CHAPTER 3 IMPLEMENTATION PLAN

Chapter 3 Implementation Plan

3-1 Implementation Plan

3-1-1 Implementation Policy

This Project is implemented in Southern Province of the Republic of Zambia under Japan's Grant Aid Assistance. The Project implementation concept and schedule should be decided after due deliberation on the construction period in the Japan's Grant Aid Assistance. Figure-3-1 shows implementation system of the Project.

The Department of Water Affairs (DWA) of the Ministry of Energy and Water Development (MEWD) is the executing agency for implementation of the Project. As the executing agency, DWA is responsible for the entire procedure from the detailed design to the procurement of the equipment and materials and the construction of the water supply facilities. Furthermore, DWA is responsible for the promotion of community participation and hygiene education, and institutionalization of the user communities in the form of establishing and managing V-WASHE committees, which are the prerequisites to achieve the proper operation and maintenance system for the water supply facilities. After the conclusion of Exchange of Notes (E/N) between both governments, a Japanese Consultant firm will enter into a consultancy agreement with the executing agency regarding the Detailed Design Study, tender documents preparation, assistance for tendering done by the executing agency, supervision of procurement and construction work, and technology transfer. As a result of evaluation on the tendering, DWA will enter into a contract with a Contractor. In accordance with the guidelines of the Japan's Grant Aid Assistance, the prime Contractor shall be a Japanese firm.

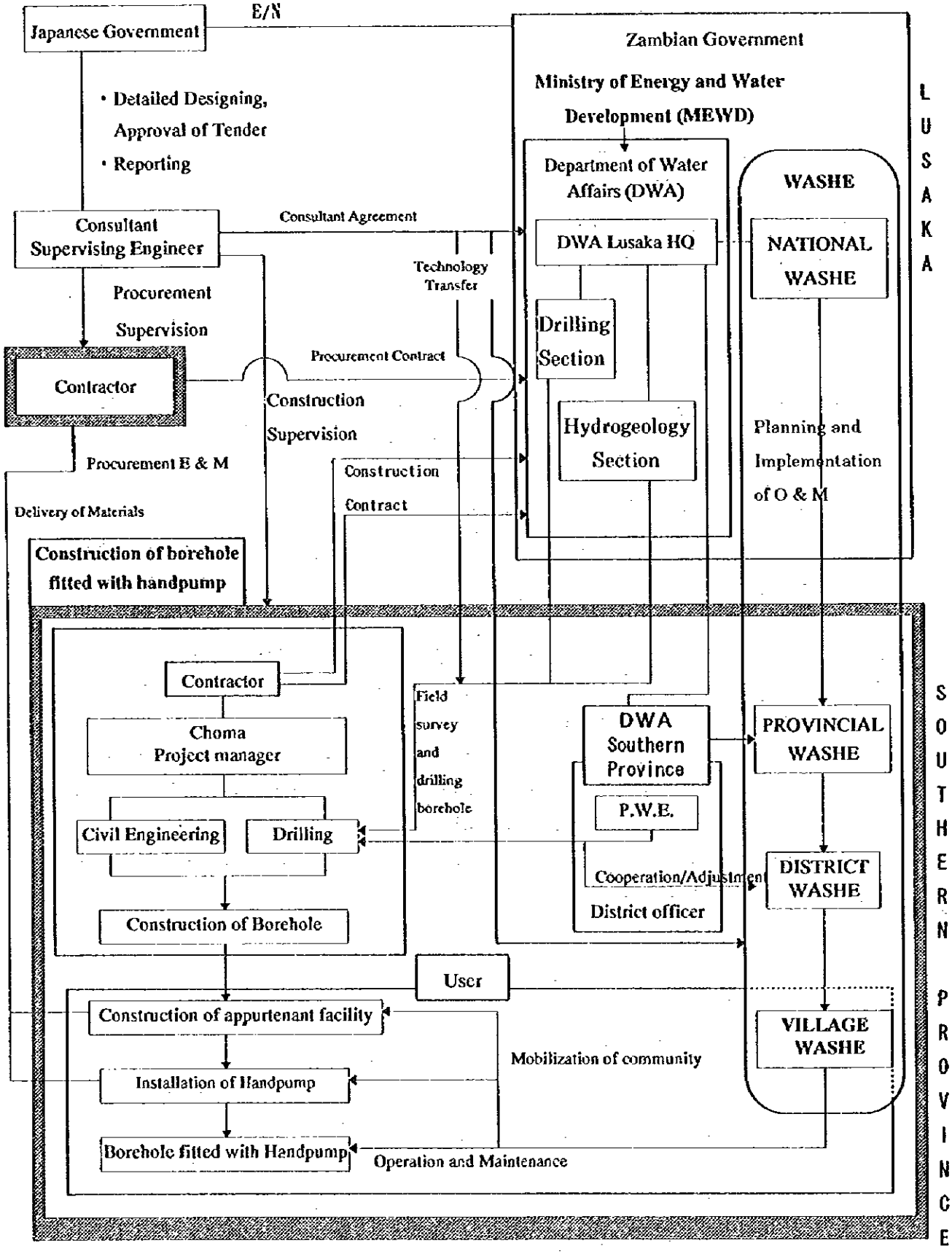


Fig. 3-1 Implementation System

The Japanese prime Contractor executes following components of the Project within the specified period based on the contract under the supervision of the Consultant.

① Procurement of equipment and materials and delivery of them to the specified sites
② Repair and maintenance of existing equipment
③ Construction of borehole water supply facilities
④ Provision of technology transfer of groundwater development and borehole construction to the DWA staff
⑤ Provision of technology transfer on the maintenance of equipment for groundwater development to the DWA staff

The prime Contractor for the Project implemented under Japan's Grant Aid Assistance shall be a Japanese firm, which must have enough experiences in the groundwater development in overseas countries as well as enough knowledge on the equipment to be procured under the Project. The prime Contractor must dispatch engineers and/or technicians in charge of technology transfer mentioned in items ④ and ⑤ above. The technology transfer related to the survey in the groundwater development to the DWA staff must be conducted by the Consultant during the period of Detailed Design Study and the Consultant supervision.

3-1-2 Implementation Conditions

The conditions in relation to the procurement of equipment and materials and the construction of facilities under the Project are as follows :

(1) Strict observation of the delivery date of procured equipment and materials and inland transportation corresponding to the implementation process

There are some restrictions in the Project implementation schedule to construct borehole water supply facilities under the Project, due to the difficulty in approach to the Project sites during the rainy seasons. For this reason, it is important to strictly observe the date of the procurement and delivery of the equipment and materials directly related to the construction. Especially, since Zambia is an inland country, the equipment and materials procured from Japan or the third country must be delivered

with long distance inland transportation. Therefore, deliberate consideration must be given to the supervision in the process of transportation and customs clearance.

(2) The process of construction work and procurement of equipment and materials to be accorded with the extent of achievement of community participation and promotion of operation and maintenance implemented by Governmentof Zambia

Promotion of community participation and the capacity building in operation and maintenance, in the form of the establishment of V-WASHE committee and training for the committee, constitute the prerequisites of construction work to be conducted in the Project sites, due to being indispensable circumstance for future maintenance of water supply facilities to be constructed in this Project. Therefore, the Contractor must give sufficient consideration to the correspondence between the process of construction works and these activities. In addition, the delivery date of the equipment and materials necessary for the community participation and promotion of operation and maintenance procured under the Project must also match with the extent of achievement of these activities.

(3) Deliberate consideration on the construction of appurtenant facilities for water supply facilities by the community

In Zambia, for the purpose to instill the sense of ownership and the responsibility for maintenance of water supply facilities, it is common that the construction of the appurtenant facilities of water supply facilities such as the concrete work is to be ordinarily borne by the beneficiary community with the instruction of the engineers and technicians. Therefore, this Project also includes construction work to be borne by the community. This portion shall be done in the responsibility of the Zambian government after the completion of the construction works under the Japanese side. However, consideration must be given to the construction and the procurement of materials by the Japanese side for smooth implementation of works by the community in the later stage.

3-1-3 Scope of Works

(1) Responsibilities of the Japanese side

① Procurement, transportation, delivery of the equipment and materials for groundwater development and construction of borehole water supply facilities
② Repair and maintenance of existing equipment for groundwater development and the related technology transfer
③ Construction of borehole water supply facilities and the technology transfer in relation to the use of relevant equipment
④ Procurement, transportation, and delivery of the equipment and materials for community participation and promotion of operation and maintenance
⑤ Consultation on the implementation of the Project (including technology transfer in relation to the groundwater development)

(2) Responsibilities of the Zambian side

① Securing of necessary Project sites for facilities construction and their approach roads
② Securing of necessary storage places for equipment and materials and working places
③ Establishment of the community-based maintenance system in the Project sites, including the establishment of V-WASHE committees and facilitation and support of activities by the committees
④ Construction of appurtenant facilities of water supply facilities by the community with sufficient support from the executing agency and the maintenance support organizations
⑤ Assignment of counterparts without charge to Japan that can be engaged in the construction works implemented by the Japanese prime Contractor and receive the technology transfer with free of charge to Japan
⑥ Rental of existing equipment for groundwater development and newly procured equipment, the use of which constitutes the prerequisite for the implementation of Project, to the Japanese prime Contractor without charge
⑦ Prompt arrangement of necessary administrative measures for the implementation of the Project including the exemption from public duties and taxes such as tariff and value added tax, acceleration of customs clearance, and provision of various

information

⑧ Bearing the expenses outside the range of the Japan's Grant Aid Assistance such as the banking fees

⑨ Smooth processing of entry formalities and provision of tax exemption measures to the Japanese operators related to this Project, and provision of security during their stay in Zambia

⑩ Preparation of necessary operation and maintenance system including manning and budget for effective function of constructed facilities and procured equipment and materials in the Project

3-1-4 Consultant Supervision

The flow of Consultant Supervision from the Detailed Design Study, tender, contract related operation, supervision on facility construction and equipment procurement to the inspection is conducted in the following order :

① Execution of the Detailed Design Study and preparation of tender documents related to the construction of facilities and procurement of equipment and materials

② Supporting the tender and evaluating the result of tender

③ Witnessing and advising to the procedures from the tender to the contract

④ Management of the schedule for procurement and transportation of equipment and materials, construction of facilities, and technical instruction and transfer

⑤ Technology transfer on the survey in the groundwater development at the stage of the Detailed Design Study

⑥ Inspection

⑦ Formulation of reports

3-1-5 Procurement Plan

The prime Contractor procures spare parts necessary to repair and service the existing equipment owned by DWA and the equipment and materials necessary for construction of water supply facilities based on the contract and the technical specifications.

The equipment and materials which has appropriate quality and adequate supply sources in Zambia or in the nearby countries will be procured locally. As for the equipment, due to the easiness of maintenance and the provision of after-sale services, priority will be given to the locally available equipment. On the other hand, as for the spare parts for the equipment procured under the previous Japanese Grant Aid Project will be procured from Japan. The procurement plan of the main equipment reflection the status of Zambian market is summarized as follows :

① Spare parts for the existing drilling machines and the trucks to load drilling machines: Since the existing equipment was manufactured in Japan and the spare parts cannot be procured in Zambia, they must be procured in Japan.

② Spare parts for existing air compressors and the trucks to load air compressors: Since the existing equipment was manufactured in Japan and the spare parts cannot be procured in Zambia, they must be procured in Japan.

③ Spare parts for existing supporting vehicles: Since the existing equipment was manufactured in Japan and the spare parts cannot be procured in Zambia, they must be procured in Japan.

④ Accessories and tools for existing drilling machines: Since the existing equipment was manufactured in Japan and the accessories and tools cannot be procured in Zambia, they must be procured in Japan.

⑤ Spare parts for the borehole pumping test equipment and the trucks to load the equipment: Since the existing equipment was manufactured in Japan and the spare parts cannot be procured in Zambia, they must be procured in Japan.

⑥ Cargo trucks, borehole pumping test equipment (to be loaded on trucks), and pick-up trucks: Since they are not manufactured in Zambia, they will be procured from the third countries including the nearby countries and Japan.

⑦ Motorcycles and bicycles: Since they are not manufactured in Zambia, they will be procured from the third countries including the nearby countries and Japan.

⑧ Casing pipes and screen pipes for boreholes: Since they are not manufactured in Zambia and the ones manufactured in South Africa are extensively used and have enough quality level as well as supplying power, those made in South Africa will be procured.

⑨ Hand pumps and their maintenance tools: The most extensively used hand pumps in Zambia with almost standardized specifications is the India Mark-II manufactured in India. Therefore, procurement from India will be examined. Attention and caution must be paid to the damages during the transportation.

⑩ Cement and gravel: They are manufactured in Zambia at stable level, and there is no problem in procuring them at site.

⑪ Fuel (gasoline and diesel oil): Since the purified products processed after being imported are in circulation all over Zambia, there is no problem to procure them at site. However, there may be an impeding occasion in which the demand and supply situation of fuel becomes tight due to the shutdown of refineries caused by the accident, careful attention is necessary.

⑫ Workshop equipment: Many of the tools distributed in Zambian market are sub-standard quality. Thus the procurement from the third country including Japan will be considered.

⑬ Office equipment including computers: Though there are distributors of European manufacturers in Zambia, the products are delivered from Europe after ordering. Therefore it can be treated as procurement from the third country.

⑭ Equipment and materials to be used for community participation and promotion of operation and maintenance: Some of the equipment manufactured in South Africa is extensively used in Zambia. Thus procurement in Zambia or from the third country will be considered.

3-1-6 Implementation Schedule

The Project is implemented in two phases. Each of the first and the second phase will be started from the conclusion of the Exchange of Notes on the Grant Aid Cooperation between Governments of Japan and Zambia and must be completed within the same fiscal year.

For both the first and the second phases, DWA concludes the Consultant Agreement with the Japanese Consultant on this Project. After the Consultant Agreement is verified by the Japanese Government, the said Consultant conducts the Detailed Design Study, prepares the tender documents, and obtain the approval of tender documents from both of the Governments of Japan and Zambia. The Consultant also helps and substitutes DWA on the tender for selecting Contractor for construction and procurement of equipment and materials to be implemented by DWA, as well as supports DWA in evaluation of the tender and negotiation with the successful bidder. After concluding the contract with the successful bidder, the Consultant supervises the construction works, inspects the

equipment and materials procured and delivered and the facilities constructed, and implements all the necessary works for the final hand-over including the witness of operational instruction to Zambian side.

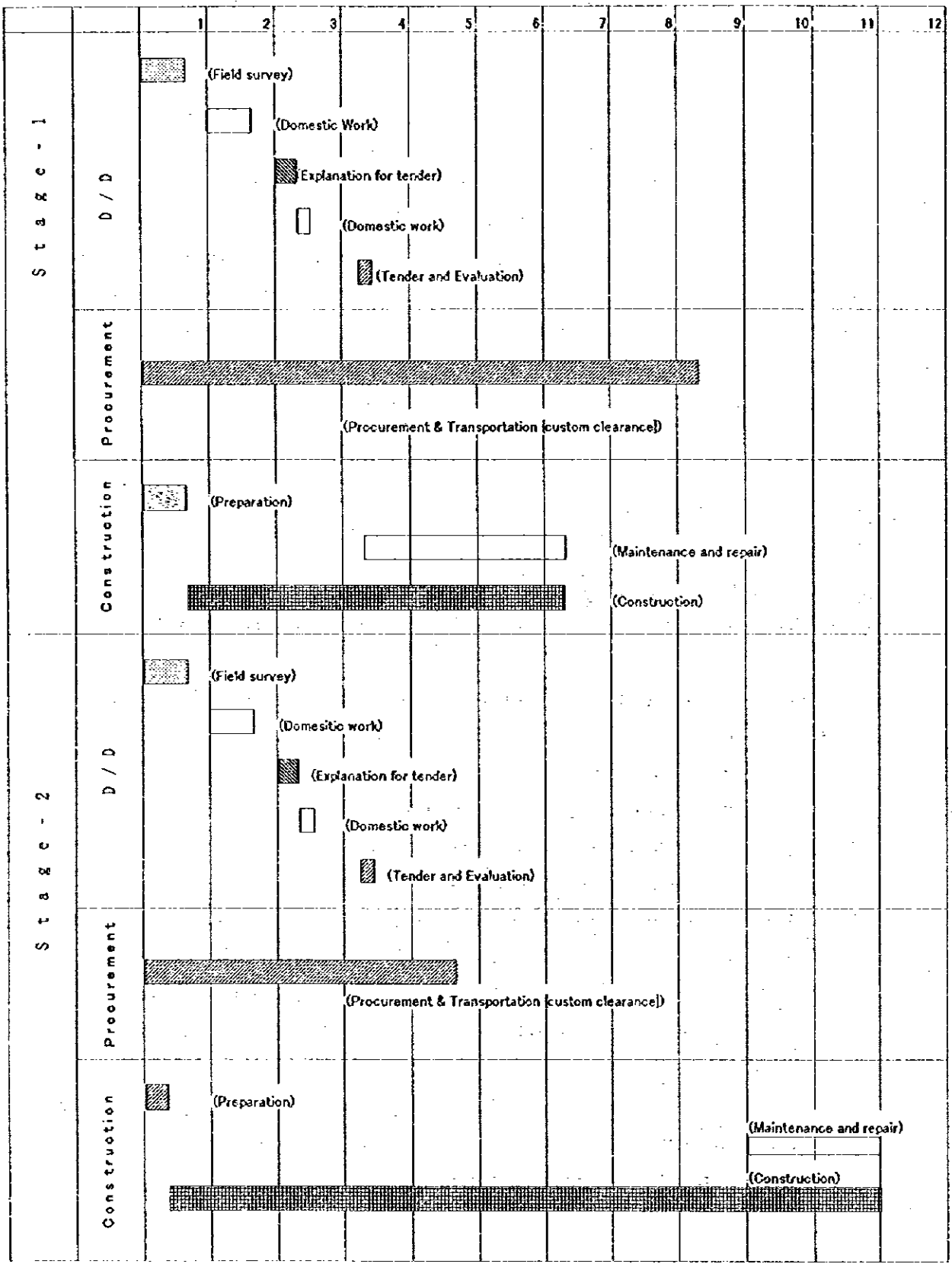
As mentioned above, the Contractor procures the equipment and materials and constructs the facilities after the verification of the Contract. As for the duration of procurement, some spare parts to service the existing drilling machines need 6 months to be manufactured while others may need 1 to 3 months. They also need two months for the marine transportation, customs clearance, and inland transportation. Even procurement from nearby countries takes about 1 month for customs clearance and inland transportation. As for the construction of facilities including the preparation period, about 6.5 months are necessary for the first phase and about 11 months for the second phase. The implementation schedule is shown in Table 3-1.

3-1-7 Obligations of Recipient Country

Government of Zambia is requested to execute following necessary arrangements for smooth implementation of the Project as is regulated in the Japanese Grant Aid Scheme.

① To provide relevant data, information and documents necessary for the execution of the Project.
② To secure necessary sites for construction of the facilities and approach roads, and carry out repair of roads or pavement if necessary.
③ To provide necessary storage place for equipment and materials, working places, temporary site offices, etc. to implement the Project.
④ To bear banking fees in the Foreign Exchange Bank in Japan in accordance with the banking arrangement for the implementation of the Project.
⑤ To make necessary arrangements for exemption of tariff, prompt customs clearance and smooth inland transportation for the Project procured equipment and materials.
⑥ To secure smooth embarkation and disembarkation for the Japanese nationality personnel related to the Project implementation based on the approval by the Contract verified by Governmentof Japan.

Table 3-1 Implementation Schedule



⑦ To exempt all tax such as tariff, value added tax, national tax etc. on the materials and labor to be purchased by the Japanese nationality personnel related to the Project implementation based on the approval by the Contract verified by Government of Japan.

⑧ To assign counterparts who can be engaged in the Project construction work done by the Japanese Contractor as to receive technology transfer on the aspect of operation and maintenance of the drilling machine and related equipment without charge as well as to rent existing ground water development equipment and newly procured equipment to the Japanese Contractor for the implementation of the Project without charge which constitute prerequisites for the Project implementation.

⑨ To secure community-based operation and maintenance system at village-level where the water supply facilities are constructed including establishment of V-WASHE Committees and facilitation and support of their activities as well as to secure sufficient support from the executing agency and the maintenance support organizations for the construction of appurtenant facilities of water supply facilities done by the community.

⑩ To consolidate and secure operation and maintenance system including manning and budget which can fully utilize Project procured equipment and materials and Project constructed water supply facilities.

3-2 Operation and Maintenance Plan

3-2-1 System and Method of Operation and Maintenance

The Government of Zambia, as its basic policy, promotes the community-based operation and maintenance system for the sustainability of water supply facilities in rural area through the provision of minimum repair works and the expenses by the community as its basic policy. Therefore, WASHE activities are being introduced for capacity building of the community in operation and maintenance. The D-WASHE committees and V-WASHE committees, established and trained through the WASHE activities, carry out operation and maintenance in each district and village level. V-WASHE committees and VLOM Teams, being made up of the beneficiaries of the water supply, provide labor force and share the cost for the repair and maintenance of water supply facilities. D-WASHE

committees consist of Director of Works for each District as the chairperson and the District member of DWA, Ministry of Education, Ministry of Health, District Council, NGOs etc. in the cross-administration point of view. D-WASHE committees instruct, assist, follow-up and monitor the activities of V-WASHE committees.

3-2-2 Operation and Maintenance Cost

Following is the estimated operation and maintenance cost for 220 borehole water supply facilities constructed under the Project to be borne by the Zambia side after the completion of the Project (Details are to see the Appendix-6).

Table 3-2 Operation and Maintenance Cost

(Thousand Kwacha / Year)

Items	Cost
1. Operation and Maintenance cost by D-WASHE committees	
1) Operation and Maintenance cost for the activities of D-WASHE committees	23,596
2. Operation and Maintenance cost by V-WASHE committees	
1) Cost for spar parts for hand pumps	14,494
TOTAL	38,090

3-2-3 Manning

The community-based organizations composed of the residents carry out above mentioned WASHE activities. Community Organizers and Pump Menders are in the position to teach, instruct and supervise these community on their organizational activities of operation and maintenance of the facilities. As for the aspect of Hygiene Education, the Environmental Health Technicians, the staff of the Ministry of Health in rural areas, are supposed to take part.

