WATER AND SANITATION FOR HEALTH PROJECT

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MALAWI SELF-HELP RURAL WATER SUPPLY PROGRAM: A MID-TERM EVALUATION OF THE USAID-FINANCED PROJECT

WASH FIELD REPORT NO. 105

DECEMBER 1983

Prepared for:
USAID Mission to the Republic of Malawi
Order of Technical Direction No. 149

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December 6, 1983

Sheldon Cole, Director
USAID Mission
Lilongwe, Malawi

Attention: David Garms

Dear Mr. Cole:

On behalf of the WASH Project I am pleased to provide you with 10 (ten) copies of a report on Malawi Self-Help Rural Water Supply Program: A Mid-Term Evaluation of the USAID-Financed Projects.

This is the final report by Dennis Warner, Raymond Isely, Craig Hafner and John Briscoe and is based on their trip to Malawi from July 16, 1983 to August 19, 1983.

This assistance is the result of a request by the Mission on April 28, 1983. The work was undertaken by the WASH Project on July 8, 1983 by means of Order of Technical Direction No. 149, authorized by the USAID Office of Health in Washington.

If you have any questions or comments regarding the findings or recommendations contained in this report we will be happy to discuss them.

Sincerely,

David Donaldson
Acting Director
Wash Project

cc. Mr. Victor W.R. Wehman, Jr., P.E., R.S.
AID WASH Project Manager
S&T/H/WS

WASH FIELD REPORT NO. 105

MALAWI SELF-HELP RURAL WATER SUPPLY PROGRAM: A MID-TERM EVALUATION OF THE USAID-FINANCED PROJECT

Prepared for the USAID Mission to the Republic of Malawi
Under Order of Technical Direction No. 149

Prepared by:

Dennis B. Warner, Ph.D, P.E.,
Raymond B. Isely, M.D., D.T.M., M.P.H.
Craig Hafner, M.A.
John Briscoe, Ph.D

December 1983

Water and Sanitation for Health Project
Contract No. AID/DSPE-C-0080, Project No. 931-1176
is sponsored by the Office of Health, Bureau for Science and Technology
U.S. Agency for International Development
Washington, DC 20523

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US$1.00 = MK 1.04

EXECUTIVE SUMMARY

A four person team staffed by the Water and Sanitation for Health (WASH) Project visited Malawi from July 16 to August 19, 1983 to evaluate the mid-point progress of the USAID-financed Rural Piped Water Project. Through interviews, observations, and contacts in the field with beneficiaries of the project, the team made an operational assessment of project progress to date, existing problems, and prospects for future development.

The evaluation team found the project, as carried out by the Department of Lands, Valuation and Water (DLVW) with assistance from the Ministry of Health (MOH) to be well-conceived, competently directed and managed, and adequately supported by the Government of Malawi (GOM). USAID financing, which began in 1980, has permitted the continuation and expansion of the already highly successful Malawi rural piped water program that began in 1968. Despite initial fears of the negative influence of such large financing, the USAID involvement has succeeded in reinforcing the basic strengths of the previously existing program and, in addition, has significantly expanded the program scope to include health education, sanitation, and research.

The observed overall success of the project is due to several key factors:

1. All project activity (including planning, mobilization of resources, construction, maintenance, and repair) is firmly based on full participation of users, their communities, and leaders. Several hundred kilometers of pipeline in a single scheme may be constructed by purely voluntary self-help. This full and enthusiastic involvement of communities on such a wide scale is unequalled anywhere in Africa.

2. The field staff of the Rural Water Section of the DLVW, and more recently those of the Health Education and Sanitation Promotion (HESP) program of the MOH, are sensitive to the need for and possess the skills to work with a community-based water supply and sanitation program. Since the rural piped water program dates back to the mid-1960s, DLVW staff have always had a strong orientation to working with communities rather than imposing outside solutions on them. As individual projects have grown more complex, the increased engineering complexity and this community based approach have formed a unique blend.

3. The staff of the Malawi rural water program has been far-seeing and dedicated, and the political leadership has been supportive of the program. These two factors have seen the project through many organizational changes and maintained its high standing as an important development initiative.

The main conclusions deal with institutional issues. The evaluation team concluded that the inputs of USAID, GOM, and of the community level organizations are timely and generally well-coordinated. Although a few readily correctable problems in billing were noted, costs and expenditures are otherwise reasonable. Despite severe staff shortages, the technical aspects of the the project have been appropriate and well conceived. The Principal Health

Coordinator has made a good start in organizing and directing an innovative Health Education and Sanitation Promotion (HESP) component. The crucial liaison role played by the Principal Health Coordinator between the MOH and the DLVW needs to be strengthened and more fully supported by both organizations. Opportunities for more coordination exist at the community and field staff level as well as at that of the central organizations. All efforts at coordination must take place in the context of a strong commitment to community participation.

The fruits of this emphasis on participation are strongly in evidence in the maintenance procedures established for existing systems. A complete maintenance procedure for routine problems is run with self-help efforts. The result in terms of a high level of system operation speaks for itself.

Staff training has been a strong feature of the rural piped water program for many years and has predated USAID involvement. The spread effect of the program over time has been based upon a steadily expanding cadre of trained, committed field staff. The training function has been continued and reinforced in the USAID-supported Project. At present, the training programs in the DLVW and MOH, which emphasize field experience in the project communities, differ greatly from the standard engineering and sanitation training usually given by technical organizations. These highly focused training activities are a key factor keeping field staff both technically competent and, more importantly, sensitive to community needs.

Although the Project Paper proposed setting up a Training and Research Unit in the DLVW to carry out training, research, information management, and evaluation functions, such a unit as a separate entity has never been fully established. Instead, a series of useful, although largely uncoordinated, investigations into technical design, system operations, and water and sanitation-related behavior have been directed by the Senior Water Engineer with the assistance of Peace Corps Volunteers, field staff, and the Centre for Social Research in Zomba. This impressive work needs to be integrated into an overall research program. DLVW probably erred in not engaging a short-term Senior Evaluation Specialist, who could have helped the cooperating agencies to develop a coordinated research and evaluation plan, including a design for a final end-of-project evaluation. It is recommended that this step still be taken.

