

Chapter 2 Contents of the Project

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2-1 Basic Concept of the Project

(1) The National and State Targets and the Project Objectives

The Government of Nigeria established the national plan in “Vision 2010”. Based on this Vision, “National Water Supply and Sanitation Policy” was formulated by FMWR. Through these plans, Nigeria aims to achieve 100% full coverage of water supply rate by the year 2011. Moreover, “Plan of Borehole Facility Construction” was made by Oyo State. It is noted that the current water supply rate of the rural areas in Oyo state is 4.28% and average water supply amounts to only 3.6 liters/person/day. In these areas, the people walk for several hundred meters to unsanitary water resources such as hollow ponds. In order to obtain safer water, they need to travel to neighboring communities for several kilometers. Therefore, the Project targets to improve water supply in the rural areas of Oyo State and contribute to the achievement of the above-mentioned national and state targets through the assistance for procurement of equipment and construction of borehole facilities by the Nigerian side.

The specific objectives of the Project are set as follows:

The water supply rate in Oyo state shall be raised from 4.28 to 5.31%*.

*Note: Serviced population by the Project = 360 persons/site × 100 sites = 36,000 persons

Current water service population = 150,000 persons

water supply rate = $(150,000 + 36,000) \div 3,500,000 = 0.0531$

The drilling capability of Oyo State Water and Sanitation Project (hereinafter referred to as “WATSAN”) employees shall be improved. Accordingly, sustainable operation and maintenance of equipment will be achieved.

The public education system by LGA WATSAN Coordinator who is trained by the Project will be improved. At least one LGA WATSAN Coordinator from each of the 16 LGAs will be trained. Moreover, based on the community participation, operation of Village WATSAN Committees (hereinafter referred to as VWC), water charge/reserve and maintenance of borehole facilities will be strengthened.

The infection rate of Guinea worm, which is a long-standing problem in Oyo state, will be decreased.

(2) Basic Policy of the Project

In the first basic design study carried out from September to November 2001, the basic Project plan was the construction of 100 boreholes and the procurement of equipment for drilling works and ground water development. However, the second basic design study team suggested that the construction work of the Project should be executed by the Nigerian side while

technical assistance for construction work will be provided by the Japanese side for the following reasons:

- Oyo State WATSAN has sufficient experience in construction of borehole facilities, and therefore, has technical capability required for executing construction work of the Project.
- Limited Grant Aid finance will be utilized efficiently and effectively with the construction work financed and carried out by the Nigerian side.

The Nigerian side agreed with the suggestion made by the Japanese side. However, due to the restriction on the amount of their budget, the Nigerian side requested that the Japanese side procure a part of the materials necessary for the construction work. Thus, for construction materials, the Nigerian side shall procure consumable materials such as bentonite, and the Japanese side shall procure the other materials.

As a result of the discussion mentioned above, both sides confirmed that the Project will have following components: (i) procurement of equipment for groundwater development and construction materials for borehole facilities, (ii) provision of technical assistance through “soft component”. It is noted that the Nigerian side shall be responsible for the construction works.

(3) Basic Concept of the Project

1) Request for Japan’s Grant Aid

The contents of the request from Nigeria as of October 2000 are listed as follows:

Construction for boreholes
• Boreholes with hand pumps 2,000 Boreholes (226 villages)
Procurement
• Drilling rig with drilling accessories
• Mud pump with carrier
• High-pressure air comp.
• Supporting Vehicles
– 1.6 × 6 Truck with 6-ton crane
– 4 × 4 Truck with 3-ton crane
– Small truck with 1-ton crane
– Pick-up type light vehicle
– Station wagon type vehicle
– Water tank lorry, 7m ³
• Geo-electric equipment
• Borehole testing equipment
– Borehole logger
– Water level detector and others
– Submersible pump
– Diesel generator for pump
• Water analysis kit
• Radio telephone system
• Equipment and tools for workshop
• Hand pump
• Engine welder
• PVC casing and screen for 2000 boreholes
Methods to operate, manage, and maintain the facilities or equipment
Financial sources for management and maintenance after completion of the requested project

2) Comparison between the Requested Contents and Basic Design

The contents of the request mentioned above were discussed during field studies. The contents of four documents are compared and shown below: namely, (1) contents of the Minutes of Discussions of the first field study (hereinafter referred to as “M/D (1)”), (2) the contents of additional request after the M/D (1) for equipment, (3) the contents of the Minutes of Discussions confirmed by the second field study (hereinafter referred to as “M/D (2)”), and (4) the contents of basic design.

A. Construction of borehole facilities

Regarding the borehole facilities, the construction work shall be managed under direct control of the Nigerian side as described in [Table 2-1](#), and a part of procurement duties for borehole construction shall be borne by Nigeria.

Table 2-1 Comparison of Contents of Borehole Constructions

Request (October 5, 2001 M/D)	Basic design
The candidate sites are to be examined in terms of socio-economic aspect, ease of construction and hydrogeological conditions. A maximum of 100 construction sites will be selected starting from the top of the list and applying criteria such as number of guinea worm infection cases, etc.	In consideration of more efficient use of the Japan's Grant Aid, the construction of borehole facilities at 100 sites is to be executed by the Nigerian side. The Japanese side will provide a part of construction materials and instruct in the construction of borehole facilities.

B. Procurement

The contents of the request have been examined in terms of the existing equipment and the current organization of Oyo State WATSAN. As a result, the main items to be procured by the Project are shown in [Table 2-2](#).

Table 2-2 Comparison of Contents of the Equipment and Materials

Contents of the request	Basic design	Reason
1 . Drilling rig Drilling rig mounted on truck 2 units	2 units	It will be two units in consideration of future plans, system and ability of execution of Oyo State WATSAN, and the size of budget, etc.
Standard accessories and tools for rig 2 lots	2 lots	Same number as the drilling rig.
Grouting pump 2 units*	2 units	Necessary for grouting
2 . Compressor mounted on truck 2 units	2 units	Same number as the drilling rig.

3 . Electromagnetic survey instrument 2 units Resistivity survey instrument 2 units	1 unit 1 unit	To fulfill the shortage for one survey team. To fulfill the shortage for one survey team.
4 . Survey/research equipment - Water level indicator 4 units Water flow meters 4 units G P S 4 units Radio telephone system 4 units Pneumatic grinding machine 2 units Centralizer 4 sets Equipment for borehole pumping test 2 sets*	Borehole logging equipment 2 sets 2 units 2 units 2 units 4 units 2 units 2 sets 2 sets (Single-set is assumed to be 1 generator and 2 submersible pump)	Necessary for finding the position of aquifer. Same number as survey team Ditto Ditto One for office, three for cars Same as the drilling rig. Ditto Necessary for understanding the yield and volume of groundwater.
5 . O&M Equipment Bearing pullers 4 units Nozzle remover 4 units Pressurized steam washing machine 2 units Hydraulic trolley jack 3 units Electrically operated air compressor 1 unit Heavy duty mechanical tool box 3 sets Light duty mechanical tool box 3 sets Riveting machine 2 units	2 units 2 units for heavy, 2 units for light 1 unit 15t 2 units 1 unit Tool box for heavy and light duty 2 sets - 2 units	The number corresponding to frequency of use and O&M teams. Ditto Ditto Ditto Ditto Ditto Including above. The number corresponding to frequency of use.
6 . RUWATSAN I hand pump 100 units Maintenance kit 1,000 sets Village level operation and maintenance tool box 100 sets Standard maintenance tool box 16 sets	100 units 100 sets 100 sets 16 sets	Same as the number of the construction of borehole facilities. Ditto Ditto The number of LGA.
7 . Water quality testing kit Water quality analysis equipment 2 sets Spectrophotometer 1 unit Distillation machine 1 unit Chemical and bacteriological reagents 1 lot	- 1 unit - 1 lot	Existing equipment is used. To fulfill the shortage for one survey team. Existing equipment is used. Corresponding to the number of borehole facilities to be constructed.
8 . Vehicles 4 x 4 truck with 4-ton crane 2 units Light vehicles 4WD pick-up 3 units Water tank truck (7m ³) 2 units* Mobile work shop 2 units*	With 2.9-ton crane 2 units 3 units 8m ³ 2 units	Same as the drilling rig. Covering the shortage of existing vehicles. Necessary to transport water for mud water drilling and grouting work. Pick-up truck is used as alternative car.
9 . Spare parts Spare parts for the above items and for existing drilling rig and vehicles 1 lot	1 lot	For one year.
10 . Casing and screen 1 lot	100 sets	Same as the number of the construction of borehole facilities.

*: Additional request after M/D (1)

C. "Soft component"

Public education and the strengthening of institutional organizations for operation and maintenance of equipment shall be conducted within the “soft component” of this Project. The instructions on the borehole facility construction shall be also provided in the “soft component”. The equipment for the “soft component” are shown in [Table 2-3](#).

Table 2-3 Equipment for the “Soft Component”

Contents of the request	Basic design	Reason
1 . O & A instrument Computer machine and accessories 3 sets UPS 3 units Laser jet printer 2 units Photocopying machine 1 units	2 sets 2 units 2 units 1 unit	The number corresponding to frequency of use. Ditto Ditto Ditto
2 . Information, education and communication materials Photo camera 1 unit Megaphone 4 units Public address system 4 units	- 2 units Type equipped with vehicle 2 units	Existing equipment is used. Necessary for the training activity. Ditto

3) Basic Concepts of the Project

<Inputs>

- Equipment and materials for construction work
- Equipment and materials for water supply work
- Equipment and materials for enlightenment and maintenance
- Engineers
- Cost for procurement
- Cost for “Soft Components”

<Activities>

- To support the construction of 100 boreholes with hand pumps by the Nigerian side.
- To procure equipment and materials for the construction of borehole facilities, training activity and O&M.
- “Soft Component”

<The following results will be expected by this project>

1. Borehole facilities will be constructed.
2. Necessary equipment for construction of borehole facilities will be supplied.
3. Construction cost of borehole facilities will be reduced by efficient construction process.
4. Effective and sustainable maintenance of the procured equipment will be executed.
5. The organization management ability of the Oyo State WATSAN will be strengthened.
6. In each Local Government Area (hereinafter referred to as “LGA”), the organization management ability of the LGA WATSAN Committee (hereinafter referred to as “LWC”) will be strengthened.

7. The organization management ability of the VWC in each community will be strengthened.

Project Design Matrix (PDM) for the target tasks by the Japanese side is shown in [Table 2-4](#).

Table 2-4 Project Design Matrix (PDM) for the Target Tasks by the Japanese Side

Project : The Project for rural water supply and sanitation in Oyo State

Duration : 19 months

Location : 16LGAs in Oyo state

Target Group : Residents in 16 LGAs in the rural area of Oyo State

Narrative Summary	Indicators	Means of Verification	Important Assumptions
<p>Overall goal 1.The rural water supply condition in Nigeria is improved.</p>	<p>1. The number of infection of water related diseases decreases. 2. The baby mortality rate decreases.</p>	<p>1. Morbidity rate provided by the Ministry of Health in Oyo state 2. Statistical annual report</p>	<ul style="list-style-type: none"> • There is no change in the development policy about local water supply section in Nigerian. • Other diseases such as epidemics do not increase rapidly.
<p>Program Purpose 1. The rural water supply condition in Oyo State is improved.</p>	<p>1. Serviced population is increased by 36,000 persons. 2. The rural water supply rate in Oyo state is improved from 4.28% to 5.31%. 3. Use of water supply facilities and water quality 4. Guinea worm morbidity rate decreases.</p>	<p>1. Report of Oyo State WATSAN 2. Report of Oyo State WATSAN 3. Monitor record of Oyo State WATSAN 4. Guinea worm morbidity rate of the Ministry of Health in Oyo state</p>	<ul style="list-style-type: none"> • Drastic economic change does not take place. • The population of the target area does not increase drastically.
<p>Outputs 1.Borehole facilities are constructed. 2.Necessary equipments for construction of borehole facilities are equipped. 3.Construction cost of borehole facilities is reduced by efficient construction process. 4.Effective and sustainable maintenance of the procured equipment are executed. 5.The organization management ability of the Oyo State WATSAN is strengthened. 6.The organization management ability of the LWC in each LGA is strengthened. 7.The organization management ability of the VWC in each community is strengthened.</p>	<p>1. The planned number of borehole constructions is achieved. 2. The equipment and materials of the project is procured on schedule. 3. The existing equipment is effectively used, and the number of unsuccessful boreholes and accidents decrease. 4. The repair technique of equipment is improved, and the life of equipment is extended. 5-1. Number of applications from LGA by borehole construction application system 5-2. The operation based on the manual is carried out. 5-3. The training of the Oyo State WATSAN staff is carried out. 6-1. LWC is established in target LGAs. 6-2. The activity of LWC based on the manual is carried out. 6-3. The training of the LGA WATSAN Coordinator is carried out. 7-1. The VWCs are established in the communities where the borehole is constructed. 7-2. The activity of VWC based on the manual is carried out.</p>	<p>1. Completion report of the project 2. Ditto 3. Order slip, delivery slip, operation record, management record, construction management record, safety confirmation record list, accident prevention and processing sheet 4. Maintenance record and equipment management ledger 5-1. Borehole construction application form 5-2. Activity record shown in the manuals 5-3. Training activity record 6-1. Establishment record of LWC 6-2. Activity record shown in evaluation and monitor records and other manuals by LGA. 6-3. Training activity record 7-1.Establishment record of VWC. 7-2. Activity record shown in monitor records, Contribution collection records, and other manuals by VWC</p>	<ul style="list-style-type: none"> • Continuous promotion of community water supply project by Oyo State WATSAN • There is no large-scale natural disaster.

Narrative Summary	Indicators	Means of Verification	Important Assumptions
<p>Activities</p> <p>< Construction of borehole facilities ></p> <p>1. To support the construction of 100 boreholes with hand pumps.</p> <p>< Procurement ></p> <p>2. To procure equipment and material for the construction of borehole facilities, enlightenment activity and O&M.</p> <p>< "Soft component" of construction guidance ></p> <p>3. To execute the construction operation and management guidance.</p> <p>4. To execute the guidance for borehole drilling technology.</p> <p>< "Soft component" of management for the maintenance of equipment and material ></p> <p>5. To execute the technical instruction for the repair.</p> <p>6. To execute the instruction for the maintenance and management of equipment.</p> <p>< "Soft component" of support for public education and institutional strengthening for facility operation, maintenance and management by local communities ></p> <p>7. To establish the application system for construction of borehole facilities from the community, and to document the related forms.</p> <p>8. To make a management manual for the water supply and the hygiene services by the Oyo State WATSAN.</p> <p>9. To execute the training concerning the organization management for the Oyo State WATSAN staff.</p> <p>10. To make the operation and management manual of LWC.</p> <p>11. To execute the training concerning the organization management for the LGA WATSAN Coordinator.</p> <p>12. To make the establishment and operation manual for the VWC, and to establish VWCs in the model communities.</p>	<p>Input</p> <p><u>The Japanese side</u></p> <p>Equipment :</p> <p>Equipment and materials for construction work</p> <p>Equipment and materials for water supply facilities</p> <p>Equipment and materials for enlightenment activity and O&M.</p> <p>Talent :</p> <p>Engineers</p> <p>Cost :</p> <p>Cost for procurement</p> <p>Cost for "soft components"</p>	<p><u>The Nigerian side</u></p> <p>Equipment :</p> <p>The existing equipment and materials of Oyo State WATSAN are provided for construction.</p> <p>Talent :</p> <p>Engineers, workers</p> <p>Cost :</p> <p>Equipment cost, labor cost, materials cost, cost for consumables, and project management cost</p>	<ul style="list-style-type: none"> • The trained staff continues his works in the Oyo State WATSAN. • There is no sudden rise in the cost of operation and maintenance. • Neither customs clearance nor transportation is extremely delayed. <p>Pre-conditions</p> <ul style="list-style-type: none"> • The cooperation of residents in the target area of the project can be obtained.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

- **Scope of the Japanese Assistance**

Japanese assistance consists of 2 components: (a) The procurement of the drilling rigs and the related equipment, and (b) The “soft component” for technology transfer concerning the construction of boreholes, operation and maintenance of the procured equipment and materials, and support on operation and maintenance of facilities.

The construction works are to be executed by Oyo State WATSAN. The materials for the construction excluding bentonite, early strengthening agent, fuel, lubricant and water are to be borne by the Japanese side as a procurement expense.

The “soft component” includes 3 items: (a) Guidance on the execution of construction works including progress control, quality control, etc, (b) Guidance on the maintenance and management for the procured equipment, (c) Support for public education and institutional strengthening for the facilities operation, maintenance and management by local personal.

- **Selection of site**

Based on social economic survey and the natural condition investigation, 100 communities are selected from 220 communities as priority sites for construction facilities in accordance with the execution ability of the Oyo State WATSAN.

Among these 100 communities, 20 communities are selected on the basis of the geophysical survey conducted by the Oyo State WATSAN.

(2) Policy on Natural Condition

- The rainfall pattern of the Oyo state is divided roughly into dry season from November to March and the rainy season from April to October. Average precipitation is about 1,200mm a year (based on ten-year past records of the Ibadan Airport). More than 80% of the rain falls in the rainy season. Therefore, the construction plan is to be prepared to take account of the access road deterioration in the rainy season and parallel decrease in work.
- The weathered zone of the upper basement rock is expected to be an aquifer. However, the thickness of the weathered zone changes remarkably and lacks continuity. The equipment plan is set in consideration of such geological features, and the drilling plan is made accordingly.

(3) Policy on Social Condition

- Traditional society and the community form of the YORUBA family remains and a system of inherited monarchy functions in rural society in Oyo state. The support plan for maintenance and management activity is made with due consideration to social composition and the needs of the VWC.

- Polygamy is a common family form in the community. The support plan is made with consideration of the role of women/wives in the VWC.
- The maintenance and management activity plan is made with consideration of the promotion of the participation and responsibility of residents.
- The water charge has been paid as “Contribution”. The maintenance and management activity plan is prepared by taking into the account the management of water charge fund and the method of money collection in accordance with the community population.

(4) Policy on Construction Situation, Local Contractor, and the Using of Local Equipment and Materials

- In the Oyo State WATSAN, about 600 boreholes have been constructed since 1993 by using the drilling rigs and the related equipment granted from United Nations Children’s Fund (“UNICEF”). Fig.2-1 shows the drilling performance .

The staff (engineers and skilled workers) totals 15 people. They have experience from five to eight years. Their technology understanding is comparatively high according to the current drilling performance and drilling works (rig operation, drilling method, and geological judgment, etc.).

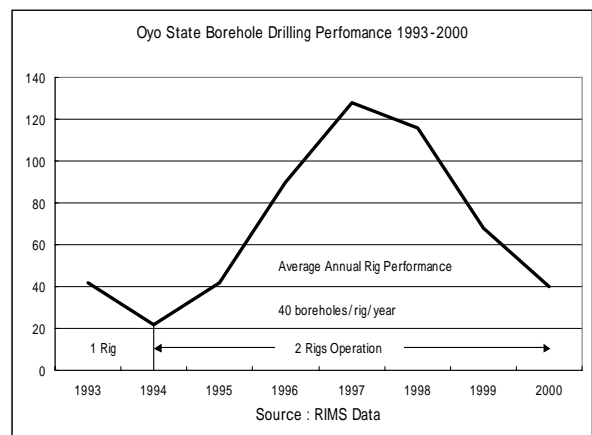


Fig.2-1 Drilling Performance

By contrast, the condition of private drilling contractors around the Oyo state including the region of this plan is generally poor: their finance ability is generally low, their drilling rigs are old-fashioned, and the number of the drilling tools and the spare parts are inadequate. Moreover, the drilling experience of engineers is scarce, and their drilling work ability is not high. Local contractors, who have sufficient finance ability, with sufficient numbers of rigs and engineers, are very few. Therefore, construction of facilities is to be executed under the responsibility of Oyo State WATSAN which has sufficient ability. A local contractor is not employed in this project.

- To secure the proper quality, materials are selected from international standard products such as BS, DIN, ISO, and ASTM, etc.
- Taking into the account after-service and maintenance, the main equipment such as rig and vehicle shall be procured from the manufactures who have agents in Nigeria and whose spare parts are easy to procure.
- Not only the procured equipment but also the existing equipment of the Oyo State WATSAN (one drilling rig and related equipment for drilling) shall be used for execution of this project.

(5) Policy on Operation and Maintenance Ability of Executing Agency

The maintenance and management ability of the Oyo State WATSAN requires improvement. Support to improve it shall be done as a “soft component” of the project. In order to improve the management ability of the Oyo State WATSAN, preparation of management and maintenance manual, the coordination between each section, sufficient public relations for LGA and communities and etc. shall be promoted.

- Technical guidance of maintenance, management and operation of the procured equipment is to be done as a “soft component” of the project.
- VWC maintains the water supply facilities with guidance from LGA and Oyo State WATSAN. The support plan for the effective organization, management method and others are prepared in order to have the guidance executed smoothly and effectively

(6) Policy on Type of Equipment

< Equipment >

- Drilling rig should be applicable for mud rotary and Down the Hole (hereinafter referred to as “DTH”) hammer drilling which is used for borehole in alluvial and hard rock formation.
- Drilling rig and compressor should be truck-mounted type in consideration of access and mobility to the site.
- The light truck and the truck with the crane should be four-wheel drive type in consideration of road conditions.
- The hand pump should be RUWATSAN 1 (VLOM Type India Mark III), which is WATSAN Standard type.

<Support to Facility Construction >

- The equipment plan, drilling method and casing program suitable for the geological conditions shall be planned with Japanese construction guidance.
- The scale of borehole facilities such as platform and drain etc, in consideration of existing facilities and influence of water pollution, shall be planned with Japanese construction guidance.

(7) Policy on Construction Method, Procurement Method and Construction Period

- Boreholes are to be drilled by the rotary and the DTH method according to the geological conditions.
- The drilling period is to be set according to the drilling experience of the Oyo State WATSAN, the decrease of access and workable days by the rainfall, etc.
- The preparation of the implementation schedule shall take into consideration the execution ability of the Oyo State WATSAN, the period for procurement and the execution period of the “soft component. ”

2-2-2 Basic Plan (Equipment Plan)

It is judged that the Oyo State WATSAN has the necessary project execution ability for the following reasons: (a) past drilling achievements, (b) the technology understanding of the drilling team is comparatively high, (c) adequate number of staff for facility construction, (d) past operation and maintenance achievements. Accordingly, **the Project** is limited to the procurement of equipment with the Nigerian side being responsible for the construction works.

(1) General Plan

<Target Communities >

220 communities chosen by priority according to a number of people who suffered from Guinea worm diseases, the total population, etc., are shown in Table 2-3. A borehole is to be constructed in one place for each community from among these 220 communities.

The Japanese side reported to the Oyo State WATSAN based on the results of geological surveys conducted twice (1st and 2nd Basic Design Study) that 80 communities were found as hopeful for developing ground water.