Since it is planned to organize WASHE committees in each of the village and district level and develop capacity of these committees by Zambia side by the completion of the Project, the manning for these organizations and their activities will be adjusted and reinforced during the implementation of the Project.

3-2-4 Budget Raise for Operation and Maintenance

The budget for D-WASHE activities shall be raised by each D-WASHE committee with the support from DWA. The maintenance cost of the water supply facility at village level such as purchasing spare parts for hand pump shall be borne by each benefiting community. Neither of the sources of the budget is quite abundant. However, the promotion and reinforcement of WASHE activities during implementation of the Project is anticipated to make the budget raise possible.

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

Chapter 4 Project Evaluation and Recommendation

4-1 Project Effect

The Government of Zambia has put her efforts in development of water and sanitation sector to improve the living standard of the residents in rural areas. Especially, with regard to the poor coverage rate of water supply, as one of the most serious problems in rural areas, Government of Zambia aims to improve it to 75% by 2015. Frequent draught, little rain, and insufficient maintenance of water supply facilities (such as the shallow wells with well buckets or the boreholes with hand pumps) bring in delay in improvement of poor coverage rate. Due to poor economic status of the residents in rural areas, construction of water supply facilities needs the support from Government. On one hand, Government of Zambia develops the reliable water sources not to be dried up during the drought by constructing boreholes as the measures for the former problem. On the other hand, Government of Zambia has tried to promote the community-based maintenance of water supply facilities at the village level such as introduction of WASHE activities for the latter problem.

As the reorganization of the water sector has been promoted by Government of Zambia, the future preparation of water supply and hygienic facilities in rural areas will become the responsibilities of local governments. In the future, the implementation of water supply projects such as this Project will clearly have the characteristics of decentralization and community-oriented, which the local authorities such as the D-WASHE Committee will promote to implement, accompanied by capacity building of residents themselves while educating the residents and facilitating community participation from the planning stage. However, other ministries related in water and sanitation sector except DWA, which is the implementing agency of the Project, are facing with insufficient number of staff and amount of budget. Thus, the water and sanitation projects are implemented mainly by DWA with the support of the supporting agencies, international agencies, and NGOs of various countries.

The coverage rate of water supply by boreholes in Southern Province still stays low at 18%. Thus, the urgent improvement of water supply, which is indispensable for the improvement of living standards of the residents in rural areas, is required. Southern Province suffers from the damages of severe drought and the district offices are continuously trying to promote construction of water supply and sanitation facilities in rural areas with the participation of the community under the WASHE concept. The

residents of rural areas of Southern Province where the water supply facilities will be constructed under the Project are mainly engaged in agricultural and dairy industries, and most of them live with self-sufficiency. Although many of these residents have only small cash income, they have a larger number of cattle which are economically valuable, compared with the residents of other Provinces. Thus, it is determined that they have sufficient capability to bear the financial burden necessary for the maintenance of the said facilities.

The Project supports the efforts of both Government of Zambia (DWA as the executing agency) and the residents of the areas to be covered under the Project for the improvement of the present condition in water supply and sanitation. Equipment necessary for the groundwater development to DWA is procured under the Project with technology transfer in groundwater development from the Japanese experienced engineers and technicians to DWA staff. On the other hand, this Project, based on the WASHE concept, constructs the borehole water supply facilities with hand pumps for the residents of rural areas having no public water supply services and yet seriously suffering from water shortage. In addition, the equipment necessary at the local government level to promote community-based operation and maintenance of constructed water facilities will be procured under the Project.

For the establishment of proper operation and maintenance system, Government of Zambia will promote the WASHE activities at district-, catchment area-, and village-levels in parallel to the implementation of the Project. WASHE activities are intended to establish the community-based management system to realize proper technical operation and maintenance of hand pumps, fund raising for future maintenance, proper utilization of facilities, and behavior changes in sanitation through hygiene education, through the establishment of the WASHE committees at each level and the capacity building of committee members mainly by bringing up human resources. Thus, capability of the community in operation and maintenance will be improved and the effects of the Project will be developed and continued. The Project was determined to have sufficient aptness from the following reasons and considered as the proper project under the Grant Aid Cooperation of Japan.

The following direct effects can be expected by the implementation of the Project.

(1) The beneficiaries of the Project are the general residents of rural areas including the underprivileged. The number of the direct beneficiaries of the Project is about

69,000, which amounts to 7% of the entire residents in rural areas in Southern Province of about 850,000. The coverage rate of water supply by boreholes in the rural areas of Southern Province will be increased from 18% at present to about 23% after the implementation of the Project.

(2) The Project fulfills the standard set by DWA which regards the maximum number of population which can have a use of one water supply facility as 250, and the sufficient water supply from both the qualitative and the quantitative points of view can be secured at the Project sites.

In addition to the items (1) and (2) mentioned above, the following items (3) and (4) can be listed as the indirect effects of this Project.

(3) In the rural areas where the water supply facilities will be constructed under the Project, the residents will be able to obtain clean and stable drinking water from the water sources close to their living district in the village. As a result, the following effects can be expected.

1) Because the rural areas in which water supply facilities will be constructed by the Project do not have the facilities for the supply of safe and stable drinking water, and the residents in the areas rely on highly contaminated hand-dug shallow wells, spring water, standing water, or running water for drinking water, the occurrences of water-borne diseases are frequent. Thus the hygienic and sanitary environments must be improved. After the implementation of the Project, decrease of water-borne diseases can be expected with the stable supply of clean water. In addition, the improvement of the hygienic and sanitation environments of villages, which can be realized with consumption of necessary amount of water, can be realized. Although the quantified data to evaluate these effects is difficult to obtain, the following effects can be listed: (1) decrease of infant mortality, (2) improvement of the health of mother and children because they are released from heavy work of fetching water, (3) reduction of unproductive hours caused by diseases, and (4) decrease of the burden for the medical expenses.

2) Usually, in the Project area, it was mainly women and children that were engaged in fetching water from water sources in a long distance outside the village. With the construction of water supply facilities in the villages under

the Project, women and children will be released from the work to fetch water. Thus the time and the energy consumed in fetching water will possibly be use in more effective way. These time and energy can be used for productive activities such as for agriculture or may lead to increase the educational opportunities for the children of school age to be able to go to school.

(4) The groundwater development related equipment such as the borehole drilling machines, which will be repaired, serviced, and maintained by the Project, will be continuously used by Government of Zambia for the construction of rural water supply facilities and can be expected to bring benefits to the local residents of wide range. In addition, with the technology transfer conducted by the Japanese engineers and technicians to DWA staff during the construction work, the technical level of Zambia will improved, which will contribute to the effective promotion of future water supply development plan by DWA to be expected after this Project is implemented.

(5) The equipment for operation and maintenance to be procured under the Project will be used for improving the operation and maintenance system in the Project sites, which the D-WASHE committee of each district facilitates. Because the equipment can be used continuously for the WASHE activities promoted by the D-WASHE committees after the completion of the Project, the equipment also has the effect to support and promote the D-WASHE activities. In addition, the equipment will be used for the WASHE activities to be facilitated by the D-WASHE committee of each district not only in the Project sites but other area of Southern Province.

Based on the above mentioned standpoints, the beneficial effects obtained through the implementation of the Project can be divided to those that can be indicated numerically and those that cannot be quantified. However the beneficial effects can be summarized and are shown in Table 4-1.

Table 4-1 Effects and Degree of Improvement due to Project Implementation

Present Situation and Problems	Measures to be Taken in the Project	Effects and Degree of Improvement by the Project
(1) Based on the National Water Policy of 1994, Government of Zambia aims to attain the coverage rate of water supply of 75% by 2015. Southern Province, in which the Project sites are dispersed, received enormous damages from the recent drought and little rain. Thus the residents eagerly desire the safe and stable water supply. However the coverage rate of borehole water supply in Southern Province stays at a low level of 18%.	Total of 220 water supply facilities will be constructed in 101 villages under the Project where the residents are suffering from the severest water problems among the entire area covering eight districts and one city in Southern Province so that the water supply will be enabled under the Grant Aid Cooperation.	Among the population of the entire Southern Province of about 1.1 million, the population of rural area is about 830,000. The coverage rate of water supply by boreholes that will not dry up during the dry season is estimated at about 18%. The number of beneficiaries of the Project is about 59,000 and the above mentioned water coverage rate by boreholes will be improved to 23%.
(2) The rural area of Zambia including the Project sites obtain the water for domestic use from highly contaminated hand-dug shallow wells, spring water, standing water, or running water, and in many cases the water quality is not appropriate for drinking. Because many shallow wells are dried up especially during the dry season, the amount of water taken from shallow wells become very scarce or the distance from the water source to the village becomes very long.	As the measures shown in the mentioned problem in the Project, the boreholes to be the stable water sources to satisfy the qualitative conditions, and total of 220 boreholes will be constructed to satisfy the number of necessary water supply facilities in accordance with the situation of water demand by the size of the Project area from the quantitative standpoint.	In the Project, the "use of one water supply facility by a population of 250", which is the standard of DWA, will be satisfied and the supply of 30 liters/capita /day will be enabled. In other words, the enough water supply from both the quantitative and the qualitative standpoints will be secured.
(3) As shown in the above item (2), the water sources with poor water quality are being used at present. Thus, the spread of diarrhea and invermination caused by water of poor quality is markedly prominent. The former is one of the causes of infant mortality. Fetching water from a long distance causes heavy burden to women and children who are involved in water fetching work.	As mentioned in the above item (2), by constructing borehole water supply facilities to satisfy both the qualitative and the quantitative conditions, the accesses to clean and sufficient amount of water having no trouble of seasonal change on stable basis will be enabled and the distance from the village to the water source will be shortened.	Being able to use clean water decreases the occurrence of water-borne diseases, which stands high moralities in the causes of death in Zambia. In addition, from the fact that enough amount of water can be obtained from the water sources in the villages even during the dry season, the distance and time to fetch water will be shortened. Thus the energy and the time consumed for fetching water can be utilized in more effective and productive way.

Present Situation and Problems	Measures to be Taken in the Project	Effects and Degree of Improvement of the Project
(4) Based on the National Water Policy, DWA is implementing the projects to improve condition of local water supply. However the equipment presently owned by DWA including the borehole drilling machines and supporting vehicles are damaged or highly decrepit, and the procurement of spare parts for the equipment has become difficult. For the smooth implementation of the plan, the said equipment needs repair by procuring the spare parts, or procurement of new equipment is needed. In addition, although the technical level of DWA excels compared with others in Zambia, it needs further technical improvement to achieve more effective and efficient water supply development.	The borehole drilling machines and the supporting vehicles procured by the past Japan's Grant Aid Assistance will be entirely repaired and serviced by procuring the spare parts. At the same time, necessary equipment will be procured including some supporting vehicles. The equipment will be serviced and delivered to DWA so that further construction of boreholes can be succeeded by DWA after the completion of the Project. The technical transfer from the Japanese engineers and technicians to DWA staff will be conducted with the technical instruction on the fields of the groundwater development study, the effective siting of boreholes, structural design of boreholes, and drilling plan and technology conforming to the geological characteristics,.	Boreholes in the Project will be constructed by DWA staff using the equipment presently owned by DWA as mentioned above. Thus the project can be implemented in a wide range and in short period of time. After the completion of the Project, the equipment will be continuously utilized by DWA to implement other water supply projects by DWA. With the improved technical capacity (experiences in the geological characteristics in Southern Province is assumed to be applied to others), the equipment is expected to be utilized sufficiently.
(5) The rural water supply and sanitation project in Zambia is being implemented with the promotion of the WASHE activities, orienting in decentralization and community participation. To establish the effective operational and maintenance system, it is necessary to improve the capability of D-WASHE committees to be established. However the equipment necessary for the promotion of WASHE activities such as vehicles, office equipment, and maintenance equipment are insufficient.	Necessary equipment for D-WASHE committees to be in charge of facilitation of WASHE activities, and operation and maintenance of the water supply facilities at the Project sites, will be procured .	The equipment procured under the Project will be used for promotion of WASHE activities at district-, catchment area-, and village- level, which will support and promote the establishment of the operation and maintenance system to be implemented by Government of Zambia.

4-2 Recommendation

In order to increase the effects of the Project, it is proposed for DWA to pay special attention to the following matters.

(1) Enforcement of operation and maintenance system: To maintain and improve the coverage rate of water supply, continuous operation and maintenance of facilities is indispensable. It is determined necessary that the organizations such as the committees constituting the bases of the WASHE activities must be permanently operated by strengthening the organizations to be established in the future such as the V-WASHE committees of village level, the catchment area committees of catchment area level, and the D-WASHE committees of district level, as well as the flexible promotion of the relationship with other donors or NGO is necessary. Therefore, the following points must need special consideration.

1) DWA must pay special attention to actively promote WASHE activities in the Project area and to have close communications and coordination with the related governmental and other organizations including the D-WASHE committees for the establishment of the V-WASHE committees with capacity building in the operation and maintenance.
2) With regard to the establishment of the D-WASHE committees and the capacity building of their staffs, DWA must try their best efforts for the effective mobilization of the related organizations including the N-WASHE committees which promote the extension of WASHE activities at nation-wide.
3) In order to secure the budget necessary for the continuous implementation of the above mentioned WASHE activities in the future, DWA must pay the maximum efforts.

(2) Collection and analysis of the data for groundwater development study: Due to the importance of the groundwater development in the preparation of water supply facilities using the boreholes as the water sources, it is necessary to further strengthen the studying capacities of DWA in water resource development. In the Basic Design Study, electric prospecting survey has been extensively employed for the physical prospecting. Improvement of the future study methods is expected, based on the resource materials obtained during the implementation stage such as the data by electric prospecting, the drilling record, and the results of pumping test of borehole water. To systematically arrange the materials based on the study and

the measured results and to accumulate them in the useful data bank are determined effective for the future development plan.

(3) Monitoring of groundwater level and water quality: In the southern part of Zambia including Southern Province, lowered groundwater level is observed due to the frequent droughts in the past and little rain. It is necessary to continuously monitor the change of the situations of groundwater which constitute the most important water source. In addition, it is necessary to pay special caution to the quality of groundwater, because the occurrence of contamination of groundwater is possible from human causes in the future, although it is not reported at present. Therefore, it is considered necessary for DWA to implement continuous monitoring of water level and the quality of groundwater as necessary in the future.

APPENDICES

APPENDIX-1 MEMBER LIST OF THE STUDY TEAM

(1) Basic Design Study

Name	Assignment	Affiliation
Yasuo Mukai	Team Leader	Development Specialist Institute for International Cooperation, JICA
Yuichi Sugano	Coordinator	First Project Study Division Grant Aid Project Study Dept, JICA
Yoshitaka Hamanaka	Chief Consultant / Management, Operation and Maintenance Planner	Japan Techno Co., Ltd.
Akira Sato	Hydrogeologist I /Drilling Planner	Japan Techno Co., Ltd.
Yasuhisa Sukeshita	Hydrogeologist II	Japan Techno Co., Ltd.
Masaki Kinemuchi	Geophysical Surveyor	Japan Techno Co., Ltd.
Yusuke Ando	Equipment Planner/Procurement Planner	Japan Techno Co., Ltd.

(2) Explanation of Draft Basic Design

Name	Assignment	Affiliation
Yasuo Mukai	Team Leader	Development Specialist Institute for International Cooperation, JICA
Yuichi Sugano	Coordinator	First Project Study Division Grant Aid Project Study Dept, JICA
Yoshitaka Hamanaka	Chief Consultant / Management, Operation and Maintenance Planner	Japan Techno Co., Ltd.
Akira Sato	Hydrogeologist I /Drilling Planner	Japan Techno Co., Ltd.

APPENDIX-2 STUDY SCHEDULE

(1) Basic Design Study

No.	Date	Day	Project Coordinators	Hamanaka, Sato	Sukeshita, Ando	Kinemuchi
1	Aug. 25	Sun				
2	26	Mon				
3	27	Tue		Arrive at Lusaka, JICA		Arrive at Lusaka, JICA
4	28	Wed		Meeting with DWA		Meeting with DWA
5	29	Thu		Meeting at Mazabuka		Meeting at Mazabuka
6	30	Fri		Meeting at Gwenbe, Monze		Meeting at Gwenbe, Monze
7	31	Sat		Meeting at Sinazongwe, Choma	Arrive at Lusaka	Mazabuka
8	Sep . 1	Sun		Meeting at Kalomo	Move to Choma	Mazabuka
9	2	Mon		Sinazongwe	Monze	Mazabuka
10	3	Tue		Sinazongwe	Choma	Mazabuka
11	4	Wed	Arrive at Lusaka	Move to Lusaka	Sinazongwe	Gwenbe
12	5	Thu	Courtesy call to EOJ,JICA,NCDP,Meeting with UNICEF		Sinazongwe	Gwenbe
13	6	Fri	Meeting with DWA. Explanation of inception report. Courtesy call to Permanent Secretary.		Monze	Gwenbe
14	7	Sat	Data collection and analysis		Monze	Gwenbe
15	8	Sun	Internal meeting		Monze	Analyses
16	9	Mon	Site survey (Siavonga)		Gwenbe	Monze
17	10	Tue	Meeting with DWA		Gwenbe	Monze
18	11	Wed	Meeting with DWA Meeting with WASHE,WSDG,CMMU		Gwenbe	Choma
19	12	Thu	Signing of Minutes		Mazabuka	Sinazongwe
20	13	Fri	Report to EOJ, JICA		Mazabuka	Sinazongwe
21	14	Sat	Leave Lusaka	Data analysis	Mazabuka	Choma
22	15	Sun	Arrive at Tokyo	Move to Livingstone	Move to Livingstone	Choma
23	16	Mon		Kalomo	Kalomo	Data analysis
24	17	Tue		Kalomo	Kalomo	Kalomo
25	18	Wed		Livingstone	Livingstone	Kalomo
26	19	Thu		Livingstone	Livingstone	Kalomo
27	20	Fri		Namwala	Namwala	Kalomo
28	21	Sat		Namwala	Namwala	Livingstone
29	22	Sun		Namwala	Namwala	Livingstone
30	23	Mon		Namwala	Namwala	Livingstone
31	24	Tue		Siavonga	Lusaka	Namwala
32	25	Wed		Siavonga	Data collection	Namwala
33	26	Thu		Siavonga	Data collection	Namwala
34	27	Fri		Report to JICA		
35	28	Sat		Data analysis	Kabwe	Siavonga
36	29	Sun		Data analysis	Data analysis	Siavonga
37	30	Mon		Meeting with UNICEF, CARE	Data analysis	Data analysis
38	Oct. 1	Tue		Report to EOJ, DWA Leave Lusaka		
39	2	Wed				
40	3	Thu		Arrive at Tokyo	Arrive at Tokyo	Arrive at Tokyo

(2) Explanation of Draft Basic Design

No.	Date	Day		Activities
1	Nov. 4	Mon	Leave Tokyo (Consultant Team)	
2	5	Tue	Arrive at Lusaka (Consultant Team)	
3	6	Wed	Arrive at Lusaka (Project Coordinators)	
4	7	Thu	Lusaka	Courtesy call to NCDP, DWA, Explanation of draft basic design
5	8	Fri	Lusaka	Meeting with DWA for draft and Minutes
6	9	Sat	Lusaka	Internal meeting, Data collection
7	10	Sun	Lusaka	Internal meeting, Data collection
8	11	Mon	Lusaka	Meeting with DWA for Minutes, Signing of Minutes
9	12	Tue	Lusaka Leave Lusaka (Project Coordinators)	Report of EOJ, JICA
10	13	Wed	Lusaka	Data Collection
11	14	Thu	Lusaka Leave Lusaka (Consultant Team)	Data Collection
12	15	Fri		
13	16	Sat	Arrive at Tokyo	

APPENDIX– 3 LIST OF CONSERNED PARTIES IN THE RECIPIENT COUNTRY

Ministry of Finance and Economic Development

1.	Mr. R. Chizyuka	Acting Director (ETC)
2.	Mr. Walubita Imkando	Principal Economist
3.	Mr. Arthur Phiri	Economist

Ministry of Energy and Water Development ; MEWD

1.	Mr. R. C. Sampa	Permanent Secretary
2.	Mr. S. Hibajene	Deputy Permanent Secretary (Technical)

Department of Water Affairs ; DWA

1.	Mr. L. L. Mbumwae	Director
2.	Mr. R. B. Khuti	Acting Director
3.	Mr. P. Chola	Chief Water Engineer
4.	Mr. S. F. Shisala	Senior Water Engineer
5.	Mr. O. L. Sangulube	Senior Hydrogeologist
6.	Mr. L. Phiri	Provincial Water Engineer (Southern Province)
7.	Mr. B. M. Chiwala	Water Engineer

Community Management and Monitoring Unit ; CMMU

1.	Mr. Dermot Carty	Team Leader

Water Sector Development Group ; WSDG

1.	Mrs. Gwen Chibuye	Assistant to Head

National Water Sanitation and Hygiene Education ; N-WASHE

1.	Mr. Isaac Mbewe	Coordinator

Siavonga District WASHE

1.	Mr. B. M. Akende	Council Secretary (District Council)
2.	Mr. S. H. Ndhlovu	Director of Works (District Council)
3.	Mr. K. Shikazwe	Deputy Director of Works (District Council)
4.	Mr. D. Chilanga	Senior Resettlement Officer (District Council)
5.	Mr. K. Katowa	District Statistical Officer (Central Statistical Office)
6.	Mr. Hector Mufaya	Electrical Water Foreman (D-WASHE)

Sinazongwe District WASHE

1.	Mr. Patson Chizebuka	Director of Works (District Council)
2.	Mr. Mwauluka Kennedy	Well Enumerator (CMMU)
3.	Mr. Chipande Robert	Operator (DWA)

4.	Mr. Stephen Banda	Water Technician (Africare)

Monze District WASHE

1.	Mr. S. S. Mwaala	Director of Works (District Council)
2.	Mr. P. C. S. Hapwaya	Senior Water Engineer (District Council)
3.	Mr. A. Njobvu	Water Development Officer (District Council)
4.	Mr. H. K. Chiinzila	Water Development Officer (District Council)

Choma District WASHE

1.	Mr. V. Hamayuwa	Director of Works (District Council)
2.	Mr. Jonathan Kasaro	Water Development Officer (DWA)
3.	Ms. Gwen Dolise Nakambaseke	Engineering Assistant (DWA)
4.	Mr. L. Mukulabari	District Health Inspector (Health-Choma)
5.	Ms. Christine Mumba M.	Environmental Health Technician (Health-Choma)
6.	Mr. J. Sikarza	Environmental Health Technician (Health-Choma)
7.	Ms. Alice Banba	Water Technician (Africare)
8.	Mr. David Kabumu	Field Coordinator Water Programmes (Africare)

Kalomo District WASHE

1.	Mr. B. Siwakwi	Council Secretary (District Council)
2.	Mr. B. N. Nakaanda	District Planning Officer (District Council)
3.	Mr. E. M. Zulu	Deputy Director of Works (District Council)
4.	Mr. J. M. Mwansa	District Water Engineer (DWA)
5.	Mr. R. N. Mukunta	Forestry Extension Officer (Ministry of Forestry)
6.	Mr. Oliver Mwananyanda	District Natural Resources Officer (Ministry of Natural Resources)
7.	Mr. M. Sikute	District Health Inspector (Ministry of Health)
8.	Mr. K. L. Mbanga	District Education Officer (Ministry of Education)
9.	Mr. W. Mukupa	District Officer in Charge, Building (Works and Supply Buildings)
10.	Mr. G. M. Wseri	District Community Development Officer (Community Department)

Mazabuka District WASHE

1.	Mr. Joel M. Bwembelo	Council Secretary (District Council)

2.	Mr. Bernard Munoni	Director of Works (District Council)
3.	Mr. Godfrey. S. Mbewe	Officer in Charge(DWA)
4.	Mr. Rejoice M. Hamooya	Educational Officer
5.	Ms. Lucy B. Zulu	Agriculturral Officer
6.	Dr. G. M. Mululuma	Veterinary Officer (Mazabuka D. A. P. H.)