The reduction of the number of proposed water schemes from the original 23 to 16 has been accompanied by an increase in the design population to more than double the original estimate. This step seems to have actually strengthened and increased the effectiveness of the project. A major question mark resides, however, over the proposed Zomba South scheme and will reside there until USAID and GOM can resolve the problems of financing the dam which is necessary to impound water for the system. Zomba South is a much needed scheme with important technical and public health implications.

Very little operational information is available on USAID-financed water systems. Projects constructed before 1980, however, have shown high levels of reliability and equity of access to users. Metering and water use studies reveal that 70 to 85 percent of the design capacity of systems is being utilized. Water consumption levels, however, are running at only 10 to 12 litres per capital per day in contrast to the 27 litres per capita per day used in system design. The precise meaning of the latter figures needs to be pursued in further studies of water-use behavior.

Because of the difficulties and expense of mounting full scale evaluations of the economic, technical, health, and social impacts of the project, the evaluation team believes that the final evaluation of the USAID-financed project should concentrate on more easily measured operational, performance, and utilization variables rather than elusive and difficult-to-assess impact variables. Suggested measures should include system operations, per capita water consumption, household water use, community participation and committee functioning, hygiene practices, simple morbidity data, water carrying time savings, and agricultural cultivation rates.

In summary, the evaluation team concludes that the USAID project has helped to make a pre-existing, basically sound, and highly successful rural piped water project even better. At this mid-point in the project, progress toward planned targets are either on or ahead of schedule. The recommendations listed below should therefore be viewed primarily as suggestions for further strengthening the USAID project in particular and the overall rural piped water program of the GOM in general. Since the program is clearly benefiting large numbers of people and strengthening GOM and community institutions, the evaluation team strongly supports this type of development assistance and suggests that it is a good investment for continuing support by the U.S. taxpayer.

The following are the key recommendations to USAID arising from the mid-project evaluation:

1. Delete the requirement of the Project Paper and the Grant Agreement for a formal Training and Research Unit within the Rural Water section of DLVW.

2. Prepare a comprehensive research and evaluation plan for the final years of the project.

3. De-emphasize the role of the ultimate impacts in the end-of-project evaluation and stress instead the assessment of intermediate level indicators of system performance, water-use behavior, and community support.

4. Strengthen the HESP component in the MOH in order to bring more health education and sanitation elements into the project.

5. Provide continued support to the Malawi rural piped water program as long as the GOM maintains its commitment to the community-based development approach so successful to date.

In addition, there are three immediate actions USAID should implement in order to strengthen support for the project within the GOM:

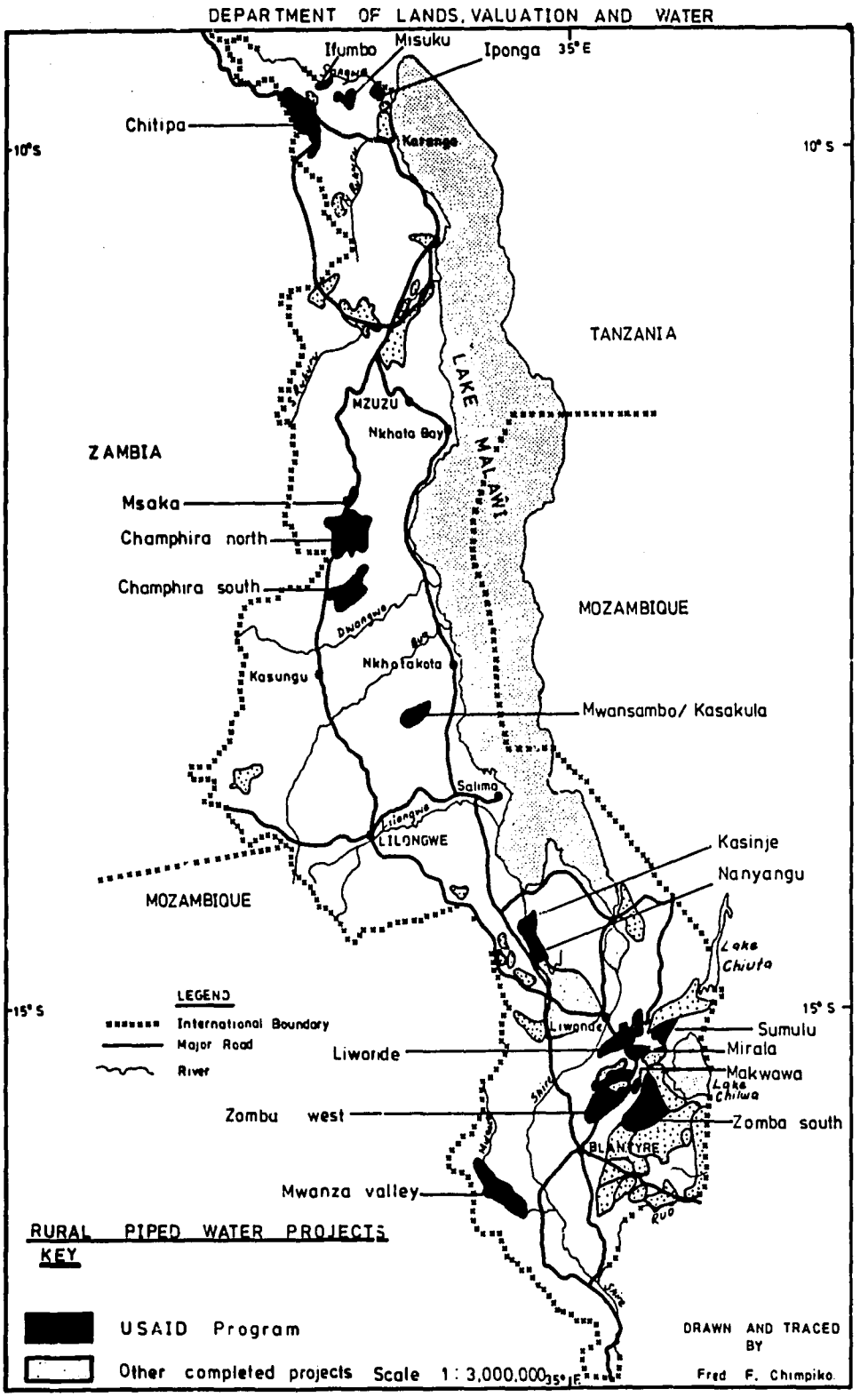
1. Re-assess project status in early 1984.