After receiving the report mentioned above, the Oyo State WATSAN has requested that total 100 communities should be the targets.

After the consideration, the Japanese government decided that the number of target communities will be 100.

< Unit Water Supply >

According to the population and number of boreholes in Oyo State, the unit water supply is 3.6 liter/person/day. Benefiting Population and Unit Water Supply of Federal Ministry of Water Resources National Water Supply and Sanitation Policy and of assistance agencies is shown in **Table 2-5**.

The unit water supply is set as 20 liter/person/day in this plan because the Oyo State WATSAN aims for the value set by UNICEF, and also past Japanese Grant Aid Projects used a similar value.

Table 2-5 Benefiting Population and Unit Water Supply

	Benefiting Population (persons / borehole)	Unit Water Supply (liter/person/day)
Federal Ministry of Water Resources National Water Supply and Sanitation Policy	250 ~ 500	30
UNICEF	500	20
WHO		5 ~ 25
Past Japanese Grant Aid Projects	450 ~ 500	15 ~ 20

Table 2-6 List of the Target Communities

S/N	Priority	Code of LGA	LGA	Community	Location		Population(1)	Population(2)	Number of Guinea Worm(1)	Number of Guinea Worm(2)	Criteria									
					Latitude(N)	Longitude(E)					Population	Guinea Worm	Assistance from LGA	Accessibility	Existing borehole	Hydrogeological condition	Total	Water Quality	Applicable village for construction borehole	
1	1	4	Ibarapa North	Isale -Akao	7° 40' 38"	3° 11' 5"	10,500	15,000	78	10	0	0	2	1	3	x	6	2	x	
2	2	4	Ibarapa North	Oke-Ola I	7° 40' 43"	3° 10' 43"	15,000	22,000	42	50	0	2	2	1	0	5	10	1	TD	
3	3	6	Orire	Daodu	8° 25' 21"	4° 7' 55"	2,853	700	78	30	5	2	2	1	0	5	15	1		
4	4	6	Orire	Elekulu	8° 23' 26"	4° 18' 28"	1,500	1,500	96	10	3	0	2	1	3	5	14		TD	
5	5	2	Afijio	Aba Ilorin	7° 42' 6"	3° 39' 6"	2,345	2,800	62	40	0	2	0	0	0	x	2		x	
6	6	6	Orire	Alangua	8° 25' 31"	4° 10' 22"	6,210	350	16	10	5	0	2	1	3	5	16			
7	7	4	Ibarapa North	A.U.D.(Igaagan)	7° 40' 15"	3° 11' 9"	5,500	6,000	23	20	0	1	2	1	3	5	12			
8	8	2	Afijio	Ilora	7° 48' 7"	3° 54' 3"	20,000	65,000	26	50	0	2	0	1	0	5	8	1		
9	9	4	Ibarapa North	Igitele	7° 40' 45"	3° 10' 59"	5,300	6,600	25	20	0	1	2	1	0	5	9	1		
10	10	4	Ibarapa North	Isale-Oja(Igangan)	7° 40' 53"	3° 10' 58"	10,300	11,000	17	50	0	2	2	1	0	5	10	1		
11	11	8	Iseyin	Ado-Awaye	7° 50' 8"	3° 25' 44"	10,500	25,000	14	10	0	0	2	1	0	5	8	2		
12	12	4	Ibarapa North	Oke-Ola II	7° 40' 54"	3° 10' 57"	5,000	5,500	12	10	0	0	2	1	0	5	8	2		
13	13	4	Ibarapa North	Iwafin (Ayete)	7° 32' 47"	3° 13' 24"	3,000	3,000	20	10	0	0	2	1	0	5	8	2		
14	14	4	Ibarapa North	Imofin (Ayete)	7° 32' 22"	3° 13' 13"	3,000	7,000	13	10	0	0	2	1	0	x	3	2	x	
15	15	4	Ibarapa North	Asunara	7° 39' 17"	3° 6' 50"	1,080	4,000	31	10	0	0	2	1	0	5	8	2		
16	16	8	Iseyin	Iserin	7° 46' 48"	3° 17' 44"	1,000	4,000	20	10	0	0	2	0	3	5	10			
17	17	4	Ibarapa North	Idiyan	7° 47' 47"	3° 7' 24"	2,500	3,000	9	10	0	0	2	1	3	x	6		x	
18	18	4	Ibarapa North	Gbelekale	7° 37' 4"	3° 7' 20"	1,000	1,000	20	10	3	0	2	1	3	5	14			
19	19	4	Ibarapa North	Olore	7° 43' 22"	3° 16' 36"	1,000	1,500	28	20	3	1	2	0	3	5	14			
20	20	6	Orire	Eleyele	8° 28' 52"	4° 11' 44"	1,450	250	11	20	5	1	2	1	3	x	12		TD	
21	21	13	Oyo West	Sooku	7° 53' 56"	3° 44' 39"	876	300	32	20	5	1	0	0	3	x	9		x	
22	22	6	Orire	Alaje	8° 27' 59"	4° 16' 44"	100	80	28	50	0	2	2	1	3	5	13			
23	23	6	Orire	Aheyesa	8° 28' 1"	4° 7' 12"	180	85	25	10	0	0	2	1	0	5	8			
24	24	6	Orire	Igbo-Ayin I	8° 27' 34"	4° 10' 22"	280	280	23	10	5	0	2	1	3	5	16			
25	25	6	Orire	Onilu	8° 26' 44"	4° 14' 18"	200	200	32	10	3	0	2	1	3	5	14			
26	26	6	Orire	Eleru	8° 29' 22"	4° 9' 3"	250	250	20	10	5	0	2	1	3	x	11		x	
27	27	6	Orire	Alawodi	8° 27' 16"	4° 8' 49"	700	750	12	10	5	0	2	1	0	5	13			
28	28	5	Ibarapa Central	Apata	7° 23' 39"	3° 10' 52"	300	300	44	10	5	0	2	1	3	5	16			
29	29	11	Ogo-Oluwa	Otamokun	7° 57' 29"	4° 10' 21"	1,200	5,000	11	50	0	2	0	1	0	x	3		x	
30	30	11	Ogo-Oluwa	Olorunda	7° 55' 27"	4° 11' 24"	500	3,000	18	50	0	2	0	1	3	x	6		x	
31	31	4	Ibarapa North	Akoya Ojelere	7° 44' 2"	3° 5' 56"	2,000	3,000	9	10	0	0	2	1	0	x	3	2	x	
32	32	3	Ibarapa East	Maya Ipa	7° 40' 44"	3° 23' 47"	2,000	3,500	6	10	0	0	0	1	3	5	9			
33	33	3	Ibarapa East	Maya	7° 40' 43"	3° 26' 43"	1,500	3,500	9	10	0	0	0	1	0	x	1	1	x	
34	34	4	Ibarapa North	Iwafin (Tapa)	7° 33' 56"	3° 13' 51"	3,000	3,000	6	w	0	0	2	1	0	5	8	2		
35	35	4	Ibarapa North	Ominigbo	7° 44' 51"	3° 6' 58"	2,000	3,000	7	10	0	0	2	1	0	5	8	2		
36	36	15	Suurulere	Elesinmeta	8° 7' 35"	4° 25' 47"	2,800	3,000	4	10	0	0	0	1	3	5	9			
37	37	4	Ibarapa North	Aba-Ibadan	7° 43' 36"	3° 7' 48"	1,100	1,000	8	10	3	0	2	1	0	x	6	2	TD	
38	38	4	Ibarapa North	Aba Isale	7° 43' 53"	3° 7' 28"	1,000	800	9	10	3	0	2	1	3	5	14			
39	39	4	Ibarapa North	Eleede	7° 45' 26"	3° 6' 43"	1,000	900	9	10	3	0	2	1	0	x	6		x	
40	40	6	Orire	Adafila	8° 27' 27"	4° 14' 2"	5,830	5,800	2	10	0	0	2	1	0	5	8	2		
41	41	3	Ibarapa East	Isale Togun	7° 35' 59"	3° 26' 58"	6,000	6,000	1	10	0	0	0	1	0	5	6	2		
42	42	4	Ibarapa North	Eleede Idifa	7° 34' 27"	3° 8' 16"	1,500	1,000	3	10	3	0	2	1	3	5	14			
43	43	6	Orire	Akute	8° 29' 30"	4° 11' 55"	750	860	5	10	3	0	2	1	3	x	9		x	
44	44	6	Orire	Alasapa	8° 31' 17"	4° 9' 15"	700	700	4	10	5	0	2	1	3	x	11		x	
45	45	6	Orire	Olokun	8° 21' 22"	4° 18' 33"	600	800	6	10	3	0	2	1	3	5	14		TD	
46	46	3	Ibarapa East	Alapa	7° 39' 14"	3° 32' 11"	600	2,000	6	10	3	0	0	0	0	5	8	2		
47	47	15	Suurulere	Abogunde	8° 13' 8"	4° 15' 13"	700	300	5	10	5	0	0	1	3	5	14			
48	48	6	Orire	Okonimowaro	8° 30' 18"	4° 12' 29"	550	480	3	10	5	0	2	1	3	x	11		x	
49	49	6	Orire	Omidoyin	8° 20' 49"	4° 16' 19"	308	300	15	10	5	0	2	1	3	5	16			
50	50	4	Ibarapa North	Egbeomo	7° 45' 8"	3° 11' 55"	440	800	8	10	3	0	2	1	0	5	11	2		
51	51	6	Orire	Oloya	8° 20' 51"	4° 11' 56"	750	1,000	3	10	3	0	2	1	0	5	11	2		
52	52	3	Ibarapa East	Idi-Ope	7° 25' 59"	3° 29' 45"	350	1,500	8	10	3	0	0	1	3	5	12			
53	53	4	Ibarapa North	Kolawole-Akamo	7° 32' 10"	3° 7' 36"	350	500	11	50	5	2	2	1	3	x	13		x	
54	54	4	Ibarapa North	Obape	7° 39' 56"	3° 17' 56"	N/R	3000	10	20	0	1	2	1	3	5	12			
55	55	6	Orire	Alawowo	8° 26' 31"	4° 11' 56"	300	300	N/R	50	5	2	2	1	3	5	18			
56	56	6	Orire	Sansan-Alasapa	8° 31' 29"	4° 9' 33"	369	70	7	10	0	0	2	1	3	x	6		x	
57	57	13	Oyo West	Ounto	8° 47'	3° 45' 12"	320	300	4	40	5	2	0	0	3	5	15			
58	58	6	Orire	Agabi	8° 23' 37"	4° 13' 55"	330	350	4	10	5	0	2	1	3	5	16			
59	59	4	Ibarapa North	Kajola Asipa	7° 34' 51"	3° 7' 14"	480	2,000	4	10	3	0	2	1	0	5	11	2		
60	60	3	Ibarapa East	Igbolaja	7° 39' 41"	3° 28' 51"	300	300	3	10	5	0	0	1	3	5	14			
61	61	5	Ibarapa Central	Abule-Oba	7° 28' 39"	3° 16' 55"	250	300	5	10	5	0	2	1	3	5	16			
62	62	6	Orire	Elebue	8° 21' 25"	4° 14' 55"	275	70	3	10	0	0	2	1	3	5	11			
63	63	3	Ibarapa East	Oke-Ola (Lanlate)	7° 32' 12"	3° 24' 52"	1,000	1,000	2	10	3	0	0	1	0	5	9	2		
64	64	8	Iseyin	Ajepero	7° 55'	3° 41' 39"	800	1,800	2	10	3	0	2	1	0	5	11	2		
65	65	4	Ibarapa North	Osinaga	7° 40' 1"	3° 6' 42"	125	500	17	10	5	0	2	1	3	x	11		x	
66	66	12	Atiba	Ola-opa	8° 2' 50"	3° 55' 19"	90	50	10	20	0	1	0	0	3	5	9			
67	67	6	Orire	Igbo-Ayin II	8° 27' 43"	4° 9' 58"	193	80	4	10	0	0	2	1	3	5	11			
68	68	6	Orire	Gaani	8° 28' 6"	4° 9' 29"	150	70	4	10	0	0	2	1	3	5	11			
69	69	4	Ibarapa North	Bogunde	7° 41' 9"	3° 6' 48"	600	400	2	10	5	0	2	1	3	x	11		x	
70	70	5	Ibarapa Central	Pako (Igboora)	7° 25' 40"	3° 17' 38"	4,000	6,000	1	10	0	0	2	1	0	5	8	2		

Table 2-6 List of the Target Communities

S/N	Priority	Code of LGA	LGA	Community	Location		Population(1)	Population(2)	Number of Guinea Worm(1)		Number of Guinea Worm(2)		Criteria						
					Latitude(N)	Longitude(E)			Population	Guinea Worm	Assistance from LGA	Accessibility	Existing borehole	Hydrogeological condition	Total	Water Quality	Applicable village for construction borehole		
71	71	5	Ibarapa Central	Onigbio (Idere)	7° 29' 44"	3° 14' 36"	3,000	7,000	1	10	0	0	2	1	0	5	8	2	
72	72	3	Ibarapa East	Oke-Imale I(Lanlate)	7° 35' 25"	3° 26' 54"	3,000	5,000	1	10	0	0	0	1	0	5	6	1	
73	73	15	Suurulere	Iwafin	8° 9' 41"	4° 23' 55"	1,650	700	1	10	5	0	0	1	3	5	14		
74	74	6	Orire	Kajola	8° 25' 51"	4° 16' 7"	768	900	1	10	3	0	2	1	0	5	11		
75	75	6	Orire	Onigbin	8° 28' 46"	4° 9' 36"	250	320	2	10	5	0	2	1	3	5	16		
76	76	6	Orire	Afekulu	8° 29' 57"	4° 12' 29"	263	350	2	10	5	0	2	1	0	x	8		x
77	77	4	Ibarapa North	Bello	7° 37' 18"	3° 37' 55"	250	300	2	10	5	0	2	1	3	5	16		
78	78	11	Ogo-Oluwa	Ayede	7° 58' 51"	4° 8' 15"	500	600	1	10	5	0	0	0	3	x	8		x
79	79	11	Ogo-Oluwa	Odo-Ifo	7° 58' 59"	4° 9' "	500	450	1	20	5	1	0	0	3	5	14		
80	80	8	Iseyin	Aba-Titun	7° 47' 6"	3° 40' 12"	300	750	1	10	5	0	2	1	3	5	1		
81	81	5	Ibarapa Central	Atokun	7° 27' 9"	3° 8' 21"	100	100	7	10	3	0	2	1	3	5	14		
82	82	5	Ibarapa Central	Elegun	7° 27' 38"	3° 7' 40"	100	80	7	10	0	0	2	1	3	x	6		x
83	83	3	Ibarapa East	Aborerin II	7° 38' 36"	3° 24' 11"	550	6,000	0	10	0	0	0	1	3	5	9		
84	84	14	Oyo East	Olufayo	7° 44' 14"	3° 59' "	200	2,000	2	20	3	1	2	0	3	5	14		
85	85	3	Ibarapa East	Abule-Oba	7° 30' 16"	3° 32' 2"	200	200	2	10	3	0	0	1	0	x	4		x
86	86	4	Ibarapa North	Idifa-Idere	7° 35' 3"	3° 7' 14"	700	1,500	1	10	3	0	2	1	3	x	9		TD
87	87	4	Ibarapa North	Idi-Ope	7° 46' 37"	3° 6' 52"	600	600	1	w	5	0	2	1	3	5	16		
88	88	4	Ibarapa North	Jagun-Olorunda	7° 38' 38"	3° 8' 50"	800	3,000	1	10	0	0	2	1	0	5	8	1	
89	89	3	Ibarapa East	Agbere	7° 30' 24"	3° 32' 14"	100	100	4	10	3	0	0	1	3	x	7		x
90	90	6	Orire	Iroogbadun	8° 27' 20"	4° 8' 57"	150	100	2	10	3	0	2	1	3	x	9		x
91	91	6	Orire	Ayepe Kangara	8° 24' 8"	4° 15' 13"	318	500	1	10	5	0	2	1	3	5	16		
92	92	6	Orire	Onira	8° 21' 30"	4° 14' 22"	138	150	1	10	3	0	2	1	3	5	14		
93	93	3	Ibarapa East	Opete	7° 27' 46"	3° 28' 49"	250	2,500	1	10	0	0	0	1	3	5	9		
94	94	4	Ibarapa North	Alasia	7° 37' 23"	3° 9' 2"	200	250	1	10	5	0	2	1	3	5	16		
95	95	12	Atiba	Osate	8° 8' 45"	3° 48' 33"	120	100	1	10	3	0	0	0	3	5	11		
96	96	12	Atiba	Idi-Emi	8° 7' 54"	3° 51' 8"	100	120	1	30	3	2	0	0	3	x	8		x
97	97	12	Atiba	Sangodare	8° 1' 57"	3° 55' 43"	100	80	1	30	0	2	0	0	3	5	10		
98	98	5	Ibarapa Central	Jagode	7° 23' 23"	3° 14' 11"	100	100	1	10	3	0	2	1	3	5	14		
99	99	10	Lagelu	Oteda	7° 31' 58"	4° "	100	250	1	10	5	0	0	1	3	5	14		
100	100	6	Orire	Olokoto	8° 35' 3"	4° 17' 53"	3,040	150	0	10	3	0	2	1	3	5	14		
101	101	5	Ibarapa Central	Oke-Iserin I	7° 26' 18"	3° 17' 5"	10,000	10,000	0	10	0	0	2	1	3	6			
102	102	3	Ibarapa East	Aborerin I	7° 31' 48"	3° 25' 10"	600	6,000	0	10	0	0	0	1	0	1	1		1
103	103	9	Itesiwaju	Ipapo	8° 7' 52"	3° 31' 30"	1,500	16,000	0	10	0	0	0	1	0	1	2		2
104	104	7	Oorelope	Akingbasa	8° 48' 15"	3° 42' 20"	850	150	0	50	3	2	0	1	3	9			
105	105	4	Ibarapa North	Gbagbangere	7° 35' 9"	3° 8' 5"	700	1,500	0	10	3	0	2	1	0	6	2		
106	106	16	Iwajowa	Aba-Ibadan	7° 52' 50"	3° 3' 54"	120	500	0	50	5	2	0	1	3	x	11		x
107	107	5	Ibarapa Central	Idofin (Igboora)	7° 25' 55"	3° 17' 6"	5,000	6,000	0	10	0	0	2	1	0	3	2		
108	108	5	Ibarapa Central	Ajegunle (Igboora)	7° 26' 18"	3° 16' 51"	5,000	5,000	0	10	0	0	2	1	3	6			
109	109	5	Ibarapa Central	Isale Oba (Igboora)	7° 26' 16"	3° 16' 38"	6,000	7,000	0	10	0	0	2	1	0	3	2		
110	110	5	Ibarapa Central	Koso (Idere)	7° 29' 49"	3° 14' 29"	3,000	5,000	0	10	0	0	2	1	3	5	11		
111	111	5	Ibarapa Central	Oke-Iserin II(Igboora)	7° 26' 16"	3° 17' 2"	12,000	6,000	0	10	0	0	2	1	0	3	2		
112	112	5	Ibarapa Central	Oke-Iserin III(Igboora)	7° 26' 32"	3° 17' 7"	8,000	5,000	0	10	0	0	2	1	0	3	2		
113	113	3	Ibarapa East	Anko	7° 38' 18"	3° 24' 15"	4,500	8,000	0	10	0	0	0	1	3	x	4		x
114	114	3	Ibarapa East	Isaba	7° 31' 55"	3° 25' 4"	4,000	6,000	0	10	0	0	0	1	0	1	1		
115	115	3	Ibarapa East	Isale Bale Alubata	7° 35' 43"	3° 26' 54"	2,500	4,000	0	10	0	0	0	1	0	1	2		
116	116	3	Ibarapa East	Oke-Imale II(Lanlate)	7° 35' 25"	3° 26' 54"	3,000	6,000	1	10	0	0	0	1	0	1	1		
117	117	3	Ibarapa East	Oke-Itabo (Lanlate)	7° 36' 54"	3° 27' 13"	3,000	6,000	0	10	0	0	0	1	0	1	1		
118	118	3	Ibarapa East	Oke-Otun (Lanlate)	7° 35' 33"	3° 27' 7"	4,000	5,000	0	10	0	0	0	1	0	1	2		
119	119	3	Ibarapa East	Sango	7° 32' 40"	3° 25' 36"	5,000	7,500	0	10	0	0	0	1	0	1	2		
120	120	4	Ibarapa North	Gaa Saliu	7° 40' 36"	3° 11' 4"	1,500	2,000	0	10	3	0	2	1	3	5	14		
121	121	8	Iseyin	Aba-Ibadan	7° 46' 28"	3° 40' 22"	1,200	2,800	0	10	0	0	2	1	3	6			
122	122	10	Lagelu	Idi-Iroko	7° 12' 11"	4° "	680	50	0	10	0	0	0	1	3	4			
123	123	11	Ogo-Oluwa	Igbo-Ileoje	8° 3' 30"	4° 11' 57"	600	520	0	10	5	0	0	1	3	x	9		x
124	124	12	Oyo West	Ilowagbade	7° 48' 15"	3° 46' 48"	1,235	1,500	0	40	3	2	0	0	3	8			
125	125	15	Suurulere	Baaya-Oje	8° 9' "	4° 19' 47"	2,500	3,500	0	10	0	0	0	1	3	4			
126	126	15	Suurulere	Iresaapa	7° 55' 15"	4° 20' 48"	5,000	5,000	0	10	0	0	0	1	3	4			
127	127	15	Suurulere	Olooye	8° 9' "	4° 20' 36"	700	200	0	10	3	0	0	1	3	7			
128	128	15	Suurulere	Olowosoke	8° 28' 27"	4° 9' 7"	1,050	800	0	10	3	0	0	0	3	5	11		
129	129	16	Iwajowa	Elekokan	7° 50' 40"	3° 13' 11"	3,025	700	0	10	5	0	0	1	3	9			
130	130	16	Iwajowa	Idiko-Ago	7° 59' 22"	3° 3' 59"	3,250	4,000	0	10	0	0	0	1	3	x	4		x
131	131	16	Iwajowa	Iganna	7° 58' 20"	3° 14' 10"	5,900	15,000	0	10	0	0	0	0	0	0	2		
132	132	3	Ibarapa East	Akeete	7° 38' 54"	3° 26' 52"	300	500	0	10	5	0	0	1	0	6	1		
133	133	3	Ibarapa East	Ayinde	7° 30' "	3° 28' 29"	400	450	0	10	5	0	0	1	3	5	14		
134	134	3	Ibarapa East	Ijeun	7° 39' 38"	3° 26' 51"	180	200	0	10	3	0	0	1	0	4	1		
135	135	3	Ibarapa East	Olawore	7° 30' 7"	3° 29' 29"	200	500	0	10	5	0	0	1	3	5	14		
136	136	3	Ibarapa East	Oloponda	7° 38' 54"	3° 27' 33"	120	120	0	10	3	0	0	1	3	7			
137	137	3	Ibarapa East	Oloro	7° 29' 33"	3° 50' 45"	80	100	0	10	3	0	0	1	3	7			
138	138	5	Ibarapa Central	Abomo	7° 28' 35"	3° 5' 43"	100	100	0	10	3	0	2	1	3	9			
139	139	5	Ibarapa Central	Alaraba	7° 28' 14"	3° 9' 39"	100	150	0	10	3	0	2	1	3	5	14		
140	140	5	Ibarapa Central	Araromi Idere	7° 29' 32"	3° 14' 57"	110	250	0	10	5	0	2	1	0	8			