Gwenbe District Council

1.	Mr. H. J. Mweenba	Council Secretary
2.	Mr. J. Kanene	Assistant Director of Works
3.	Mr. G. M. Misitumwa	Assistant Officer in Charge (DWA Gwenbe)

Namwala District Council

1.	Mr. J. J. Chama	Council Secretary (District Council)
2.	Mr. Millow Muzhiwo	Acting Director of Works (District Council)
3.	Ms. Jane Chikwata	Member of Parliament (District Council)

Livingstone City Council

1.	Mr. C. C. Chibbonta	Town Clerk (City Council)
2.	Mr. J. C. Lilema	Deputy Director of Finance (Water) (City Council)
3.	Mr. R. S. Mutale	Acting Water Distribution Supervisor (City Council)
4.	Mr. F. Moya	Clerk of Works (City Council)

Embassy of Japan in Zambia

1.	Mr. Tadashi Masui	Ambassador
2.	Mr. Takayuki Miyashita	Counselor
3.	Mr. Mitunori Yuki	First Secretary
4.	Mr. Tatsuro Koga	Second Secretary
5.	Mr. Hisatoshi Shimada	Second Secretary
6.	Mr. Yasuhiro Murakami	Second Secretary

JICA Zambia Office

1.	Mr. Yoshinori Ebata	Resident Representative
2.	Mr. Kouzou Tsukada	Deputy Resident Representative
3.	Mr. Shinji Obuchi	Assistant Resident Representative

UNICEF

1.	Mr. Mark Stirling	Representative
2.	Dr. S. P. Mathur	Project Officer (WASHE)

World Vision International

1. Mr. Dan Ole Shani	Associate Director Field Programmes
2. Mr. Mwala Priscar	Clerical Officer

Africare

1. Mr. Peter Elkind	Technical Coordinator

Care Zambia

1. Mr. Greg Duly	Country Director
2. Mr. Godfrey A. Mitt	Program Officer
3. Mr. Ernest Mwbeya	Project Supervisor
4. Mr. Oliver Kanene	Coordinator

APPENDIX-4 (1) MINUTES OF DISCUSSIONS ON BASIC DESIGN STUDY

APPENDIX-4 MINUTES OF DISCUSSIONS

(1) Basic Design Study

MINUTES OF DISCUSSIONS
ON
BASIC DESIGN STUDY
ON
THE RURAL WATER SUPPLY DEVELOPMENT PROJECT
IN
SOUTHERN PROVINCE
IN
THE REPUBLIC OF ZAMBIA

Based on the results of the Preliminary Study, the Japan International Cooperation Agency (JICA) decided to conduct a Basic Design Study on the Rural Water Supply Development Project in Southern Province in the Republic of Zambia (hereinafter referred to as "the Project").

JICA sent to the the Republic of Zambia a study team (hereinafter referred to as "the Team"), which is headed by Mr. Yasuo MUKAI, Development Specialist, Institute for International Cooperation, JICA, and is scheduled to stay in the country from August 27 to October 1, 1996.

The Team held discussions with the officials concerned of the Government of Zambia and conducted a field survey at the study area.

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

Lusaka, September 12, 1996

Mr. Yasuo MUKAI
Leader
Basic Design Study Team
JICA

Mr. Romance C. SAMPA
Permanent Secretary
Ministry of Energy and Water Development
The Republic of Zambia

Mr. Richard M. CHIZYUKA
Acting Director (ETC)
Ministry of Finance and Economic Development
The Republic of Zambia

ATTACHMENT

1. Objective

The objective of the Project is to improve the living standard of rural population by means of rural water supply development.

2. Project Area

The project areas are located at the place of administrative nine (9) districts in Southern Province (namely as Namwala, Kalomo, Choma, Monze, Mazabuka, Gwembe, Siavonga, Sinazongwe and Livingstone). (see ANNEX- I)

3. Responsible and Executing Organization

(1) Responsible Organization of the Project is the Ministry of Energy and Water Development.
(2) Executing Organization of the Project is the Department of Water Affairs (DWA). (see ANNEX- II)

4. Items requested by the Government of Zambia

After discussions with the Basic Design Study Team, the following items were finally requested by the Government of Zambia.
However, the final components of the Project will be decided after further studies.

(1) Construction of water supply facility (borehole fitted with hand pump) at the sites listed in ANNEX-III.
(2) Procurement of i) spare parts and consumables for existing drilling machines, supporting vehicles, testing equipment and other related equipment, ii) equipment and materials necessary for the construction of water supply facilities, iii) motivation equipment and workshop equipment necessary for operation and maintenance of water supply facilities, listed in ANNEX-IV.

5. Japan's Grant Aid System

(1) The Government of Zambia has understood the system of Japan's Grant Aid on ANNEX-V as explained by the team.
(2) The Government of Zambia will take the necessary measures described in ANNEX-VI for the smooth implementation of the Project, on condition that the Grant Aid Assistance by the Japanese Government is extended to the Project.

6. Schedule of the Study

(1) The consultants will proceed to further studies in Zambia until October 1, 1996.

(2) Based on the Minutes of Discussions and technical examination of the study results, JICA will prepare the draft report and dispatch a mission in order to explain its contents in the beginning of November, 1996.

(3) In case that the contents of the report are acceptable in principle by the Government of Zambia, JICA will complete the final report and send it to the Government of Zambia by the end of January, 1997.

7. Other Relevant Issues

(1) The Zambian side is willing to shift to Southern Province the equipment (three (3) sets of drilling machines, supporting vehicles, testing equipment and other related equipment) procured under the Japan's Grant Aid (the Project for Rural Water Supply Development, Phase-III) in 1991-1994, located in Central Province, and this shift to Southern Province shall be completed not later than the end of August, 1997.

(2) The above-mentioned equipment and one (1) set of drilling machine, supporting vehicles, testing equipment and other related equipment procured under the Japan's Non-Project Grant Aid in 1989, located in Southern Province shall be used for drilling and construction of water supply facilities in the Project.

(3) The Zambian side will prepare plans to establish V-WASHE (water committee) at each site for the Project before the draft report is brought to Zambia by JICA's mission.

(4) The Zambian side will take necessary measures to establish the D-WASHE in the districts where the D-WASHE does not exist at present and to reinforce the D-WASHE's activities in the Project area before the commencement of the Project.

(5) Especially the following details of the Project will be decided by the Japanese side after further study:

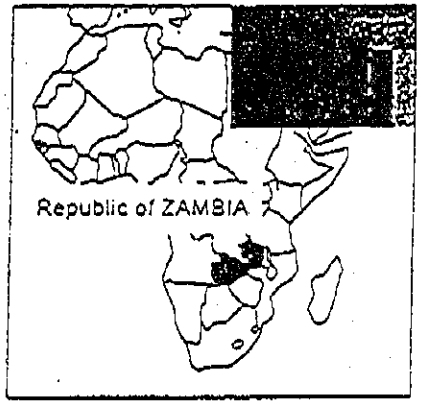
i) Project sites and number of water supply facilities to be constructed .

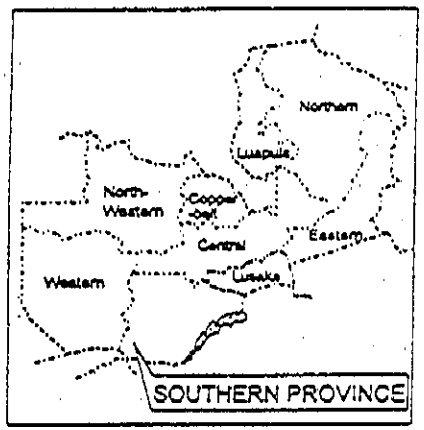
ii) Items and quantity of equipment and materials to be procured under the Project.

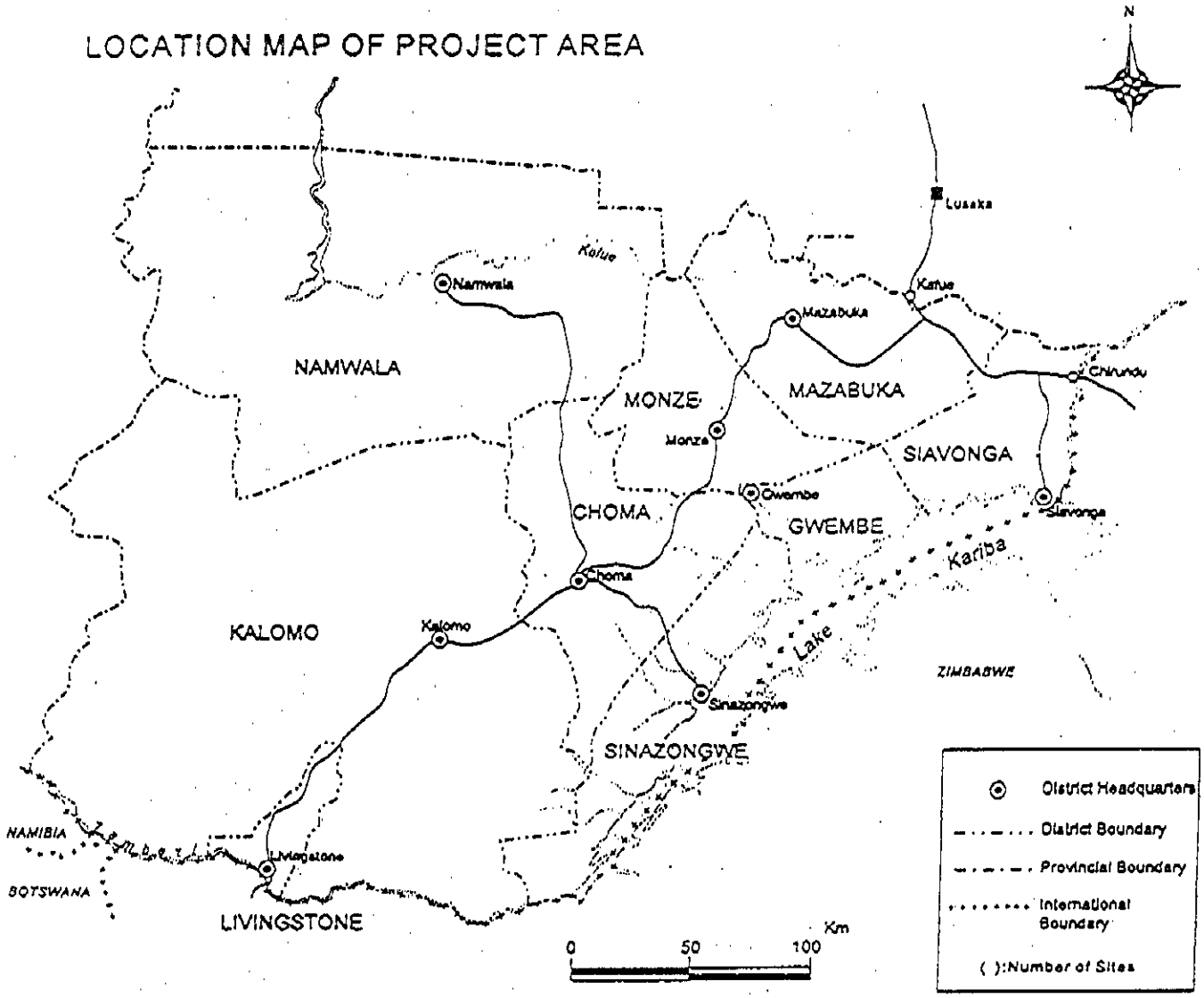
ANNEX- I

BASIC DESIGN STUDY ON THE RURAL WATER SUPPLY DEVELOPMENT PROJECT IN SOUTHERN PROVINCE IN THE REPUBLIC OF ZAMBIA

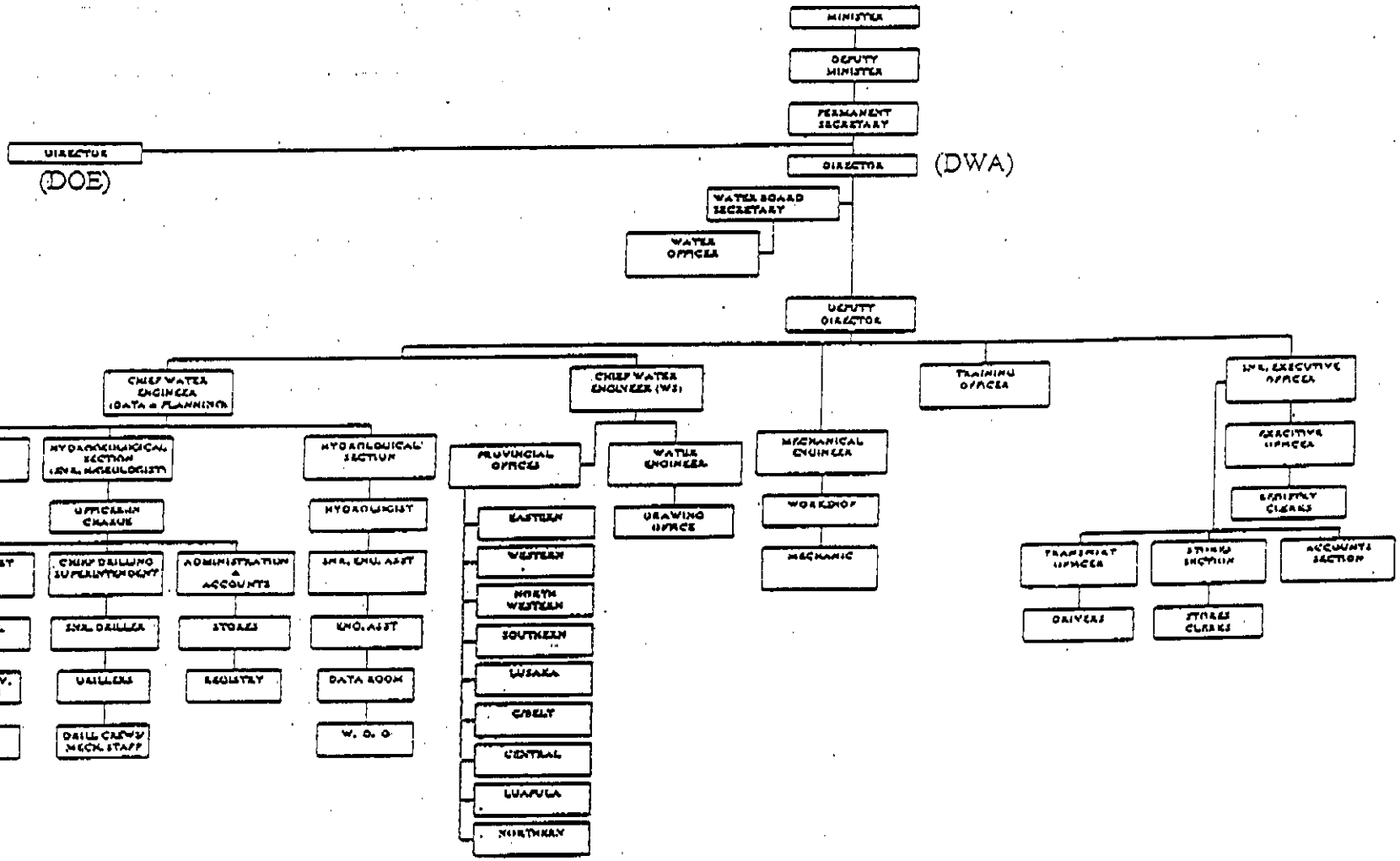
LOCATION MAP OF PROJECT AREA







ANNEX- II Ministry of Energy and Water Development
Department of Water Affairs



ANNEX-III List of Villages (1/2)

No.	District Name	Village Name	Estimated Population		Necessary Boreholes Popu. 250	No. of Existing Boreholes	No. of Requested Boreholes
			1,996	1,997			
1	Namwala	Shimayoba School	3,500	3,640	14	0	14
2	- do -	Sigwidi Village	2,950	3,068	12	0	12
3	- do -	Chief Kaingu	3,000	3,120	12	0	12
4	- do -	Chief Muwezwa	1,700	1,768	7	0	7
5	- do -	Bayangwe Village	750	780	3	0	3
6	- do -	Nkobo Village	650	676	2	0	2
7	- do -	Tampe Village	500	520	2	0	2
8	- do -	Naumba Village	500	520	2	0	2
9	- do -	Masombo Village	450	468	1	0	1
10	- do -	Moobola Village	600	624	2	0	2
11	- do -	Kabwe School	550	572	2	0	2
12	- do -	Ngabo Settlement	600	624	2	0	2
13	- do -	Namulumbwe Village	230	239	1	0	1
14	- do -	Naumba Village	300	312	1	0	1
15	- do -	Bachele Village	460	478	1	0	1
16	Sinazongwe	Mweezya School	700	727	2	0	2
17	- do -	Syasimuna Village	400	415	1	0	1
18	- do -	Mazyamuna Village	350	364	1	0	1
19	- do -	Fodwi Village	450	467	1	0	1
20	- do -	Simapumba Village	500	519	2	0	2
21	- do -	Siankuku Village	400	415	1	0	1
22	- do -	Simumpande Village	500	519	2	1	1
23	- do -	Syankumba Village	400	415	1	0	1
24	Livingstone	Simoonga Village	568	588	2	0	2
25	- do -	Kasiya R.H.C.	894	925	3	0	3
26	- do -	Mapenzi/Nansanzu	700	725	2	0	2
27	- do -	Katiba Village	500	518	2	0	2
28	- do -	Makoli Vill./Mandandi Village	600	621	2	0	2
29	Monze	Mukwelele Village	350	355	1	0	1
30	- do -	Chigbwa Village	270	274	1	0	1
31	- do -	Maambo Lukubi Village	180	182	1	0	1
32	- do -	Chikonga Village	200	203	1	0	1
33	- do -	Mpokota Village	275	279	1	0	1
34	- do -	Mwanza West Clinic	300	304	1	0	1
35	- do -	Nangweluka Village	200	203	1	0	1
36	- do -	Cheepababulembe Village	200	203	1	0	1
37	- do -	Muvwanga Village	250	253	1	0	1
38	- do -	Simuzingine Village	250	253	1	0	1
39	- do -	Chinungwe Village	150	152	1	0	1
40	- do -	Simumba Village	300	304	1	0	1
41	Kalomo	Syanjase Village	1,500	1,579	6	0	6
42	- do -	Mpolo Village	1,000	1,053	4	0	4
43	- do -	Chibule Village	600	632	2	0	2
44	- do -	Swafu Village	1,000	1,053	4	0	4
45	- do -	Siabozu Village	500	526	2	0	2
46	- do -	Syejumba Village	600	632	2	0	2
47	- do -	Nkungwa School	1,500	1,579	6	0	6
48	- do -	Polo Village	1,200	1,263	5	0	5
49	- do -	Konayuma Village	600	632	2	0	2
50	- do -	Siankape Village	450	474	1	0	1
51	- do -	Siempondo Village	500	526	2	0	2
52	- do -	Chikuyu Village	400	421	1	0	1
53	- do -	Kayuni Village	1,500	1,579	6	0	6

ANNEX-III List of Villages (2/2)

No.	District Name	Village Name	Estimated Population		Necessary Boreholes Popu. 250	No. of Existing Boreholes	No. of Requested Boreholes
			1,996	1,997			
54	Kalomo	Chawa Village	600	632	2	0	2
55	- do -	Biondwazi Village	500	526	2	0	2
56	- do -	Chibalani Village	400	421	1	0	1
57	Choma	Hinamanjolo Village	1,750	1,790	7	0	7
58	- do -	Sibanyati Settlement	900	920	3	0	3
59	- do -	Sepande Village	720	736	2	0	2
60	- do -	Singani Upper School	1,000	1,023	4	0	4
61	- do -	Munaputi Village	250	256	1	0	1
62	- do -	Maluma Village	800	818	3	0	3
63	- do -	Nakeempa RHC	1,600	1,636	6	0	6
64	- do -	Siakakole Village	540	552	2	0	2
65	- do -	Simbulo Primary School	360	368	1	0	1
66	- do -	Muzoka Village	1,000	1,023	4	0	4
67	- do -	Munyama Health Post	700	716	2	0	2
68	- do -	Mulongo Village	240	245	1	0	1
69	- do -	Simudima Primary School	500	511	2	0	2
70	Gwembe	Halumya Village	500	522	2	0	2
71	- do -	Siacheeka Village	500	522	2	0	2
72	- do -	Fumbo P. School	500	522	2	0	2
73	- do -	Gulumunyama School	200	209	1	0	1
74	- do -	Sinafala Turn Off	700	730	2	0	2
75	- do -	Chisabuka	200	209	1	0	1
76	- do -	Sinafala Village	350	365	1	0	1
77	- do -	Mabula P. School	200	209	1	0	1
78	- do -	Siabwango	350	365	1	0	1
79	- do -	Hazobwe Village	150	156	1	0	1
80	- do -	Hachcelo Village	400	417	1	0	1
81	- do -	Hachangu Village	160	167	1	0	1
82	Mazabuka	Mukwela School	1,500	1,550	6	0	6
83	- do -	Malala Village	600	620	2	0	2
84	- do -	Ngandu Haveenzu Village	500	517	2	0	2
85	- do -	Chisekwa Village	350	362	1	0	1
86	- do -	Mulando Village	450	465	1	0	1
87	- do -	Mwandakhama Village	400	413	1	0	1
88	- do -	Bondo Village	500	517	2	0	2
89	- do -	Kaunga P. School	800	826	3	0	3
90	- do -	Muvela Village	400	413	1	0	1
91	- do -	Mweemba Primary School	400	413	1	0	1
92	- do -	Mulawo Primary School	300	310	1	0	1
93	- do -	Nadezwe Agri. Camp	500	517	2	0	2
94	- do -	Makangala Village	1,000	1,033	4	0	4
95	- do -	Naluama Primary School	1,000	1,033	4	0	4
96	Siavonga	Simamba/Matero	500	511	2	0	2
97	- do -	Manchamvwa	600	613	2	0	2
98	- do -	Siamwiinga Village	350	358	1	0	1
99	- do -	Dibwi	400	409	1	0	1
100	- do -	Dambwe	450	460	1	0	1
101	- do -	Chinyama	200	204	1	0	1
102	- do -	Siamwiinga P. School	350	358	1	0	1
103	- do -	Zembamba Village	255	261	1	0	1
104	- do -	Mangaba Village	230	235	1	0	1
Total			66,082	68,505	242	1	241

ANNEX-IV

List of equipment and materials

1.	For Construction	
1-1	Spare parts for drilling machine and relevant equipment (drilling machine mounted on truck, air compressor mounted on truck, testing equipment, supporting trucks)	4 sets
1-2	Materials for borehole fitted with handpump	
	(1) Casing pipe (PVC)	sufficient for construction in the Project
	(2) Screen pipe (PVC)	- ditto -
	(3) Hand pump with spare parts kit	- ditto -
1-3	Supporting vehicles and equipment	
	(1) Cargo truck	2 units
	(2) Pick-up truck	18 units
	(3) Pump testing equipment mounted on truck	1 set
1-4	Workshop equipment (generator, welder, air-compressor, chain tong, hydraulic jack, lathe machine, hand grinder, cutting machine, fishing tools for pump, others)	1 set
2.	For community mobilization and operation & maintenanc	
2-1	Supporting vehicles	
	(1) Pick-up truck	9 units
	(2) Motor-bike	18 units
	(3) Bicycle	18 units
2-2	Office equipment	9 sets
2-3	Equipment and tools for maintenance	1 lot
2-4	Equipment and materials for education	1 lot

ANNEX - V

Japan's Grant Aid System

1. Grant Aid Procedures

1) Japan's Grant Aid Program is executed through the following procedures.