2. Prepare a high-level manpower plan for the DLVW.

3. Sponsor visits for DLVW officials to rural water and sanitation programs in neighboring African countries.

ACKNOWLEDGEMENTS

The evaluation team wishes to acknowledge the assistance and encouragement of John Burroughs, Jr., U.S. Ambassador to Malawi, Sheldon W. Cole, USAID/Malawi Mission Director, and all other personnel in the USAID Mission who helped with this effort. Acknowledgement is also given to the officials and staff in the Department of Lands, Valuation, and Water and the Ministry of Health for their excellent cooperation and patience during the visits of the evaluation team. In this regard, special note must be made of the assistance given to the evaluation team by L.H. Robertson, Principal Water Engineer in the DLVW, and R.A. Ainsworth, Principal Health Coordinator in the MOH.


DEPARTMENT OF LANDS, VALUATION AND WATER
Ifumbo
Misuku
Iponga
35°E
Chitipa
10°S
Karonga
10° S
TANZANIA
LAKE MALAWI
MZUZU
Nkhata Bay
ZAMBIA
Msaka
Champhira north
Champhira south
MOZAMBIQUE
Kasungu
Nkhotakota
Mwansambo/ Kasakula
Salima
LILONGWE
Kasinje
Nanyangu
MOZAMBIQUE
Lake Chiuta
15°S
LEGEND
International Boundary
Major Road
River
Liwonde
15° S
Sumulu
Mirala
Makwawa
Lake Chilwa
Zomba west
Zomba south
BLANTYRE
Mwanza valley
RURAL PIPED WATER PROJECTS
KEY
USAID Program
Other completed projects
Scale 1 : 3,000,000
35°E
DRAWN AND TRACED BY
Fred F. Chimpiko

Chapter 1

INTRODUCTION

This report constitutes a mid-term evaluation of the USAID-financed rural piped water project in Malawi. Since 1969, the Government of Malawi (GOM) has been carrying out a large-scale program of rural gravity-fed water supply projects throughout the country. These projects have been characterized by self-help village labor inputs, community responsibility for operation and maintenance, and GOM assistance in the form of materials and technical advice.

In August 1980, USAID agreed to provide a grant of $6 million to finance commodity purchases, GOM field staff salaries, and the incorporation of health education and sanitation elements in a five-year project during which up to 23 rural piped water schemes would be built. The inputs of the GOM and the user communities into this project were established to be an equivalent to $2 million. Substantive work on the water schemes began in the Department of Lands, Valuation and Water (DLVW) in April 1981, while the health activities were initiated within the project-funded Health Education and Sanitation Promotion (HESP) component in the Ministry of Health (MOH) in mid-1982.

The need for a mid-project assessment arose out of recommendations in the Project Paper, which called for a formative mid-term evaluaton. The purpose of the present mid-term evaluation is two-fold:

(1) to measure current progress towards achieving end-of-project status and ultimate project outputs, purpose, and goals, and

(2) to establish baseline data to be used for the final evaluation.

This report has been prepared for the USAID Mission to Malawi by the Water and Sanitation for Health (WASH) Project at the request of the AID Office of Health in the Bureau of Science and Technology. The evaluation was performed by a four-person team composed of Dr. Dennis B. Warner, WASH Project Director (team leader); Dr. Raymond B. Isely, WASH Associate Director (health and community participation specialist); Mr. Craig Hafner, WASH Senior Project Officer (institutional specialist), and Dr. John Briscoe, University of North Carolina School of Public Health (economist/sanitary engineer). The evaluation team spent a total of 14 person weeks in Malawi over the period 16 July - 19 August 1983.

Chapter 2

BACKGROUND

2.1 Origins of the Malawi Rural Water Supply Program

The major factors contributing to the history and development of the Malawi Rural Water Supply Program have been a strong central government policy, a perceived need for water on the part of people, the favorable geographical setting, a tradition of effective local village organization, and the skills and vision of the program staff. Each of these factors has played an important role in shaping and influencing the program over the past 15 years.

Since independence in 1964, President Banda has advocated a strong policy of rural development and self-reliance. His government has supported a wide variety and number of self-help projects throughout the country. The rural people have requested assistance from the government and donors to help them to obtain better access to more and cleaner water for domestic use. This perceived and articulated need for water by rural Malawians has been found in all parts of the country. The combination of a policy of promoting rural development and the people's expressed need for water in the rural areas laid the foundation for the program.

The topography and the annual rainfall in Malawi provide the setting for the program. High plateaus form three-fourths of Malawi's land area. These water catchment areas provide the source for relatively unpolluted water for the populated plains below. In addition, the average annual rainfall is 45 inches, varying between a minimum of 25 inches and a maximum of 114 inches.

Another factor which has influenced the Malawi water program is the long tradition of villagers' involvement through committees. The strength of the committees to motivate and to insure active participation of the local people has been demonstrated repeatedly over the years. The traditional and political committees have been the model for the self-help water project committees which have organized and coordinated large numbers of self-help workers over the many months during construction.

The final significant factor influencing the water program is the knowledge and skills of technical and administrative staff of the program. Sensitivity in dealing with the self-help project committees and workers using basic community development methods has built a sense of pride and ownership among the users.

The first gravity-piped water project began in 1967 in Chingale west of Zomba in the central region with the assistance of the U.S. Ambassador's self-help fund. It was organized by the village local leaders with the assistance of the Ministry of Community Development and its engineer, L.H. Robertson. The project emphasized community involvement and decision making in planning, organizing, managing, and constructing the system. From this relatively small project completed in 1969, involving 5000 people but including over 25 miles of piping, a number of other projects in the Mulanje area were conceived. Village leaders from Mulanje in the Southern region visited the Chingale project, talked to the people and saw what could be done. Through word of

mouth and village visits, the message spread that water could be piped down from the hills and plateaus great distances and that the people, with technical assistance from the Government, could build and maintain the systems themselves.