Table 2-6 List of the Target Communities

S/N	Priority	Code of LGA	LGA	Community	Location		Population(1)	Population(2)	Number of Guinea Worm(1)	Number of Guinea Worm(2)	Criteria							
					Latitude(N)	Longitude(E)					Population	Guinea Worm	Assistance from LGA	Accessibility	Existing borehole	Hydrogeological condition	Total	Water Quality
141	141	5	Ibarapa Central	Baba-Ode	7° 28' 49"	3° 17' 46"	80	100	0	10	3	0	2	1	3	9		
142	142	5	Ibarapa Central	Balogun	7° 33' 52"	3° 18' 57"	100	300	0	10	5	0	2	0	0	7	2	
143	143	5	Ibarapa Central	Gaa Abukele	7° 30' 23"	3° 15' 23"	120	120	0	w	0	0	2	1	3	6		
144	144	5	Ibarapa Central	Gaa Balogun	7° 24' 50"	3° 18' 15"	64	60	0	w	0	0	2	1	3	6		
145	145	5	Ibarapa Central	Iyaororan	7° 27' 2"	3° 14' 14"	60	150	0	10	3	0	2	1	3	9		
146	146	4	Ibarapa North	Alagbaa	7° 35' 5"	3° 7' 12"	800	1,000	0	20	3	1	2	1	3	5	15	
147	147	5	Ibarapa Central	Oba-Okegbodun	7° 29' 26"	3° 16' 54"	85	90	0	10	0	0	2	1	0	3		
148	148	5	Ibarapa Central	Oba-Orile	7° 45' 38"	3° 17' 15"	110	200	0	10	3	0	2	1	3	9		
149	149	5	Ibarapa Central	Odo-Eye	7° 34' 18"	3° 17' 33"	165	200	0	10	3	0	2	1	3	9		
150	150	5	Ibarapa Central	Olowolayemo	7° 32' 28"	3° 12' 40"	130	200	0	10	3	0	2	1	0	6	2	
151	151	5	Ibarapa Central	Sangote	7° 31' 30"	3° 10' 24"	200	300	0	10	5	0	2	0	3	5	15	
152	152	5	Ibarapa Central	Sabalaju	7° 34' 18"	3° 20' 9"	180	200	0	10	3	0	2	1	3	9		
153	153	5	Ibarapa Central	Tobalogbo	7° 31' 57"	3° 16' 53"	160	1,200	0	10	3	0	2	1	0	6	2	
154	154	5	Ibarapa Central	Tuturu	7° 31' 30"	3° 10' 24"	100	400	0	10	5	0	2	1	3	5	16	
155	155	4	Ibarapa North	Abidioki	7° 48' 6"	3° 12' 24"	495	1,100	0	10	3	0	2	1	0	6	2	
156	156	4	Ibarapa North	Araromi Alagba	7° 32' 22"	3° 7' 36"	80	300	5	40	5	2	2	1	3	x	13	x
157	157	4	Ibarapa North	Ahoro	7° 35' 53"	3° 16' 51"	100	300	0	10	5	0	2	1	3	11		
158	158	4	Ibarapa North	Alafia	7° 35' 53"	3° 8' 29"	200	320	0	10	5	0	2	1	0	8	2	
159	159	4	Ibarapa North	Apodun	7° 36' 44"	3° 7' 26"	85	70	0	20	0	1	2	1	3	7		
160	160	4	Ibarapa North	Araromi	7° 36' 39"	3° 7' 41"	80	100	0	10	3	0	2	1	3	9		
161	161	4	Ibarapa North	Dagbere	7° 35' 12"	3° 5' 42"	230	300	0	10	5	0	2	1	3	11		
162	162	4	Ibarapa North	Okebi	7° 35' 49"	3° 9' 21"	240	500	0	10	5	0	2	1	0	8	2	
163	163	4	Ibarapa North	Onile	7° 36' 40"	3° 10' 25"	150	120	0	10	3	0	2	1	3	9		
164	164	4	Ibarapa North	Osaero	7° 37' 35"	3° 13' 12"	110	80	0	10	0	0	2	1	3	6		
165	165	4	Ibarapa North	Sando	7° 37' 46"	3° 1' 16"	100	120	0	10	3	0	2	1	3	9		
166	166	4	Ibarapa North	Temidire Alalade	7° 34' 36"	3° 6' 44"	250	1,000	0	10	3	0	2	1	3	x	9	x
167	167	8	Iseyin	Aba-Agba	7° 44' 36"	3° 31' 33"	300	850	0	10	3	0	2	1	0	6	2	
168	168	8	Iseyin	Apenpe	7° 48' 10"	3° 41' 39"	550	1,500	0	10	3	0	2	1	0	6	2	
169	169	8	Iseyin	Finijo	7° 52' 21"	3° 33' 54"	300	650	0	10	5	0	2	1	0	8	2	
170	170	8	Iseyin	Sagboile	7° 50' 24"	3° 33' 45"	500	1,200	0	10	3	0	2	1	0	6	2	
171	171	8	Iseyin	Idi-Ori	7° 45' 47"	3° 17' 41"	350	800	0	10	3	0	2	1	3	5	14	
172	172	8	Iseyin	Iseyin Area	8° 1' 25"	3° 41' 20"	2000	2000	0	10	3	0	2	1	0	6	1	
173	173	11	Ogo-Oluwa	Temidire Ayinde	7° 52' 6"	4° 12' 24"	60	80	1	10	0	0	0	0	3	3		
174	174	7	Oorelope	Onipako	8° 53' 18"	3° 43' 53"	640	50	0	50	0	2	0	0	3	5		
175	175	6	Orire	Gbemi	8° 28' 39"	4° 13' 59"	1,710	1,700	0	10	3	0	2	1	0	6	2	
176	176	6	Orire	Tuwure	8° 19' 8"	4° 12' 55"	1,500	2,500	0	10	0	0	2	1	0	3	2	
177	177	6	Orire	Elerukanfila	8° 29' 22"	4° 13' 31"	1,050	400	0	10	5	0	2	1	0	8	2	
178	178	6	Orire	Baba-Eko	8° 31' 8"	4° 11' 57"	870	250	0	10	5	0	2	1	0	8	2	
179	179	6	Orire	Egbejoda	8° 12' 30"	4° 8' 14"	824	350	0	10	5	0	2	1	3	5	16	
180	180	6	Orire	Oniki	8° 30' 50"	4° 14' 36"	810	700	0	10	5	0	2	1	0	8	2	
181	181	6	Orire	Onikoko	8° 22' 55"	4° 10' 14"	730	700	0	10	5	0	2	1	0	8	1	
182	182	6	Orire	Agbadasaka	8° 23' 8"	4° 14' 54"	258	250	0	10	5	0	2	1	0	8	2	
183	183	6	Orire	Alapa	8° 13' 14"	4° 6' 25"	342	340	0	10	5	0	2	1	3	11		
184	184	6	Orire	Alapete	8° 28' 54"	4° 12' 45"	200	200	0	10	3	0	2	1	3	9		
185	185	6	Orire	Aribaba	8° 28' 4"	4° 18' 20"	300	300	0	10	5	0	2	1	3	11		
186	186	6	Orire	Budo-Odeolagbon	8° 36' 21"	4° 9' 25"	486	350	0	10	5	0	2	1	3	11		
187	187	6	Orire	Ideji-Okebe	8° 23' 30"	4° 11' 58"	204	220	0	10	3	0	2	1	3	9		
188	188	6	Orire	Igbo-Eleru	8° 23' 6"	4° 10' 36"	384	250	0	10	5	0	2	1	3	11		
189	189	6	Orire	Itamerin	8° 26' 12"	4° 17' 30"	228	320	0	10	5	0	2	1	3	11		
190	190	6	Orire	Kanbi	8° 24' 6"	4° 8' 45"	485	470	0	10	5	0	2	1	0	8	2	
191	191	6	Orire	Oke-Igba Alafia II	8° 25' "	4° 15' 59"	96	100	0	10	3	0	2	0	3	8		
192	192	1	Akinyele	Ileba	7° 38' 52"	3° 57' 32"	120	500	0	10	5	0	2	1	3	11		
193	193	1	Akinyele	Oyetaju	7° 36' 43"	3° 54' 31"	100	200	0	50	3	2	2	1	3	11		
194	194	6	Orire	Olugbodi	8° 15' 13"	4° 7' 51"	150	150	0	10	3	0	2	1	3	9		
195	195	6	Orire	Onikeke	8° 19' 13"	4° 7' 51"	444	500	0	10	5	0	2	1	0	8	2	
196	196	12	Atiba	Latula	8° 25' 57"	3° 48' 59"	345	400	0	20	5	1	0	0	3	9		
197	197	12	Atiba	Osuamo-(Kosoamo)	8° 15' 47"	3° 50' 3"	440	1,000	0	30	3	2	0	1	3	9		
198	198	13	Oyo West	Aketa	7° 53' 40"	3° 51' 12"	142	100	0	20	3	1	0	0	3	7		
199	199	13	Oyo West	Enuoroba	7° 50' 58"	3° 51' 17"	80	50	9	20	0	1	0	0	3	4		
200	200	15	Suurulere	Adudu	8° 55' 22"	4° 25' 32"	270	250	0	10	5	0	0	1	3	9		
201	201	15	Suurulere	Alakopo	8° 5' 36"	4° 20' 55"	150	250	0	10	5	0	0	1	3	9		
202	202	15	Suurulere	Alayin	8° 9' 36"	4° 23' 26"	260	200	0	10	3	0	0	1	3	7		
203	203	15	Suurulere	Atapa	8° 4' 6"	4° 25' 15"	160	500	0	10	5	0	0	1	3	9		
204	204	15	Suurulere	Idi Ose	8° 1' 18"	4° 17' 51"	200	300	0	10	5	0	0	1	3	9		
205	205	15	Suurulere	Ilenla Ifa	8° 5' 36"	4° 20' 55"	216	130	0	10	3	0	0	1	3	7		
206	206	15	Suurulere	Keewo	8° 9' 12"	4° 21' 35"	350	500	0	10	5	0	0	1	3	9		
207	207	15	Suurulere	Lekewogbe	8° 1' 7"	4° 22' 51"	200	100	0	10	3	0	0	0	3	6		
208	208	15	Suurulere	Odanbon I	8° 2' 11"	4° 26' 1"	210	300	0	10	5	0	0	0	3	8		
209	209	15	Suurulere	Onilu	8° 3' 58"	4° 19' 4"	80	90	0	10	0	0	0	0	3	3		
210	210	15	Suurulere	Opadoyin	8° 9' 11"	4° 26' 34"	200	300	0	10	5	0	0	1	3	9		

Table 2-6 List of the Target Communities

S/N	Priority	Code of LGA	LGA	Community	Location		Population(1)	Population(2)	Number of Guinea Worm(1)	Number of Guinea Worm(2)	Criteria						Water Quality	Applicable village for construction borehole	
					Latitude(N)	Longitude(E)					Population	Guinea Worm	Assistance from LGA	Accessibility	Existing borehole	Hydrogeological condition			Total
211	211	15	Suurulere	Saki	8° 6' 17"	4° 24' 7"	350	300	0	10	5	0	0	1	3	9			
212	212	15	Suurulere	Sekengbede	8° 6' 58"	4° 22' 22"	132	350	0	10	5	0	0	1	3	9			
213	213	16	Iwajowa	Ayetro-Ile	7° 59' 32"	3° 5' "	320	500	0	10	5	0	0	1	3	9			
214	214	16	Iwajowa	Obelu	7° 52' 53"	3° 4' "	130	300	0	10	5	0	0	0	3	8			
215	215	16	Iwajowa	Olopele	7° 53' 10"	3° 5' 21"	150	250	0	10	5	0	0	1	3	9			
216	216	16	Iwajowa	Sambeleke	7° 53' "	3° 5' 10"	80	150	0	10	3	0	0	1	3	7			
217	217	16	Iwajowa	Tudi	7° 51' 25"	3° 11' 20"	560	3,000	0	10	0	0	0	1	3	4			
218	218	2	Afijio	Aba-Kuti	7° 48' 45"	3° 45' 52"	60	50	2	10	0	0	0	0	3	3			
219	219	2	Afijio	Jagun	7° 53' 38"	3° 48' 57"	50	60	2	20	0	1	0	0	0	1			
220	220	14	Oyo East	Bago	7° 52' 45"	3° 55' 22"	60	40	1	20	0	1	2	0	3	6			
Notes (1) List of request									Marks									Marks	
(2) Socioeconomic survey									Population: 250 ~ 750persons									5	
									100 ~ 249persons or 751 ~ 2,000persons									3	
									<100 or >2001persons									0	
									Assistance from LGA: good									2	
									bad									0	
									Guineaworm: More than 30 persons									2	
									10 ~ 30persons									1	
									Less than 10 persons									0	
									Accessibility: No problem									1	
									Problem									0	
<u>Evaluation of Criteria</u>									Population									250-750persons is the most suitable for O&M of hand pump	
									Assistance from LGA									Activity of LGA WATSAN Committee, budget of water supply, awareness of LGA Governor	
									Guinea worm									More than 30 persons is high	
									Accessibility									Accessibility in rainy and dry seasons	
									Existing borehole									Non existing borehole is high priority	
									Hydrogeological condition									Level of Ground water development potential	
									Water quality									Basic factor for drinking water	
									Construction borehole									High ground water development potential	
									Existing Borehole									none	
									Hydrogeological Condition									High	
									Water quality									good	
									Ground water development potential									high	
									Test drilling:									TD	
																		low	
																		X	

Breakdown of Number of Communities

LGA	Number of Community		LGA	Number of Community	
	Requested	Confirmed		Requested	Confirmed
Akinyele	2	2	Itesiwaju	1	1
Afijio	4	4	Lagelu	2	2
Ibarapa East	26	26	Ogo-oluwa	6	6
Ibarapa North	45	45	Atiba	6	7
Ibarapa Central	30	30	Oyo East	2	2
Orire	49	49	Oyo West	5	4
Oorelope	2	2	Surulere	20	20
Iseyin	11	11	Iwajowa	9	9
			Total	220	220

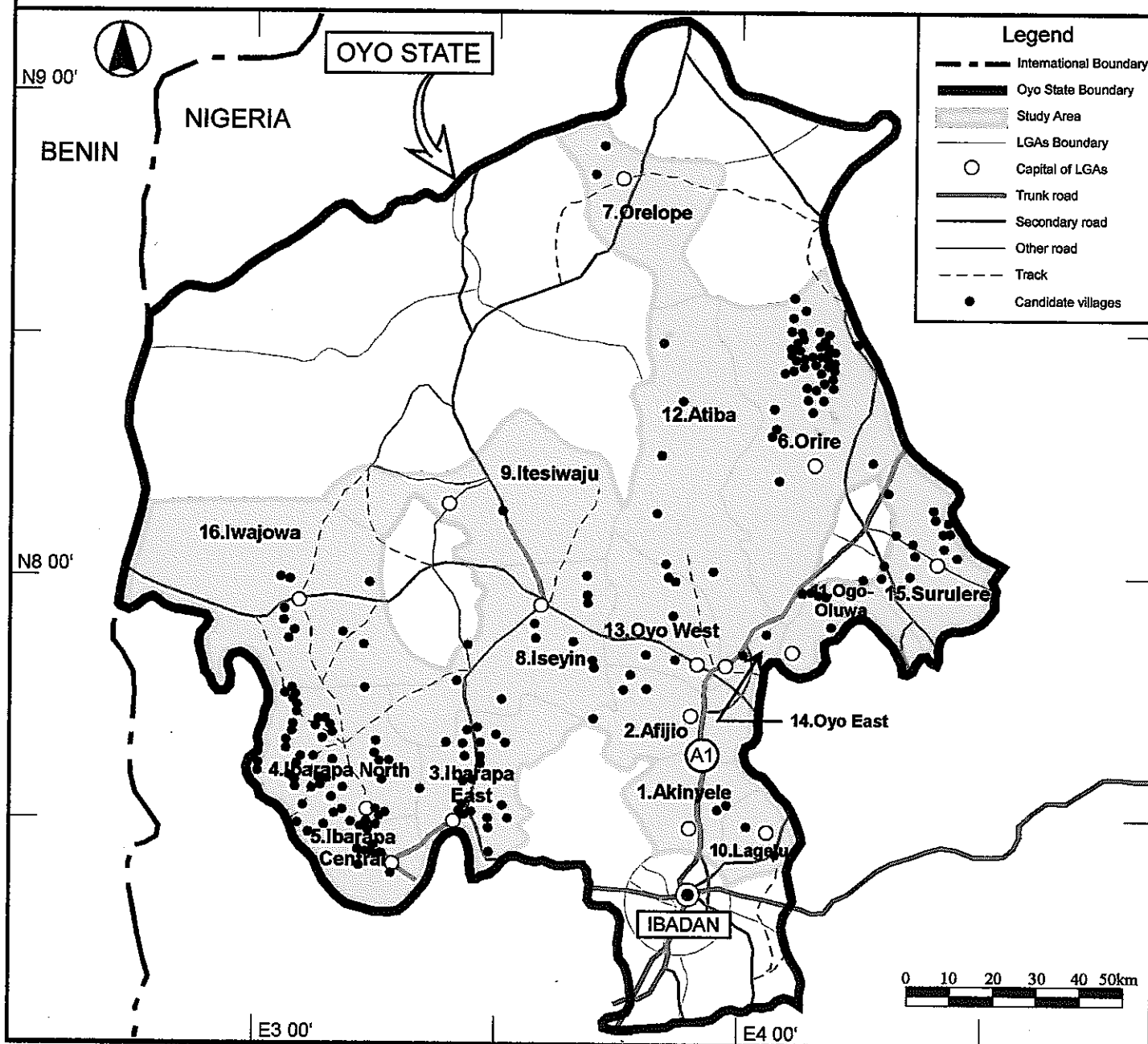


Fig.2-2 Location of Candidate Communities

<Operation Hours of Hand Pump and Benefiting Population>

In populous communities, the operation hours of the hand pump is about 15 hours. It has been used for 12 hours on average. In this project, operation hours is set at 10 hours according to the present condition of use and maintenance management of hand pumps.

When the operation hours is set at 10 hours/day and capacity of a hand pump is 12 liter/min, the benefiting population per a hand pump is calculated as follows:.

$$12 \text{ liter/min.} \times 10 \text{ hours} = 7,200 \text{ liter/day}$$
$$7,200 \text{ liter/day} / 20 \text{ liter/person/day} = 360 \text{ persons}$$

< Selection of the target communities>

Social economic survey was executed in 220 communities. Among these 220 communities, in accordance with the priority given by Oyo State WATSAN, geophysical survey was executed in 117 communities and water quality test executed in 100 communities.

The target communities are selected by criteria such as: (a)water supply population, (b)Guinea-Worm disease, (c) existing boreholes, (d)access to the communities, (e) support of LGA to the communities, (f) ground water development potential , (g)water quality. The list of the target communities is shown in [Table 2-6](#).

<Examination of water resources>

Target water resource is ground water which is recharged by rainfall.

When unit water supply is 20 liter/person/day and benefiting population is 360 persons per borehole, total water supply required in 100 boreholes is calculated below.

$$20 \text{ liter/person/day} \times 360 \text{ person} \times 100 \text{ boreholes} = 720 \text{ m}^3 / \text{day} \text{ (} 262,800 \text{ m}^3 / \text{year).....}$$

The annual rainfall of Oyo state is 1,200mm, area of Oyo state is 27,140km². So, annual total rainfall is calculated below.

$$27,140 \text{ km}^2 \times 0.0012 \text{ km/year} = 32.57 \text{ km}^3 / \text{year} \text{ (} 3.257 \times 10^{10} \text{ m}^3 / \text{year)}$$

In general, recharge of ground water excluding evaporation is from 1 to 30 % of annual rainfall and for Oyo State recharge of ground water is assumed as 1 %.

Annual recharge of ground water is,

$$3.257 \times 10^{10} \text{ m}^3 / \text{year} \times 0.01 = 3.257 \times 10^8 \text{ m}^3 / \text{year}.....$$

Annual total rainfall () is sufficiently higher than the ground water abstraction rate required ().

Based on these premises, there will be no problem in terms of the recharge of ground water.

<Water Quality of Raw Water>

According to water quality test, Nitrate nitrogen content (NO₃, from 61 to 120mg/liter) in existing 18 boreholes of Ibarapa North, Ibaraoa East, Orire and Iseyin, is over WATSAN Standard (45mg/liter). This is due to insufficient drainage which causes the inflow of spilt water into

boreholes. It is considered that this can be prevented if sufficient drainage is installed.

Also, Iron content (from 1.3 to 3mg/liter) in 8 boreholes (existing boreholes and test boreholes) of Ibarapa East and North is over WATSAN Standard (1.0mg/liter). However, it is said that this value of 0.4 ~ 1mg/kg Body weight/day will not be harmful for health (WHO). The metal taste is noticed by iron content of more than 1 mg/ liter, but can be reduced by boiling or leaving it standing for a while.

Manganese (from a test borehole in Ibarapa North) is from 0.15 to 0.25mg/liter against the standard of 0.1mg/liter. There may be some stain on clothes washed by water having manganese of more than 0.1mg/liter. However, for drinking water, 0.5mg/liter is the temporary standard of WHO.

Accordingly, in the project, raw water is used directly as potable water without treatment. The water quality in this region is generally good. However, considering the particularity of water quality in each area, water quality shall be confirmed by water quality test on raw water during construction stage.

<Facility Construction>

Facility construction is conducted by Oyo State WATSAN. Design criteria and construction method are as follows.

- The Platform is based on the WATSAN Standard. Finishing of boreholes is done by casing, because non-casing may cause the problem of the pump filling up with collapsed soil.
- The length of drainage for boreholes is 6m for prevention of water pollution.
- In many existing boreholes, water intake is from the weathered zone. In this plan also, the borehole drilling is to be made in this weathered zone. Average drilling depth of boreholes is 50m. However, actual depth will depend on factors such as thickness of weathered zone, the drop of water level due to pumping, water reserving effect and sand accumulation in casing.
- Casing program is decided by lithology, water level and borehole logging.
- Concerning the drilling diameter, at the locations where work casing is required, a diameter of more than 12-1/4" will be used and, for further depths, 8-5/8" will be used. The 6" casing and screen are used for finishing of borehole. The gravel packs are used for protection of clogging of screen.
- Gap between drilling wall and screen in upper part of borehole is sealed by grout to prevent water pollution.
- Soakage pit is installed for infiltration of waste water. The structure is based on WATSAN Standard. A soakage is 1 by 1 by 1 meter.
- The fence should be set up by the community so that domestic animals, etc. will not enter the borehole facilities.
- These construction methods will follow the guidance in the "Soft Component" plan.