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

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

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

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

Fourthly, the Project, once approved by the Cabinet, with the Exchange of Notes signed by the Governments of Japan and the recipient country.

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

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study, conducted by JICA on a requested project is to provide basic document necessary for the appraisal of the project by the Japanese Government. The contents of the Study are as follows:

a) Confirmation of items agreed on by both parties concerning the basic concept of the project.
b) Evaluation of the appropriateness of the project to be implemented under the Grant Aid

Scheme from a technical, social and economic point of view.

c) Confirmation of items agreed on by both parties concerning the basic concept of the project.

d) Preparation of a basic design of the Project.

e) Estimation of the costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid Project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

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

2) Selection of Consultants

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

The consulting firm(s) used for the study is (are) recommended by JICA to the recipient country to also work on the project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

3. Japan's Grant Aid Scheme

1) What is Grant Aid ?

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

2) Exchange of Notes (E/N)

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

3) "The period of the Grant" means the one fiscal year in which the Cabinet approves the project for. Within the fiscal year, all procedure such as exchanging of Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed..

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

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

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

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

5) Necessity of "Verification"

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

6) Undertakings required of the Government of recipient country

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

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

into the recipient country and stay therein for the performance of their works.

7) "Proper Use"

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

8) "Re-export"

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

9) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan(hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

ANNEX-VI

Necessary Measures to be Taken by the Government of Zambia in Case Japan's Grant Aid is Extended

1. To secure the sites for the Project.

2. To clear, level and reclaim the sites prior to commencement of the construction.

3. To provide data and information necessary for the Project.

4. To provide the land for access road, a temporary site office, warehouse and stock yard during implementation of the Project.

5. To provide necessary facilities for the Project such as warehouse for spare parts, drilling accessories and other incidental facilities.

6. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the site.

7. To construct the access road to the site prior to commencement of the construction.

8. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

9. To exempt taxes (VAT etc.) and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation.

10. To ensure prompt unloading and customs clearance at a port of disembarkation in Zambia and facilitate internal transportation therein of the products purchased under the Grant.

11. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Zambia with respect to the supply of the products and services under the Verified Contracts.

12. To accord Japanese nationals whose services may be required in connection with supply of the products and services under the verified contracts, such facilities as may be necessary for their entry into Zambia and stay therein for the performance of their work.

13. To assign the necessary staff and secure the necessary budget for operation and maintenance of the equipment purchased under the Grant.

14. To maintain and use properly and effectively the equipment procured under the Grant Aid.

15. To bear all the expenses other than those to be borne by the Grant Aid necessary for construction of the facilities as well as for the transportation and the installation of the equipment.

16. To maintain the control of tools and spare parts purchased under the Grant.

APPENDIX-4 (2) MINUTES OF DISCUSSIONS ON THE EXLPANATION OF DRAFT BASIC DESIGN

(2) The Explanation of The Draft Basic Design

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY
ON
THE RURAL WATER SUPPLY DEVELOPMENT PROJECT
IN SOUTHERN PROVINCE
IN
REPUBLIC OF ZAMBIA
(CONSULTATION ON DRAFT REPORT)

In September 1996, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Rural Water Supply Project in Southern Province (hereinafter referred to as "the Project") to the Republic of Zambia, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Zambian side on the components of the draft report, JICA sent to Zambia a study team (hereinafter referred to as "the Team"), which is headed by Mr. Yasuo MUKAI, Development Specialist, Institute for International Cooperation, JICA, is scheduled to stay in the country from November 5 to November 14, 1996.

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

Lusaka, November 11th, 1996

Mr. Yasuo MUKAI
Leader
Draft Report Explanation Team
JICA

Mr. S. HIBAJENE
Deputy Permanent Secretary
Ministry of Energy and Water Development
The Republic of Zambia

Mr. Richard M CHIZYUKA
Acting Director (ETC)
Ministry of Finance and Economic Development
The Republic of Zambia

ATTACHMENT

1. Components of the Draft Report

The Government of the Republic of Zambia has agreed and accepted in principle the components of the draft report proposed by the Team.

2. Japan's Grant Aid system

2-1. The Government of the Republic of Zambia has understood the system of Japanese Grant Aid explained by the team.(ANNEX I.)

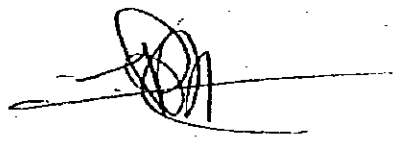
2-2. The Government of the Republic of Zambia will take the necessary measures, described in ANNEX II. for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further schedule

The team will make the Final report in accordance with the confirmed items, and send it to the Government of the Republic of Zambia by the end of January, 1997.

4. Other Issues Relevant to the Project in case Japan's Grant Aid is executed

The Government of the Republic of Zambia has agreed to make every endeavor to secure necessary funds from national budget and/or Japanese counterpart funds for the execution of the Project.



Annex I

Japan's Grant Aid Scheme

I. Grant Aid Procedures

1) Japan's Grant Aid Program is executed through the following procedures.

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(2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.

(3) To secure buildings prior to the procurement in case the installation of the equipment.

(4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of products purchased under the Grant.

(5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

(6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their works.

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the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

ANNEX II

Necessary measures to be taken by the Government of the Republic of Zambia in case Japan's Grant Aid is executed.

1. To secure the necessary construction sites to implement the Project.

2. To clear, level and reclaim the site prior to commencement of the construction.

3. To construct the access road to the site prior to commencement of the construction.

4. To secure maintenance system in the villages where the Project will be implemented including the establishment and promotional activities of water committee, preparation of supporting organizations and promotion of theses activities.

5. To secure the community to construct appurtenant facilities of water supply facilities with support and promotion of the construction by the implementation organization and the maintenance support organizations.

6. To assign staffs that can participate in the construction works implemented by the Japanese prime contractor and receive the technical transfer without charge.

7. To ensure rental of existing equipment for groundwater development and newly procured equipment, the use of which constitutes the prerequisite for the implementation of the Project, to the Japanese prime contractor without charge.

8. To provide data and information necessary for the Project.

9. To provide the land for access road, a temporary site office, warehouse and stock yard during implementation of the Project.

10. To provide necessary facilities for the Project such as warehouse for spare parts, drilling accessories and other incidental facilities.

11. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lighting in and around the site.

12. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

13. To exempt taxes (VAT etc.) and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation.

14. To ensure prompt unloading and customs clearance at a port of disembarkation in Zambia and facilitate internal transportation therein of the products purchased under the Grant.

15. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Zambia with respect to the supply of the products and services under the Verified Contracts.

16. To accord Japanese nationals whose services may be required in connection with supply of the products and services under the verified contracts, such facilities as may be necessary for their entry into Zambia and stay therein for the performance of their work.

17. To assign the necessary staff and secure the necessary budget for operation and maintenance of the equipment purchased under the grant.

18. To maintain and use properly and effectively the equipment procured under the Grant Aid.

19. To bear all the expenses other than those to be borne by the Grant Aid necessary for construction of the facilities as well as for the transportation and the installation of the equipment.

20. To maintain the control of tools and spare parts purchased under the Grant

21. To prepare necessary personnel affairs and operation and maintenance system including the budget to effectively function the construction of facilities and the procurement of equipment accompanying the Project.

APPENDIX–5 COST TO BE BORNE BY THE RECIPIENT COUNTRY

DESCRIPTION	AMOUNT (Kwacha)		
	PHASE I	PHASE II	PHASE I&II TOTAL
1. Labor Cost for DWA Implementation Team			
1-1) salary	12,618,786	25,237,752	37,856,358
1-2) allowance	43,800,000	87,600,000	131,400,000
Sub-Total	56,418,786	112,837,572	169,256,358
2. Cost and personnel Expenditure for WASHE Activities	15,169,863	30,818,496	45,988,364
2-1) Establishment and Capacity Building of D-WASHE Committee			
2-2) Capacity Building of Pump Mender, Community Organizer, Environmental Health Technician	81,248,820	162,497,640	243,746,460
2-3) Establishment and Capacity Building of V-WASHE Committee	30,459,600	81,225,600	11,685,200
Sub-Total	126,878,288	274,541,736	401,420,024
3. Cost for Construction and Rehabilitation of Approach Road			
3-1) Namwala	802,402		802,402
3-2) Monze	5,177,413		5,177,413
3-3) Sinazongwe	362,369		362,369
3-4) Siavonga		181,215	181,215
3-5) Choma		7,429,658	7,429,658
3-6) Kalomo		3,417,128	3,417,128
3-7) Livingstone		1,501,360	1,501,360
3-8) Mazabuka		1,294,314	1,294,314
Grand Total	189,639,258	401,202,983	590,842,241

APPENDIX–6 OPERATION AND MAINTENANCE COST

COST (Kwacha/Annual)

DESCRIPTION	UNIT COST	VOLUME	COST(Kwacha)
1. Operation and Maintenance Cost borne by D-WASHE Committee			
1-1) Maintenance of 9 vehicles	1,287,720/yr/unit(*1)	9 unit	11,589,480
1-2) Maintenance of 9 motor cycles	182,010/yr/unit(*2)	9 unit	1,638,086
1-3) Photocopying	60,000/distr./month(*3)	9 distr.×12 months	6,480,000
1-4) Telecommunication	36,000/distr./month(*4)	9 distr.×12 months	3,888,000
		Sub-Total	23,595,566
2. Operation and Maintenance Cost Borne by V-WASHE Committee			
2-1) Spareparts for hand pump	65,885/pump(*5)	220 pumps	14,496,601
		Sub-Total	14,491,601
		Total	38,090,167

*1) 7% of the cost of the vehicle (US$17,600.-) per annual
*2) 7% of the cost of the motor vehicle ($2,063.6.-) per annual
*3) K.300.-/piece×200pieces/month
*4) K.500.-/min.×20min.×4times/month
*5) Quoted form CMMU
Exchange rate at 1US$=1282.05 Kwacha

APPENDIX-7 SUMMARY OF THE REQUESTED VILLAGES-1

No.	District	Site Name	Chief Area 1)	Ward 2)	Types of the village 3)	Hydrogeological potential 4)	Approach Road 5)	Population 1996	Population 1997	Necessary number of boreholes	Number of existing boreholes	Number of to-be drilled boreholes 6)	Types of current water sources	Distance to water source (km)	Existence of Clinic P:Pump installed	Existence of Schools P:Pump installed	Number of pupils	Organization for water and sanitation activities	Major diseases	Geoelectric survey	Remarks
1		Shimayoba School	Muchila	Maala	C	○	◎	660	685	3	1	2	borehole	2.0	○	○	390		dysentery,schistosome	○	
2		Sigwidi Village	Naumba	Chitongo	B	○	◎	1,200	1,248	4		4	shallow well		○				dysentery,schistosome,malaria	○	
3		Chief Kaingu	Kaingu	Itumbi	C	△	◎	300	312	1		1	dry pond	2.5					dysentery,schistosome,malaria	○	
4		Chief Muwezwa	Muwezwa	Nyambo	C	△	○	1,440	1,498	5		5	river	8.0		○	150		dysentery,schistosome,malaria	○	
5		Bayangwe Village	Chilyabufu	Banawale	C	△	○	300	312	1		1	dry pond	1.0					dysentery,schistosome,malaria	○	
6		Nkobo Village	Kaingu	Itumbi	C	○	△	400	416	1		1	shallow well	1.0		○	80		dysentery,malaria	○	
7	NAMWALA	Tampe Village	Muchila	Namakube	C	○	◎	500	520	2		2	shallow well	1.5		○	56		malaria	○	
8		Naumba Village	Naumba	Itumi	C	○	△	600	624	2		2	shallow well	0.5					dysentery,malaria	○	
9		Masompe Village	Muchila	Ndema	C	○	△	800	832	3		3	dry stream	1.0					dysentery,malaria,measles	○	
10		Mobola Village	- do -	Moobola	B	○	◎	800	832	3	2	1	borehole	4.0	○	CP			dysentery,malaria	○	
11		Kabwe School	- do -	- do -	C	○	◎	400	416	2		2	shallow well	3.0	○	○	252		dysentery,schistosome,malaria	○	
12		Ngabo Settlement	Mukobela	Kaluweza	C	○	◎	800	832	3		3	shallow well	0.1		○	under construction		dysentery,malaria	○	
13		Nsmulumbwe Village	- do -	- do -	C	○	◎	300	312	1		1	river	6.0	○				dysentery,schistosome,malaria	○	
14		Nachumba Village	Nalubamba	Mbeza	C	○	◎	750	780	3		3	reservoir	3.0					dysentery,schistosome	○	
15		Bachele Village	Shimbizhi	Lubanda	C	○	○	1,000	1,040	4		4	shallow well	3.0		○	280		dysentery,schistosome,malaria	○	
total	15sites							10,250	10,661	38		35			5	7				15	
16		Mweezya School	Synazongwe	Nkandabwe	C	○	◎	700	727	3		3	dry stream	1.8		○	320	○	schistosome,diarrhea	○	
17		Syansimuna Village	- do -	Nangombe	C	△	○	400	415	1		1	dry stream	2.0				○	malaria,diarrhea	○	
18		Mazyamuna Village	- do -	- do -	C	○	◎	350	364	1		1	spring	1.5					malaria,diarrhea	○	
19	NAZONGW	Fodwi Village	- do -	- do -	C	○	○	450	467	1		1	dry stream	1.0	○			○	schistosome,malaria,diarrhea	○	
20		Simapumba Village	- do -	- do -	C	○	◎	500	519	2		2	dry stream	5.0					malaria,diarrhea	○	
21		Syankuku Village	- do -	- do -	C	○	△	400	415	1		1	dry stream	3.0					schistosome,malaria,diarrhea	○	
22		Simumpande Village	- do -	Sinazongwe	B	◎	◎	500	519	2	1	1	borehole	2.0		CP	unknown	○	malaria,diarrhea	○	
23		Syankumba Village	- do -	Nangonbe	A	○	△	400	415	1		1	shallow well	0.1				○	malaria,diarrhea	○	
total	8sites							3,700	3,843	12		11			1	2				8	
24		Simonga Village	Sekute	Simoonga	B	○	◎	600	618	3		3	river	2.0					malaria,diarrhea	○	
25		Kasiya R.H.C.	Mukuni	Senkobo	C	◎	◎	600	618	2		2	dry stream	0.5	○				schistosome,malaria,diarrhea	○	
26	LIVING-	Mapenzi/Nansanzu	- do -	Nansanzu	C	○	◎	750	776	3	1	2	borehole	0.1					dysentery,malaria	○	
27	STONE	Katiba Village	- do -	Syungu	C	○	△	300	311	1		1	dry stream	0.1					malaria,diarrhea	○	
28		Makoli Vill./Mandandi Village	Mukuni	Senkobo	C	△	◎	500	518	3		3	reservoir	2.5		○	300		dysentery,schistosome,malaria	○	
total	5sites							2,550	2,639	12		11			1	1				5	
29		Mukwelele Village	Ufwenuka	Ufwenuka	C	○	△	350	355	1		1	reservoir	0.3					malaria,diarrhea	○	
30		Chigabwa Village	Chona	Moomba	A	○	△	270	274	1		1	borehole	5.0				○	diarrhea	○	
31		Maambo Lukubi Village	Mwanza	Mwanza East	C	○	◎	180	182	1		1	borehole	2.6				○		○	
32		Chikonga Village	Ufwenuka	Chipembele	C	○	○	200	203	1		1	shallow well	0.1					dysentery,malaria	○	
33		Mpokota Village	Chona	Chona	C	○	◎	275	279	1		1	shallow well	0.4				○	diarrhea	○	
34	MONZE	Mwanza West Clinic	Mwanza	Mwanza West	C	△	○	300	304	1		1	borehole	2.0	○			○	malaria	○	
35		Nangweluka Village	- do -	- do -	C	○	○	200	203	1		1	borehole	3.0				○	diarrhea	○	
36		Cheepahabulembe Village	Chona	Chona	C	△	○	200	203	1		1	borehole	2.5				○	malaria,diarrhea	○	
37		Muvwanga Village	Ufwenuka	Ufwenuka	C	△	○	250	253	1		1	reservoir	0.4					schistosome,diarrhea	○	
38		Simuzingine Village	Chona	Moomba	C	△	▲	250	253	1		1	borehole	4.0				○	diarrhea	○	
39		Chinongwe Village	Ufwenuka	Ufwenuka	C	○	◎	150	152	2		2	dry stream	1.0	○	○	315		malaria,diarrhea	○	
40		Simuumba Village	Mwanza	MwanzaWest	C	○	◎	300	304	2		2	dry stream	0.7					dysentery,malaria	○	
total	12sites							2,925	2,964	14		14			2	1				12	
41		Syanjase Village	Mukuni	Mukuni	C	△	○	300	316	1		1	borehole	0.8				○	dysentery,malaria	○	
42		Mpola Village	- do -	- do -	A	○	△	300	316	1		1	river	0.2				○	dysentery,malaria	○	
43		~~Chibule Village~~	- do -	- do -	C	–	–			1	1	0									Excluded from the list because there is existing borehole.
44		Sinanfu Village	- do -	- do -	C	○	△	580	611	2		2	dry stream	2.0				○	diarrhea	○	
45		Siabozu Village	- do -	- do -	C	○	△	500	526	2		2	dry stream	1.5				○	schistosome,diarrhea	○	
46		Syejumba Village	Simwatachela	Simwatachld	C	○	○	500	526	3		3	spring	0.2	○	○	195		schistosome,diarrhea	○	
47		Nkungwa School	- do -	- do -	C	○	○	600	626	2		2	dry stream	0.5		○	157		dysentery,diarrhea,measles	○	
48	KALOMO	Polo Village	- do -	- do -	C	○	△	750	790	3		3	reservoir	0.3					malaria,diarrhea	○	
49		~~Konyuma Village~~	- do -	Chidi	C	–	×					0									Excluded from the list due to problems in approach road.
50		Siankope Village	- do -	- do -	C	○	△	750	790	3		3	dry pond	0.2					schistosome,malaria,diarrhea	○	
51		Siempondo Village	- do -	Simwatachela	C	○	△	600	632	2		2	dry stream	1.0					malaria,diarrhea		
52		Chikuyu Village	- do -	- do -	C	△	◎	600	632	2		2	dry stream	0.7	○				diarrhea, asyphilis	○	
53		Kayuni Village	- do -	Simwatachld	C	○	◎	300	316	2		2	shallow well	1.0		○	320		malaria	○	
54		~~Chona Village~~	- do -	Simwatachela	C	×	×	200	211			0	river	1.0					diarrhea		Excluded from the list due to hydrogeological difficulties.
55		Siandwazi Village	Mukuni	Zimba	C	○	△	600	632	2		2	river	10.0					diarrhea	○	
56		Chibalani Village	- do -	Mukumi	C	○	△	240	253	1		1	shallow well	2.0					diarrhea	○	
total	13sites							6,720	7,075	27		26			2	3				12	