2.2 Objectives of the USAID-Financed Project

The program goal for the AID/Malawi Self-Help Rural Water Supply Project as stated in the Project Paper is "to improve the basic living conditions and health of Malawi's rural populations/poor" by reducing the water-related diseases among rural villagers and increasing disposable time for rural women and children. The project purpose is "to assist the GOM in its rural piped water program which in turn will provide safe water to a significant percentage of Malawi's rural population."

The specific end of project status included in the project paper was:

1. Up to 202,000 rural villagers (approximately 40,000 rural families) will have access to safe water from communal taps.

2. The rural water supply program--based on the provision of gravity-fed piped water--will be expanded, strengthened, and coordinated with the MOH.

3. Up to 202,000 rural villagers will be exposed to health education relating to improve sanitation and hygiene practices.

The major outputs as spelled out in the project paper were:

1. The completion of up to 23 rural piped water sub-projects/systems.

2. The training of up to 20 new Malawi staff annually and the in-service training, leading to promotion, of about 120 Malawi technical staff in construction, operation, maintenance and in basic health and sanitation education.

3. Focused health education activities in sanitation and hygiene undertaken in each of the 23 locations receiving rural piped water.

4. The establishment of a fully staffed and functioning Training and Research Unit in the DLVW Rural Water Section which will institutionalize monitoring, evaluation, and research and data collection concerning the technical, health, economic and social implications of the water systems.

2.3 Background to WASH Involvement

In late 1981 the USAID Mission to Malawi requested information from the Water and Sanitation for Health (WASH) Project for the Department of Lands, Valuation, and Water. Following a December 1982 visit by the then-Chief of the

Water and Sanitation Division of the AID Office of Health (S&T/H/WS), USAID/Malawi requested WASH assistance for a trainer to assist the HESP program with staff training during the first half of 1983.

In March 1983, USAID/Malawi requested WASH assistance in preparing a scope of work for the mid-term evaluation of the Malawi rural piped water project. This scope of work was completed by WASH in April, 1983. Shortly thereafter a formal request for WASH participation in the field evaluation was made to the AID Office of Health by USAID/Malawi. The request was approved and the AID Office of Health issued Order of Technical Direction No. 149 dated July 1983, authorizing the WASH Project to undertake the evaluation as outlined in the scope of work. Prior to receipt of the official authorization, the WASH staff identified a four-member team and sent their names to USAID/Malawi and the Government of Malawi for approval in June 1983. The approval was given, and an advance member of the WASH team arrived in Malawi on 16 July while the other three team members officially arrived in Lilongwe on 23 July.

Chapter 3

EVALUATION METHODOLOGY

3.1 Purpose of Evaluation

Evaluation implies measurement, and the purpose of project evaluation is the measurement of project status in order to determine progress towards defined project objectives. In the Malawi rural piped water project, the Project Paper established a variety of objectives, termed project outputs, purposes, goals, and end-of-project status (USAID, 1980). It also called for a final evaluation of the project as well as a formative mid-term assessment of project progress.

According to the Project Paper, the purpose of the mid-term evaluation was "to validate the GOM and AID inputs to the project as being sufficient in quality and quantity to achieve the project outputs." If deficiencies were found, the evaluation team was expected to recommend remedial actions to be undertaken during the remaining life of the project.

The evaluation requested by AID, however, was much more comprehensive than that outlined in the Project Paper. Because of the international attention received by the project and the likelihood of a GOM request for extension and enlargement of the project, the AID Africa Bureau in February 1982 suggested that the mid-term evaluation include a review of the progress of institutional development. Specifically, it requested the following be assessed:

- -- progress in developing water systems management capacity,
- -- progress in developing and managing rural water data collection systems
- -- progress in developing processes for testing appropriate technological innovations (filters, pumps, etc.),
- -- progressing in achieving the interministerial coordination required to move simultaneously toward widely-accepted water distribution objectives and towards less widely understood health-education/ sanitation goals requiring changes in living habits.

3.2 Evaluation Model

An evaluation model proposed in earlier WASH Reports (Warner and Woolf, 1981, and Warner, 1981) was adapted for the Malawi rural piped water project. Emphasizing the sequential nature of linkages from initial project inputs to ultimate project outputs and impacts, the model, shown below in Figure 1, provides a basic framework for organizing evaluation activities.

Each level of Figure 1 represents an order of effects that are dependent upon all previous effects. The initial efficiency level consists of the immediate, or direct, consequences of project development, which include all project inputs, operations, and physical outputs under the control of project officials. These consequences can generally be assessed in straightforward physical units.

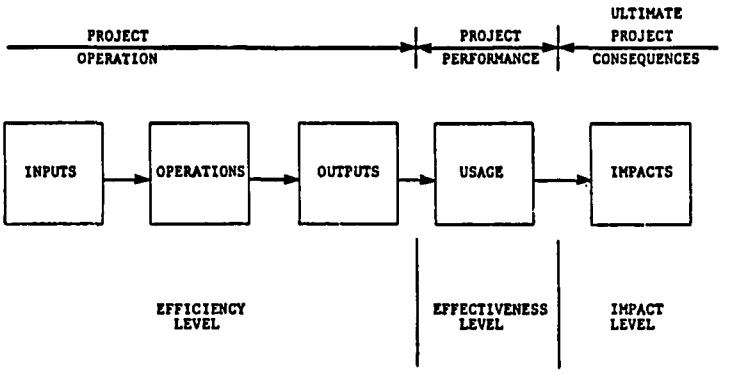


FIGURE 1: GENERAL EVALUATION MODEL FOR WATER AND SANITATION PROJECTS

The secondary effectiveness level involves the more complex consequences of project performance, or the use of project systems. This includes the water use and sanitation practices adopted by the project communities as well as the type of health education and maintenance support the communities give to the new systems. Project officials cannot directly control these consequences. They can only hope to favorably influence the behavioral patterns in the recipient communities. Similarly, because of the difficulties in measuring behavior, surrogate, or indicator, measures often must be employed.