<Success Rate>

Among six test drillings, three boreholes were successful. Two of unsuccessful boreholes were at points that were regarded as the fissure zones such as cracks and the crushing zone in the bedrock. Three boreholes out of four that were intended for the weathered zone succeeded (in the calculation, success rate is 75%). Therefore, the ground water development targets the weathered zones; fissure zones should be excluded. Based on these premise, it is judged that the success rate of 75% or more can be secured although the sample number of the test drillings is small.

However, according to drilling for which Oyo State WATSAN has drilled 627 boreholes, the success rate is 91%.

Accordingly, the success rate in the Project is fixed as 90 %. The quantity of construction materials such as casing, gravel for gravel pack, mud water admixture and form will be decided by this rate.

(2) Equipment Plan

1) Equipment and Material

Equipment and material include 9 items: (a) equipment for drilling works (drilling rig, tools, accessory and compressor), (b) Geophysical survey equipment (electromagnetic and electric resistivity), (c) survey equipment and instruments (GPS, radio telecommunication instrument, pumping test instrument, and borehole logging equipment), (d) Operation and maintenance equipment (repair equipment for workshop), (e) hand pump and tools, (f) reagent and apparatus for water analysis, (g) vehicles, (h) construction materials, (i) drilling tools for Oyo State WATSAN's existing rig.

Equipment and materials are planned in accordance with the requirements, kind of existing equipment, quantity, present condition and use plan. Flow chart for selection of equipment for drilling works is shown as Fig.2-3.

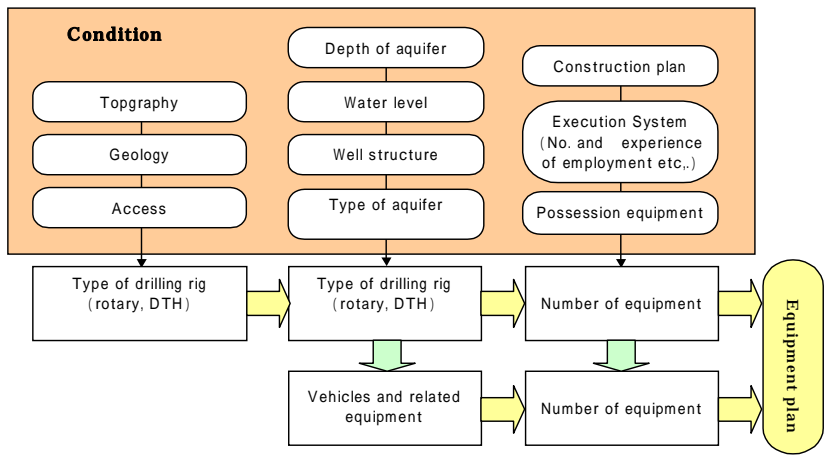


Fig. 2-3 Flow Chart of Selection

Equipment Plan is shown in [Table 2-7](#).

Table 2-7 Procured Equipment and Materials

No	Equipment	Main Specification and Component	Quantity	Unit
1	Drilling Equipment			
1 - 1	Drilling Rig	Drilling methos : DTH / Mud rotary drilling, Max. drilling depth in plan : 100m, Max. drilling diameter: 12-1/4"~8-5/8", Truck : 4x4(P.T.O)	2	units
1 - 2	Drilling Tools and Accessories	Drilling Strings, DTH hammer, Casing pipes, etc.	2	sets
1 - 3	Drilling Tools	Drilling bits, DTH hammers for 30 boreholes	2	sets
1 - 4	Grouting Pump	Discharge volume : 23liter/min, Hopper capacity: 200 liter	2	units
1 - 5	Grouting Mixer	Volume : 200liter×2tanks	2	units
1 - 6	Air Compressor	: High pressure (Truck mounted) Air volume : 30.0m ³ /min, Pressure : 2.01MPa (20.5kgf/cm ²) : Truck Diesel, Load cap. : 7ton, Drive : 4×4	2	units
2	Geophysical survey Equipment			
2 - 1	Electromagnetic Survey Equipmen	Frequency : 100Hz : Survey Dpth 100m, including analysis software	1	unit
2 - 2	Resistivity Survey Equipment	Survey depth : 100m Including analysis software	1	unit
3	Survey Equipment			
3 - 1	Water Level Detector	Survey depth : 100m, Detecting type : Buzzer	2	units
3 - 2	Triangular Weir	JIS Standard, Notch : 0.07 m , Dimension : 900×600×600 mm	2	units
3 - 3	GPS	Measuring items : Latitude, Longitude, Alutitude, Tolerance 15RMS,	2	units
3 - 4-1	Radio Telecommunication Equipment(Basecamp)	HFRadio, Frequency Range : 3.0~30MHz Communication distance : 150Km	1	unit
3 - 4-2	Radio Telecommunication Equipment(mobile)	HFRadio, Frequency Range : 3.0~30MHz Communication distance : 150Km	3	units
3 - 5	Borehole logging Equipment	Measuring items : SP, Gamma, Resistivity	2	units
3 - 6-1	Submersible Pump	Capacity : 50liter/min. 80m depth for 6" casing pipe	2	units
3 - 6-2	Submersible Pump	Capacity : 100liter/min. 80m depth for 6" casing pipe	2	units
3 - 7	Diesel Engine Generator	Diesel, 3-phase, Not less than 8.5kW	2	units
4	Operation and Maintenance Equipment			
4 - 1	Bearing Puller	for general vehicles, Pulling Cap. 17ton	2	units
4 - 2-1	Nozzle and injection Puller	for Large size	2	units
4 - 2-2	Nozzle and injection Puller	for Small size	2	units
4 - 3	Car Washer (Pressurized steam washing machine)	Applicable Hot (steam) and Cold water, Discharge volume : 600liter/hr, Pressure : 7MPa (70kgf/cm ²)	1	unit
4 - 4	Hydraulic Garage Jack	Removable type, capacity : 15ton	2	units
4 - 5	Air compressor	Discharge volume : 250liter/min, Pressure : 0.9MPa	1	unit
4 - 6	Mechanical Tools	Operation and Maintenance Tools for vehicle	2	sets
4 - 7	Riveting Machine	Revet Diameter : 2.4, 3.2, 4.0, 4.8mm, including each revets	2	sets
5	Hand pump and tools			
5 - 1	Hand Pump	Type : VLOM Type India Mark , Setting depth : 40m, including connecting stainless rods and uPVC riser pipe	100	sets
5 - 2	Maintenace Kits	Spare parts for Hand Pump(5-1)	100	sets
5 - 3	Village mechanical Tools	Village level Tools for Hand Pump(5-1)	100	sets
5 - 4	LGA Maintenance Kits	LGA level Tools for Hand Pump(5-1)	16	sets
6	Water Analysis Apparatus			
6 - 1	Reagent	for existing model "DREL-2000" and 400 samples	1	lot
6 - 2	Spectrophotometer	Ultraviolet type (equivalent with HACH2000)	1	unit
7	Vehicles			
7 - 1	Pick up Car	Diesel Engine, Water cooled, Double cabins, 4×4drive	3	units
7 - 2	Cargo Truck with Crane	Diesel Engine, Water Cooled, Road Cap. : 5.5t, Crane Cap. : 2.9t, 4×4Drive, : Length 6.2m	2	units

Table 2-7 Procured Equipment and Materials

No	Equipment	Main Specification and Component	Quantity	Unit
7 - 3	Water Tanker	Diesel Engine, Water cooled, Tank Cap.: 8,000liter, 4×4drive	2	units
8	Borehole construction Material			
8 - 1	Casing Pipe	uPVC 6", Screwed joint, Thickness: 6.0mm	3,885	m
8 - 2	Screen Pipe	uPVC 6", Screwed Joint, Thickness: 6.0mm, Slot width: 1mm	1,665	m
8 - 3	Casing Centralizer	for uPVC 6"and drilling diameter 8-5/8"	555	p.s
8 - 4	Bottom Plug	for uPVC 6"	111	p.s
8 - 5	End Cap	for uPVC 6"	111	p.s
8 - 6	Cement	Portland cement	121.9	ton
8 - 7	Fine Aggregate	for concrete	49.5	m ³
8 - 8	Coarse Aggregate	Max Dia.: 20mm	96.1	m ³
8 - 9	Re-Bar	D10mm	4.7	ton
8 - 10	Form	Steel form	3	sets
8 - 11	Cobble Stone	Dia.: 80~130mm	85.4	m ³
8 - 12	Sand	for filter of Soakage Pit	15.8	m ³
8 - 13	Brick	for filter of Soakage Pit, Dimension: 18×10×5cm	25,000	p.s
8 - 14	Gravel	for filter of Soakage Pit Dia.: 20~40mm	27.0	m ³
8 - 15	Gravel	for filter of Soakage Pit, Dia.: 50~100mm	72.0	m ³
8 - 16	Gravel	for Gravel Pack of boreholes, Dia.: 2~6mm	93.4	m ³
8 - 17	Fiber Sacks	for anti suction, Dimension: 100×50cm	400	sheets
8 - 18	Forming Agents	for DTH Hammer drilling	3,751.8	kg
8 - 19	Mud-Water Admixture	for mud rotary drilling	285.3	kg
9	Tools and Accessories for Existing Rig	for drilling of 40 boreholes such as Cross over sub., Drill collar, Bit sub.,etc.	1	sets

2) Necessity and Basis of Quantity for Equipment and Materials

Equipment for Drilling Works (1-1)

-Drilling Rig

Purpose of use: Drilling works.

Quantity:

The number of procured drilling rigs is two, for the following reasons:

- a) Oyo State WATSAN has two drilling rigs, which are superannuated. One drilling rig, which was made in 1992 and should be replaced, cannot be used due to breakdowns; it is judged that of its life can be extended only 1-2 years if it will be repaired. Moreover, the rig made in 1995 is also approaching to the year of replacement, so in the near future, both drilling rigs may be unable to be used.
- b) Oyo State WATSAN has requested two rigs to improve the water supply rate which is to be increased from 4.28 to 17.5 % in 2006. About 1,800 boreholes are needed to accomplish this.
- c) There are sufficient staff for three drilling teams in Oyo State WATSAN and they have capability and experience for drilling. Also, ten workshop staff have sufficient knowledge and capability for operation and maintenance.
- d) Up to the present, the budget has covered operation cost for 100 drillings/year with the existing 2 rigs. Based on the past budgetary expenditure, the Nigerian government will make every effort to obtain the budget for this project and its maintenance cost in the future. It is confirmed in M/D that the budget for this project will be provided by the Nigerian side.

Taking into consideration the staff organization of Oyo State WATSAN, management and maintenance and budgetary amount, it is presumed that the procurement, operation and maintenance of two rigs is possible.

In this plan, two rigs shall be procured, considering the improvement plan of water supply rate in the Oyo state.

Deposition: Water Supply Section

-Drilling Tools and Accessories (1-2)

Purpose of use: Drilling tools and accessories for 100m depth

Quantity: Two sets for the two rigs shall be procured since they are necessary for drilling works.

Deposition: Water Supply Section

-Tools (1-3)

Purpose of use: Drilling works

Quantity: Drilling works for 30 nos. of boreholes down to 50m depth.

Deposition: Water Supply Section

-Grouting Pump (1-4)

Purpose of use: Sealing between casing and boreholes wall. Oyo State WATSAN does not have the grouting pump.

Quantity: 2 pumps, one for each rig, shall be procured.

Deposition: Water Supply Section

-Grouting Mixer (1-5)

Purpose of use: Grouting mixer shall be used for agitating of material for cementing work.

Quantity: 2 mixers for 2 grouting pumps shall be procured.

Deposition: Water Supply Section

-Air Compressor (1-6)

Purpose of use: Air compressor shall be used for DTH hammer drilling.

Quantity: 2 compressors shall be procured because it is necessary to have one compressor per rig.

Deposition: Water Supply Section

Geophysical Survey Equipment

- Electromagnetic Survey Equipment (2-1)

Purpose of use: This Equipment shall be used for sounding of the aquifer in the basement rock.

Quantity: Oyo State WATSAN has 1 unit. It will not be sufficient for the future plan. There are 2 survey teams in Oyo State WATSAN, and 1 unit is to be allocated to each team; thus, 1 unit shall be procured.

Deposition: Water Supply Section

- Resistivity Survey Equipment (2-2)

Purpose of use: For geological mapping, depth to bed rock determination, localization of weathered zone clay/gravel determination.

Quantity: 1 unit shall be procured. (Same reason as (2-1))

Deposition: Water Supply Section

Survey Equipment and Instruments

-Water Level Detector (3-1)

Purpose of use: The water level detector shall be used for detecting water level during pumping test and borehole monitoring. Oyo State WATSAN does not have a water level detector

Quantity: 2 units shall be procured because it is necessary to have 2 teams for Pumping test.

Deposition: Water Supply Section

-Triangular Weir (3-2)

Purpose: The triangular weir shall be used for measuring the yield during pumping test. Oyo State WATSAN does not have a triangular weir.

Quantity: 2 units shall be procured because it is necessary to have 2 teams for Pumping test.

Deposition: Water Supply Section

-GPS (3-3)

Purpose of use: The GPS shall be used for measuring and recording the latitude, longitude and altitude of borehole and geophysical survey points. Oyo State WATSAN does not have a GPS.

Quantity: 2 units shall be procured because there are 2 survey teams in Oyo State WATSAN.

Deposition: Water Supply Section

- Radio Telecommunication Instruments (3-4)

Purpose of use: This system shall be used for communication between the base camp and mobile camp. It is about 150km or more from office to site, moreover, telecommunication conditions in Nigeria are bad, so it is difficult to communicate between base camp and sites. The efficiency of work can be increased by this system.

Quantity: Based on the number of working teams (3 for mobile and 1 for base camp), a total of 4 units shall be procured.

Deposition: 1 unit for administration section (office), 3 units shall be used in common for the sections.

-Borehole Logging Equipment (3-5)

Purpose of use: This equipment shall be used for confirming the location of aquifer and the placement of strainer installation. Oyo State WATSAN does not have this equipment. Oyo State WATSAN has decided the casing program based on their experience; therefore, the placement of strainer may be unsuitable. This equipment is necessary for borehole logging test.

Quantity: 2 units shall be procured based on the number of drilling teams. 2 units are shared among 3 drilling teams.

Deposition: Water Supply Section

-Pumping Test Instruments (3-6)

Purpose of use: The pumping test shall be conducted for confirming the yield capacity of boreholes. The successful and unsuccessful boreholes shall be judged by pumping test. Oyo State WATSAN does not have pumping test instruments.

Quantity: Necessary instruments for pumping test include submersible motor pump and diesel engine generator. The two kinds of submersible pumps (50liter/min and 100liter/min) shall be provided for detailed examination. For two pumping test teams, four submersible motor pumps and two diesel engines shall be procured.

Deposition: Water Supply Section

Operation and Maintenance Equipment (4)

This equipment shall be used for operation and maintenance of vehicles and rigs, etc. The workshop of Oyo State WATSAN prepares the equipment for operation and maintenance of existing equipment. However, Oyo State WATSAN does not have the equipment listed below. This equipment can maintain all vehicles of Oyo State WATSAN. These equipment shall be deposited in Workshop Section.

-Bearing puller (4-1)

Purpose of use: The bearing puller shall be capable of the removal and replacement of gear, bearing, wheels and other press-fit parts for vehicles, etc.

Quantity: Two sets shall be procured for the workshop and the site.

-Nozzle and Injection Puller (4-2)

Purpose of use: This equipment shall be capable of the removal and replacement of engine nozzle and injection for vehicles, etc.

Quantity: Four sets (2 sets for large-sized and 2 sets for small-sized vehicles) shall be procured for the workshop and the site.

-Car Washer (4-3)

Purpose of use: This equipment shall be used for washing and cleaning up of vehicles.

Quantity: One unit shall be procured for the workshop.

-Hydraulic Garage Jack (4-4)

Purpose of use: This equipment shall be used for lifting up of cars, trucks for maintenance.

Quantity: Two sets shall be procured for the workshop and the site.

-Air Compressor (4-5)

Purpose of use: This equipment shall be used for filling tires and cleaning up engines or air elements, etc.

Quantity: One unit shall be procured for the workshop.

-Mechanical Tools(4-6)

Purpose of use: This equipment shall be used for repair and replacement of the spare parts, etc.

Quantity: Two sets shall be procured for the workshop and the site.

-Riveting Machine (4-7)

Purpose of use: This equipment shall be used for repair of equipment.

Quantity: Two sets shall be procured for the workshop and the site.

Hand Pump and Tools

-Hand Pump (5-1)

Purpose of use: The hand pump shall be installed in constructed boreholes of 40m depth for lifting of drinking water.

Quantity: Based on the number of boreholes for this plan, 100 sets shall be procured for 100 boreholes.

-Maintenance Kits (5-2)

Purpose of use: The maintenance kits shall be used for maintenance of hand pumps.

Quantity: 100 sets shall be procured for the supplied 100 hand pumps.

-Village Mechanical Tools (5-3)

Purpose of use: These tools shall be used for normal maintenance of hand pumps in each community.

Quantity: 100 sets shall be procured for the supplied 100 hand pumps.

-LGA Mechanical Tools (5-4)

Purpose of use: These tools shall be used for normal maintenance of hand pumps in each LGA.

Quantity: 16 sets shall be procured for 16 LGAs.

Water Analysis Apparatus

-Reagent (6-1)

Purpose of use: The reagents are for analysis of Nitrate, Nitro acid, Fluoride, Chloride, Manganese, Iron, Phosphate, Arsenic, PH, Calcium, Magnesium, Sodium, Potassium, Coliforms, and total Bacteria and provided to the Planning Section.

Quantity: Oyo State WATSAN has analyzed the quality of water with reagents that were provided by UNICEF. They are not sufficient for this plan. It is difficult to obtain these reagents because: (a) all of them are imported, (b) Oyo State WATSAN is not accustomed with importing procedures, (c) it takes long time to import, (d) if quantity of reagents is small, price is rises, etc. Therefore, reagents for each of the 100 places are prepared for this plan.

The reagents that will be necessary for utilization in the future will be obtained from UNICEF or domestic agents of importing. The analysis of water quality is done three times in each borehole; thus the amount of reagent to be prepared is about 400 according to the following calculation:

$$3 \text{ samples/borehole} \times 100 \text{ boreholes} \times 1.3 \text{ (spare)} = 390 \quad 400$$

-Spectrophotometer (6-2)

Purpose of use: The spectrophotometer for water analysis kit shall be of the simplified testing method and to cover the following test items:

Nitrate, Nitro acid, Fluoride, Chloride, Manganese, Iron, Phosphate, Arsenic, PH, Calcium, Magnesium, Sodium and Potassium

Quantity: Oyo State WATSAN has two portable water analysis instrument and one spectrophotometer. These instruments have been brought and used for analysis of the water quality in borehole sites.

In this plan, boreholes are drilled in three places simultaneously. The distance between points where boreholes are drilled is more than 100 km so that one team can only analyze one point within a single day. Moreover, it is necessary to collect water samples for water quality analysis during pumping test. Therefore, the sampling time is limited to a short period. The necessity to conduct water quality test simultaneously in the three points is very rare. In fact, pumping tests are conducted by two teams so that water quality tests are also conducted by two teams. If the water quality test is examined by only one team, it would cause delay in stages of pumping test and all schedules will be affected by delay at one part. Therefore, number of teams that analyze of water quality should be two and spectrophotometer should be also prepared two including one that is presently used in order to carry out the work efficiently for the system of three drillings. Furthermore, the period of endurance of machines for tests is generally regarded as ten years. The existing one has been already utilized for ten years and has become superannuated. If it does not work, the problem will not be able to be solved immediately. Although, it is possible to use another organization that can analyze the quality of water, it is not practical because it is very

expensive.

From the reasons mentioned above, a new machines for tests should be provided to Planning Section.

Vehicles

- Pick up Cars (7-1)

Purpose of use: The pick up cars are used for transporting workers who take part in construction of boreholes and also some people who are concerned in activities of its promotion.

Quantity: There are eight existing vehicles. One is impossible to repair. Although the others (7 vehicles) can be used (one has some trouble), the driving mileage is over 200,000 km and they have been used very roughly under hard conditions. As a result of the survey, it was observed that six of the seven vehicles have been repaired frequently and even though they are repaired, they break down again easily. Moreover, four of them were bought in 1992 and they seem to be very old and so the expense for repairing will increase. They are too old and therefore should be replaced with new ones.

Thus, there is concern that number of vehicles that cannot be used will increase in the future.

For the future plan, eleven vehicles are needed: namely, three for three drilling teams, two for two geophysical survey teams, two for two pumping test and installation of hand pump teams, one for the Sanitation Section, one for the Comm. Mob. Section, one for the Planning, Monitoring & Evaluation Section and one for the Workshop.

Drilling teams, geophysical survey teams, and pumping test and installation of hand pump teams have their own working stages individually so that at least eight vehicles should be secured. Two vehicles, which have been repaired frequently, of the seven existing ones, are to be replaced with new ones. As a conclusion, 3 vehicles should be procured in order to satisfy the present requirement of at least eight vehicles. Each team has to share vehicles by adjusting hours of use in order to cover the shortage of vehicles.

Operation and Maintenance: The Workshop has ten workers and they have maintained and managed eleven vehicles for the drilling and have comparatively good ability for repairing vehicles.

The state government is responsible for the expense of management and maintenance concerning the drilling equipment and vehicles. Since the state government attaches importance to the improvement of water supply rate in rural areas, it will secure sufficient budget for management and maintenance due to the increase of vehicles.

- Cargo Truck with Crane (7-2)

Purpose of use: Cargo Truck with Crane is for transportation of materials and tools such as casing pipe and tools for drilling.

Quantity: Two vehicles are needed (as many as drilling rigs) because of the requirement of drilling works, and provided to Water Supply Section.

- Water Tanker (7-3)

Purpose of use: The water tankers are for supplement of water for drilling works such as DTH hammer, mud drilling, grouting and the construction of borehole facilities, etc.

Quantity: The Oyo State WATSAN does not have any water tanker. Water for drilling works is bought and transported from Water Supply Corporation in state. Securing water depends on the situation of their water tankers. When the Oyo State WATSAN obtains a water tanker, it will be possible to receive water regularly and to cut expense and time wasted by securing water from the river.

The radius of the area that is planned is within 100 km and the average time which takes to transport water is 5 hours due to condition of roads. In order to secure the amount of water (15m³) that is used in a day, it is necessary to provide water routinely one or two times a day and one vehicle is needed in each section.

If three drilling rigs work, three water tankers are needed. However, in this plan, two water tankers shall be procured because using all three rigs at the same time is very short, and water for drilling works may be transported from Water Supply Corporation temporarily, or many water tanks may be prepared at drilling site and so on.