APPENDIX-7 SUMMARY OF THE REQUESTED VILLAGES-2

No.	District	Site Name	Chief Area 1)	Ward 2)	Types of the village 3)	Hydrogeological potencial 4)	Approach Road 5)	Population 1996	Population 1997	Necessary number of boreholes	Number of existing boreholes	Number of to-be drilled boreholes 6)	Types of current water sources	Distance to water source (km)	Existence of Clinic P:Pump installed	Existence of Schools P:Pump installed	Number of pupils	Organization for water and sanitation activities	Major diseases	Geoelectric survey	Remarks
57		Hinamanjolo Village	Hamaundu	Batoka	C	○	◎	1,000	1,023	5		5	shallow well	0.3		○	450		dysentery,diarrhea	○	
58		Sibanyati Settlement	Singani	Stateland	C	○	◎	900	920	3		3	pond	7.0		○	280			○	
59		Sepande Village	- do -	Siasikabole	C	◎	○	750	767	4	1	3	borehole	1.5		○	500		dysentery,schistosome,cholera	○	
60		Singani Upper School	- do -	Singani	C	○	◎	800	818	3		3	dry stream	1.0	○	○	280		dysentery,schistosome,malaria	○	
61		Munaputi Village	- do -	- do -	C	○	◎	250	256	2		2	dry stream	2.0	○	○	280			○	
62		Maluma Village	Hamaundu	Batoka	C	○	◎	750	767	4	2	2	borehole	2.5		OP	450	○	dysentery,schistosome,malaria	○	
63	CHOMA	Nakeempa RHC	Singani	Nakeempa	C	○	○	1,600	1,636	6	1	5	borehole	0.5	○	OP	573		malaria,diarrhea	○	
64		Siskakole Village	- do -	Singani	C	○	○	540	552	3		3	shallow well	0.1		○	280		malaria	○	
65		Simbulo Primary School	Hamaundu	Kasiya	C	△	△	360	368	2		2	reservoir	5.0		○	280		dysentery,diarrhea	○	
66		Muzoka Village	- do -	Nachibanga	C	◎	◎	1,000	1,023	4	1	3	borehole	0.2	OP	○	45	○	dysentery,schistosome,cholera	○	
67		Munyama Health Post	- do -	Kasiya	C	○	◎	800	818	3		3	pond	4.0	○	○	280	○	dysentery,malaria	○	
68		Mulongo Village	- do -	Hamaundu	C	○	◎	500	511	3		3	dry stream	2.0	○	○	720		dysentery,malaria	○	
69		Simudima Primary School	- do -	Kasiya	C	○	△	750	767	3		3	reservoir	0.2		○	250		dysentery,schistosome,malaria	○	
total	13sites							10,000	10,226	45		40			6	13				13	
70		Halumya Village	Munyumbwe	Munyumbwe	B	○	◎	750	782	3	1	2	borehole	1.0	OP				dysentery,malaria,diarrhea	○	
71		Siancheeka Village	Chipepo	Chipepo	C	○	◎	500	522	2		2	lake	2.0					malaria,diarrhea	○	
72		Fumbo P. School	Munyumbwe	Munyumbwe	B	○	◎	800	835	4		4	shallow well	0.2		○	378		dysentery,schistosome,cholera	○	
73		Gulumunyanga School	Chipepo	Chipepo	C	○	▲	750	782	3		3	dry pond	1.0		○	96		schistosome	○	
74		Sinafala Turn Off	- do -	- do -	C	○	◎	700	730	2		2	shallow well	1.0					schistosome,malaria,diarrhea	○	
75	GWEMBE	Chisabuka Village	- do -	- do -	A	○	○	200	209	1		1	river	8.0					diarrhea	○	
76		Sinafala Village	- do -	Cheeza	C	○	◎	350	365	2		2	deep well	1.0		○	280	○	malaria,diarrhea	○	
77		Mabula P. School	- do -	- do -	C	○	▲	600	626	2		2	dry stream	0.2		○	125		dysentery,schistosome,malaria	○	
78		Siabwango	- do -	- do -	C	○	△	350	365	1		1	dry stream	2.0					malaria,diarrhea	○	
79		Hazobwe Village	Munyumbwe	Munyumbwe	C	○	△	250	261	1		1	dry stream	0.4					malaria,diarrhea	○	
80		Hacheelo Village	- do -	- do -	C	○	◎	500	522	2		2	dry stream	0.2					malaria,diarrhea,syphilis	○	
81		Hachangu Village	- do -	- do -	C	○	△	400	417	1		1	dry stream	0.5					malaria,diarrhea	○	
total	12sites							6,150	6,416	24		23			1	4				12	
82		Mukwela School	Mwenda	Malala	C	○	◎	900	930	3		3	dry stream	1.0		○	225		malaria	○	
83		Malala Village	- do -	- do -	B	○	◎	1,500	1,550	7	1	6	borehole	1.0		OP	696	○	malaria,diarrhea	○	
84		Ngandu Haveenzu Village	- do -	- do -	B	○	◎	750	775	3		3	shallow well	0.5					malaria,diarrhea	○	
85		Chisekwa Village	- do -	- do -	C	○	◎	500	517	2		2	dry stream	1.5					dysentery,malaria,diarrhea	○	
86		Mulando Village	- do -	- do -	C	○	◎	500	517	2		2	dry stream	1.0					diarrhea,measles,Hansen's disease,tuberculosis	○	
87		Mwendankama Village	Naluama	Nansenga	C	○	◎	500	517	2		2	dry stream	2.0					dysentery,diarrhea	○	
88	MAZABUKA	Bonbo Village	Mwenda	Chitete	C	△	○	500	517	2		2	dry stream	7.0					dysentery	○	
89		Kaunga P. School	- do -	Upper Kaleya	C	○	○	600	620	2		2	river	0.5		○	518		dysentery,schistosome,malaria,measles	○	
90		Muvela Village	- do -	Nabweatuba	C	○	◎	750	775	3		3	shallow well	0.5					diarrhea,measles	○	
91		Mweemba Primary School	Siantalika	Ngwezi	C	○	◎	400	413	2		2	borehole	2.0		○	311	○	schistosome,malaria,diarrhea	○	
92		Mulawo Primary School	Naluama	Chitete	C	△	◎	400	413	2		2	reservoir	2.0		○	350		dysentery	○	
93		Nadezwe Agri. Camp	Mwenda	Mabwtuba	C	○	◎	500	517	2		2	dry stream	0.5					malaria,diarrhea	○	
94		Makangala Village	Mwanachinguala	Ngwezi	C	○	◎	1,000	1,033	4		4	dry stream	1.0					schistosome,malaria,diarrhea	○	
95		Naluama Primary School	Naluama	Chitete	C	○	◎	250	258	2	1	1	borehole	1.0	OP	○	200		dysentery	○	
total	11sites							9,050	9,350	38		36			1	6				14	
96		Simamba/Matero	Simamba	Simamba	C	○	○	180	184	2		2	shallow well	1.0		○	245		dysentery,schistosome	○	
97		Manchamvwa	Sinadambwe	Lusangazi	C	○	○	360	368	2		2	dry stream	2.0	○	○	245		schistosome,diarrhea,measles	○	
98		Siamwiinga Village	Sikongo	Sikongo	C	○	○	500	511	2		2	dry stream	1.0	○				dysentery,schistosome,malaria,diarrhea	○	
99	SIAVONGA	Dibwi	Sinadambwe	Lusangazi	C	○	○	720	736	2		2	dry stream	0.5	○				dysentery,schistosome,malaria,diarrhea	○	
100		Dambwe/Syakalinda	- do -	- do -	C	○	○	1,000	1,022	4		4	dry stream	2.0		○	175		schistosome,diarrhea		
101		Chinyama /Jamba	Sikongo	Sikongo	C	○	○	800	818	3		3	dry stream	4.0	○	○	165		malaria,diarrhea		
102		Siamwinga P. School	- do -	- do -	C	△	○	100	102	2		2	dry stream	1.0	○	○	100		dysentery,schistosome,malaria,diarrhea	○	
103		Zemba Zemba Village	Sinadambwe	Chirundu	C	○	◎	1,000	1,022	4		4	borehole	3.0	○				malaria,diarrhea,cholera	○	
104		Mangaba Village	Sikongo	Sitongo	C	○	○	800	818	3		3	dry stream	0.5					malaria,diarrhea	○	
total	9sites							5,460	5,581	24		24			6	5				7	
Grand total								56,805	58,755	234	14	220		1.8	25	42		22		98	

Remarks

1)Chief Area
Territory of traditional "Chief"

2)Word
Constituency for district election

3)Types of the villages
A:Clustered houses in one place
B:Clustered houses in several places
C:Scattered houses

4) Hydrogeological potencial
◎:High potential
○:Have potential
△:Have potential at specified place
×:Low potential

5) Approach Road
◎:Possible to transport drilling rig even in the rainy season
○:Possible to transport drilling rig only in the dry season
△:Necessary to repair road partly to transport drilling rig (not approachable in the rainy season)
▲:Necessary to repair road to transport drilling rig (not approachable in the rainy season)
×:not approachable

6) Number of to-be constructed boreholes is calculated as one borehole for 250 capitals . A borehole will be constructed at school in case if the number of pupils is more than one third of the village population.

Appendix-8 Rural population ratio against Total population (District base, estimation)

District	Total Population 1980	Total Population 1990 (1)	Growth Rate (%)	Rural Population 1990 (2)	Rural / Total (2) / (1) 1990 (%)	Rural Population 1995	Rural Population 1996	Rural Population 1997	Total Population 1995	Total Population 1996	Total Population 1997
Namwala	56,058	83,075	4.01	73,942	89.0	90,013	93,625	97,381	101,132	105,189	109,409
Sinazongwe	43,771	63,586	3.80	52,763	83.0	63,594	66,014	68,525	76,639	79,555	82,582
Livingstone	71,521	82,952	1.49	5,003	6.0	5,388	5,468	5,550	89,335	90,670	92,024
Monze	110,423	126,039	1.33	105,873	84.0	113,112	114,618	116,144	134,657	136,450	138,266
Kalomo	97,177	162,674	5.29	152,937	94.0	197,875	208,336	219,352	210,473	221,601	233,317
Choma	130,416	163,050	2.26	127,530	78.2	142,596	145,816	149,109	182,312	186,430	190,640
Gwembe	20,666	35,462	5.55	33,449	94.3	43,816	46,247	48,813	46,453	49,031	51,751
Mazabuka	112,258	155,436	3.31	113,521	73.0	133,581	137,990	142,564	182,902	188,952	195,203
Siavonga	20,633	34,876	1.64	27,235	78.1	29,546	30,032	30,525	37,836	38,457	39,089
Total	671,923	907,150	3.05	692,253	76.3	819,521	828,859	877,964	1,061,738	1,096,333	1,132,281

Remarks

Total Population for 1980 and 1990 and Rural Population for 1990 are derived from CSO Data.
Population Growth Rate is calculated from the power from Total Population in 1980 to 1990.
Rural Population after 1995 is estimated from using the population growth rate adding to the Rural Population in 1990.

Appendix-9 Popularization of water supply facilities in villages in each District

District	No. of wells in 1995			No. of Boreholes in the Project (2)	No. of wells after the Project		Ratio of water supply from Boreholes	
	Boreholes (1)	Shallow wells	Total		Boreholes (1)+(2)	Total Wells	Current*1	After the Project*2
Namwala	81	182	263	35	116	298	22.5	29.8
Sinazongwe	26	40	66	11	37	77	10.2	13.5
Livingstone	3	1	4	11	14	15	13.9	63.1
Monze	134	193	327	14	148	341	20.6	31.9
Kalomo	128	57	185	26	154	211	10.2	17.6
Choma	95	128	223	40	135	263	16.7	22.6
Gwembe	32	18	50	23	55	73	18.3	28.2
Mazabuka	84	149	233	36	120	269	15.7	21.0
Siavonga	19	9	28	24	43	52	16.1	35.2
Total	602	777	1,379	220	822	1,599	18.4	23.4

Remarks

The Number of wells in 1995 are derived from CMMU Data.
CMMU treats Livingstone as part of Kalomo District. For the use of this report, the No. of wells in Kalomo District was divided into that of Livingstone and Kalomo District according to the population volume.
Water supply ratio is 250 capital / 1 borehole.
*1Calculated from Rural Population in 1995 and No. of Boreholes in 1995.
*2 Calculated from Rural Population in 1997 and No. of Boreholes after the construction of the Project.

APPENDIX-10 CONDITION OF EQUIPMENT AND VEHICLES

(1) Equipment and Vehicles allocated in Southern Province

Equipment and Vehicles	Procured Year	Project Title	Condition	Utilization in the Project
Drilling Machine (1)	1986	The Project for The Rural Water Supply Development	• Damage in roller of must and drilling head • Leakage of oil from valve • Time-worn engine and chassis • Used for 10 years	Not utilized
Drilling Machine (2)	1991	Non-Project Grant Assistance (2KR)	• Damage in battery terminal and side mirror • Operational performance seems good • Possible to utilize for the Project after proper repair and maintenance	Utilized
Air Compressor (1) [10,579hr]	1991	Non-Project Grant Assistance (2KR)	• Substitution engine air, oil, and fuel filter are required. • Damage in solenoid valve • Possible to utilize for the Project after proper repair and maintenance	Utilized
Air Compressor (2) [11,330hr]	1991	Non-Project Grant Assistance (2KR)	• Possible to utilize for the Project after proper repair and maintenance	Utilized
Truck Mounting Air Compressor (1) (81,202km)	1986	The Project for The Rural Water Supply Development	• Heavy damages in engine and chassis • Used for 10 years. • Mileage exceeds 8,000km.	Not utilized
Truck Mounting Air Compressor (2) (95,410km)	1991	Non-Project Grant Assistance (2KR)	• Damage in plate spring • Engine and chassis are decrepit • Mileage exceeds 100,000km	Not utilized
Supporting Vehicle	1986	The Project for The Rural Water Supply Development	• Heavy damage in engine and chassis • Used for 10 years	Not utilized
Supporting Vehicle	1991	Non-Project Grant Assistance (2KR)	• Mileage exceeds 79,000km. • Engine and chassis are decrepit	Not utilized

(2) Equipment and Vehicles procured under Phase-III

NO	Code No	Procured years	Mileage (Km)		Types of Vehicles and equipment	Maker	Purpose of usage	Present situation	House power H P	Fuel	Procured Stage
1	R-1	1992	*	15,000	Drilling machine	Hino	Drilling Borehole	Running	215	Diesel	1
2	R-2	1992	1	9,422	Drilling machine	Hino	Drilling Borehole	Running	215	Diesel	1
3	R-3	1993	2	9,932	Drilling machine	Hino	Drilling Borehole	Running	215	Diesel	3
4	T-1	1992	2	61,872	Cargo Truck fitted with 6t crane	Hino	Support to drilling borehole	Damage of loading platform	260	Diesel	1
5	T-2	1992	2	14,441	Cargo Truck to mount air compressor	Mitsubisi	To carry air compressor	Running	215	Diesel	1
		1992	2	(1,797hr)	Air compressor	Ingasoll Rand		Running	336	Diesel	1
6	T-3	1992	*	10,000	Cargo Truck to mount air compressor	Mitsubisi	To carry air compressor	Running	215	Diesel	1
		1992			Air compressor	Ingasoll Rand		Running	336	Diesel	1
7	T-4	1992	2	77,897	Cargo Truck fitted with 3t crane	Mitsubisi	To carry pumping test equipment	Running	157	Diesel	1
8	T-5	1992	2	72,517	Cargo Truck fitted with 3t crane	Mitsubisi	To carry pumping test equipment	Damage of front glass	157	Diesel	1
9	T-6	1993	2	49,137	Cargo Truck fitted with 6t crane	Hino		Running	260	Diesel	2
10	T-7	1993	1	35,661	Cargo Truck fitted with 3t crane	Mitsubisi	To carry pumping test equipment	Running	160	Diesel	3
11	T-8	1993	1	7,166	Cargo Truck to mount air compressor	Hino	To carry air compressor	Running	215	Diesel	3
					Air compressor	Ingasoll Rand		Running	336	Diesel	3
12	T-9	1993	*	8,000	Cargo Truck	Hino	Supporting to drilling borehole	Running	215	Diesel	3
13	TR-1	1992	2	8,536	Water tanker	Mitsubisi	To carry water	Running	159	Diesel	1
14	TR-2	1992	2	55,195	Oil tanker	Mitsubisi	To carry fuel	Running	159	Diesel	1
15	TR-3	1993	1	25,870	Oil tanker	Mitsubisi	To carry fuel	Running	160	Diesel	2
16	TR-4	1993	2	26,814	Oil tanker	Mitsubisi	To carry fuel	Running	160	Diesel	2
17	TR-5	1993	2	26,854	Water tanker	Mitsubisi	To carry water	Running	160	Diesel	3
18	TR-6	1993	2	26,834	Oil tanker	Mitsubisi	To carry fuel	Running	160	Gasoline	3
19	RR-1	1992	3	65,542	Station Wagon to mount logging equipment	Toyota	For logging	Running	79	Gasoline	1
20	RR-2	1992	2	27,371	Station Wagon to mount logging equipment	Toyota	For logging	Running	79	Gasoline	1
21	RR-3	1993	2	80,193	Station Wagon to mount logging equipment	Toyota	For logging	Running	70	Diesel	3

Mileage 1: Surveying on June 5th 1996, 2: September 29th, 3: October 10th *Hearing survey

APPENDIX-11 LIST OF EQUIPMENT TO BE PROCURED

EQUIPMENT & MATERIALS FOR CONSTRUCTION

	ITEM	QUANTITY	ORIGIN	DESCRIPTION
1.	SPARE PARTS FOR DRILLING & RELATED EQUIPMENT			Necessary spare parts to repair and maintain four units of the existing drilling rigs procured in previous Japanese grant which will be used for drilling in the project. Repair & maintenance before operation in the project and after the project to be considered.
(1)	Spare parts for drilling equipment mounted on truck			
1)	For 3 drilling rigs procured under Phase-III Project	3 lots	Japan	Spare parts necessary for repair & maintenance of drilling machine and of its truck chassis mounting drilling machine.
2)	For 1 drilling rig procured under Non-Project Grant	1 lots	Japan	Spare parts necessary for drilling machine and for its truck chassis mounting drilling machine.
3)	Standard accessories for 1)&2) drilling rigs	1 set	Japan	Standard accessories such as drill pipes.
4)	Drilling tools for drilling 220 boreholes	1 lot	Japan	Necessary drilling tools for air drilling & mud drilling such as DTH hammer, bits.
5)	For cargo trucks procured under Phase-III Project	3 lots	Japan	Spare parts necessary for repair & maintainance 3 units of cargo trucks.
6)	For water tank trucks procured under Phase-III Project	3 lots	Japan	Spare parts necessary for repair & maintainance 3 units of water tank trucks.
7)	For fuel tank trucks procured under Phase-III Project	3 lots	Japan	Spare parts necessary for repair & maintainance 3 units of fuel tank trucks.
(2)	Spare parts for air-compressor mounted on truck			Existing air-compressors require repair and maintenance and spare parts are necessary.
1)	For 3 air-compressors procured under Phase-III Project	3 lots	Japan	Spare parts necessary for repair & maintainance of 3 air-compressors and their mounting trucks.
2)	For 1 air-compressor procured under Non-Project Grant	1 lot	Japan	Spare parts necessary for repair & maintainance of air-compressor.

	ITEM	QUANTITY	ORIGIN	DESCRIPTION
(3)	Spare parts for testing equipment			Existing testing equipment require repair and maintenance and spare parts are necessary.
1)	For 3 pump testing equipment mounted on truck procured under Phase-III Project	3 lots	Japan	Spare parts necessary for repair & maintainance of 3 pump testing equipments and their mounting trucks including replacement of submersible motor pumps.
2)	For 3 borehole logging equipment mounted on station wagon procured under Phase-III Project	3 lots	Japan	Spare parts necessary for repair & maintainance of 3 station wagons mounting logging equipments. The logging equipments do not require spare parts.
3)	For 2 geoelectric survey equipment procured under Phase-III Project	2 lots	Japan	Spare parts necessary for repair & maintainance of 2 geoelectric survey equipments.
2.	MATERIALS FOR CONSTRUCTION OF BOREHOLE FITTED WITH HANDPUMP			Materials necessary for drilling & construction of 220 boreholes with handpumps are as listed on the left corner. Diameter of casing is designed as fÓ100mm, drilling depth is 60-100m, screen to be installed for the depth of 30%. Centralizer is to be installed at every 6m of casing/screen. Guide pipe is to be installed for collapsing formation. India MK-II manufactured in India is common in Zambia. (total length of pipe is 17,515m) Cement, sand, gravel are materials for concrete work of construction of appurtenant facilities. Installation of handpump and construction of platform and soakay will be done by the villagers under supervision of Drilling fluid additives are polymer, foaming agent and CMC.
1)	Casing pipe, PVC for 220 boreholes	12260 m	Third Country	
2)	Screen pipe, PVC for 220 boreholes	5255 m	Third Country	
3)	Centralizer for 220 boreholes	2919 units	Third Country	
4)	Casing bottom for 220 boreholes	220 units	Third Country	
5)	Casing Cap for 220 boreholes	220 units	Third Country	
6)	Guidepipe, steel for 220 boreholes	924 m	Third Country	
7)	Handpumps India MK-II for 220 boreholes*	220 sets	Third Country	
8)	Drilling fluid additives for 220 boreholes	1 lot	Third Country	
9)	Materials for concrete work for 220 appurtenant facilities	1 lot	Zambia	

	ITEM	QUANTITY	ORIGIN	DESCRIPTION
3.	SUPPORTING VEHICLES AND			Supporting vehicles are necessary for drilling/construction
	SUPPORTING EQUIPMENT & MATERIALS			and the existing vehicles procured under previous projects
				are used more than their lives, and replacement of these
(1)	Truck to carry materials			vehicles is necessary.
	for construction			
1)	Cargo truck with crane to be attached to	1 unit	Japan	Existing cargo truck attached to NonProject drilling rig was
	drilling rig procured under Non-Project*			procured under Phase-I (1986) and requires its replacement.
2)	Truck to mount air-compressor	1 unit	Japan	Existing truck mounting this air-compressor was procured
	procured under Non-Project*			under Non-Project and requires its replacement.
(2)	Pick-up truck to carry staff & materials	18 units	Japan	Existing station wagon and pick-up trucks procured under
	of teams of drilling(A/B/C/D)/pump test			Phase-III were used more than their lives. Replacement is
	pump test(A/B/C/D)/construction(A/B/C/D)			necessary. Distribution : 2 units to each team of drilling,
	/survey and management*			1 unit to each of pump test construction,survey & management.
(3)	Pump testing equipment mounted on truck			The drilling rig procured under Non-Project does not have
1)	Cargo truck with crane*	1 unit	Japan	a pump testing equipment for its supporting team.
2)	Diesel engine generator*	1 unit	Third	An additional pump testing equipment is necessary and to
3)	Submersible motor pump*	1 set	Country	be procured.
4)	Riser pipes, valves & accessories	1 set	Third	
5)	Notch box for pump testing	1 set	Country	
(4)	Camping equipment & materials	1 lot	Third	Camping materials such as tent, camp bed, water tank,cooking
	for staff of teams of survey/drilling/		Country	instrument with sufficient quantity to cover for the Zambian
	pump test/construction incl. tent,			staff in the field are required.
	camp bed, portable water tank,etc.			
(5)	Radio telephone equipment*			Radio telephone equipment for communication between drilling
1)	station type	3 units	Japan	site and main depot/sub depot are required.
2)	portable type	8 units	Japan	Distribution:1 for Choma main depot, 2 for seub depot,
		3 units	Japan	4 for drilling rigs, 4 for pick-up truck of drilling team.
(6)	Transportable water/fuel tank			Tanks to store water/fuel at sites/sub depot are required.
1)	Tank for water	8 units	Japan	Steel tank with capacity of 2,000m3.
2)	Tank for fuel	13 units	Japan	Steel tank with capacity of 2,000m3.