The third and final level is the impact level, which includes the ultimate health, economic, and social consequences of the project. To the policymaker, these are the long-run benefits that water and sanitation projects are intended to achieve. The existence of these impacts is dependent upon the occurence of project outcomes at the earlier efficiency and effectiveness levels. Measurement of project impacts, however, is extraordinarily difficult and may require a disciplined research approach with strict project controls to produce meaningful results. The World Health Organization, which has recently developed a Minimum Evaluation Procedure containing a series of evaluation measures for project outputs and project usage, advises against attempting to measure project impacts in operational field assessments (WHO, 1983). The use of the model in Figure 1 was intended to serve two basic functions in the mid-term evaluation:

1. to measure current progress towards achieving end-of-project status and ultimate project outputs, purpose, and goal, and

2. to establish a baseline of evaluation data for the final evaluation.

These functions, as well as the specific institutional issues of concern to the Africa Bureau, were incorporated into the evaluation model within the following five areas:

1. Project inputs by USAID, GOM, and the local community.
2. Strengthening of institutions involved in the project.
3. Project outputs of community water supply and sanitation schemes.
4. Project utilization of water and sanitation systems.
5. Project impacts (health, economic, social).

Figure 2 is an expanded view of the evaluation model adapted for the Malawi rural piped water project. Because of the difficulties involved in measuring higher-level project outcomes, it was agreed in advance that primary emphasis in the mid-term evaluation would be placed on the assessment of project status by developing a detailed baseline of data for the initial operations, or efficiency, level shown in Figure 2. This level represents the process of overall project development. Secondary emphasis was to be given to the assessment of the higher-level outcomes of project performance and ultimate impacts. These outcomes represent overall project benefits and should be more fully assessed in the final evaluation.

3.3 Scope of Work for OTD No. 149

1. Inputs of Funds, Commodities, and Personnel

    1.1 Determine the quantities, timing, costs (both foreign exchange and local currency), and general availability of the following AID inputs:

        1.1.1 Construction program (commodities, vehicles and equipment, RWS field staff salaries, operating costs, tools and miscellaneous equipment).

        1.1.2 Maintenance program (RWS field and other staff salaries, office equipment, per diem for training courses, water meters, motorcycles, operating costs, and library and publications).

        1.1.3 Monitoring, coordination and evaluation (Senior Evaluation Specialist, Public Health Coordinator, data gathering by an outside institution, vehicles, and operating expenses).

    1.2 Determine the local currency cost equivalents and, where appropriate, the availability/quantities and timing of the following GOM inputs:

        1.2.1 Salaries of RWS Headquarters staff.

        1.2.2 Self-help labor in water system construction and maintenance.

        1.2.3 Other contributions (RWS office space and DLVW warehouses, office equipment, supplies, literature, easement costs, part-time professional field staff, and locally furnished commodities).

2. Strengthening of Institutional Systems

    2.1 Describe the following project development activities within the Rural Water Section:

        2.1.1 Planning (project identification, feasibility determination, and selection).

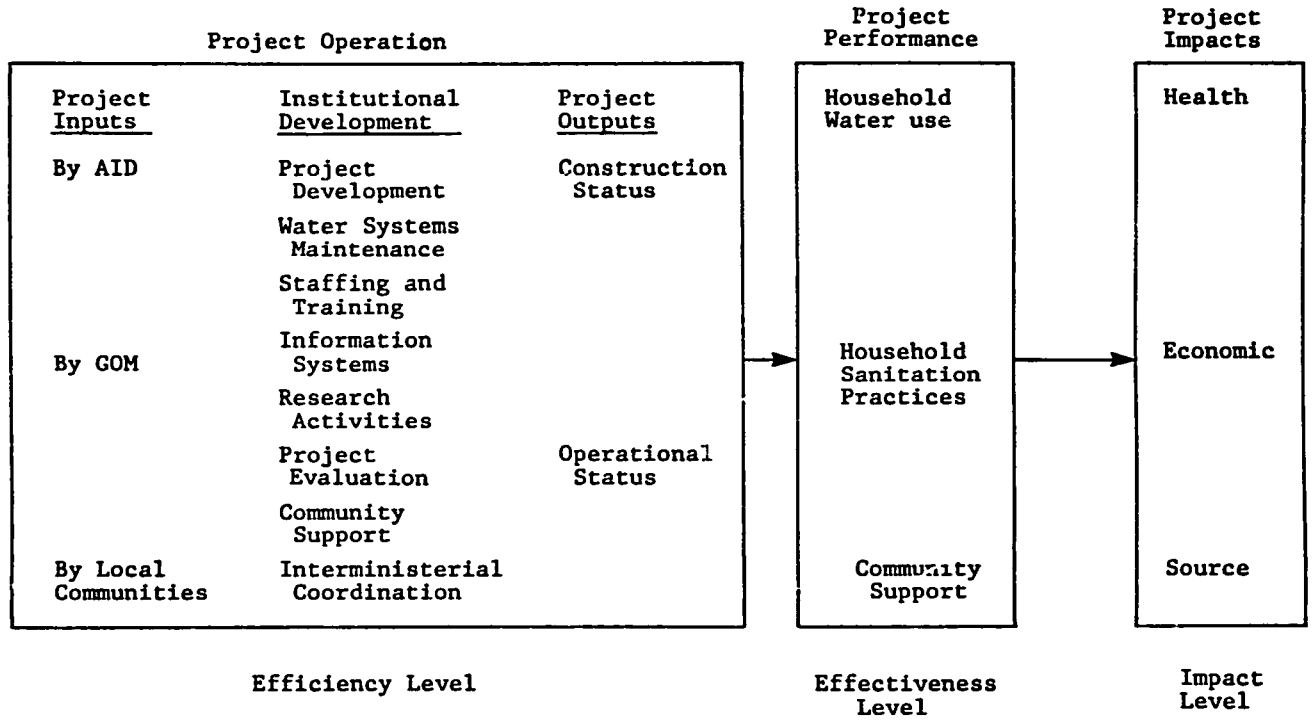


FIGURE 2. EVALUATION MODEL FOR MALAWI RURAL PIPED WATER PROJECT

2.1.2 Design (engineering design and cost estimating).

2.1.3 Procurement (commodity programming, ordering, and inventory control).

2.1.4 Construction (field scheduling, field construction, project completion, and system testing).

2.2 Describe the water systems maintenance procedures within the RWS Training and Research Unit. Include both current procedures and procedures anticipated following Project completion.