Therefore, two water tankers for 2 drilling rigs are needed and to be provided to Water Supply Section.

Construction Materials

The materials shall be used for construction of 100 boreholes. Materials, purpose of use and quantity are shown in [Table 2-8](#).

Table 2-8 Materials for construction of 100 boreholes

Material	Purpose of use	Quantity
Casing pipe (8-1) Screen (8-2) Centralizer (8-3) Bottom Plug (8-4) End cap (8-5)	Finishing of borehole	111 boreholes*
Cement (8-6)	Grouting and Construction of Platform	100 boreholes and platform
Fine aggregate (8-7) Coarse aggregate (8-8) Form (8-10) Re-bar 8-9) Cobble stone (8-11)	Construction of platform	100 platform
Sand (8-12) Brick (8-13) Gravel (8-14) Gravel (8-15)	Soakage pit	100 soakage pits
Gravel (8-16)	Gravel Pack	111 boreholes
Fiber sacks (8-17)	Soakage pit	100 Soakage pits
Forming (8-18) Mud-water admixture (8-19)	drilling	111 boreholes*

Note) * Be decided by successful rate of borehole

Tools and accessory for Existing Rig

In this plan, existing one drilling rig shall be used. However, several tools and accessories of the existing rig are not compatible with others. Moreover, some tools are insufficient for drilling of 100 boreholes. Accordingly, the tools shown in [Table 2-9](#) shall be procured.

Table 2-9 Tools and Accessories for Existing Rig

	Tool	Specification	Quantity	Reason
9- 1	Crossover subassembly	2-3/8"(B)x4-1/2"IF(P) 2-3/8"(B)x4IF(P) 2-3/8"(B)x3-1/2"IF(P)	2 pcs 2pcs 2pcs	Compatible
9-2	Drill collar	8"O.Dx4-1/2IFx6m 6-3/4"O.Dx4IFx6m 4-3/4"O.Dx3-1/2"IFx6m	1pc 1pc 1pc	Prevention of bent borehole
9-3	Bit subassembly	6"-5/8REG(B)x4-1/2"IF(B) 4-1/2"-4"/8REG(B)x4"IF(B) 3-1/2"REG(B)x3-1/2"IF(B)	1pc 1pc 1pc	Compatible
9-4	Bit stabilizer	12-1/4" with 4-1/2"IF 8-5/8" with 4-1/2"IF	2pcs 2pcs	Prevention of bent borehole
9-5	Drag bit	12-1/4" with 6-5/8"IF	2pcs	Drilling
9-6	Tri-con (Roller) bit	8-5/8" x4-1/2"REG(P) 12-1/4"x6-5/8"REG(P)	5pcs 13pcs	Reaming
9-7	DTH hammer	6"-8" 8"-10"	2pcs 2pcs	Reaming
9-8	Button bit	6-5/8" 8-5/8"	2pcs 16pcs	Drilling
9-9	Work casing	10'x5.5mx2 、 3mx2, 2mx1, 1mx1 Casing band, Casing head , Shoe, Swivel	20m 1 set	Protection of collapse of borehole

3) Specification of Major Equipment and Materials

a Equipment and materials for the borehole construction

• Drilling rig (1-1)

The specification of the drilling rig is generally decided depending on borehole structure geological features casing diameter drill pipe diameter drilling method maximum drilling depth.

Borehole structure

The structure of the well should be tube well.

Geological features

The base geological feature in the region is crystal rocks such as gneiss and schist and the weathered zone is distributed from several to about 55m in parts. Therefore the procured drilling

rig is expected to drill a wide range of geological features from soft rock to hard rock.

Casing diameter

The boreholes are constructed by Oyo State WATSAN until now with 6" casing pipes because borehole construction with 6" casing is easier than 4" ones and it is possible to deal with many troubles. Therefore, the diameter of the casing should be 6" in this project in consideration of the construction technique of Oyo State WATSAN.

Drill pipe diameter

The casing diameter of the borehole of this project is 6", therefore the drill pipe diameter should be 4-3/4".

Drilling method

The drilling method should be DTH method for hard rock and mud-drilling method for soft geological features in consideration of geological features of the borehole construction point.

Maximum drilling depth

The base geological feature in the region is crystal rocks such as gneiss and schist and the weathered zone is distributed from several to about 55m in parts. This layer is assumed to be the main object layer of underground water development in Oyo State WATSAN. There are two types: cracked unweathered rock where a part is not weathered and the weathering belt where underground water is developed. In the project area, unweathered basic rock has been exposed, and also the weathered belt is thin. In the underground water development in the future, therefore, there is a possibility that it will be necessary to target fissure water at the thin weathered zone. Oyo State WATSAN have the drilling results up to about 75m for weathered zone and fissure water in basic layers. Underground water development for shallow depths seems to be difficult in the future, and the drilling depth will need to increase. Therefore, the maximum drilling depth of the rig in this procurement plan should be 100m in consideration of the underground water development in the future intended for fissure water.

• Grouting pump (1-4)

The grouting pump ability is calculated by the following formula.

$$Q = Sv / (hr \times)$$

Q : Discharge volume of the grouting pump (liter/min)

Sv : Slurry volume per 1 borehole = 580 liter

hr : Grouting time per 1 borehole = 0.5 hour

: Coefficient = 0.85

Discharge volume of the grouting pump is shown below:

$$Q = 580 / (30\text{min} \times 0.85) = 22.7 \text{ liter/min}$$

Therefore, the grouting pump with the ability of more than 23 liter/min is selected in this project

- Air compressor mounted on separate truck (1-6)

<Air compressor>

Calculation of necessary air pressure

Necessary pressure of the air compressor is calculated by the lowest operating pressure and water head.

- Lowest operation pressure : 10.5kgf/cm²
- Water head pressure : 10kgf/cm² (maximum drilling depth: 100m)

Therefore, necessary pressure of the air compressor will be 2.01Mpa (20.5kgf/cm²[10.5+10.0]), and the high pressure type is selected.

Calculation of air supply

Air supply is calculated by the following formula.

$$V = Q/A$$

$$A = 1/4 \times \pi \times (D^2 - d^2)$$

V : Flow velocity in the space between the rod and the wall of the borehole. It is generally from 1,200 to 1,500m/min.

Q : Necessary air volume (m³/min)

A : Space area between the rod and the wall of the borehole (m²)

D : Borehole diameter (m)

d : Rod diameter (m)

In case borehole diameter = 0.2191m(8-5/8"), rod diameter = 0.12m (4-3/4"), V=1,200m/min, air supply is as follows:

$$Q = 1/4 \times \pi \times (0.2191^2 - 0.12^2) \times 1/2 \times (1,200 + 1,500) = 35.63 \text{ m}^3/\text{min}$$

The maximum air supply of the compressor of high-pressure type is about 30m³/min. Therefore, the air supply capacity of the air compressor selected in this project will be 25~30m³/min.

<Truck>

All air compressor equipment weighs (1-6) about 6.5 tons. Since it is necessary to load about two (about 500 kg) drums of fuel, therefore, the amount of loading in the truck for the air compressor will be 7 tons. The truck will be 4-wheel-drive type as it is necessary to run on unpaved roads to the site.

b. Borehole monitoring and test equipment

- Submersible pump (3-6-1 & 3-6-2)

<Pump diameter>

The pump which can be set up in the 6" uPVC pipe is selected.

<Total head>

Total head of the pump will be 80m so that the pumping test can be executed in case of maximum drilling depth of 100m.

<Rating voltage>

When the pump is selected from each maker's catalog, the rating voltage should be single phase 200V for about 1.5~2.2 kW of motor output. (In general, it is assumed that it is economically advantageous to have the rating voltage 200V when the motor output is 37 kW or less.) However, it is assumed the three-phase circuit of 400V is used as described below.

• Generator (3-7)

The rating capacity and the rating output of a generator necessary to drive submersible pump (3-6-1,2) for pumping test are examined.

<Generator capacity>

The rating capacity of the generator is calculated by the following formula in consideration of the voltage descent momentarily at the electric motor start.

$$PG = Ps \times (1/Vd - 1) \times X'd$$

PG : Sum total of load input (KVA)

Ps : Electric motor start capacity with the maximum start capacity
= $3^{0.5} \times V \times Is \times C$

V : Ratings voltage = 200V

Is : Start current = $2.2kW \times 3.6 \times 5 = 39.6$

C : Start coefficient = 1.0

Vd : Permissible voltage descent rate = 0.3

X'd : Mean value of excessive reactance and the subsequent excessive reactance of electric motor = 0.275

$$Ps = 3^{0.5} \times 200 \times 39.6 \times 1.0 = 13,717A \quad 13.72KA$$

$$PG = 13.72 \times (1/0.3 - 1) \times 0.275 = 8.79 KVA$$

<Engine output>

Engine output of the generator is calculated by the following formula.

$$Ps = KVA \times \text{Coefficient} / (G \times 0.736)$$

Ps : Engine output

KVA : Generator capacity = 8.79KVA

: Coefficient = 0.8

G : Generator efficiency =0.85

$$P_i = 8.79 \times 0.8 / (0.85 \times 0.736) = 11.24 \text{ Ps} \times 0.736 = 8.27 \text{ kW}$$

The generator which satisfies rating capacity of 9 KVA and the engine output of 8.5 kW is selected from the above-mentioned results in consideration of some surplus capacity. Moreover, the three-phase circuit with 400V of the rating voltage of the generator of this class is generally used. There are only few ones of the single phase with 200V. Therefore, the rating voltage will be a three-phase circuit with 400V in this project.

c. Supporting vehicles

<Driving form>

Driving form of the vehicle procured for this project will be a 4*4 type in consideration of running on unpaved roads and the desert zone.

<Light vehicle>

Light vehicles procured for this project are used to transport people and materials of the borehole construction to the site. Therefore pick-up trucks of double cab type are selected for the purpose. The amount of loading will be 500kg or more.

<Diesel truck with crane>

Load capacity

The loading capacity is decided contingent on transporting the main equipment necessary to dig 50m boreholes scheduled in this project, divided into two portions. Materials of casing pipes, screen pipes, hand pumps, and concrete materials, etc. are not considered as possible to transport during the borehole construction.

The weight of the main equipment necessary for constructing the borehole is as follows:.

- 4-3/4" Drill pipe		
= 27.0kg/m × 50m	=	1,350kg
- 6-3/4" Drill collar (6m × 2nos)		
= 154.0kg/m × 12m	=	1,848kg
- 8" Drill collar (6m × 2nos)		
= 224.0kg/m × 12m	=	2,688kg
- DTH Hammer bit	=	420kg
- 10" Work casing		
= 42.1kg/m × 10m	=	421kg
- Air pipe (BQ)		
= 6.0kg/m × 50m	=	300kg
- Riser pipe (4"SGP)		
= 12.2kg/m × 100m	=	1,220kg
- Grouting pump	=	400kg
- Grouting mixer	=	450kg

Total

9,097kg

Therefore, the amount of necessary load capacity becomes 4.55 5ton. Actually, tools and accessories will be transported at the same time as these main equipment. The loading capacity in the truck with the crane procured for this project will be 5.5 ton.

Size of carrier

The largest one of the above-mentioned materials is a 8" drill collar, 1,344 kg in weight, and 6m in length. It is not advisable to load these equipment and materials into the body of a usual size carrier and to transport them in consideration of the safety of the vehicle. Therefore, in this project a long size 6.2m carrier will be selected.

Crane capacity

The heaviest one of the above-mentioned equipment is a 8"drill collar, weight 1,344 kg (2,688/2). It is important that the crane has the ability to load and unload that equipment weight. Moreover, it is necessary to consider the size of the truck with the crane. The size of the crane procured for this project will be 2.9 ton or more from the above-mentioned viewpoints.

Water tank truck

The volume of water necessary to dig one borehole is:

- Mud-drilling : $1/4 \times \pi \times 0.3112^2 \times 10.00 = 0.761 \text{ m}^3$
- Washing : $1.80\text{m}^3/\text{hr} \times 3.0\text{hr} = 5.400 \text{ m}^3$
- DTH : $1.80\text{m}^3/\text{hr} \times 8\text{hr} \times 80\% \times 4\text{days} = 46.080 \text{ m}^3$
- Others : 10% of the above-mentioned total = 5.224 m³

Total 57.465 m³

Days which are required to dig are 4 and the distance from the water supply point to the site is 100km on average, with 2 round trips in a day. Therefore, the capacity of the water tank truck will be $57.5 \div 4 \div 2 = 7.2\text{m}^3$ 8,000 liters.

4) The Main Equipment and Materials Procurement Sources

The main equipment and materials are procured from the following procurement sources. Estimation from these procurement divisions is compared and the procurement price is decided.

Table 2-10 Procurement Sources of Main Equipment and Materials

Equipment and materials	Procurement source	Reason
Equipment related to borehole construction	Japan or third countries	<ul style="list-style-type: none">• It is not manufactured in Nigeria.• Procurement will be made through an agency that will take care of after-sales service.• The demand for Japanese products is high in the Oyo State WATSAN.

Survey / research equipment	Japan	<ul style="list-style-type: none"> • It is not manufactured in Nigeria. • Procurement will be made through an agency that will take care of after-sales service.
Maintenance equipment	Japan	<ul style="list-style-type: none"> • It is not manufactured in Nigeria. • The procurement can be made through an agency that has enough capability in delivery management and maintaining the quality of equipment.
Hand pump and maintenance tools	Third countries	<ul style="list-style-type: none"> • There are some imitation equipment and materials, which are manufactured in Nigeria and do not confirm to international standards. • The product of high international standard and high reliability is adopted. • Procurement will be made through an agency that will take care of after-sales service.
Support vehicle	Japan	<ul style="list-style-type: none"> • Although it is not manufactured in Nigeria, it is possible to procure it from a local dealer. • The technical staffs of the Oyo State WATSAN have a high recognition and familiarity with Japanese products. • The procurement will be made through an agency from whom the spare parts can be easily procured, and the system of after-sales service is well established.
Casing etc.	Third countries	<ul style="list-style-type: none"> • There are some imitation equipment and materials, which are manufactured in Nigeria and do not confirm to international standards. • The product of high international standard and high reliability is adopted. • Since the transportation expense is high in comparison with the cost of the product, the procurement will be made through a nearby third countries.

2-2-3 Basic Design Drawing

The standard structure of borehole, platform and soakage pit are shown in Fig. 2-4 and 2-5.

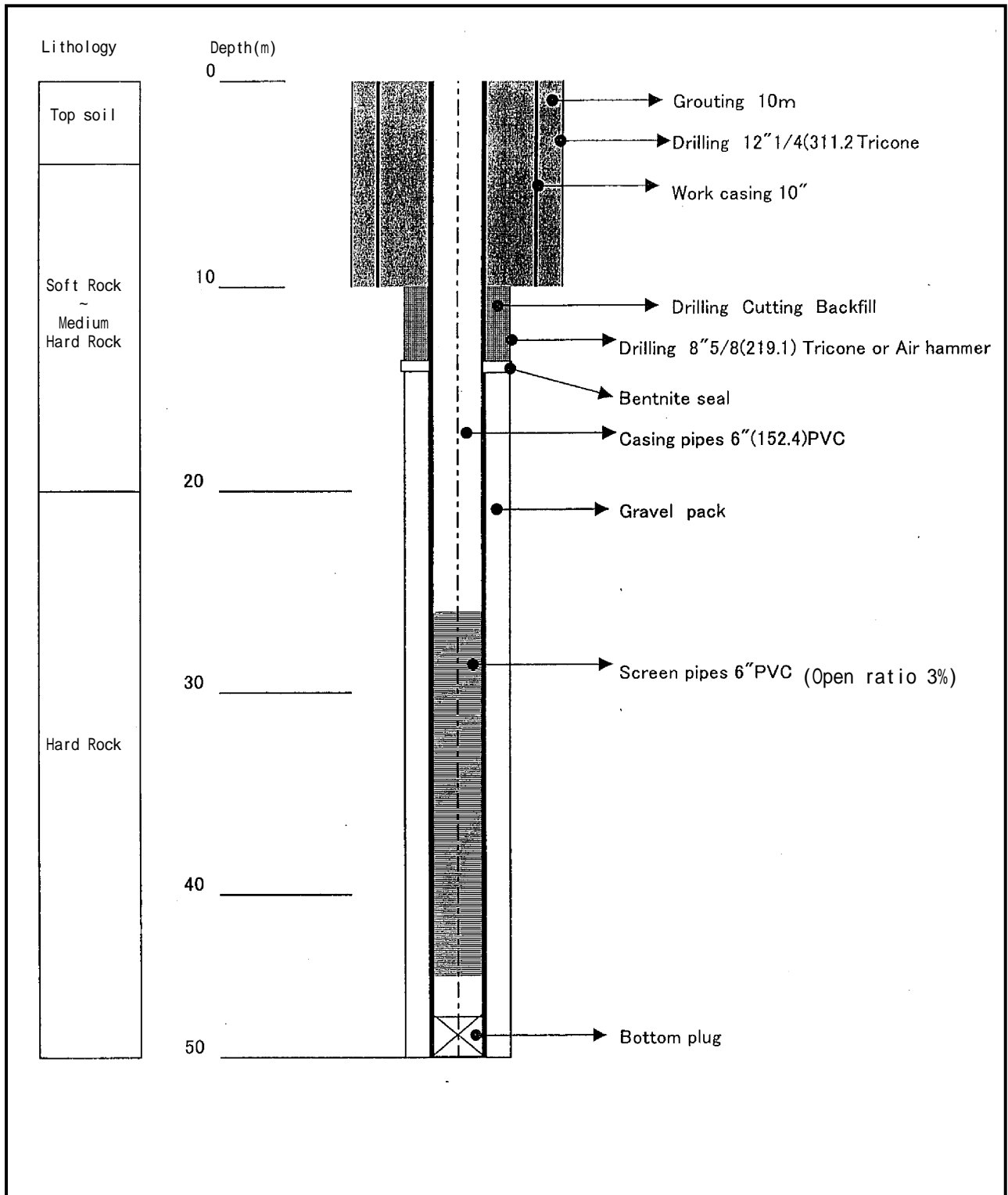


Fig. 2-4 Standard Structure of Borehole

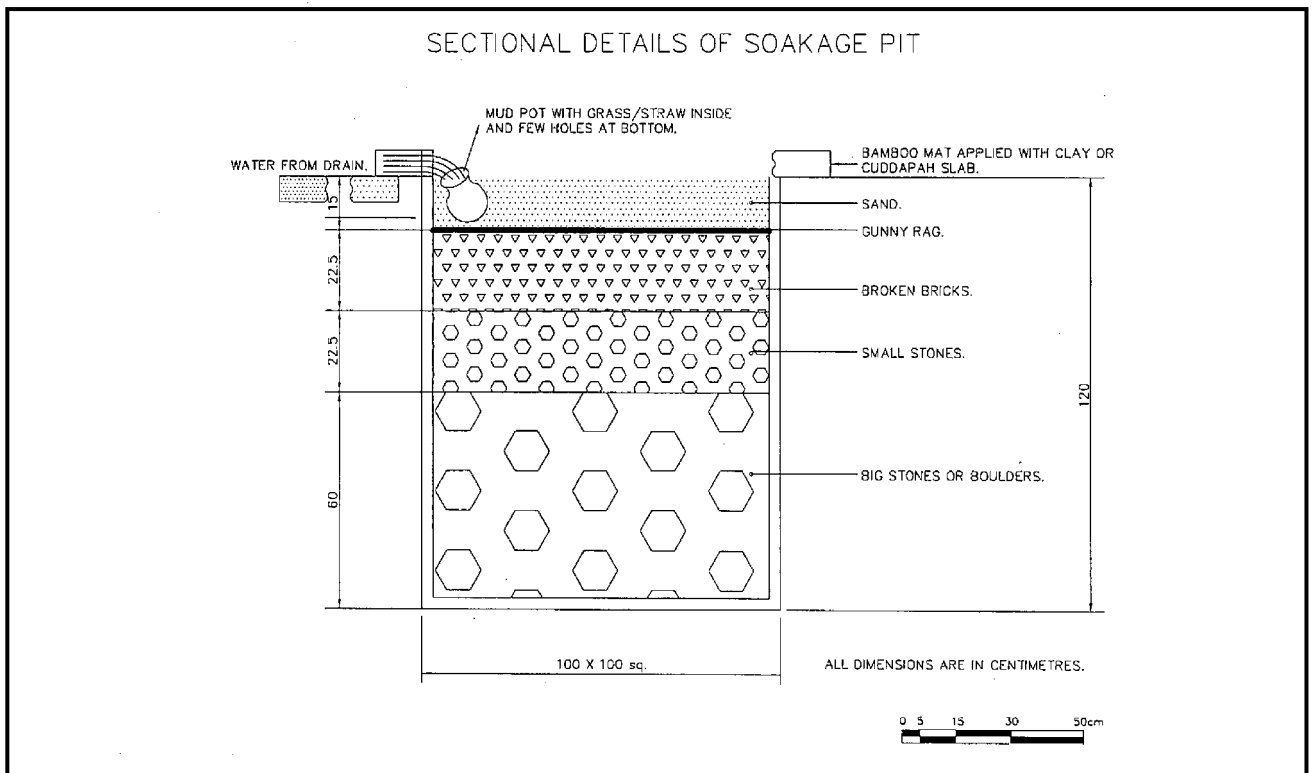
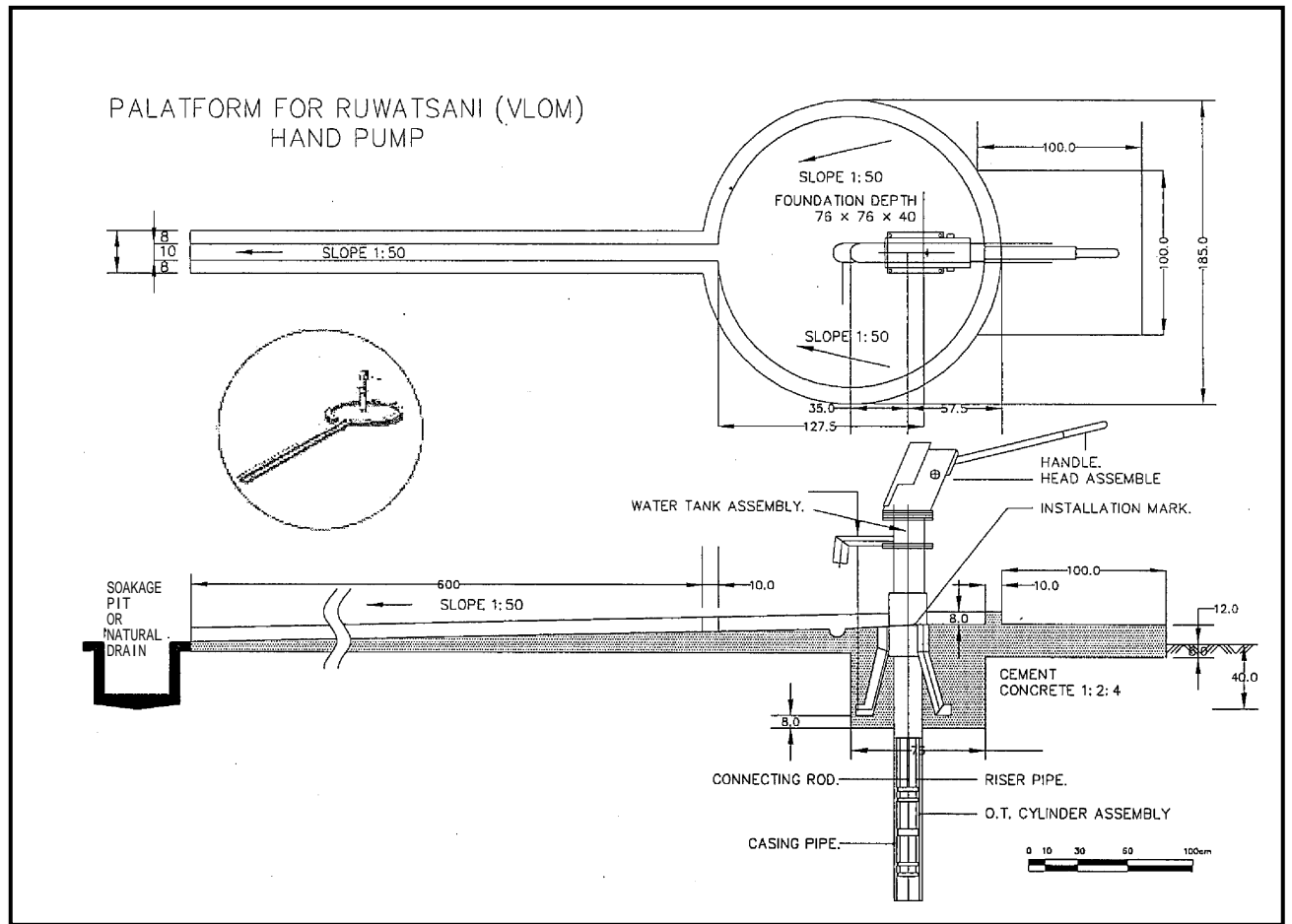


Fig.2-5 Standard Structure of Platform and Soakage Pit

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

- Timing for procurement and transportation route is matched to the implementation schedule of borehole construction.
- The selection of equipment will be made in consideration of the system of the maintenance, procurement of spare parts, consumables and the environmental conditions in which it will be used.
- The equipment which will be more suitable for the Nigerian conditions will be selected among the equipment which are manufactured in Japan, Nigeria or a third country based on the results of investigation of local technological level and the maintenance management situation, etc.
- Oyo State WATSAN is the organization responsible for the maintenance management of equipment and materials.
- The respective communities, where the borehole drilling will be carried out, will be responsible for the maintenance of borehole facilities.
- Materials to construct facilities are selected in accordance with international standards such as BS, DIN, ISO, and ASTM as much as possible.