	ITEM	QUANTITY	ORIGIN	DESCRIPTION
4.	WORKSHOP EQUIPMENT			The equipment and vehicles used in the project will be
	Diesel engine generator*, Desel Engine	1 unit	Japan	repaired and maintained at the workshop in the Provincial
	welder*, Gas welding equipment, Air			Water Engineer (PWE) Office in Choma. Since the existing
	compressor*, Hydraulic jack, Lathe*			workshop does not have sufficient
	Pump fishing tools, General maintenance			tools for the work new tools are necessary.
	tools, Container to store workshop			Containers to store these workshop tools and to store
	equipment			supplied spare parts are necessary.
	Container to store spare parts & materials	6 units	Japan	
5.	SPARE PARTS FOR THE ABOVE EQUIPMENT			Spare parts necessary for two years operation of the items
	INDICATED WITH *			indicated with *

EQUIPMENT & MATERIALS FOR COMMUNITY PARTICIPATION AND OPERATION & MAINTENANCE]

	ITEM	QUANTITY	ORIGIN	DESCRIPTION
1.	SUPPORTING VEHICLES			The District level staff involving in D-WASHE activities in
1)	Pick-up truck to carry staff & materials	9 units	Japan	9 Districts require transports to carry equipment, materials
	for education/training of communities*			and staff.
2)	Motorbike to carry staff & materials	18 units	Japan	
	for education/training of communities*			
3)	Bicycle to carry staff & materials	18 units	Third	
	for education/training of communities*		Country	
2.	OFFICE EQUIPMENT			The D-WASHE of each District has their offices and for their
1)	Personal computer for data processing incl.	2 sets	Third	activities equipment such as personal computer, photocopy
	display, printer, UPS, AVR*		Country	machine, facsimile, others are necessary.
2)	Photocopying machine*	9 sets	Third	
			Country	
3)	Facsimile*	9 sets	Third	
			Country	
4)	Global poisitioning system, portable type	9 sets	Third	
			Country	
5)	Plastic laminate coating equipment	9 sets	Third	
			Country	
3.	MAINTENANCE TOOLS FOR HANDPUMP FACILITY			Area pump menders in the project area will use the tools for
1)	Standard tools (for repair)	46 sets	Third	handpump installation/repair and concrete work of the
	of handpump		Country	appurtenant facility for borehole. V-WASHE needs maintenance
2)	Special tools (for installation)	46 sets	Third	kit consisting of spanners and consumables.
	of handpump		Country	
3)	Tools for concrete work	46 sets	Third	
			Country	
4)	Maintenance kit of handpump	220 sets	Third	
			Country	
4.	Materials for community participation	32 sets	Third	Community mobilization require materials which will be used
	incl. board, pins, marker, etc.		Country	at village level meetings.
5.	SPARE PARTS FOR THE ABOVE EQUIPMENT			Spare parts necessary for two years operation of the items
	INDICATED WITH *			indicated with *

APPENDIX-12 HYDROGICAL EVALUATIONS

(1).Results of Geoelectric Prospecting Analysis - Planned Borehole Depth

(2).Measured Resistivity curve on the sites

(3).Southern Province Rural Water Supply Project Phase I (1985), Phase II (1988) Borehole Location Map

(4).Southern Province Rural Water Supply Project Phase I (1985), Phase II (1988) Borehole Data

(1) Result of Geoelectric Prospecting Survey Analysis - Planned Borehole Depth -1

No.	District	Site Name	Soil (m)	Alluvium (m)	Laterite (m)	KALAHARI GROUP			KAROO GROUP				KATANGA GROUP				BASEMENT ROCK				Fractured Zone (m)	Planed Borehole Depth (m)
						Clay-Silt (m)	Sand,Gravel (m)	Sandstone (m)	Mudstone, Shale (m)	Sandstone (m)	Schist (m)	Basalt (m)	Weathering Zone (m)	Shale (m)	Sandstone, Quartize (m)	Schist (m)	Weathering Zone (m)	Granite (m)	Gneiss (m)	Schist (m)		
1	Namwala	Shimayoba School	0 ~ 1			20 ~ 30	3 ~ 20 30 ~ 52	52 ~													64 ~	80
2		Sigwidi Village	0 ~ 2			2 ~ 18 24 ~ 48 56 ~ 80	18 ~ 24 48 ~ 56	80 ~													92 ~	100
3		Chief Kaingu	0 ~ 2														2 ~ 10 22 ~ 28	10 ~ 22 36 ~			36 ~ 84	90
4		Chief Muwezwa	0 ~ 1			1 ~ 4 8 ~ 28 30 ~ 34	4 ~ 8 28 ~ 30	34 ~													60 ~ 84	90
5		Bayangwe Village	0 ~ 3			3 ~ 30 36 ~ 52 88 ~	30 ~ 36 52 ~ 72														72 ~ 88	90
6		Nkobo Village	0 ~ 3														3 ~ 12	12 ~			24 ~ 40	60
7		Tempe Village	0 ~ 2			18 ~ 22	2 ~ 18											22 ~ 76	76 ~			70
8		Naumba Village	0 ~ 1		1 ~ 2												2 ~ 6 12 ~ 30	6 ~ 12 30 ~			48 ~ 52	60
9		Masompe Village	0 ~ 3			3 ~ 8 14 ~ 20	8 ~ 14 20 ~ 32	32 ~											72 ~		72 ~ 84	90
10		Mobola Village	0 ~ 25			25 ~ 16	16 ~ 30	30 ~ 52											52 ~		52 ~ 60	60
11		Kabwe School	0 ~ 2														2 ~ 12	12 ~ 24 56 ~	24 ~ 56			60
12		Ngabo Settlement	0 ~ 2		2 ~ 6	6 ~ 26 32 ~ 40 80 ~ 88	26 ~ 32	40 ~ 80 88 ~													40 ~ 80	80
13		Namulumbwe Village	0 ~ 2			2 ~ 28 64 ~ 72	28 ~ 32 48 ~ 64 72 ~														32 ~ 48	60
14		Nachumba Village	0 ~ 2			6 ~ 14 44 ~ 52	2 ~ 6 14 ~ 44	64 ~ 72 76 ~													52 ~ 64 72 ~ 76	80
15		Bachele Village	0 ~ 4			4 ~ 30		30 ~ 80 84 ~													80 ~ 84	90
16	Sinazongwe	Mweezya School	0 ~ 1	1 ~ 3					52 ~	3 ~ 44											44 ~ 52	60
17		Syansimuna Village			0 ~ 8				8 ~ 20 28 ~												20 ~ 28 80 ~	90
18		Mazyamuna Village			0 ~ 2				6 ~ 20 32 ~ 68	2 ~ 6 20 ~ 28 72 ~											28 ~ 32 80 ~ 88	90
19		Fodwi Village			0 ~ 1				6 ~	1 ~ 6											32 ~ 48 56 ~ 64	70
20		Simapumba Village							3 ~ 20 28 ~ 40 60 ~ 76	0 ~ 3 40 ~ 60 76 ~											20 ~ 28	60
21		Syankuku Village		0 ~ 3					3 ~ 8 20 ~ 32 40 ~ 48	8 ~ 20 48 ~											32 ~ 40 60 ~ 80	80
22		Simumpande Village			0 ~ 3				3 ~ 18 48 ~ 60 84 ~	18 ~ 40 60 ~ 72											40 ~ 48 72 ~ 84	90
23		Syankumba Village			0 ~ 3				3 ~ 24 48 ~ 64 84 ~	30 ~ 44 64 ~ 84											24 ~ 30 44 ~ 48	60
24	Living Stone	Simonga Village	0 ~ 1									1 ~ 64 68 ~									40 ~ 48 72 ~ 84	70
25		Kasiya R.H.C.	0 ~ 1		1 ~ 3							3 ~										60
26		Mapenzi/Nansanzu	0 ~ 2									2 ~										60
27		Katiba Village	0 ~ 1									1 ~									16 ~ 20 76 ~ 92	100
28		Makoli/Mandandi Village			0 ~ 1								1 ~ 10	10 ~							64 ~ 84	90
29	Monze	Mukwelele Village	0 ~ 1														1 ~ 10	10 ~			60 ~ 68	70
30		Chigabwa Village			0 ~ 2								2 ~ 22			22 ~					52 ~ 60	60
31		Maambo Lukubi Village			0 ~ 3								3 ~ 12	12 ~							72 ~ 84	90
32		Chikonga Village			0 ~ 1												1 ~ 14	14 ~			14 ~ 16	60
33		Mpokota Village			0 ~ 1									1 ~ 64				64 ~			64 ~ 68	70
34		Mwanza West Clinic			0 ~ 1								1 ~ 10	10 ~ 84				84 ~				80
35		Nangweluka Village			0 ~ 4								4 ~ 8		8 ~			60 ~			52 ~ 60	60
36		Cheepahabulembe Village			0 ~ 2								2 ~ 8	8 ~							56 ~ 68	70
37		Muvwanga Village			0 ~ 1												1 ~ 12	12 ~			12 ~ 22 48 ~ 52	60
38		Simuzingine Village			0 ~ 2								2 ~ 18		18 ~ 60						24 ~ 28	60
39		Chinongwe Village			0 ~ 6												6 ~ 20	20 ~			48 ~ 56	60
40		Simuumba Village			0 ~ 2								2 ~ 8		8 ~						~	70

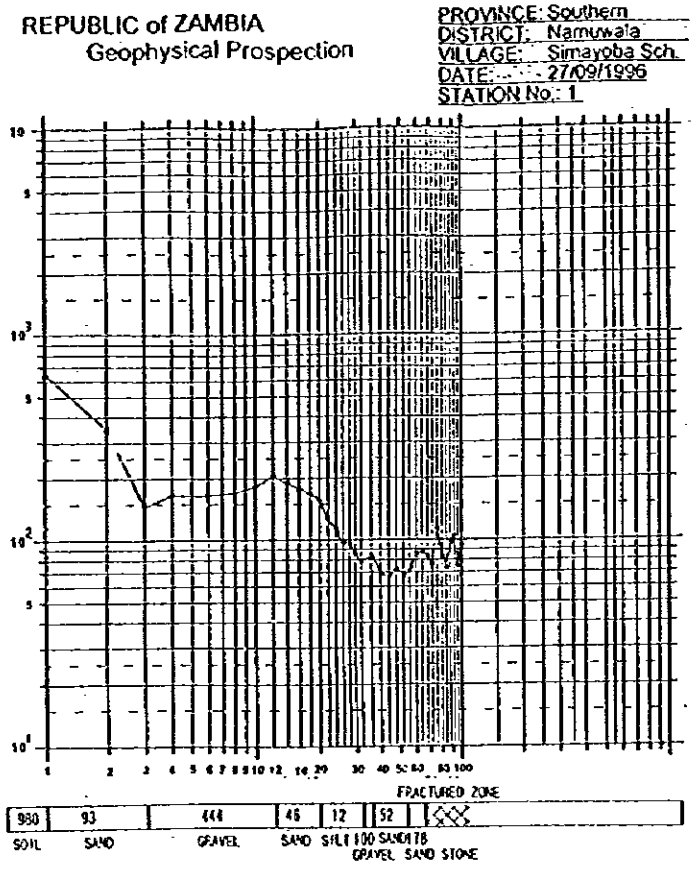
(1) Result of Geoelectric Prospecting Survey Analysis - Planned Borehole Depth -2

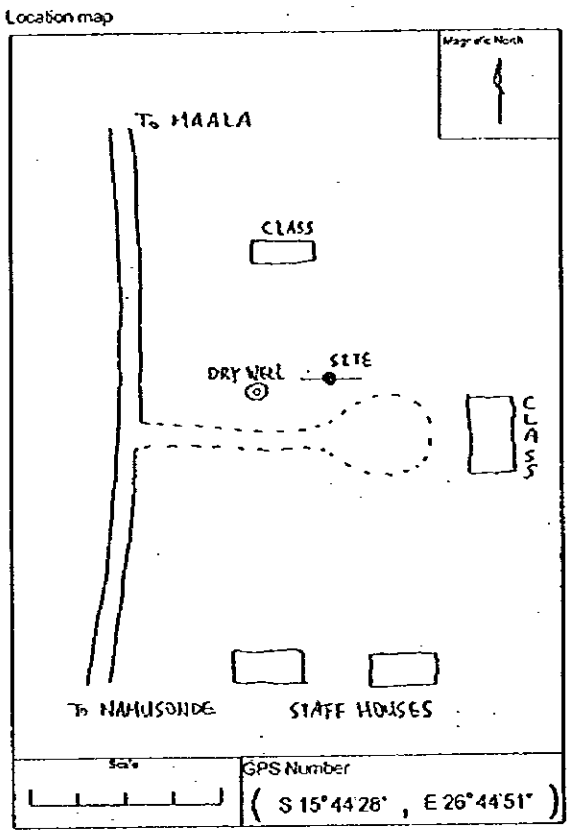
No.	District	Site Name	Soil (m)	Alluvium (m)	Laterite (m)	KALAHARI GROUP			KAROO GROUP				KATANGA GROUP				BASEMENT ROCK				Fractured Zone (m)	Planed Borehole Depth (m)
						Clay-Silt (m)	Sand,Gravel (m)	Sandstone (m)	Mudstone, Shale (m)	Sandstone (m)	Schist (m)	Basalt (m)	Weathering Zone (m)	Shale (m)	Sandstone, Quartize (m)	Schist (m)	Weathering Zone (m)	Granite (m)	Gneiss (m)	Schist (m)		
41		Syanjase Village			0 ~ 1							1 ~									60 ~ 72	70
42		Mpola Village			0 ~ 2							2 ~									20 ~ 32	80
																					64 ~ 72	
43		Chibule Village	excluded																			80
44		Sinanfu Village			0 ~ 1												1 ~ 4	4 ~ 16			68 ~ 76	80
																	16 ~ 36	36 ~				
45		Siabozu Village			0 ~ 2												2 ~ 22	22 ~			68 ~	80
46		Syejumba Village			0 ~ 2							2 ~ 40						40 ~				80
47		Nkungwa School			0 ~ 3													3 ~				70
48	Kalomo	Polo Village			0 ~ 1												1 ~ 14	14 ~			40 ~ 44	
																					52 ~ 60	
49		Kongyuma Village	excluded																			70
50		Siankope Village			0 ~ 3												3 ~ 12	12 ~			60 ~ 64	
51		Siempondo Village	excluded																			80
52		Chikuyu Village	0 ~ 1														1 ~ 6	6 ~			68 ~ 72	80
53		Kayuni Village			0 ~ 2												2 ~ 6	6 ~				
54		Chana Village	excluded																			
55		Siandwazi Village			0 ~ 2												2 ~ 8	8 ~			18 ~ 22	70
																					48 ~ 60	
56		Chibalani Village			0 ~ 2							2 ~ 40						40				80
57		Hinamanjolo Village			0 ~ 2												2 ~ 12	12 ~			26 ~ 32	80
																					56 ~ 64	
																					76 ~ 80	
58		Sibanyati Settlement			0 ~ 2												2 ~ 22	22 ~			26 ~ 30	80
																					52 ~	
59		Sepande Village			0 ~ 2												2 ~ 6	6 ~ 14		32 ~ 44	44 ~ 52	60
																	14 ~ 24	24 ~ 32				
																		52 ~				
60		Singani Upper School			0 ~ 4												4 ~ 12	12 ~			30 ~ 32	90
																					38 ~ 40	
																					80 ~	
61		Munaputi Village			0 ~ 1					1 ~ 40								40 ~			26 ~ 30	80
																					52 ~ 72	
		Maluma Village			0 ~ 1												1 ~ 12	12 ~			12 ~ 28	80
																					58 ~ 64	
																					80 ~ 88	
63	Choma	Nakeempa RHC			0 ~ 1												1 ~ 24	36 ~		24 ~ 36	44 ~ 48	90
																					80 ~ 84	
64		Siakakole Village			0 ~ 2												2 ~ 16	16 ~			56 ~ 60	80
																					72 ~ 76	
65		Simbulo Primary School			0 ~ 1												1 ~ 3	3 ~			52 ~ 64	70
66		Muzoka Village			0 ~ 6												6 ~ 24	24 ~			28 ~ 44	80
																					68 ~ 80	
67		Munyama Health Post	0 ~ 2														2 ~ 16	16 ~			22 ~ 28	60
																					36 ~ 44	
68		Mulongo Village			0 ~ 2												2 ~ 10		10 ~		28 ~ 48	60
69		Simudima Primary School			0 ~ 1												1 ~ 10	10 ~			32 ~ 40	60
70		Halumya Village	0 ~ 1						1 ~ 4	4 ~ 56											30 ~ 36	80
									56 ~												72 ~ 80	
71		Siancheeka Village	0 ~ 2						2 ~ 12	12 ~ 26											18 ~ 22	70
									26 ~ 60	60 ~ 88											60 ~ 68	
									88 ~												76 ~ 80	
72		Fumbo P. School	0 ~ 1						1 ~ 3	3 ~											60 ~ 72	70
73		Gulumunyanga School	0 ~ 1						6 ~ 14	1 ~ 6											14 ~ 22	70
									64 ~ 88	14 ~ 64											28 ~ 36	
										88 ~											52 ~ 64	
74		Sinafala Turn Off	0 ~ 1						1 ~ 12	12 ~ 68											16 ~ 22	70
									68 ~												28 ~ 36	
																					52 ~ 68	
75	Gwembe	Chisabuka Village	0 ~ 1						1 ~ 44	44 ~ 60											24 ~ 26	80
									60 ~ 76	76 ~											76 ~ 84	
76		Sinafala Village	0 ~ 1						1 ~ 24	24 ~											44 ~ 60	60
77		Mabula P. School	0 ~ 2						2 ~ 22	22 ~ 28											72 ~ 80	80
									28 ~ 52	52 ~												
78		Siabwango	0 ~ 1						1 ~ 14	14 ~ 32											14 ~ 20	60
									32 ~ 72	72 ~											48 ~ 60	
																					80 ~	
79		Hazobwe Village	0 ~ 1						1 ~ 18	18 ~ 48											40 ~ 48	80
									48 ~ 72	72 ~											72 ~ 80	
80		Hacheelo Village	0 ~ 1																		80 ~ 84	90

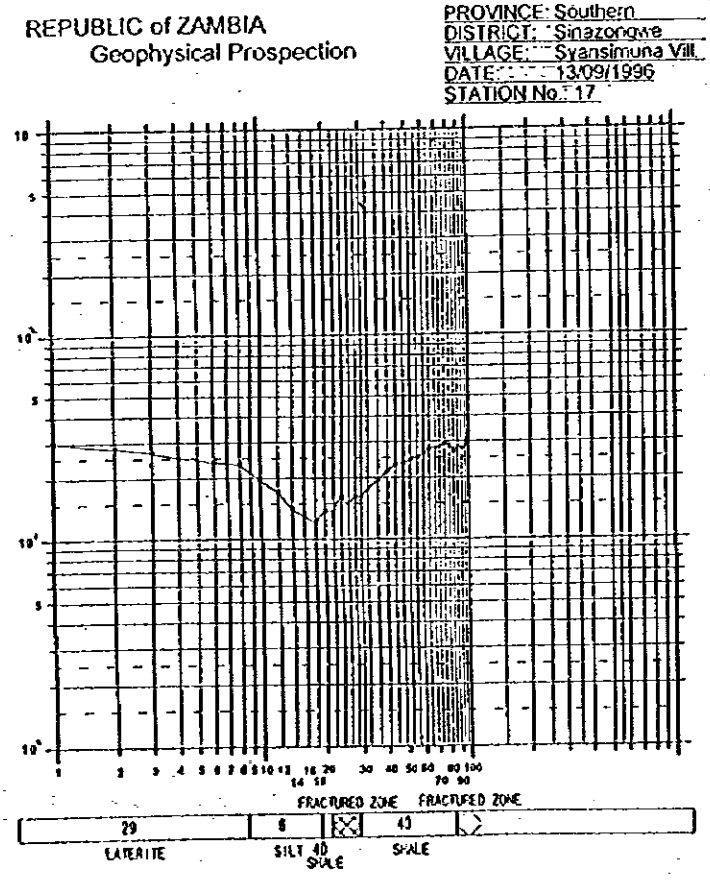
(1) Result of Geoelectric Prospecting Survey Analysis - Planned Borehole Depth -3