2.2.1 Routine maintenance (water quality monitoring, inspection visits, maintenance capabilities, and financing of recurrent costs).

2.2.2 Major maintenance (reporting, availability of staff, transport, and equipment, and financing or recurrent costs).

2.3 Describe the training provided by the following organization:

2.3.1 RWS Training and Research Unit (RWS technicians and professional staff).

2.3.2 Ministry of Health (District Health Inspectors, Surveillance Assistants, Village Health Committees).

2.4 Describe the research activities of the RWS Training and Research Unit:

2.4.1 System baseline data development.

2.4.2 System studies (least-cost analysis, time savings, community preferences, etc.).

2.5 Describe the information systems procedures used in the RWS Training and Research Unit:

2.5.1 Data collection.

2.5.2 Data recording, processing, storage, and retrieval.

2.6 Describe the health and sanitation education activities which support the rural water program:

2.6.1 Activities of Public Health Coordinator.

2.6.2 Role of Village Health Communities and Tap Committees.

2.7 Describe the procedures for community support of a water project:

2.7.1 Responsibilities of committees (Main Project Committee, Section Committee, Branch Committee, and Village Health and Tap Committees).

2.7.2 Interrelationships between the RWS and the various committees.

2.8 Describe the procedures for interministrial coordination:

2.8.1 The role of the Public Health Coordinator.

2.8.2 The community-based organizational network.

2.8.3 Activities of an interministerial National Action Committee for the Water Decade.

3. Outputs in Terms of Community Water Systems

3.1 Determine the construction status of the piped water systems project:

3.1.1 Number of systems begun and current stage of completion.

3.1.2 Location and geographic distribution of systems.

3.1.3 Construction schedule of systems.

3.2 Determine the operational status of the completed systems:

3.2.1 Water quantity (volumes of water produced per day/per month/per capita).

3.2.2 Water quality (bacteriological tests, disinfection dosage rates).

3.2.3 System reliability (frequency and duration of system stoppages).

3.2.4 System accessibility (distance from households to water points).

3.2.5 System sanitation (drainage around water taps).

4. Performance of Community Water Systems

4.1 Determine household uses of water system:

4.1.1 Sources of household water (water tap, well, river, etc.).

4.1.2 Proportion of households using the water system.

4.1.3 Per capita daily consumption of water.

4.1.4 Types of water usage (cooking, cleaning, washing, bathing, house building, garden irrigation, beer brewing, other small industry, public institutions).

4.2 Determine sanitation practices of community:

4.2.1 Proportion of households with sanitary latrine.

4.2.2 Proportion of households with sanitary water storage container.

4.3 Determine community support of water systems:

4.3.1 Enforcement of water usage practices.

4.3.2 Provision of self-help labor and local commodities during construction.

4.3.3 Provision of necessary labor to carry out maintenance functions.

5. Project Impacts

5.1 Determine the following health aspects:

5.1.1 Reduced morbidity in water related diseases (schistosomiasis, roundworms, skin infections, etc.).

5.1.2 Greater awareness of hygiene practices.

5.2 Determine the following economic aspects:

5.2.1 Water carrying time savings on completed project.

5.2.2 Changes in water consumption rates over time.

5.2.3 Establishment of new public services or small industries which require water for proper operation.

5.3 Determine the following social impacts:

5.3.1 Experience in project planning and implementation.

5.3.2 Efforts to undertake other cooperative activities in the community.

5.3.3 Increased involvement of women in self-help activities and in positions of local leadership.

3.4 Evaluation Procedures

Overall procedures used in this mid-term evaluation can be described in terms of evaluation design, organization, data collection, analysis, and reporting.

Evaluation design was carried out within the WASH office over the period April-June 1983. The design adopted for this study was based upon recent

developments in the evaluation literature, previous activities of the WASH Project, and the personal experiences of members of the WASH team. Representatives of the AID Office of Health, the Africa Bureau, and the USAID Mission to Malawi were consulted during the formulation of the evaluation design. Formal AID approval for the final design and scope of work was given in June, 1983.

As this evaluation was intended to assess an on-going project and to help improve the performance of the project, evaluation measures appropriate for operational purposes were chosen. Such measures included the use of existing quantitative data, reports and records in files, extensive interviews with officials, technicians, and local residents, and numerous first-hand observations of actual field conditions. The evaluation design and the measures incorporated within it were intended to provide AID with an operational assessment carried out and reported in terms related to current project operations. This evaluation was not intended to be a research study and, therefore, rigorous experimental controls and statistical procedures were not used. It was intended that the overall findings and conclusions of these measures would be dependent upon the comprehensiveness of the scope of work and thoroughness and experience of the evaluation team.

Organization of the evaluation began before the team left for Malawi. The various sub-elements of the scope of work were assigned to specific individuals for investigation and analysis. Where appropriate, the results for each sub-element in the scope of work were to be reported in the following manner:

1. Definition of issue.

2. Project Status

   - pre-project status (before USAID involvement)
   - current project status
   - end-of-project status

3. Comments, conclusions, and recommendations

While in Malawi, the team met daily to coordinate evaluation activities and to critically discuss all findings, conclusions, and recommendations.

Upon arrival in Malawi, the team had introductory meetings with officals of USAID, the MOH, and the DLVW. The scope of work and evaluation plan were discussed at these meetings and future interviews, field trips, and briefing sessions were arranged. The WASH team leader acted as the contact in all official meetings with the GOM, USAID, and the U.S. Embassy.