2-2-4-2 Implementation Conditions

- The engineer who will be dispatched by the Supplier before handing over the equipment, will carry out the inspection and the guidance for maintenance management of equipment. Thus, the Japanese side notes that various procedures of import, customs clearance, and the vehicle registration, shall be smoothly carried out by the Nigerian side.
- The Nigerian side notes that the export permission, the export customs clearance arrangement, and other export procedures are done without delay.
- Japanese supplier(s) will confirm the transportation situation of equipment and materials. And he will note that customs clearance and the receipts are promptly done and after a bond period, it is necessary to report any accident.

2-2-4-3 Scope of Works

The handing over of equipment at the Oyo State WATSAN and the concerned LGAs is the responsibility of the Japanese side. The maintenance management of the equipment and materials after handing over is done by the Nigerian side. Moreover, the management of the construction work and the constructed borehole facilities is the responsibility of the Nigerian side. During construction of boreholes, the Japanese side will conduct technical transfer of drilling, quality/production control etc. by “soft component”. But the Japanese side doesn’t have the responsibility for construction works. However, the Nigerian side does not have enough budget to procure all the materials needed for the construction. Therefore, the materials for construction

shall be provided by the both sides as mentioned below.

The Japanese side : cement, sand, gravel, reinforced bar, form, cobble stone, brick, pebble stone, boulder (rubble stone), foam (blowing agent), mud-water admixture (polymer), casing Pipe, screen Pipe, centralizers, bottom plug

The Nigerian side : bentonite, high early strengthening agent, fuel, lubricant, water

2-2-4-4 Consultant Supervision

In order to carry out the equipment supply smoothly from tendering to transport and final set up, the consultants and the supplier should carry out procurement management activities as mentioned below.

The equipment planner of the consultant shall conduct a meeting with the supplier to confirm the details of equipment, and to inspect the equipment before shipping. He shall also confirm the technical transfer and the handing over of maintenance manuals to the Nigerian side.

The supplier will also dispatch an engineer for the management at the time of arrival of the drilling rigs and vehicles at the Lagos port. When the supplier procures equipment and materials, they will explain how to operate the drilling rigs equipped with the truck, DTH, mud water drilling tools, compressor, vehicles, and underground water physical survey instruments, etc to be supplied in this project. This work will be executed at the Oyo State WATSAN in consideration of the establishment of the maintenance management.

2-2-4-5 Procurement Plan

In principle, equipment and materials required for the project are to be procured in Nigeria, because of ease of procurement and maintenance management. However procurement from Japan and other countries is examined according to the specification, the price, aftercare service, etc.

- Equipment for geophysical survey, research, maintenance are neither manufactured nor assembled in Nigeria or the neighboring Africa nations. Thus the procurement of these equipment and materials is assumed to be done from the maker from whom the system of after-sales service is established and has local agency.
- Drilling rigs and equipment for drilling works are neither manufactured nor assembled in Nigeria. Thus the procurement of these equipment and materials is assumed to be done from the maker from whom the system of after-sales service is established and has local agency.
- Products in accordance with an international standard with high reliability will be procured for the hand pumps, casing pipes, and screen pipes.
- Except for a part of materials which is delivered to concerned LGAs like cement and the aggregate, etc., most equipment and materials is handed over in the Oyo State WATSAN where they are situated. Therefore, the cost of inland transportation from the Lagos port to Ibadan is borne by Japanese side.
- Because it is not possible to procure domestically in Nigeria the foam and the mud-water

admixture, these are procured from Japan. Pipes are to be procured from other countries (neighboring countries) considering cost. Other materials are to be procured in Nigeria.

- Cement, sand, gravel, reinforced bar, forms, cobble stone, brick, pebble stone, and boulders of the procurement materials of the Japanese side are to be delivered to concerned LGA. There is sufficient room in the storage space for the equipment and materials because LGA possesses a site of about 1 ha, and has a warehouse too. The cement and forms will be stored in the warehouse and the remaining materials will be stored at places to be specified by LGAs. Foam, mud-water admixture, casing Pipe, screen Pipe, centralizers, and bottom plugs are to be stored into the warehouse in the Oyo State WATSAN. Moreover, the procurement of the construction materials, divided into 1-2 lots according to the amount of the construction materials, is to be delivered to the Oyo State WATSAN in the Ibadan city and concerned LGAs at the final handing over place by Japanese supplier.
- In regard to storage for construction materials procured under the Project, the construction materials delivered to Oyo State WATSAN would be judiciously managed under the supervision of the Project Director. In the case of recipient LGA, the Executive Chairman will be responsible for proper management and security of the materials.

2-2-4-6 Implementation Schedule

(1) Period for Procurement of Equipment/Materials and Construction

<Procurement of Equipment/Materials>

The equipment and materials used in the construction works are to be procured from Japan, a third country, and locally. In case of the equipment and materials to be procured in Japan, a period of about eight months is necessary including from two to six months for manufacturing the equipment, procurement, and two months for transportation and installation of equipment and materials. In case of procurement from a third country, it is considered that it will take about two to five months to manufacture the equipment and materials, and a total period of six to seven months will be necessary including the time required for the delivery at the sites. About one month is required for the local procurement of construction materials such as cement.

<Construction period of borehole facilities>

The borehole construction work will be executed in the process shown in [Fig.2-6](#).

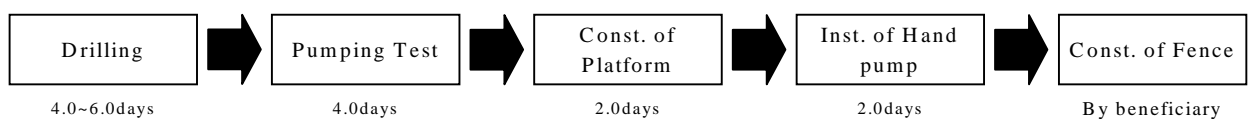


Fig. 2-6. The Borehole Construction Work

Each work will be conducted by the individual team such as drilling team, pumping test team,

installation team, etc. except for the construction of fence which is to be made by the benefiting villagers after handing-over.

Oyo State WATSAN currently executes the borehole construction using two rigs from 1994 to 2000, and has attained a result of 40 boreholes on average per rig per year. Therefore, it is considered that the number of borehole facilities that can be completed in the construction period by using three rigs are 100.

(2) Implementation Schedule

As described in the preceding sub-section, the borehole construction will be conducted using three drilling rigs consisting of one existing rig of Oyo State WATSAN and two rigs to be procured under the Project. Twelve months is needed for the borehole construction by existing rig of Oyo State WATSAN and six months for procured rig. The tentative Implementation schedule which consists of detailed design, procurement of equipment, and construction with “soft component” is shown in [Table 2-11](#).

Table 2-11 Implementation Schedule

Items		1	2	3	4	5	6	7	8	9	10	11	12
D. Design	Field survey	█											
	Detailed Design in Japan		█	█	█								
	Tendering			█	█								
Procurement	Manufacturing & Assembling					█	█						
	Transportation of Equip. & Materials				█	█	█	█					
	Supply of Local Materials	█				█	█		█				
Construction	Soft Component	█	█	█	█			█	█	█			
	Construction of Tubewells	█	█	█	█	█	█	█	█	█	█	█	█

2-3 Obligations of the Federal Republic of Nigeria

The scope of works to be undertaken by the Government of Nigeria is as follows:

(1) Borehole facilities construction

Obligations of the Federal Republic of Nigeria are shown in [Table 2-12](#).

Table 2-12 Obligations of the Federal Republic of Nigeria

Item	Nigeria
Construction work	<ul style="list-style-type: none"> - Mobilization and demobilization of drilling rig - Drilling, Borehole logging, installation of casing & screen pipes, gravel packing, pumping test, Water quality analyses, cementing, backfilling, and finishing - Bentonite, High early strengthening agent - Installation of hand pumps, and construction of platform - Construction equipment, vehicle, labor expense, cost of other consumables and water - Common temporary work expense

	- Site expenditure, etc.
Cost	Cost necessary for the above-mentioned construction
Construction period	Preparation of construction schedule in E/N period Construction completion within construction period If the construction will not be completed, Nigerian side will take up the responsibility to complete the construction.
Siting	Among the 100 sites, the siting for 20 sites will be conducted by the Nigerian side. They also should provide enough support and have discussion with the Japanese side for the 29 sites for which the siting will be conducted by the Japanese side in detailed design stage. (Remaining 51 sites were selected at basic design stage.) Among the 100 sites, if siting for any borehole is judged unsuccessful, then the siting for an alternative borehole has to be conducted by the Nigerian side at their own responsibility and expense.
Quantities of construction materials	The Nigerian side will be responsible for construction materials exceeding 100 sites.
The method of delivery of materials	From office of recipient LGAs to each borehole site The Nigerian side will have the management responsibility of materials.
Exemption of taxes	The Federal Ministry of Water Resources in collaboration with National Planning Commission will prepare the documents for exemption of taxes on materials to be purchased under the Grant Aid before the commencement of the construction. Such documents should be delivered to the Supplier by FMWR.
Quality control & Inspection	The Nigerian side will undertake the responsibility of quality control and compliance to specifications, etc.
Safety/ Security measures	Responsible for any accident during construction Anti-theft measures of the equipment and materials at the sites
Warranty on borehole facility	Responsible
Others	Improvement of access road Construction of fence around borehole facility

(2) Others

- To provide data and information necessary for the implementation of the Project
- To secure the construction sites for the Project and to clear, level and reclaim the sites prior to the commencement of the construction.
- To provide office and counterpart free of charge to Japanese consultant
- To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement
- Advising commission of Authorization to Pay (A/P), and Payment commission
- To ensure prompt unloading and custom clearance of the materials and equipment procured by the Project.
- To exempt Japanese Nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Nigeria with respect to the supply of the products and services under the verified contracts.
- To acquire number plates registered for the vehicles procured by the Project
- To maintain and use properly and effectively the facilities constructed and equipment provided under the Project.
- To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the execution of the Project.
 - Preparation of storage and workshop of Oyo State WATSAN and LGAs.
 - To take measures necessary for the safety and security for the Japanese nationals.

The above-mentioned undertaking by the Government of Nigeria, which were explained and agreed at the previous studies, has been described in the minutes of discussions as the obligations of the Nigerian side. Therefore, it is judged to be appropriate and agreeable that the Nigerian side executes the above-mentioned undertakings.

(3) Project Costs Borne by the Government of Nigeria

Expenses borne by the Government of Nigeria are shown in the [Table 2-13](#).

Table 2-13 Total Expenses borne by the Government of Nigeria
(Unit: million Naira)

Description	Expenses	Remarks
(1) Land for the facilities	-	Coordination and confirmation with communities for all the lands are required.
(2) Construction of access roads and protection fences	-	By beneficiary communities
(3) Materials	3.00	Construction cost for 100 sites
(4) Fuel, others	14.05	ditto
(5) Personnel expenses of Labor	11.52	ditto
(6) Maintenance cost	6.43	ditto
Total	35.00	

Besides the above expenses, Value Added Tax, Customs Duty and other import taxes, which will be imposed on equipment and materials procured by Japanese Grant Aid Project in accordance with the taxation system will be exempted by the Nigerian side.

2-4 Project Operation Plan

(1) Operation and Maintenance of Drilling Equipment

The members of Oyo State WATSAN total 59 persons and its Organization is shown in [Fig.2-7](#).

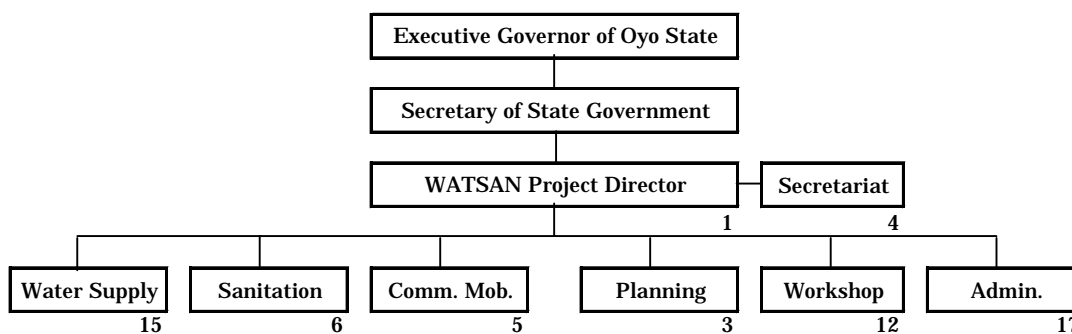


Fig.2-7 Organization of Oyo State WATSAN

<Operation System>

The construction procedure with the equipment under the project is geophysical survey, drilling, pumping test, construction of platform and installation of hand pump. The formation of Personnel Necessary of Operation of the Equipment is as shown in [Table 2-14](#).

Table 2-14 Formation of Personnel Necessary for Operation of the Equipment

Work Details	Formation per one team	Necessary Number under the Project	Number of Present Staff	Remarks
Geophysical survey	Geophysical Survey Engineer: 1 Assistant - 1	4 persons	3 persons	In charge of Water supply section One trainee as assistant will be provided from state government
Drilling works	Drilling Engineer - 1	3 persons	3 persons	Drilling Operation of drilling equipment, and inspection. Machine processing etc., Maintenance of vehicles
	Drilling assist. Engineer - 1	3 persons	3 persons	
	Mechanic - 1	3 persons	3 persons	
	Drivers - a few	6 persons	6 persons	
Pump Test	Engineer - 1	2 persons	0	Two groups are necessary
	Plumber - 1	2 persons		
	Assistant - 2	4 persons		
Installation of Hand Pump	Engineer - 1	1 person	1 person	In charge of Water supply section
	Assistant - 2	2 persons	2 persons	
	Total:	30 persons	21 persons	

Geophysical survey equipment consists of electro-magnetic survey equipment, electric resistivity survey equipment, geologic survey equipment, GPS and others. Water supply section of Oyo State WATSAN will operate and maintain these equipment. Oyo State WATSAN, which has used similar survey equipment provided under UNICEF, has sufficient capability to use these equipment.

After the completion of drilling, the borehole logging is an important activity to locate the aquifer and the point of screen placement. Sufficient training is to be conducted for mastering of this technology, since the staff of Oyo State WATSAN do not have enough experience in this matter. Japanese engineer will carry out technical instruction about equipment operation method and interpretation of the drilling results under the “soft component” for mastering the technology related to operation of these equipment.

Since the drilling staff of Oyo State WATSAN do not have much experience in pumping test, eight persons need to be recruited newly for two teams. Japanese engineer will execute technical instruction about equipment operation method and interpretation of the records under the “soft component” for mastering the technology as well as borehole logging to these staff.

There are enough staff for the three drilling teams in Oyo State WATSAN and they have capability and experience for drilling. However, the present drilling engineers have experience to operate by DTH method but have less experience to operate by the rotary method. Therefore, the instruction to operate the procured drilling rigs is necessary and the technical transfer related to the basic technology of the borehole drilling method needs to be carried out. Based on these matters, the instruction by the Japanese engineer under the “soft component” should be conducted putting emphasis on efficient technical transfer connected to the actual drilling work.

Furthermore, it is not only the construction techniques related to drilling works, but also the consistent operation management which should be established for the stock management and maintenance of equipment and materials.

<Operation and Maintenance System (Staff, Workshop, Management System)>

Scope of operation and maintenance work for the procured drilling rigs and related equipment, supporting vehicles, geophysical survey equipment etc. are as follows:

- Daily inspection and regular inspection of equipment
- Inspection, maintenance and safekeeping of tools for construction
- Safekeeping and inventory control of construction materials
- Inspection, maintenance and repairing work at the sites
- Repairing of breakdown and overhaul of the old equipment
- Safekeeping of related technical data such as manuals

Geophysical survey equipment will be maintained by water supply section of Oyo State WATSAN in the same way as the presently owned equipment. The mechanics and drivers in workshop section of Oyo State WATSAN are in charge of maintenance for the most parts of the procured equipment. The present staff in WATSAN workshop section for each area and the scope of works is shown in [Table 2-15](#):

Table 2-15 Present Staff in WATSAN Workshop Section

Area	Number	Scope of Works
Inventory Control	1	Full-time personnel in WATSAN Headquarters, in charge of inventory control and custody of vehicles and spare parts of hand pump, and custody and maintenance of maintenance manuals, parts list and other relevant data
Maintenance of Vehicles	5	Maintenance, Inspection and overhaul for Truck, Small-size vehicles, Compressor, Chassis, Engine, Driving System, Electrical System
Machine processing	1	Mechanical processing by Lathe, Drilling Machine, Welding Machine, Hydraulic Equipment and dismantle a machine, assembling and production
Plumbing Work	1	Pipe fabrication and assembling (pipe cutting, bending, thread-cutting, connection of distribution pipe, installation of relevant apparatus)
Special Vehicles Driver	3	Operation and Daily Inspection of Truck, Compressor and Generator

All of the staff mentioned above have enough knowledge and capability judging from their length of experience and the conditions of the maintenance of the present equipment. The number of equipment owned by Oyo State WATSAN will increase through the new equipment to be provided by the Project. It is judged that the maintenance of the equipment is possible based on the efficiency of the maintenance work due to the execution of guidance by Japanese engineer as "soft component". The management and maintenance after the Project implementation including the

construction staff are shown in [Table 2-16](#):

Table 2-16 Management and Maintenance after the Project Implementation

Classification	Section In-charge	Method of Operation and Maintenance
Daily Inspection and Maintenance at the Sites	Water Supply, Workshop	Repair and operation will mainly depend on present staff (15 persons) of the drilling section
Unexpected malfunction at the Sites	Workshop	In case that the above mentioned personnel can not manage, mechanics or mechanical engineers from the headquarters will be dispatched to the sites, if necessary.
Periodic Inspection of Equipment and Repairing Work	Workshop	The work will be carried out on the basis of the planned schedule at the repair workshop in Oyo State WATSAN.
Overhaul and other large scale repairing	Workshop	The work will be carried out at the repair workshop in Oyo State WATSAN, or private factories depending on the work contents.

(2) Operation and Maintenance of Borehole with Hand Pump

Based on the National Water Policy and Rural Water Supply Plan in Oyo state, the Oyo State WATSAN is planning to carry out the sustainable operation and maintenance of borehole facilities by leading the villagers for establishment of facility maintenance organization by villagers themselves for the construction of borehole facilities. The education and leading activity of villagers related to operation and maintenance are conducted by Oyo State WATSAN and LGA WATSAN Coordinator belonging to each LGA and visiting each community.

VWC is the villagers' organizations established for maintenance of borehole facilities. VWC established in each community consists of ten persons such as chairman, secretary, accountant and maintenance group of borehole facilities selected by villagers. Participation of female members should also be included, since the traditional society and family form remain in the Oyo state rural areas. VWC will carry out maintenance of borehole facilities with the assistance of LGA WATSAN Coordinator. An accountant is to be in charge of collection of water charge, purchase of spare parts, etc. However, it is necessary to consider the payment method of water charge, which shall be made as batch payment or monthly payment in consideration of present condition in the village. For this purpose, VWC will decide on the payment method of water charge after discussing with the village people based on the guidance by the LWC and LGA WATSAN Coordinator. LWC does the examination procedure of the borehole construction application from each community as the window organization of the rural water supply project in cooperation with the Oyo State WATSAN. Also LWC takes responsibility for guidance and supervision of VWC, and promotion and supervision of the water supply and hygiene project in the village level.

LGA WATSAN Coordinator is responsible not only for establishment of the organization of VWC, but also to visit each community for sustainable maintenance of borehole facilities and operation of management organization and monitoring of maintenance and activity conditions. He is also responsible for carrying out elucidation and educational activity for villagers based on the needs of the area. Before carrying out the construction of borehole facilities under the Project, VWC and maintenance group will be established. Educational extension activities are indispensable for this purpose. It is also important to carry out the periodic monitoring and supervision of operation of hand pump. Elucidation and educational activities by Oyo State WATSAN and LWC have been stagnant until now because of various reasons and maintenance of borehole facilities by villagers has not been carried out sufficiently at the existing borehole facilities. In order to promote the activation of Oyo State WATSAN and LWC activity, technical assistance is planned in the Project. Therefore, improvement of LGA WATSAN Coordinator's performance and strengthening of Oyo State WATSAN organization will be planned. The elucidation and extension activity will be carried out efficiently and effectively, and more than the present level.