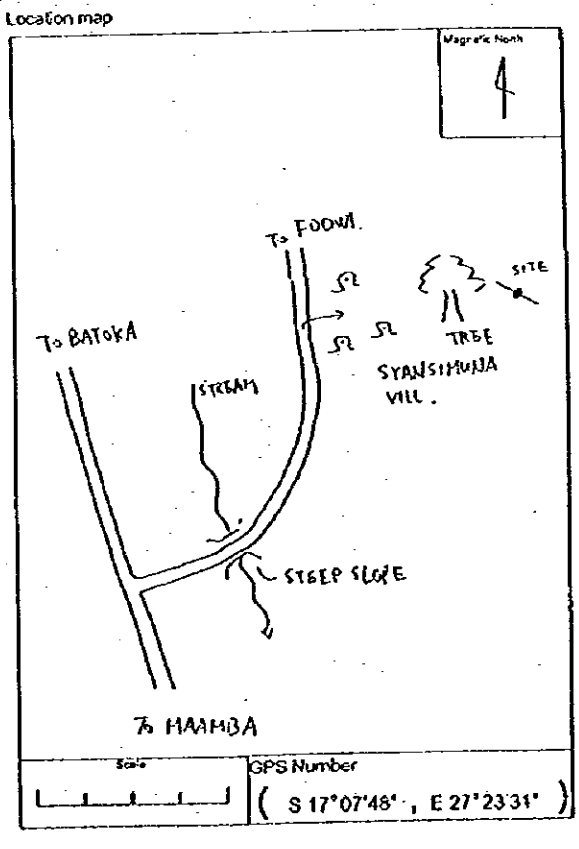
No.	District	Site Name	Soil (m)	Alluvium (m)	Laterite (m)	KALAHARI GROUP			KAROO GROUP				KATANGA GROUP				BASEMENT ROCK				Fractured Zone (m)	Planed Borehole Depth (m)
						Clay-Silt (m)	Sand,Gravel (m)	Sandstone (m)	Mudstone, Shale (m)	Sandstone (m)	Schist (m)	Basalt (m)	Weathering Zone (m)	Shale (m)	Sandstone, Quartize (m)	Schist (m)	Weathering Zone (m)	Granite (m)	Gneiss (m)	Schist (m)		
81	Gwembe	Hachangu Village	0 ~ 4						8 ~ 14 20 ~ 32	4 ~ 8 14 ~ 20 32 ~							1 ~ 26	26 ~				80
82	Mazabuka	Mukwela School	0 ~ 2												2 ~						60 ~ 72	80
83		Malala Village	0 ~ 2												2 ~						14 ~ 18 68 ~ 76	80
84		Ngandu Haveenzu Village	0 ~ 3											3 ~ 6	6 ~						14 ~ 16 56 ~ 60	60
85		Chisekwa Village	0 ~ 1											1 ~ 6	6 ~						24 ~ 28 52 ~ 54	60
86		Mutando Village	0 ~ 2											6 ~ 16	2 ~ 6 6 ~						44 ~ 48 ~	60
87		Mwendankama Village	0 ~ 2														2 ~ 10	10 ~			36 ~ 48 88 ~	100
88		Bonbo Village			0 ~ 1								1 ~ 10		40 ~	10 ~ 32					32 ~ 40 72 ~ 88	90
89		Kaunga P. School			0 ~ 2								2 ~ 12	60 ~ 78		12 ~ 40 88 ~					40 ~ 60 78 ~ 88	90
90		Muvela Village			0 ~ 2										2 ~ 18	18 ~					30 ~ 32 56 ~ 66	70
91		Mweemba Primary School			0 ~ 3								3 ~ 8		40 ~ 56	8 ~ 40 60 ~					36 ~ 40 56 ~ 60	60
92		Mulawo Primary School			0 ~ 1								1 ~ 10			10 ~					44 ~ 52	60
93		Nadezwe Agri. Camp			0 ~ 3								3 ~ 22			22 ~					2 ~ 30 60 ~ 72	80
94		Makangala Village			0 ~ 2								2 ~ 6	6 ~ 32 84 ~		32 ~ 84					56 ~ 60	60
95		Naluama Primary School			0 ~ 1								1 ~ 6		48 ~ 60	6 ~ 48 60 ~					16 ~ 28 40 ~ 48	60
96	Siavonga	Simamba/Matero			0 ~ 2				2 ~ 20 44 ~ 56	20 ~ 44 56 ~											20 ~ 32 72 ~ 76	80
97		Manchamvwa	0 ~ 2						20 ~ 48 72 ~	2 ~ 20 48 ~ 72											12 ~ 16 48 ~ 52 80 ~	60
98		Siamwiinga Village			0 ~ 1				3 ~ 24 48 ~	24 ~ 48 52 ~ 72											24 ~ 30 60 ~ 64	70
99		Dibwi	0 ~ 2						2 ~ 16	16 ~											16 ~ 32 48 ~ 72	70
100		Dambwe/Syekalinda	excluded																			
101		Chinyama /Jamba	excluded																		68 ~ 80	80
102		Siamwinga P. School	0 ~ 2						6 ~ 60	2 ~ 6 60 ~											32 ~ 40	70
103		Zemba Zemba Village	0 ~ 3	3 ~ 12					12 ~												64 ~ 72	
104		Mangaba Village	0 ~ 2	2 ~ 12					26 ~	12 ~ 26											22 ~ 26	60

(2).Measured Resistivity curve on the sites



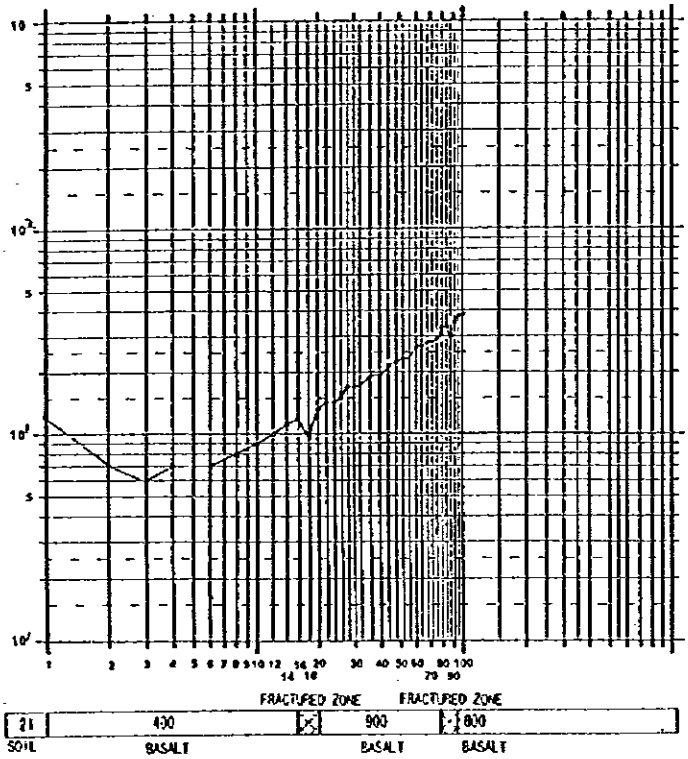




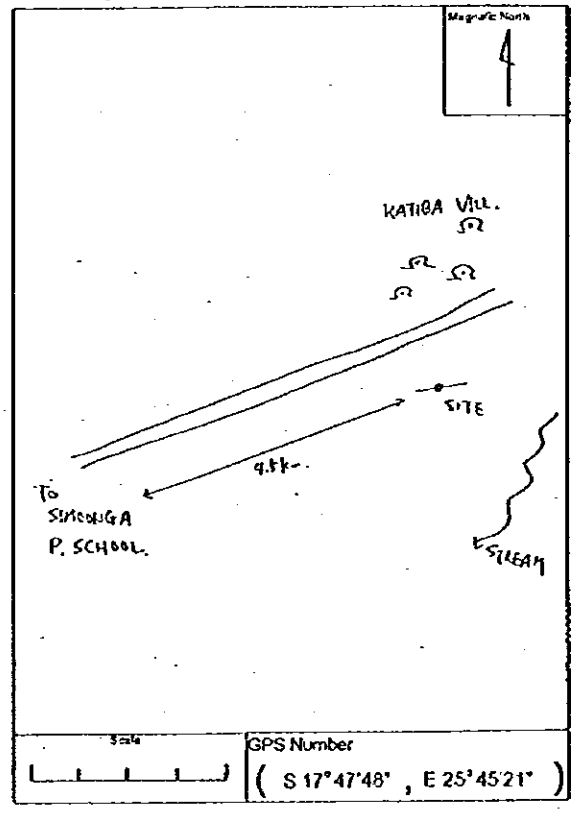


REPUBLIC of ZAMBIA
Geophysical Prospection

PROVINCE: Southern
DISTRICT: L. Stone
VILLAGE: Katiba Vill.
DATE: 23/09/1996
STATION No.: 27

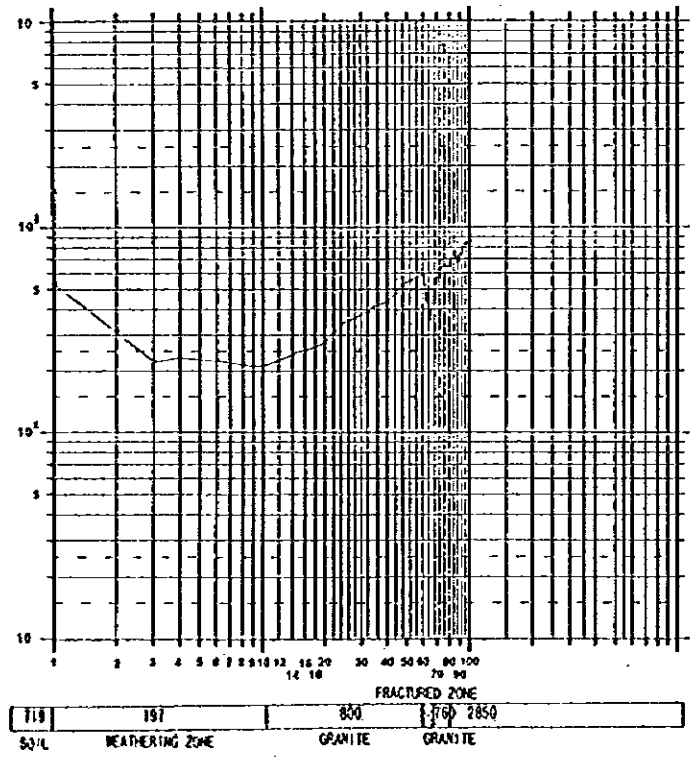


Location map

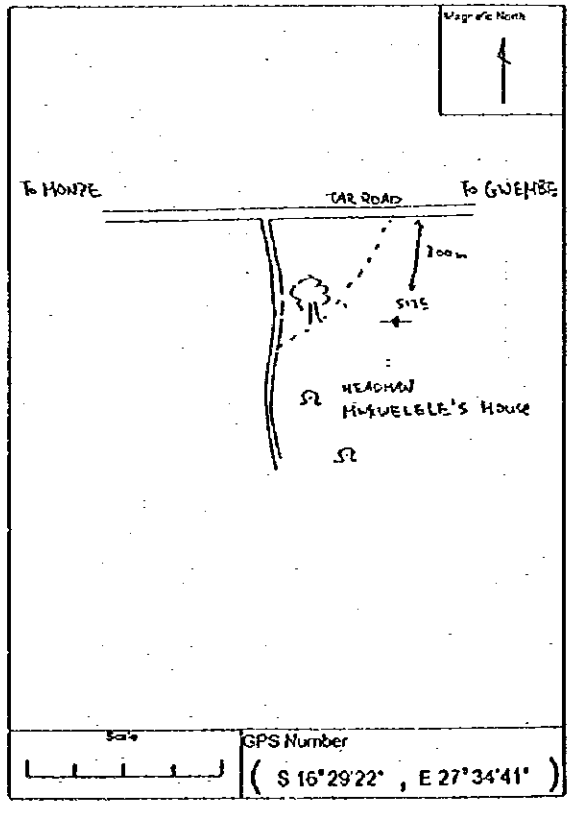


REPUBLIC of ZAMBIA
Geophysical Prospection

PROVINCE: Southern
DISTRICT: Monze
VILLAGE: Mukuwelele Vill.
DATE: 09/09/1996
STATION No.: 29

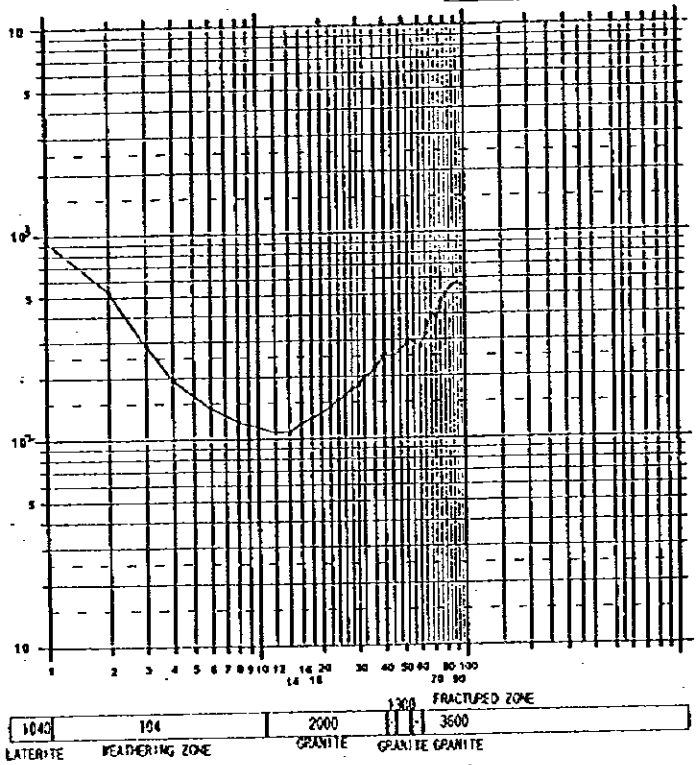


Location map

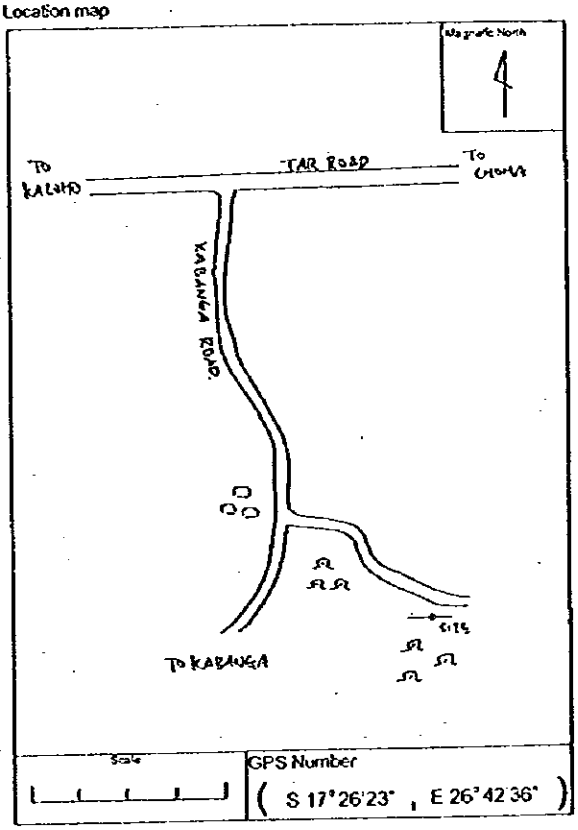


REPUBLIC of ZAMBIA
Geophysical Prospection

PROVINCE: Southern
DISTRICT: Kalomo
VILLAGE: Polo Vill.
DATE: 20/09/1996
STATION No.: 48

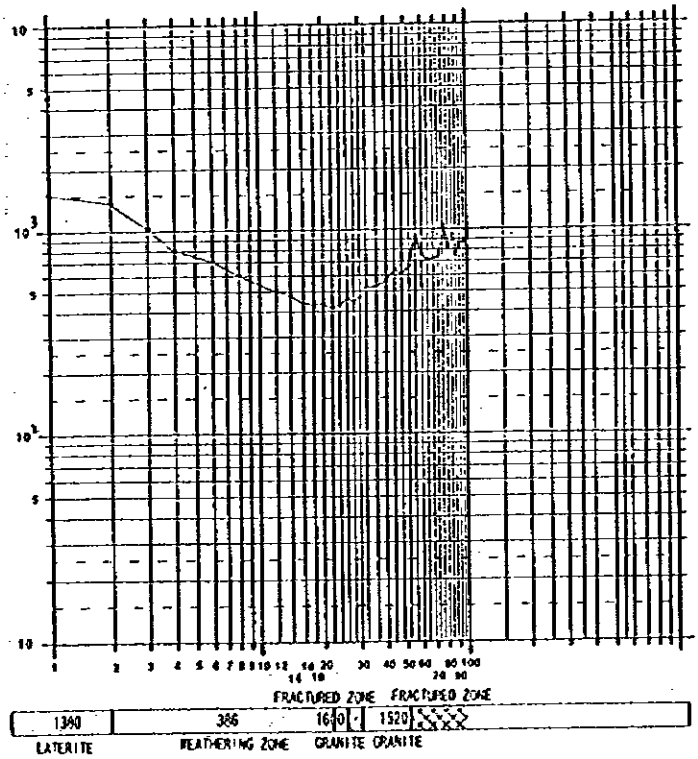


Location map

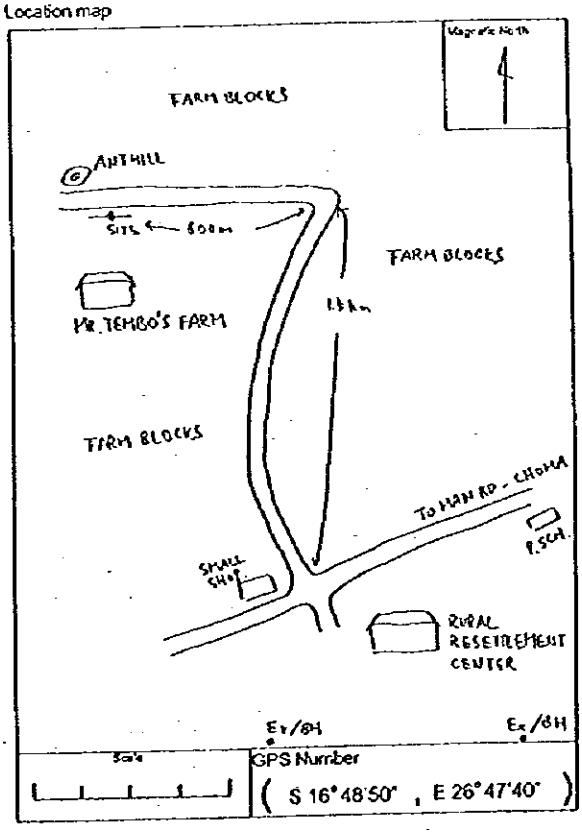


REPUBLIC of ZAMBIA
Geophysical Prospection

PROVINCE: Southern
DISTRICT: Choma
VILLAGE: Sibanyati Settlement
DATE: 14/09/1996
STATION No.: 58

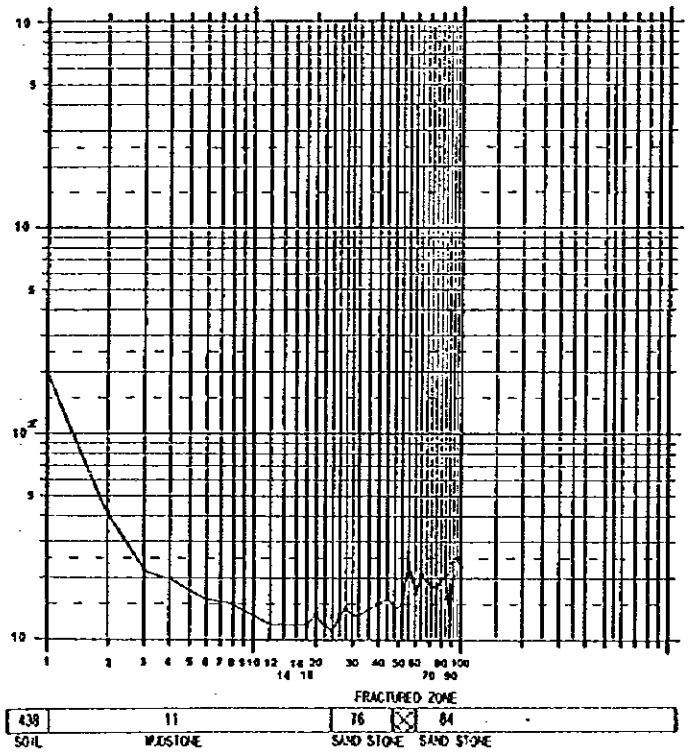


Location map

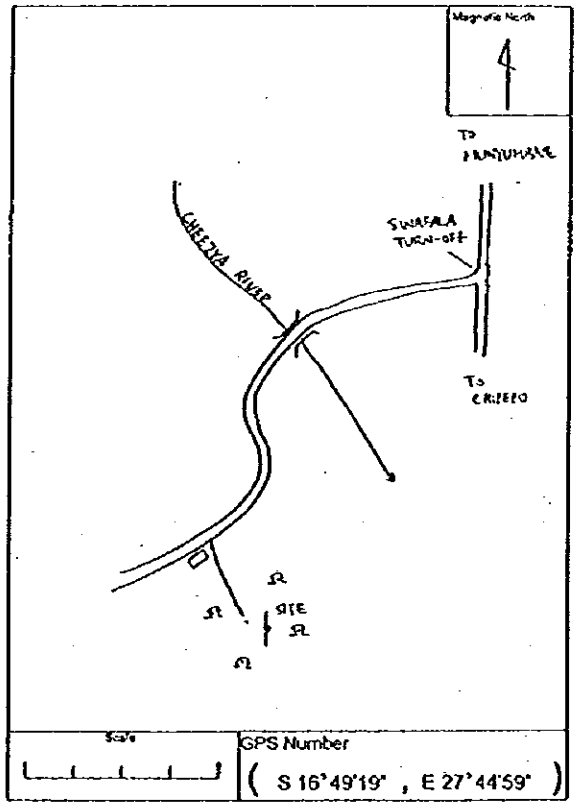


REPUBLIC of ZAMBIA
Geophysical Prospection

PROVINCE: Southern
DISTRICT: Gwembe
VILLAGE: Sinafala Vill.
DATE: 04/09/1996
STATION No.: 76