Data collection involved a review of project reports and USAID, MOH, and DLVW project files, as well as interviews with officials, field personnel, and local residents of project communities. Approximately 60 percent of data collection efforts occurred in the capital city of Lilongwe and 40 percent in the field. Visits were made to communities with and without water projects and to areas with and without health education and sanitation activities. Among the areas visited by one or more team members were Dombole, Liwonde, Mirala, Mulanje, Zomba West, Ntcheu, and Mbiza. Although most interviews and field visits were unstructured, a questionnaire was developed to guide the interviews with village-level health personnel and village residents.

The analysis of data began at the end of the first week after arrival in Malawi. Since the scope of work subdivided the evaluation into numerous discrete sub-elements, the associated analysis and drafting of the report were begun as soon as the required data collection was accomplished. All major issues were discussed among the WASH team before any conclusions or recommendations were presented to USAID or the GOM. The results of internal team discussions having particular sensitivity or importance to project performance were informally reviewed with USAID and GOM officials before final adoption by the team. In this manner, both USAID, the DLVW, and the MOH had advanced knowledge of the evaluation findings and had an opportunity to discuss the main recommendations before they were formally presented at the briefings or in the draft report.

Reporting the results of the evaluation began almost immediately with informal discussions, as described above. A joint briefing of USAID, the DLVW, and the MOH occurred on 10 August 1982, at which point the WASH team had finished its data collection, most of the analysis, and was preparing the preliminary draft report. Three of the team members departed Malawi over the following two days as had been originally scheduled. The team leader remained an additional week to finish and assemble the report, which was delivered to USAID/Malawi on 19 August 1983. Further debriefings on the evaluation occurred in Washington, D.C., including an informal presentation to AID officials at the WASH office on 16 September 1983 and a formal debriefing at the State Department on 25 October 1983.

Chapter 4

PROJECT OPERATION: INPUTS

Project inputs are provided by USAID, by the Government and people of Malawi, and by other agencies. In this section, the inputs made by each of these groups are described and progress is assessed by comparing the actual level of inputs over the first two years of the project with the planned level of inputs over this period. Projects are made of USAID-funded expenditures to the end of the project and projected expenditures are compared to allocations.

4.1 USAID Inputs

USAID provides funding for three programs in the overall Malawi rural piped water program. These are the construction program, the maintenance program, and the monitoring, coordination and evaluation program. Inputs are financed through one of two mechanisms. Payments for pipes, vehicles, and equipment are made directly from USAID to the supplier upon presentation of an invoice. All other items are paid by the GOM. The DLVW prepares periodic financial statements of these expenses and submits them to Treasury, which in turn submits them to USAID for repayment.

4.1.1. Construction Program

The major activity of the USAID-funded project is the construction of gravity-fed piped water supply schemes. USAID provides inputs into the construction of intakes, pipelines, tanks, and taps required in such schemes in the form of commodities (with PVC pipes being by far the largest single item), vehicles and equipment, the salaries of "non-established" staff on the construction crews, operating expenses (principally fuel), and tools and equipment.

Table 1, which gives projected expenses in the above categories for each of the 16 USAID sub-projects, shows that estimated construction costs total K5,007,000. The table also presents some summary information on the demographic and engineering characteristics of each of these sub-projects. The 1977 population is derived from the 1977 census figures for the villages to be served by the project. The "ultimate" population is based on an assessment of the carrying capacity of the land in the area served by the project and estimates of the maximum population which can be supported by that land area. In most cases the "ultimate population" figure was used as the design population for the system. The costs presented in the table only include costs to be funded by USAID. These figures do not include salaries paid by the GOM, overheads paid by the GOM, labor and land donated by the population, contributions by other donors (which cover the major portion of the real costs of the senior project personnel and, in the case of Chitipa, the cost of the pipeline). Costs were abstracted from Project Development Submissions, which are prepared by the Rural Water Supply Unit and submitted to, and approved by, Treasury for inclusion in the Annual Construction Plans. The projects are listed in the order in which construction was started or is scheduled to be started.

TABLE 1: DETAILS OF USAID-FUNDED PROJECTS

	REGION	DISTRICT	POPULATION (1000's)		LENGTH OF PIPING (km)	NUMBER OF TAPS	ESTIMATED COSTS OF USAID-FUNDED ITEMS (10^3 MK)					
							Commodities		Personnel			
			1977	Ultimate			Pipes & Fittings	Plant & Vehicles	Field Staff	Running Expenses	Misc	Total
Liwonde	South	Machinga	14	23	118	144	170	22	10	15	6	222
	Central	Ntcheu										
Nanyangu/Kasinje	Central	Ntcheu	30	34	169	226	197	22	12	20	8	259
Iponga	North	Karonga	4	5	24	35	35	22	2	6	2	67
Chitipa	North	Chitipa	8	36	323	300	84	0	10	34	9	136
Mwanza	South	Chikwawa	?	40	218	400	689	12	24	42	10	777
Chimaliro N.	North	Mzimba	11	25	167	154	192	10	12	16	6	236
Mwansambo	Central	Ntchisi	?	15	60	145	113	10	12	16	6	157
Misuku	North	Chitipa	3	4	17	26	30	1	2	6	2	41
Sumulu	South	Machinga	18	24	80	100	215	30	7	8	2	261
Mirala	South	Machinga	9	13	56	81	91	0	6	10	1	108
Makwana	South	Zomba	15	16	68	101	76	0	8	8	1	93
Zomba S.	South	Zomba	88	120	550	1,000	1,440	40	40	60	30	1,610
Chimaliro S.	North	Mzimba	17	32	221	200	358	12	24	6	0	400
Zomba W.	South	Zomba	38	75	340	353	524	0	25	32	9	590
TOTALS				463	2,450	3,200	4,253	181	200	279	94	5,007

Table 2 compares actual expenditures for project submissions prepared on the basis of detailed engineering designs with the projected expenditures presented in the Project Paper. As can be seen from Table 2, the proportion of total expenditures allocated to commodities is substantially higher than originally envisioned, while expenses for vehicles and equipment, operating costs, miscellaneous, and field staff are substantially lower than initially anticipated.

