 7)