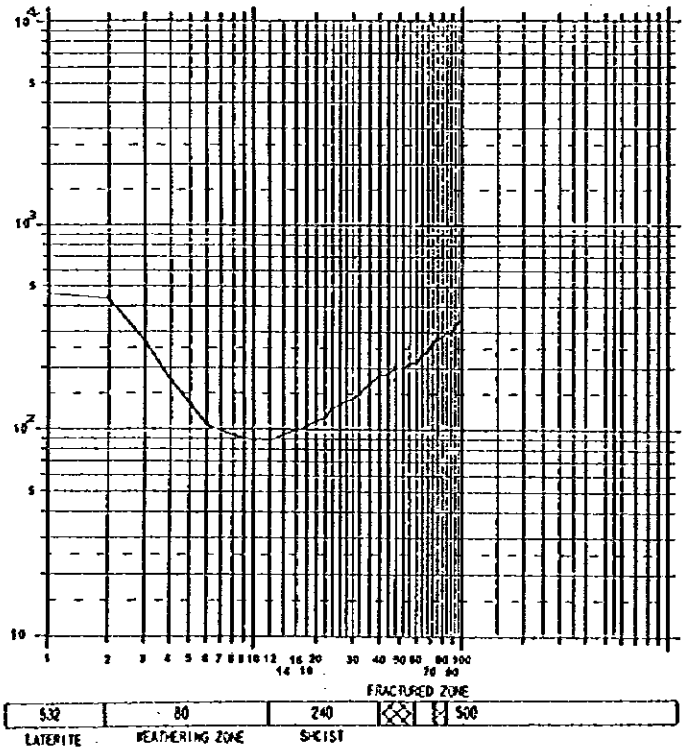


Location map

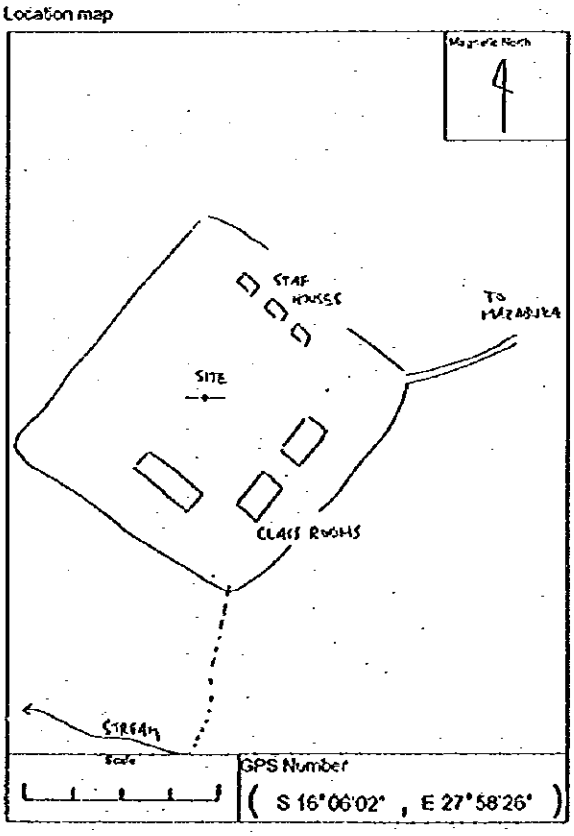


REPUBLIC of ZAMBIA
Geophysical Prospection

PROVINCE: Southern
DISTRICT: Mazabuka
VILLAGE: Kaunga P.Sch.
DATE: 03/09/1996
STATION No.: 69

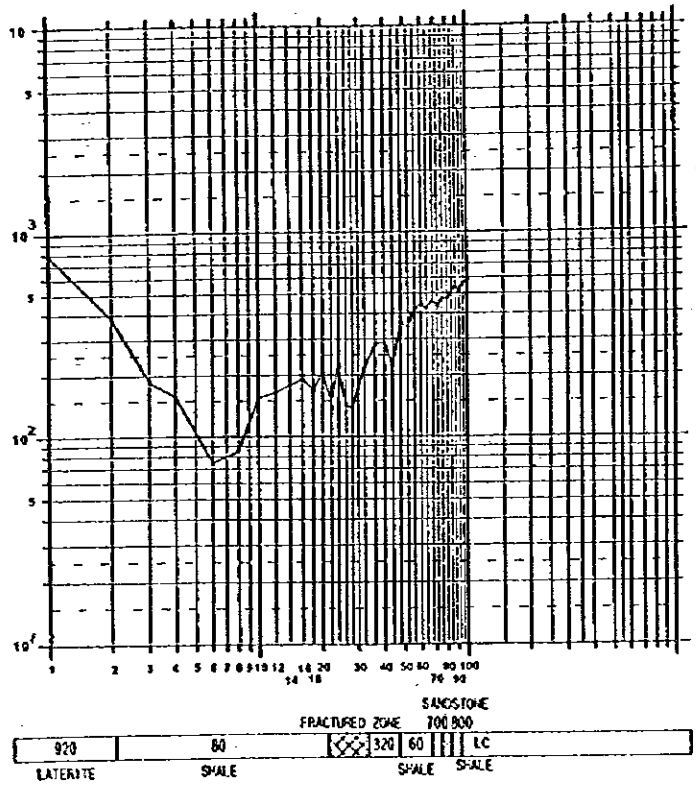


Location map

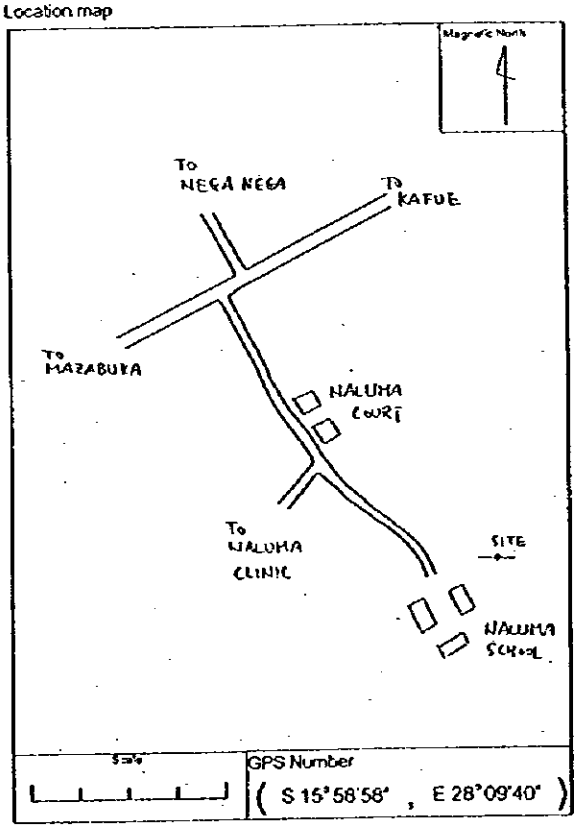


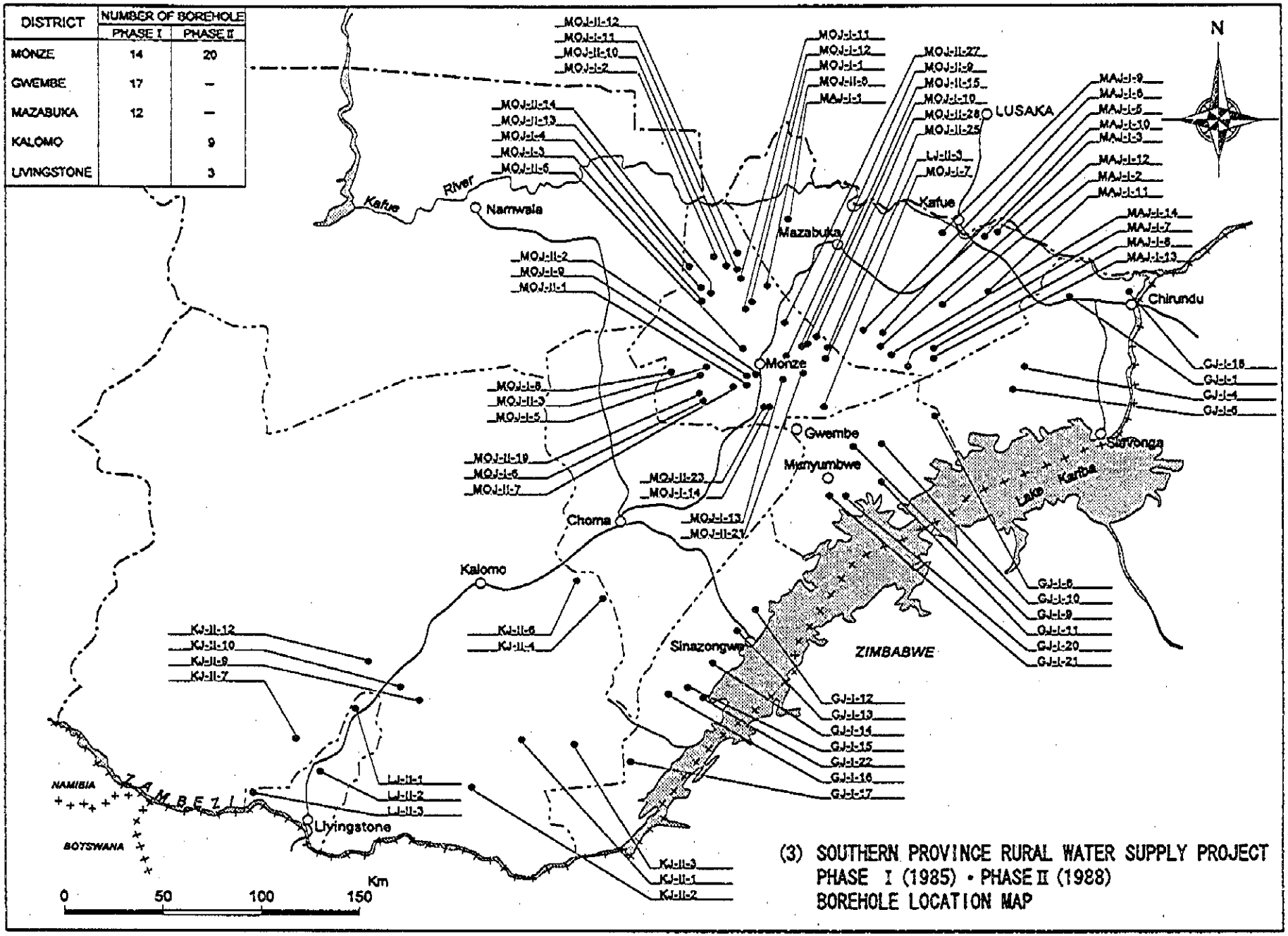
REPUBLIC of ZAMBIA
Geophysical Prospection

PROVINCE: Southern
DISTRICT: Mazabuka
VILLAGE: Naluama P.Sch.
DATE: 03/09/1996
STATION No.: 95



Location map




DISTRICT | NUMBER OF BOREHOLE | PHASE I | PHASE II
MONZE | 14 | 20
GWEMBE | 17 | –
MAZABUKA | 12 | –
KALOMO | | 9
LIVINGSTONE | | 3
N
LUSAKA
Kafue River
Kafue
Namwala
Mazabuka
Monze
Gwembe
Choma
Kalomo
Sinazongwe
Mynyumbwe
Chirundu
Siavonga
Lake Kariba
ZIMBABWE
NAMIBIA
BOTSWANA
ZAMBEZI
Livingstone
0 50 100 150 Km
(3) SOUTHERN PROVINCE RURAL WATER SUPPLY PROJECT
PHASE I (1985) • PHASE II (1988)
BOREHOLE LOCATION MAP

(4) Borehole Data in Southern Province-1

Province	Borehole No.	Drilled Year	Diameter	Depth of Borehole	Pumping rate	Static Water Level	Dynamic Water Level	Drawdown	Specific Capacity	Position of Screen	Aquifer	Thickness of Laterite
			(mm)	(m)	(l/min)	(m)	(m)	(m)	(m^3/d/m)	(m)		(m)
MONZE	MOJ-I 1	1987	100	70.0	DRY						Mudstone	3.5
	MOJ-I 2	1987	150	78.5	6.3	5.0	36.3	31.3	0.29	13~16 25~28 34~37 40~43 49~58	Schist	0.3
	MOJ-I 3	1987	100	42.0	25	8.0	23.1	15.1	1.66	25~41	Schist	10
	MOJ-I 4	1987	100	40.0	43	10.0	21.8	11.8	5.24	23~29	Schist	1
	MOJ-I 5	1987	100	36.0	33	9.4	21.6	12.2	3.89	23~35	Schist	3
	MOJ-I 6	1986	100	40.0	43	3.6	22.1	17.5	3.36	15~19 23~35	Gneiss	3
	MOJ-I 7	1986	100	40.5	36	9.4	23.3	13.9	3.74	16~24 32~36	Gneiss	4
	MOJ-I 8	1986	100	32.0	11	3.1	20.9	17.8	0.89	7~19	Sand, Gravel-Schist	9
	MOJ-I 9	1986	100	52.5	50	4.3	31.1	26.8	2.7	8~12 32~44	Schist	3
	MOJ-I 10	1987	150	42.0	47	6.5	22.3	15.8	4.29	15~21 27~36	Schist	0
	MOJ-I 11	1987	100	60.5	20	12.1	20.8	8.7	3.31	40~60	Schist	4
	MOJ-I 12	1987	100	31.0	150	14.1	21.6	7.5	28.8	18~30	Quartzite	4
	MOJ-I 13	1987	100	40.5	25	12.8	20.5	7.7	4.81	24~40	Gneiss	3
	MOJ-I 14	1987	100	40.5	200	1.2	12.1	10.9	26.41	32~40	Quartzite - Gneiss	3
	MOJ-II 1	1989	100	49.0	18	6.2	31.6	25.4	1.02	16~25 36~44	Schist	2
	MOJ-II 2	1989	100	61.0	33	11.3	32.5	21.2	2.24	28~32 40~48 52~56	Schist	5
	MOJ-II 3	1989	150	43.0	72	10.1	11.4	2.3	79.75	14~18 30~43	Quartzite	3
	MOJ-II 4	1990	100	32.5	12	3.0	26.8	23.8	0.72	15~26 31~36	Schist	5
	MOJ-II 5	1990	100	40.0	35	5.7	20.1	14.4	3.5	29~41	Schist	6
	MOJ-II 7	1990	100	72.0	6.7	30.5	40.3	9.8	0.98	24~28 32~36 40~48	Granite	6
	MOJ-II 8	1990	100	57.5	15	18.4	31.2	12.8	1.69	24~48 32~36 40~48	Schist	12
	MOJ-II 9	1989	100	78.0							Granite	3
	MOJ-II 10	1990	100	37.0	54	6.6	14.8	8.2	10.8	20~32	Schist	5
	MOJ-II 11	1989	100	54.0	20	15.3	37.0	21.7	1.33	37~45 49~53	Schist	6
	MOJ-II 12	1989	100	43.0	38	12.7	26.5	13.8	3.97	32~44	Silt	6
	MOJ-II 13	1990	100	60.0	17	13.4	36.9	23.5	1.04	35~54	Quartzite	6
	MOJ-II 14	1990	100	48.0	32	21.8	24.2	2.6	17.7	26~31 35~44	Schist	6
	MOJ-II 15	1990	100	60.0							Schist	10
	MOJ-II 19	1990	100	50.0	11	7.9	19.1	9.2	1.72	26~34 38~46		
	MOJ-II 21	1990	100	39.5	38	12.7	26.5	13.8	3.96	15~23 26~35		
	MOJ-II 23	1989	100	37.0	35	5.6	12.8	7.2	7.00	20~32		
	MOJ-II 25	1989	100	57.0	30	21.4	30.7	9.3	4.65	24~40		
	MOJ-II 27	1989	100	37.5	100	8.7	8.8	0.1	144.	20~24 28~32		
	MOJ-II 28	1989	100	40.0	30	2.4	28.8	26.4	1.65	8~20	Schist	10

Note : MOJ-I means Phase-I, MOJ-II means Phase-2 of the Japanese Grant Aid Project implemented in Southern Province.

Borehole Data in Southern Province-2

Province	Borehole No.	Drilled Year	Diameter	Depth of Borehole	Pumping rate	Static Water Level	Dynamic Water Level	Drawdown	Specific Capacity	Position of Screen	Aquifer	Thickness of Laterite
			(mm)	(m)	(l/min)	(m)	(m)	(m)	(m^3/d/m)	(m)		(m)
GWEMBE	GJ-I-1	1987	100		DRY						Shale	6
	GJ-I-4	1987	100	79.0							Shale	3
	GJ-I-6	1987	100	70.0	21	7.0	28.6	21.6	1.40	18~25 57~69	Mudstone	3 9
	GJ-I-8	1986	100	60.0	6	8.5	45.3	37.2	0.23	35~31	Mudstone	0.9
	GJ-I-9	1986	100	60.0	10	13.9	20.9	7.0	2.1	23~21 43~55	Mudstone	2
	GJ-I-10	1986	100	56.0	8	3.5	43.7	40.2	0.29	27~43	Mudstone	0.5
	GJ-I-11	1986	100	72.5	25	40.06	40.13	0.07	514	60~72	Sandstone	2
	GJ-I-12	1986	100	45.0	40	10.1	13.4	3.3	17.4	20~24 28~40	Sandstone Mudstone	2
	GJ-I-13	1986	100	40.5	50	9.2	12.9	3.7	19.4	32~44	Mudstone	6
	GJ-I-14	1986	100	36.5	70	9.2	12.7	3.6	28.4	16~20 29~32	Shale	0
	GJ-I-15	1986	100	82.0	15	8.3	28.5	20.2	1.1	34~60	Sandstone -Shale Mudstone	6
	GJ-I-16	1986	100	40.5	35	8.8	21.2	12.4	3.7	12~16 28~36	Sand, Gravel Sandstone	12
	GJ-I-17	1986	100	36.5	160	11.3	15.4	4.1	55.7	16~29 28~32	Mudstone	2
	GJ-I-18	1986	100	79.0							Mudstone	0.5
	GJ-I-20	1986	100	72.0	20	32.9	43.2	10.3	2.8	43~51 59~67	Mudstone Sandstone	1.2
	GJ-I-21	1987	100	48.0	150	29.3	32.0	2.7	80.1	31~43 32~36	Sandstone	0.5
	GJ-I-22	1986	150	48.0	300	4.9	6.7	1.8	235	36~45	Sandstone - Mudstone	0.3
MAZABUKA	MAJ-I-2	1987	100	40.0	37.5	2.9	27.9	25.0	2.16	7~16 23~31	Laterite	2
	MAJ-I-3	1987	100	73.0	DRY						Gneiss	2
	MAJ-I-5	1987	100	36.0	39	6.6	20.6	14.0	4.02	23~35	Quartzite	2
	MAJ-I-6	1987	100	36.0	20	5.3	16.9	10.6	2.48	23~35	Schist	2
	MAJ-I-7	1987	100	37.0	113	20.3	21.4	1.0	160	20~32	Gneiss	2
	MAJ-I-8	1987	100	73.0	DRY						Gneiss	2
	MAJ-I-9	1987	100	40.0	53	8.4	35.3	26.9	2.84	27~39	Quartzite	2
	MAJ-I-10	1987	100	79.5	5.6	16.9	31.1	14.2	0.56	27~47	Diabase	2
	MAJ-I-11	1987	100	40.0	32	9.2	33.0	23.8	1.93	23~39	Granitic Gneiss	2
	MAJ-I-12	1987	100	68.5	-	1.5	-	-	-	15~35	Schist	2
	MAJ-I-13	1987	100	33.5	20	4.3	17.1	12.7	2.26	9~21	Gneiss	2
	MAJ-I-14	1987	100	70.0	DRY						Gneiss	2
KALOMO	KJ-II-1	1990	100	61.5							Granite	6
	KJ-II-2	1990	100	60.0	8.7	23.2	45.4	22.2	0.564	29~48	Quartzite	6
	KJ-II-3	1990	100	48.0	29	4.0	17.7	13.7	3.05	26~34 37~43	Schist Quartzite	7
	KJ-II-4	1990	100	42.0	35	4.0	10.2	6.2	8.13	26~38	Schist	6
	KJ-II-6	1990	100	41.5	81	6.0	32.2	26.2	4.45	24~38	Schist Quartzite	12
	KJ-II-7	1990	100	30.0	56	3.4	6.3	2.9	27.8	24~32	Basalt	6
	KJ-II-9	1990	100	63.0	11	13.6	51.9	38.3	0.414	48~57	Schist, Gneiss	6
	KJ-II-10	1990	100	61.5							Granitic Gneiss	6
	KJ-II-12	1990	100	42.0	32	10.9	16.8	5.9	7.81	26~57	Schist, Gneiss	6
LIVINGSTONE	LJ-II-1	1990	100	60.0	DRY						Silt	6
	LJ-II-2	1990	100	36.0	28	21.3	22.2	0.9	44.8	21~32	Sandstone , Basalt	6
	LJ-II-3	1990	100	60.0	DRY						Silt	8

Note : MOJ-I means Phase-I, MOJ-II means Phase-2 of the Japanese Grant Aid Project Implemented In Southern Province

APPENDIX-13 REFFERENCES

1. NATIONAL DEVELOPMENT PLAN

(1)The Public Service Reform Programme Bulletin(PSRP), Volume 1 Issue 1, Cabinet Office, August, 1995

2. POPULATION STATISTICS

(1)1990 Census of Population, Housing & Agriculture, Volume 8, Central Statistical Office, August, 1994

(2)Vital Statistics Report 1987-1992 , Central Statistical Office, September, 1995

3. ECONOMY, FOOD

(1)Household Food Security, Nutrition and Health Monitoring Report, Central Statistical Office, January/February, 1996

(2)Household Budget Survey 1993/1994, Central Statistical Office, December, 1995

(3)Drought Impact Monitoring System in Zambia (Report of a Pilot Survey in Kalomo, Luangwa, and Senanga Districts), Central Statistical Office, June, 1992

4. TOPOLOGOCAL MAP, GEOLOGICAL MAP, GEOGRAPHICAL MAP

(1)Topographical Map 1:250,000, Survey Department, Surveyor General, Ministry of Lands and Natural Resources

(2)Map Catalogue, Survey Department, January, Surveyor General, Ministry of Lands and Natural Resources, 1984