(3) Operation and Maintenance Cost

1) Maintenance Cost for the procured Equipment

Operation and maintenance cost of the Oyo State WATSAN from 1997 to 2000, which includes the maintenance cost of 2 existing drilling rigs, 11 related vehicles and fuel costs, etc. is shown in [Table 2-17](#).

It is judged that the maintenance expense at present is especially high, because of superannuation of both the existing drilling rigs and the vehicles.

It is estimated that operation and maintenance expense will increase by about 7,500,000 Naira by introducing the procured equipment. According to the Oyo State WATSAN, there is no problem to arrange the budget for operation and maintenance expenditure, because the Oyo state government will surely carry out enough budgetary measures for the operation and maintenance cost of the Oyo State WATSAN.

In order to expand the rural water supply facilities for improvement of the rural water supply rate of Oyo state in the future, and to give priority to the investment for the rural water supply, it is necessary to secure a certain budget, by which the plan for the future can be carried out through the Oyo state government.

Table 2-17 Project Cost for Water Supply in Oyo State and Budget for Operation of WATSAN

(Unit : one million Naira)

Items	1997	1998	1999	2000	Remarks
Operation/Maintenance Cost of Equipment	4,704	11,999	1,995	7,238	
Purchase expenses for construction materials	7,693	6,566	0	7,461	
Office Administration Cost	235	763	85	244	
Others	2,318	5,419	575	760	
Total	14,940	24,747	2,655	15,703	
Ratio of O/M Cost to the total cost of Oyo State WATSAN (%)	31.5%	48.5%	75.1%	46.1%	
Project Cost of water supply in Oyo State	885,000	1,033,420	720,000	845,000	

2) Expenses and Maintenance of Borehole with Hand pump

The RUWATSAN I hand pump (Indian Mark III) is considered as the WATSAN's standard VLOM pump. It has generated many good results and has high valuation in Nigeria with the maximum lifting head of 40 m and high endurance under suitable maintenance. Since some consumable parts need to be changed periodically, it is necessary for villagers to conduct these kinds of maintenance activities as the beneficiaries of the Project. Therefore, a reserve fund should be collected and managed by VWC to cover purchase of the necessary spare parts, to change the parts periodically and to repair other malfunctionings. Oyo State WATSAN and LGA is responsible for complicated repairs and rehabilitation of boreholes, while the community will bear the cost for such required expenses. The division of duties is shown in Table 2-18 and the villagers should have a good understanding of VWC's activities.

Table 2-18 Division of Expenses to be borne for Borehole with Hand Pump

Description	Division of Expenses			Remarks
	WATSAN	LGA	Community	
Daily inspection and cleaning of borehole facility				
Management of water charge				
Periodic exchange of consumable parts of borehole				Purchase of spare parts, enforcement of substitution working
Unexpected malfunction of pump				Main repairing work by WATSAN, expenses should be paid by villagers
Maintenance of appurtenant facilities				Installation of fence, repairing of platform etc.
Renewal of old pumps				Once in 10 years (expenses should be paid by villagers).
Monitoring of water quality				

Note; responsible for the work and the expenses responsible for only expenses

As mentioned above, maintenance of borehole with hand pump is to be basically carried out by

the benefiting villagers and the villagers will pass the responsibility to the maintenance group selected among them. When the hand pump is handed over, the tools necessary for repairing hand pump are handed over to maintenance group, and it is not necessary to purchase these tools separately. Technical knowledge required for the periodic inspection and parts change is a basic matter, and it is possible to be acquired with the guidance of Oyo State WATSAN. Therefore, the expenses for the purchase of change parts, repair and renewal of hand pump are the main issues in the regular maintenance of borehole. The necessary spare parts and cost of maintenance of RUWATSAN I pump to be installed in most of the boreholes in the Project are shown in [Table 2-19](#).

Table 2-19 Annual O/M Cost per Hand pump (unit=Naira)

Items	Unit Price	Quantity per year	Cost	Remark
Periodical exchange of consumable parts of borehole	21,800	0.5	10,900	Once a 2 years
Purchase of Maintenance kit	14,374	0.1	1,438	Once a 10years
Washing of borehole screen etc.	36,000	0.1	3,600	Once a 10years
Renewal of old pumps	92,000	0.1	9,200	Once a 10years
Total	-	-	24,138	

Annual cost for operation and maintenance of a borehole is calculated to be 24,200 Naira, equivalent to 67 Naira/person/year, based on an average of 360 persons per borehole facility. According to the socio-economic survey data, most community people voluntarily paid 20 Naira/male/month and 10 Naira/female/month of water charge . Therefore, it is considered that the villager can pay the above amount as community water charge. It is important that contribution be continuously paid for working out necessary cost for the maintenance of the hand pump, considering the expense in the emergency such as the breakdown of the hand pump, etc.

2-5 “Soft Component” Plan

The “soft component” of this project consists of the following three items: (1) Construction Guidance, (2) Instruction of the equipment maintenance and management and (3) Support for public education and institutional strengthening for facility operation, maintenance and management by local communities.

(1) Construction Guidance

1) Background

Oyo State WATSAN executes the construction of water supply facilities in the rural areas of Oyo state, and they have constructed about 600 facilities to date. However, according to the performance results of the office, the boreholes in the bedrock region are constructed without casings, and the pumping test and borehole logging have not been carried out in the Oyo state.

Therefore, decreases in the volume of pump discharge and disruption of pump for maintenance have occurred due to the deposit of sediments.

In order to secure durable performance of boreholes, it is preferable to carry out borehole finishing by inserting a screen and filling up the surroundings with gravel pack. Borehole logging is effective to predict the fissures that have groundwater and it is necessary to plan the casing and design the position of the screen. The pump discharge of the borehole can be determined by pump test to check the relationship between pump discharge and the lowering of underground water level. In addition, useful data can be attained to contribute to sustainable groundwater development in the future.

It is required that many water supply facilities be constructed effectively by this plan in the short term. For this purpose, it is considered that not only the technical aspects such as the improvement of borehole digging technology and the strengthening of construction management ability at the borehole construction work, but also the sustainable and effective management are indispensable.

The maximum effect can be achieved by avoiding loss of time, reducing the number of failure boreholes and preventing accidents, etc. through precise groundwater exploration and the selection of drilling points based on the results of analysis, formulation of the construction plan and implementation schedule under the constraints of limited human resources and budget.

2) Outputs

For the staff of Oyo State WATSAN, capacity building from both sides (construction management and technical aspects concerning to the construction of facility) has the following goals:

- i. The quality of facility is improved
- ii. The observance of the construction period for the construction of facility is recognized, and the implementation of project is carried out smoothly as per the plan.
- iii. Construction technology and construction management ability of Oyo State WATSAN staff are improved.

3) Execution Format

The execution format is engineering support by the Japanese Engineers.

4) Activities

The execution period of “soft component” is programmed as 12 months, which starts 4 months before the commencement of drilling borehole. The implementation and assignment schedule is

shown in [Table 2-20](#).

Table 2-20 Implementation and Assignment Schedule

	Items	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Schedule	Contract with Consultant																				
	Detailed design		■																		
	Tendering																				
	Construction									■	■	■	■	■	■	■	■	■	■	■	■
Soft component	Preparation of documents in Japan						■			■											
	Guidance of Operation & Management							■	■	■											
	Guidance of Drilling										■	■	■			■	■	■			
	Guidance of Drilling															■	■	■			

In this “soft component”, it is hoped that the construction of boreholes with high quality are executed at a good success rate by achieving overall technology transfer of the operation and maintenance of the drilling equipment, construction skill, quality control, and safety management, etc. The contents of the works are divided mainly into operation management guidance, and technical guidance for drilling.

Construction operation and management guidance

Capacity building of the planning of the construction schedule and others are carried out by the Japanese engineer for strengthening the operation management of the water supply section, workshop and other sections before commencement of the construction. The contents of guidance are as follows.

1. Construction planning for drilling
2. Staff Arrangement and management program which affects borehole construction ---- preparation of the format of management record
3. Planning of construction program ---- preparation of the format of construction supervision and quality records
4. Safety control ---- preparation of safety control record list, and accident response measures

Guidance for borehole drilling technology

The basic training will be carried out to acquire the theory of drilling technology by the Japanese

drilling engineer in the Oyo State WATSAN before the commencement of construction. The contents of guidance are as follows:

1. Instruction for equipment operation method by rotary and DTH drilling rig
2. Guidance for borehole logging
3. Guidance for Pumping test
4. Construction guidance of concrete works

The number of trainees for technology transfer is about 21 persons, who are the staff of the management, maintenance, and construction sections in the Oyo State WATSAN, as shown in [Table 2-21](#).

Table 2-21 Oyo State WATSAN Construction Management, Maintenance, and Construction Section

No.	Position	In charge Area	No. of trainees
1	Operation Manager	Construction plan, Safety control, General management	3
2	Store manager	Equipment and materials management, Inventory management, Order management	1
3	Equipment Maintenance Eng.	Inspection of equipment, repairing and renewal planning	2
4	Drilling Engineer	Construction, quality control, safety measures	3
5	Asst. Drilling Engineer	Construction, accident prevention	3
6	Operator	Operation methods, daily inspection, and operating control	9
Total			21

The working schedule of each item of the Japanese engineers and their assignment schedule are shown in [Tables 2-22](#) and [2-23](#) respectively.

5) Procurement of Consultant Services

It is considered that the construction management capabilities of the local consultants are not sufficient to perform the technical assistance to the Oyo State WATSAN starting from preparation of construction planning until progress control, quality control, and safety management during the construction period. Therefore, it is judged that the procurement of consultant services will be technical assistance by the Japanese consultant.

Table 2-22 Schedule of "Soft Component" for Construction

No.	Item	1	2	3	4	5	6	7	8	9	10	11	12	Place	Remark
1	preparation of Text	□		□										In Japan	English Text : 25, Audiovisual Aids: 1
2	Meeting to WATSAN for preparation of Guidance		■											Ibadan	Training Plan and schedule
3	Guide of Construction planning		■											Ibadan	Basic Construction planning
6	Guidance of drilling Techniques and supervision		■	■										Ibadan	Instruction/Manual for Drilling
7	Guidance of Quality Management			■										Ibadan	Manual of Quality Management and Check sheet
8	Guidance of O/M for equipment				■									Ibadan	Manual of O/M Management and Check sheet
9	Guidance of safety /security for Construction				■									Ibadan	Manual of safety Control Management and Check sheet
10	Guidance of Drilling Works				■						■			Site	Records of Construction Supervision, quality management and Check sheet
11	Preparation of Report to WATSAN/JICA				■								■	Ibadan	Preparation of report
12	Report to WATSAN/JICA in Nigeria													Ibadan/Abuja	

Table 2-23 Detailed Assignment Plan

No.	Item	1	2	3	4	5	6	7	8	9	10	11	12	man/month	Remark
1	Japanese Consultant (Guidance of Operation and Management)	█	█	█	█									3M/M	in Japan:0.5M/M in Nigeria:2.5M/M
2	Japanese Consultant (Guidance of Drilling 1)			█	█	█	█	█			█	█	█	7M/M	in Japan:0.5M/M in Nigeria:6.5M/M
3	Japanese Consultant (Guidance of Drilling 2)										█	█	█	3M/M	in Japan:0.0M/M in Nigeria:3.0M/M
4	Vehicle-1		█	█	█						█	█	█	5.5Month	for Japanese staff
5	Vehicle-2				█	█	█	█			█	█	█	6.5Month	for Japanese staff

(2) Instruction of the Equipment Maintenance and Management

1) Background

The maintenance and management of the equipment is executed in the water supply section that constructs boreholes, workshop section, water quality unit of planning monitoring evaluation section, and store keeping section. At present, there are 15 staff in the water supply section, 10 staff in workshop, one staff in water quality unit, and one storekeeper, making a total of 27 staff who are responsible for executing management and the repairs of the equipment.

Since the equipment were procured by UNICEF, they also provided the education for the maintenance management of existing equipment, therefore, the repair checking technique of the WATSAN staff is good. However, the repair ability of special machine parts such as the oil pressure pumps is still insufficient. Equipment which breaks down has been left as it is, thus the equipment is not effectively used. It is necessary to improve repair techniques in order to use the procured equipment **effectively** for the long term.

Although a maintenance management ledger is kept, the maintenance and management is not carried out in a systematic manner. Therefore, the breakdown of machine parts occurs frequently for several years after procurement. In this situation, the number of boreholes, which can be drilled, is also reduced. In order to carry out sustainable maintenance and management, it is necessary to maintain a proper record of maintenance management, appropriate equipment management and an updated plan.

Documents such as order slips are accumulated as the hard copies in the office now, and only a few staff can obtain information from their copies. Therefore, it is necessary to construct the system that organizes information on the equipment maintenance management of the above-mentioned, and is shared by Oyo State WATSAN staff in order to effectively operate the equipment.

From this background, in order to carry out the maintenance management on a systematic manner and to use the equipment effectively for a long term, a “soft component” will be executed in this project.

2) Expected Achievements (Direct Effects)

The expected achievements by this “soft component” are as follows:

- The repair techniques for the equipment are improved.
- The systems of maintenance and management of the equipment are improved.

3) The Form of Implementation

The form of implementation will be engineering support.

4) Activities

Instruction of maintenance and management of equipment

The method of appropriate maintenance and management of equipment will be instructed. As the execution method, the Japanese consultant makes the equipment maintenance management record format, and instructs the operation method, the check method and the update plan.

Training of engineer

The repair technique will be instructed to the workshop members. As the execution method, the Japanese consultant instructs the repair techniques of the equipment including the oil pressure equipment by actually using existing equipment.

5) Procurement Service

The procurement service of the Nigerian side will be directly supported by Japanese consultant. The maintenance and management ability of the equipment of Oyo State WATSAN is more than the standard. Although it is cheaper to carry out the maintenance and management through local contractors, they do not have enough management abilities compared to the staff of Oyo State WATSAN.

6) Project Schedule and Output

Project schedule and output are shown in [Table 2-24](#). And Activity Plan of “Soft Component” and Detailed Assignment Plan are shown in [Tables 2-25](#) and [2-26](#), respectively.

Table 2-24 Implementation Schedule and Output

No.	Item	1	2	3	4	5	6	7	8	9	10	11	12	Location	Output
1	Preparation in Japan	□													
2	Instruction of methods of maintenance	■												Ibadan	
3	Instruction of arrangement and management methods		■											Ibadan	Maintenance check record, Equipment management ledger
4	Instruction of making of the equipment maintenance management plan		■											Ibadan	
5	Instruction of repair techniques		■	■										Ibadan	Text for oil pressure equipment structure and principle explanation
6	Making of a final report			■										Ibadan	Final Report
7	Report to WATSAN office and JICA			▼										Ibadan/ Abuja	

Table 2-25 Activity Plan of “Soft Component”

Activities	Execution time	Contents	Expected Achievements	Facilitators	Participants
Preparation in Japan	Before constructing facilities with existing equipments	<ul style="list-style-type: none"> • Preparing of text for oil pressure equipment structure and principle explanation. • Preparing of maintenance check record list (It is a daily check record list, and checks such as working the repair condition of the equipment are recorded. The workers fill in on a prescribed form and the record is filed.) • Preparing of equipment management ledger (A basic parameter of machine parts such as the specifications and the manufacturing years of equipments is managed. The date and the content etc. of repairs are recorded in the equipment management records of repairs and maintenance. The workers fill in on a prescribed form and the ledger is filed.) 		Japanese consultant	
Instruction of method of appropriate maintenance of equipments	Ditto	<ul style="list-style-type: none"> • Instruction of method of maintenance (The necessity of check to be done every day and at regular intervals should be understood. A concrete check method will be instructed in the actual condition using existing equipments.) • Instruction on arrangement and management methods such as maintenance check record, equipment management ledger, order slips, and insertion delivery slips (The document and the slip piled up by the unarrangement will be classified, and filed. The staff who uses it should keep them in the place which can be used if necessary. The store manager should take the whole responsibility of management.) • Instruction of equipment maintenance management plan (A well developed plan of the repairs and the method of planning the annual maintenance plan based on the check record will be instructed.) 	<ul style="list-style-type: none"> • Equipments can be used for its life period by appropriate maintenance management. • Based on maintaining the record of equipment maintenance and management, it will be possible to confirm the record of maintenance and form the schedule of repairing plan. • It will be possible to reflect the repairing plan in the budget plan 	Ditto	Oyo State WATSAN Water Supply dept. Workshop
Instruction of repair technique to workshop member	Ditto	<ul style="list-style-type: none"> • Instruction of repair techniques of existing borehole equipments (Consultant instructs a basic structure and the principle of equipments related to the oil pressure by using the text. And its practice is instructed by using actual equipments. Moreover, practice is instructed by using actual equipments about other related machine parts such as the digging rigs and compressors.) 	<ul style="list-style-type: none"> • The repair technique of equipments improves. • The breakdown of equipments decreases. 	Ditto	Oyo State WATSAN Workshop
Making of report	Before ending this “soft component”	<ul style="list-style-type: none"> • Making of report. 		Ditto	

Table 2-26 Detailed Assignment Plan

No.	Item	1	2	3	4	5	6	7	8	9	10	11	12	Quantity	Note
The Japanese side															
1	Japanese Consultant													2.3M/M	Japan:0.3M/M Nigeria:2.0M/M
2	Vehicle(sedan)													2.0M	For Japanese consultant

(3) Support for Public Education and Institutional Strengthening for Facility Operation, Maintenance and Management by Local Communities

1) Background

The operation and management of Oyo State WATSAN, over the past ten years, has been very challenging based on its functions, which are as follows:

- To increase access to potable water supply and eventually eradicate fecal and water related diseases in rural communities.
- To improve standard of living and increase productivity in rural areas.
- To increase access to proper waste disposal through promotion, construction, use and maintenance of low cost “Sanplat” (sanitation platform) latrines.
- To promote behavioral changes with respect to water use, personal hygiene and efficient means of excreta disposal.
- To enable participating communities to operate and maintain their own installation through specially designed training and cost recovery scheme.

However, despite the input of Oyo State WATSAN, it has been discovered that certain measures, which will further enhance effective implementation of the program, need to be put in place. These are:

- Need for production of request format for assistance on provision of water and sanitation facilities in the LGA and communities, thereby allowing for proper collaboration, documentation and bottom-up approach.
- Need for operation and management manual for proper implementation, monitoring and evaluation of Oyo State WATSAN activities. This will enhance sustainability and effective use of the facilities.

Furthermore, the LGAs also have great role to play in the implementation of WATSAN activities. However, ten out of the sixteen LGAs to be included in the Project are yet to have functional VWCs. In order for these LGAs to play their role effectively there is need for the following:

- Strong collaboration with Oyo State WATSAN
- Capacity Building for LGA WATSAN personnel
- Technical training for LGA Artisans.

In addition, the importance of community level operation and maintenance (O&M) cannot be

over emphasized. Currently, Oyo State WATSAN establishes a 10- member VWC in every targeted community. These committees are involved in the planning, implementation, operation and maintenance of water and sanitation facilities. Some of the activities are mobilization of the communities for water and sanitation activities/ contribution of funds for maintenance of WATSAN facilities, promotion of hygiene education/ eradication of guinea worm disease, construction of sanplat latrines, repair and maintenance of Hand pumps, distribution and effective use of monofilament filters, etc

However, some of the VWC are not functioning properly; hence the need for training of Village Based Workers (VBWs), Artisans, etc on operation and maintenance.

In view of the foregoing there is an urgent need to strengthen the three administrative levels (State, LGA and Community) in order to have sustainable operation and maintenance of water and sanitation facilities that are in place.

In order to have adequate inventory of procured equipment and efficient utilization of facilities provided there is urgent need for a “soft component” of the Project.

- 1 Strengthening of institutional and operational aspects of Oyo State WATSAN
- 2 Training plan of Oyo State WATSAN staff and LGA WATSAN Coordinator
- 3 Strengthening of institutional and operational aspects of LWC
- 4 Establishment of community based VWCs and strengthening of their operating system

2) Expected Achievements (Direct Effects)

- 1 Strengthening of institutional and operational aspects of Oyo State WATSAN
 - The format of applications for borehole construction shall be developed, thereby establishing the application system between communities, LGAs and Oyo State WATSAN.
 - An operation manual of water supply and sanitation projects shall be prepared with the provision of distinct roles for each section.
 - Cooperation between each section within Oyo State WATSAN shall be facilitated, thereby improving management capacity of Oyo State WATSAN on water supply and sanitation project.
- 2 Training plan of Oyo State WATSAN staff and LGA WATSAN Coordinator
 - Training of Oyo State WATSAN staffs and LGA WATSAN Coordinators shall be performed and improvement of expertise and technology shall be achieved.
 - Textbooks for the training of Oyo State WATSAN staff shall be prepared.
 - Operation manuals for LGA WATSAN Coordinators shall be prepared

3 Strengthening of institutional and operational aspects of LWC

- An application system for borehole construction shall be established, through which the LWC can express the local needs for boreholes in LGAs. It is expected to establish an LGA support system for borehole management by communities.
- Cooperation between LWC and Oyo State WATSAN shall be facilitated upon implementation of water supply and sanitation projects.

4 Establishment of community based VWCs and strengthening of their operating system

- A VWC shall be organized prior to a borehole construction, which will lead to the active involvement of community people in facility operation, Maintenance and Management.
- Training of VWCs shall be performed and improvement of understanding about contribution, maintenance, management of records, and sanitary education shall be achieved.

3) The Form of Implementation

The form of implementation shall be by management assistance.

4) Activities

The proposed activities are described as follows:

1 Strengthening of institutional and operational aspects of Oyo State WATSAN

- Organization of a committee for the water supply and sanitation project manual.
- Preparation of the operation manual on water supply and sanitation projects, in which the function of each section is clarified.

2 Training plan of Oyo State WATSAN staff and LGA WATSAN Coordinator

- Preparation of training programs for the improvement of service operation, on such subjects as planning, participatory development methods, sanitary education, and gender issues. The program shall be conducted with invited lecturers.
- Preparation of an activity manual for LGA WATSAN Coordinators and conduct a training program for the Coordinators.

3 Strengthening of institutional and operational aspects of LWC

- A working team shall be organized in order to establish LWC in the 10 LGAs. The team shall organize a caravan to introduce the activities of the Committees to LGAs.
- Preparation of working regulations for LWC and establishing the system of application appraisals, as well as the system of monitoring and evaluation after facility construction.

4 Establishment of community based VWCs and strengthening of their operating system

- A supporting team shall be organized for the establishment of VWC. The team shall prepare the organization and operation manual for VWCs.
- A model VWC shall be established in each of 6 cooperative LGAs (Ibarapa Central, Ibarapa North, Iseyin, Oyo East, Akinyele, Orire)

The details of the above activities are shown in [Table 2-27](#).

Table 2-27 Detailed Plan of Activities (1/4)

1 Strengthening of institutional and management aspects of Oyo State WATSAN

Before and during construction of boreholes

Activities	Contents	Expected Achievements	Facilitators	Participants
1. Production of the model application format for borehole construction 2. Establishment of community application system for borehole construction 3. Preparation of the management and operation manual of borehole construction for Oyo State WATSAN	1. To form a working team of 10 members including a Japanese consultant, to prepare request form. 2. To examine and formulate a system in which communities can apply to Oyo State WATSAN for borehole construction via LGAs. 3. To prepare a management and operation manual of borehole construction for Oyo State WATSAN	1. The model request format shall be prepared 2. The management and operation manual shall be prepared. 3. The request procedures and administrative works for borehole construction shall be enhanced	Japanese and local consultant	10-membered working team
Working Team 1 1. Japanese Consultant (1) 2. Staff of Oyo State WATSAN (4) 3. LGA WATSAN Coordinator (2) 4. FMWR Staff (1) 5. State Gov. Staff (1) 6. Local Consultant (1) Total 10 people	1-1 To form the working team within the first one week. 1-2 To conduct interview with State Gov. and FMWR officials and two selected communities. (2 weeks) with existing Boreholes within the first two weeks 1-3 To conduct interview for LWCs in the 6 selected LGAs about water supply and sanitation activities (5 days / LGA) The topic shall be a. The present application system for borehole construction b. The processing of application received by Oyo State WATSAN c. The present system of operation and management of LWCs 1-4 To hold 7 meetings within 5 months (1 meeting / 4 days)	Equipment and Personnel required 1. Personal computer, 2. Photocopy machine, 3.,UPS 4. Printer 5. Hiring of Vehicle (Field survey in 6 LGAs) 30 days (1 vehicle 5 days x 6 LGAs) (Meetings) 28 days (1 vehicle x 4 days x 7 times) 6. Local consultant 7 months 7. LGA WATSAN Coordinator Accommodation 42days (3days x 7 times x 2 pers.) Daily Allowance 56days (4days x 7 times x 2 pers.) 8. Working Team 1 Accommodation 96 days (4 pers. x 4 days x 6 LGAs) Daily Allowance 120days (4 pers. x 5 days x 6 LGAs)		
	Note 1 -- One week shall be allocated to set up the working team and the planning of entire activities. The entire plan refers to 1) Strengthening of institutional and management aspects of Oyo State WATSAN, 2) Strengthening of institutional and management aspects of WATSAN Committees at LGA level 3) Establishment of VWCs and strengthening of operation system of their operations, and 4) Training program Note 2 -- The survey contents are, 1) Oyo State government policy on water supply and sanitation 2) budget planning process, 3) Collaboration on water supply project between FMWR, Oyo State gov. and LGAs, 4) Record of boreholes within LGAs. 5) Mode of contribution and collection of fund for the maintenance of borehole constructed by Oyo State WATSAN 6) Frequency of breakdown/repair work Note 3 -- The 7 meetings shall be held at Oyo State WATSAN Office, throughout the 5 months.			

Table 2-27 Detailed Plan of Activities (2/4)

2 Training Program of Oyo State WATSAN and LGA WATSAN Personnel

Before and during construction of boreholes

Activities	Contents	Expected Achievements	Facilitators	Participants
1. Human resource development and Capacity Building of Oyo State WATSAN Personnel 2. Human resource development and Capacity Building of LGA WATSAN Personnel	1. The Japanese and local consultant shall prepare the training schedule and its curriculum. 2. Invited speakers and UNICEF staff etc. shall give lectures 3. The members of the working team 2 shall participate in the training program.	1. A manual shall be produced for the training of Oyo State WATSAN personnel 2. The management and operation manual shall be produced for LGA WATSAN Coordinators.	Japanese and local consultants, invited lecturers, UNICEF staff	Oyo State WATSAN personnel LGA WATSAN personnel (16 LGAs)
Working Team 2 1. Japanese Consultant (1) 2. Local Consultant (1) 3. Invited Lecturer (minimum number 3) Proposed lecturers 1. Oyo State WATSAN staff 2. FMWR staff 3. Oyo State Gov. staff 4. Min.Health staff 5. NGO staff 6. UNICEF Staff	1-1 To form the working team within the first six week and prepare the training program and its curriculum. 1-2 The training program includes the field study in neighboring communities with the existing boreholes. 1-3 3 teams shall be formed from Oyo State WATSAN and LGA WATSAN personnel. The 3 teams, each having 23 trainees shall undertake the course within 5 months. The program consists of 3 parts; each takes 4 days to complete. 1-4 At the end of this program, the management and operation manual shall be produced for LGA WATSAN Personnel.	Equipment/Personnel 1. Personal computer, 2. Photocopy machine, 3. UPS 4. Printer 5. Local consultant (same as above) 6. Trainees (LGA WATSAN Personnel) Accommodation 432 days (48 pers. x 3 days x 3 times) Daily Allowance 576 days (48 pers. x 4 days x 3 times) Hiring of Vehicle 72 days (2 vehicle x 4 days x 3 times x 3 teams) 7. Invited lecturer 36 days (4 days x 3 times x 3 team)		
	Note 1 – Training program and its contents 1. Lectures. 2. Field study. <u>Lectures for Oyo State WATSAN</u> 1. The expected status of water supply and sanitation projects in Oyo State after Japanese grant aid. 2. The collaboration between units (section) in the implementation of WATSAN activities. (Problem analysis, and possible solutions/ approach), 3. Monitoring and evaluation of water supply and sanitation facilities. 4. Roles of Oyo State WATSAN in O&M of water and sanitation facilities. . <u>Lectures for LGA level management</u> 1. Roles and status of LGAs in water and sanitation activities. 2.Future roles of LGAs in the establishment of WATSAN facilities. 3. Roles and status of LWCs, 4. Roles and status of LGA WATSAN Personnel. <u>Lectures for Community level management</u> 1. Status and policy for VWC, 2. Status of Contribution and collection for O&M of WATSAN facilities. 3. Environment sanitation and disease control 4. Roles and issues of women in the community 5. Discussion of projects for economic development of community. <u>Lectures on PCM method</u> 1. PCM analysis on status of water supply and sanitation projects. <u>Lectures on hygiene education and environmental sanitation</u> 1. Reasons for negative attitude of people toward Pit latrine 2. Water borne diseases Note 2 – The external lecturers shall be invited from University of Ibadan, Institute of Socio-economics in Nigeria, or other relevant institutions. UNICEF officers are also being considered as invited lecturers. Note 3 – LGA WATSAN personnel shall participate in the training program.	*** Group report is required at the final session of the program.		

Table 2-27 Detailed Plan of Activities (3/4)

3 Strengthening of institutional and management aspects of WATSAN Committees at LGA level

Before and during construction of boreholes

Activities	Contents	Expected Achievements	Facilitators	Participants
1. Establishment of WATSAN Committees in 10 LGAs 2. Strengthening of collaboration between Oyo State WATSAN and LWCs	1. To form a working team of 10 members including a Japanese consultant, to assist in the establishment of WATSAN Committees at LGAs. 2. To prepare a management and operation manual for LWCs to facilitate the collaboration with Oyo State WATSAN	1. LWC shall be established in all 10 LGAs. 2. The collaboration between Oyo State WATSAN and the LWCs shall be strengthened.	Japanese and local consultants, invited lecturers.	10-membered working team
Working Team 2 1. Japanese Consultant (1) 2. Staff of Oyo State WATSAN (4) 3. LGA WATSAN Coordinator (2) 4. FMWR Staff (1) 5. State Gov. Staff (1) 6. Local Consultant (1) Total 10 people	1-1 Preintervention Teams shall visit 10 LGAs in 5 months to introduce the activities of Oyo State WATSAN to communities. 1 trip takes 5 days.	Equipment /Personnel required 1. Personal computer, 2. Photocopy machine, 3. UPS 4. Printer, 5. Loudspeakers carried by vehicles 6. Hiring of Vehicle 50 days (1 vehicle x 5 days x 10 times) 7. Local consultant 8. Working Team 2 Accommodation 200 days (5 pers x 4 days x 10 times) Daily allowance 250days (5 pers x 5 days x 10 times)		
	Note 1 – The Plan of Oyo State WATSAN to introduce Preintervention Team 1. To plan the schedule of Preintervention Team to travel to 10 LGAs. The schedule shall be fixed through the collaboration with each LGAs and Oyo State Government. 2. 5-member Pre-intervention Team shall be formed with working team member 3. Each trip to the LGA shall be scheduled for 5 days including 1 day of transportation 4. Introduction of Preintervention Team shall be held at LGA offices and communities with existing Oyo State WATSAN boreholes. 5. The mission of Preintervention Team shall be as follows: 1) The introduction of entire activities of Oyo State WATSAN (to draw out a pamphlet depicting the activities of the Office) 2) The introduction of future activities of Oyo State WATSAN 3) Description of status of LGAs in water supply and sanitation projects. 4) Discussion of LGAs' budget on water supply and sanitation projects. 5) Listing of LGA staff in charge of water supply and sanitation projects 6) Inventory of Water and sanitation facilities. 7) Roles of LGA on water supply and sanitation activities at community level. 8) The formation VWC. 9) Field trip to outstanding VWCs. 10) Establishment of LWC and holding of inaugural meeting 11) Preparation of a plan for regular meeting between Oyo State WATSAN and LGA WATSAN Department.			

Table 2-27 Detailed Plan of Activities (4/4)

4. Establishment of VWC and strengthening of their operating system

Before and during construction of boreholes

Activities	Contents	Expected Achievements	Facilitators	Participants
1. Establishment of VWC 2. Training of VWC to assist in the preparation of guideline for operation and maintenance of WATSAN facilities.	1. To form a working team of 12 members including a Japanese consultant, to assist in the establishment of VWCs. 2. To carry out training program for VWC in order to enhance community-based O&M.	1. Manual for VWC establishment shall be produced. 2. A manual shall be produced for the training of VWC personnel 3. VWC will maintain and keep record on WATSAN facilities for onward transmission to LGA.	Oyo State WATSAN staff and Local NGOs	6 communities of 6 selected LGAs.
Working Team 3 1. Japanese Consultant (1) 2. Local NGO (2) 3. Staff of Oyo State WATSAN (4) 4. LGA WATSAN Coordinator (2) 5. FMWR Staff (1) 6. State Gov. Staff (1) 7. Local Consultant (1) Total 12 people	1-1 To form the working team 3 by adding 2 members from local NGO to the working team 1. 1-2 To prepare training program in the first week after the team formation. 1-3 To establish VWC in each of 6 selected LGAs and conduct training program for the Committees. (3 months). 1-4 To prepare manual for VWC establishment on the basis of experiences of model VWC. (4 weeks)	Equipment & personnel required 1. Personal computer, 2. Photocopy machine, 3. UPS 4. Printer, 5. Loudspeakers carried by vehicles, 6. Portable microphone. 7. Local consultant 8. Hiring of Vehicle 60 days (2 vehicles x 5 days x 6 LGAs) 9. Working team 3 Accommodation 192 days (8 pers. x 4 days x 6 LGAs) Daily Allowance 240 days (8 pers. x 5 days x 6 LGAs) 10. NGO staff Senior staff x 2 pers. x 3 month		
	Note 1 – The basic goals of VWC The principle of O&M The establishment of model VWC in communities The training program of model VWC in communities Subjects of the training program 1) Selection criteria, roles, term of office, Committee member replacement, committee meetings, community meetings, minute taking 2) Inspection, O&M of pumps, duties of artisans, record keeping 3) Decision to repair , type of repair by community, report to LGAs 4) Public information board for O&M of WATSAN facilities in community 5) Collection, management, auditing, and saving of contribution collected for maintenance 6) Disease in community, disease of children, Guinea worm cases and its eradication , Hygiene education and environmental sanitation. 7) Roles of men and women, from the view point of gender, participatory dialogue of communities, 8) Economic development of communities, local products, participatory dialogue of communities etc.,			

5) Procurement of Services

The procurement of services shall be achieved by sub-contract basis in order to utilize local resources for the following reasons::

- The expertise of human resource development of Oyo State WATSAN team will complement the corroborative work of Local Resources person and thereby improve the overall capacity of Oyo State WATSAN in project operation and maintenance.
- Oyo State WATSAN personnel experience should be enhanced by participatory development and institutional strengthening of rural communities.
- Competent personnel including reputable Non Governmental Organization (hereinafter referred to as “NGO”) to fulfill the role of facilitator shall be employed.

The “soft component” of this Project involves the following three parties (individuals) under the instruction of the Japanese consultant.

A. Staff of Oyo State WATSAN

The staff members are encouraged to cultivate their potential capacity through the participation in planning and implementation of training program and playing the role of facilitator. They are expected to instruct others to enable the independent training activities of Oyo State WATSAN.

B. Local consultants

Local consultants shall be assigned from lecturer-level specialists in rural development in Ibadan University and other relevant institutions. They are expected to assist the Japanese consultant in the Project.

C. Local NGOs

Among more than 10 local NGOs in Ibadan, only “FAHPAC (Family Health & Population Action Committee)” is capable of conducting a training program in communities throughout Oyo State. FAHPAC obtained experience in sanitary education in communities at the request of Oyo State WATSAN. In this Project, therefore, FAHPAC shall participate as an implementing agency for the establishment of VWCs and the training program of borehole M&M. There is a small Local NGO which is conducting it’s activities only in one LGA. In future, we may consider of working such a Local NGO.

6) Project Schedule and Output

Detailed Project schedule and detailed input plan are shown in [Tables 2-28](#) and [2-29](#), respectively. Upon the implementation of the “soft component” of this Project, participation of relevant agencies is expected with their relevant roles as shown in [Table 2-30](#).

Table 2-28 Implementation Schedule

No.	Activities	1	2	3	4	5	6	7	8	Place	Outputs	
X	Domestic Work (Preparation of work) - Collection of information and development of contents of training textbook - Making of draft manual etc.	█								Japan		
1.S	To form the working team. - To organize the working team of 10 members and make the entire plan forward.		█							Ibadan		
1.S2	Interview for State Gov., FMWR, and communities. - Present application method for borehole construction, - Investigation on present processing system.		█							State Gov. etc.		
1.S3	Interview on LWCs in the 6 LGAs. - Present application method for borehole construction. - Investigation on present processing system.			█						LGA		
1	Preparation of application form for borehole construction, making of the management and operation manual of borehole construction for Oyo State WATSAN. To hold 7 meetings of "application form for borehole construction "and "management and operation manual for Oyo State WATSAN activities". Final production and printing of "Application form " and "The Manual ".				█	█	█	█	█	█	█	Request form for WATSAN facilities / Manual of O & M for Oyo State WATSAN activities.
2	Preparation of training program for Oyo State WATSAN and LGA WATSAN Personnel / Production of draft Training Manual Human resource development and education of Oyo State WATSAN Personnel and LGA WATSAN Personnel. Schedule of training Final production of Training Manual / summary of training.		█		█	█	█	█	█	█	█	Training Manual
3	Introduction of Oyo State WATSAN Preintervention Team Implementation schedule of Oyo State WATSAN Preintervention Team. Summary of activities/ Production of a pamphlet of Oyo State WATSAN				█	█	█	█	█	█	█	Oyo State WATSAN Pamphlet
4	Establishment and training of VWC to assist in the O & M . Establishment and training of 6 Model VWC. Production of O & M Manual and Training Manual for VWC.						█	█	█	█	█	"Operation and Maintenance Manual" "Training Manual "for VWC.
5	Production of report for Oyo State WATSAN and JICA.								█	Ibadan	Final report	

Table 2-29 Detailed Assignment Plan

No.	Items	1	2	3	4	5	6	7	8	9	10	11	12	Quantity	Remarks	
Budget of Japanese side																
1	Japanese Consultant (Support on public education and institutional strengthening for facility operation, maintenance and management by communities)	■													7.7M/M	Japan: 0.7M/M Nigeria: 7.0M/M
2	Local consultant	■													7.0M/M	
3	Invited lecturer			■	■	■	■	■	■	■	■	■	■	36days	4days×9times	
4	Local NGO						■							6.0M/M	Senior staff 2 people	
5	Vehicle1 4WD	■													7.0months	For Japanese staff
6	Vehicle2*) 4WD		■												Total 4.8months	For working team
7	Vehicle3 4WD						■	■	■	■	■	■		1.0month	5 days×6 times For local NGO	
8	Vehicle4 4WD						■	■	■	■	■	■		1.0month	5 days×6 times For local NGO	

*) For Interview surveys of existing VWCs, meetings for each working group, trainings, Oyo State WATSAN introduction caravan.

Table 2-30 The Role of Main Project Actors

Project Actor	Role	Reference
1 . Japanese Consultant	<ul style="list-style-type: none"> * To manage the whole program of “soft components” and report the whole activities. * To facilitate the implementation of program by Local consultant, NGO and others. * To facilitate the Training Program of Oyo State WATSAN personnel and others. 	
2 . Oyo State WATSAN personnel	<ul style="list-style-type: none"> * To manage with a Japanese consultant for the whole program. * To prepare a training program and training documents for VWC and LGA WATSAN Personal with Local Consultant. * To coordinate collaboration with other State Ministries and LGA. 	
3 . Local NGO	<ul style="list-style-type: none"> * To prepare a program on the establishment of VWC. * To prepare a program on O&M of WATSAN facilities. * To prepare the plan and establish the Model VWC. 	
4 . Local Consultant	<ul style="list-style-type: none"> * To plan and execute the following works with Japanese Consultant - “soft components”. <ul style="list-style-type: none"> 1) Capacity Building of Oyo State WATSAN personnel 2) Collaboration with LGA and Oyo State WATSAN * To prepare various documents on Oyo State WATSAN Operation. 	
5 . UNICEF / Nigeria	<ul style="list-style-type: none"> * To render advice and give support to Oyo State WATSAN on the whole Program. * To send technical advisers as requested by the training program. * To support with development and provision of training materials e.g. Overhead Projector, Stationery, etc. 	
6 . Federal Government Officer	<ul style="list-style-type: none"> * To render advice and give support to Oyo State WATSAN on the whole Program. * To report the whole program and activities to the Federal Government. * To coordinate the program between Oyo State WATSAN and other agencies. 	
7 . Oyo State Government Representative	<ul style="list-style-type: none"> * To render advice and necessary support to Oyo State WATSAN and LGA on the program. 	Officer from other relevant Ministry
8 . LWC	<ul style="list-style-type: none"> * To manage the whole program of water and sanitation at LGA level. * To prepare the program on water supply and sanitation at community level and liaise with Oyo State WATSAN. * To evaluate and monitor the water and sanitation program at community level and to report it to Oyo State WATSAN. 	
9 . LGA WATSAN Coordinator	<ul style="list-style-type: none"> * To communicate with Oyo State WATSAN and VWC. * To support the program of water and sanitation at community level * To evaluate and monitor the water and sanitation program at community and to report officially to Oyo State WATSAN. 	
10. VWC	<ul style="list-style-type: none"> * To manage and maintain the program of water and sanitation in the community. (Fund collection for O&M, Regular maintenance of WATSAN facilities, promotion of Hygiene Education and Environment sanitation and etc.) * To keep records on the WATSAN facilities and to report it to LGA. 	

7) Equipment for O& A and Enlightenment

The equipment for “soft component” is shown in Table 2-31. This equipment is used for preparation of documents before the construction of boreholes. The megaphone and etc. are also procured within the “soft component” before the construction commencement.

Table 2-31 Equipment for “Soft Component”

No.	Equipment	Main specification and component	Quantity
S1	O&A		
S1 - 1	Personnel computer	Desk top type, display: 15", CPU: Pentium 600MHz, HD: 15GB, Memory: 64MB, OS: Windows 2000 (English version), Soft: Office 2000 (English version)	2sets
S1 - 2	UPS	Computer (1-1) 10 minutes	2sets
S1 - 3	Printer	Monochrome, size: A5-A3, Resolution: 1,200DPI	2sets
S1 - 4	Photocopy machine	Monochrome, size: A5-A3, Zoom	1set
S2	Training Activity		
S2 - 1	Portable megaphone	output: 15 W, distance of transmission: 300m	2sets
S2 - 2	Vehicle mounted megaphone	output: 40 W, distance of transmission: 500m	2sets

Necessity and quantity bases are as follows:

: O&A Equipment (S 1)

- Personnel Computer (S1-1)

Purpose of use: The personnel computer shall be used for record of equipment, borehole data and monitoring, and also be used for preparation of documents for “soft component”.

Quantity: The Oyo State WATSAN has two personnel computers and will share them within the section. Two additional units should be newly procured and used by every section at any time because it will become more difficult to share them due to the requirement of increased data, and works for operation and management of newly procured equipment.

Deposition : They are provided “ soft component” working teams. After using “ soft component “ teams, they are given to the five sections: namely, Water Supply Section, Workshop, Planning and Evaluation Section, Community Mobilization Section, and Sanitation Section. Those sections will use computers as needed.

- UPS (S1-2)

Purpose of use : The electricity current is cut frequently. They are necessary for securing electricity supply for the computer.

Quantity : Two UPS s are planned because they are to be used in pairs with computers.

Deposition : The same as computers

- Printer (S1-3)

Purpose of use : They are used for output materials that are used in “soft component” for management and records of materials and for daily works.

Quantity : Two printers are planned according to new computers that are provided.

Deposition : The same sections that are provided with computers.

-Photocopy machine(S1-4)

Purpose of use : The same as printer.

Quantity : One is in use. Its model is old. There are troubles often. Therefore, new one is planned in order to follow the increasing frequencies of use in this plan including “ soft component” and in the future plan.

Deposition : It is provided to “ soft component” working teams. After the end of use, it is given to the Admin. Section.

: Training Activity Equipment (S 2)

-Portable Megaphone (S2-1)

Purpose of use : They are used for training in communities, for explanations to residents outside such as at meetings, for education to residents, and for activities of training and promotion

Quantity : The Oyo State WATSAN has no portable megaphone It is necessary for trainings and meetings. The Comm. Mob. Section and the Sanitation Section are main users. Two portable megaphones are planned so that each section can move with them individually. At the beginning, “soft component” working teams will use them, after that, they will be provided to The Comm. Mob. Section and the Sanitation Section.

-Vehicle-Mounted Megaphone (S2-2)

Purpose of use : They are used for the same purpose as portable megaphone.

Quantity : Oyo State WATSAN has no vehicle-mounted megaphone at present. The Comm. Mob. Section and the Sanitation Section are main users and their activities will increase due to the plans for the future. Furthermore, when their sphere of their activities are considered, it is expected that their activity will be at different points. Therefore, two vehicle-mounted megaphone are necessary for each section to be able to use them at the same time and to be active and efficient. At the beginning, “ soft component” working teams will use them and after their use, they are to be provided to Mob. Section and the Sanitation Section.