TABLE 2: COMPARISON OF IMPORTANCE OF DIFFERENT ITEMS IN PROJECT PAPER AND IN PROJECT SUBMISSIONS

	PROJECT PAPER	DETAILED PROJECT SUBMISSIONS
Commodities	66%	85%
Vehicles and Equipment	8%	4%
Field Staff	10%	4%
Operating Costs	10%	6%
Miscellaneous	5%	2%
	100%	100%

The first column contains percentages of total of $5,036,000 allocated to construction in the Project Paper. The second column is derived from total projected expenditures of MK 5,007,000 in the Detailed Project Submissions (see Table 1).

Figure 3 presents the planned starting and estimated completion dates for each of the USAID-funded sub-projects. It is anticipated that construction on two projects (Chitipa and Zomba South) will not be completed by September 1985 and that construction on four projects (Mwanza, Chilmaliro South, Zomba West, and Msaka) will be completed by September 1985 only if the projects are completed on schedule.

Progress by the end of the second year of the project (March 30, 1983) is summarized in Table 3. First, progress on the engineering components of each sub-project is shown followed by the actual expenditures incurred on each sub-project. The table also shows the original budget for each sub-project as well as the proportion of the budget expended to date. The same information is presented in another form in Table 4, in which the actual and projected (in the Project Paper) expenditures over the first two years of the project are compared. The general conclusions to be drawn from these tables of USAID inputs into the construction program are:

(1) Actual expenditures on the early sub-projects were slightly in excess of the projected expenditures, in part because expenditures which would logically be spread over all projects (such as vehicle costs) were all attributed to the initial projects, and in part

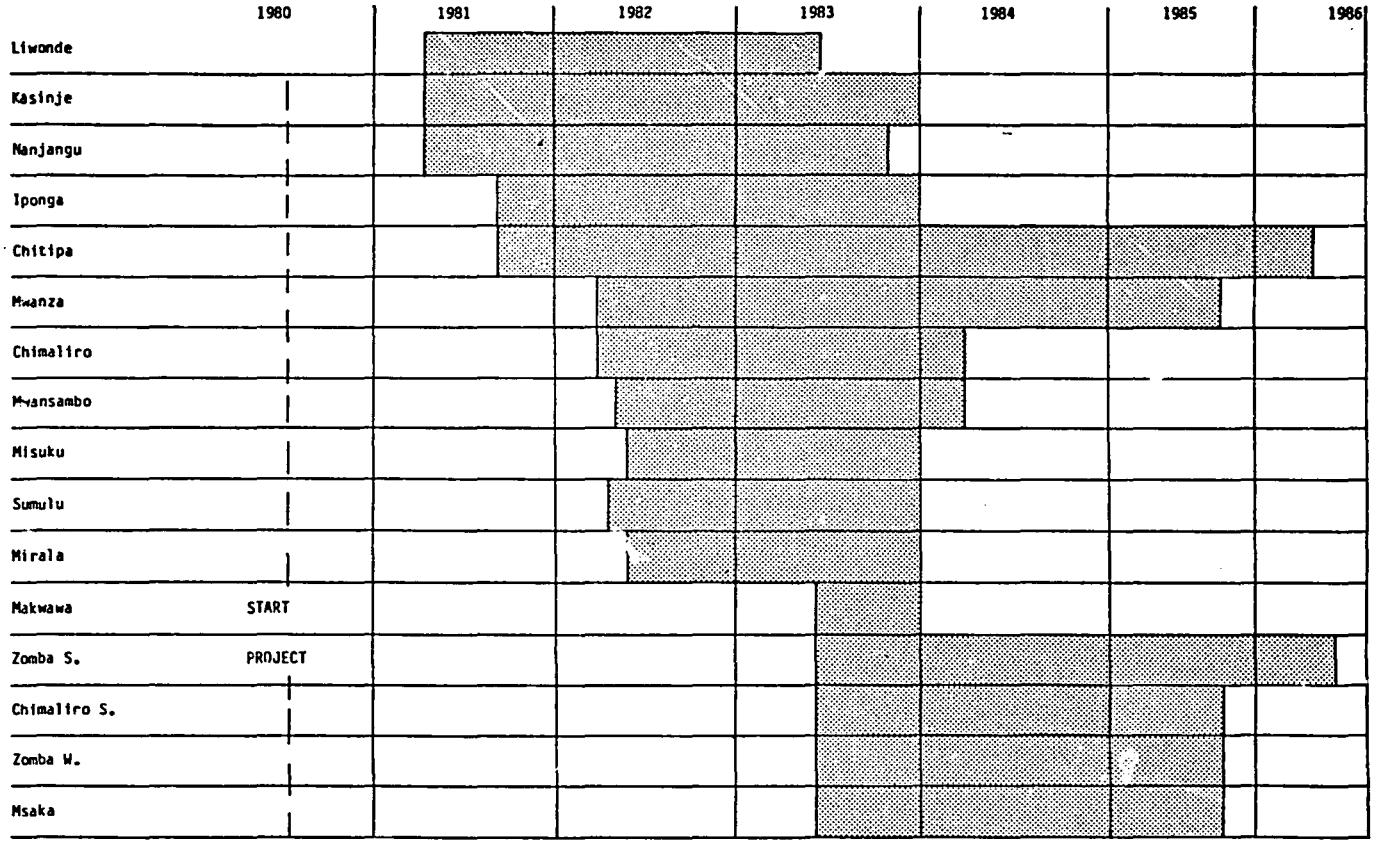


Figure 3: USAID RURAL PIPED WATER PROJECT PROGRAM

TABLE 3: PHYSICAL AND FINANCIAL PROGRESS OF USAID-FUNDED PROJECTS BY END MALAWIAN FY 1982 (MARCH 30, 1983)

	PROPORTION COMPLETED (%)					EXPENDITURE (1,000 MK)						
	INTAKE	MAIN LINE	TANK	BRANCH LINE	TAPS	PIPE	VEHICLES	OTHER FY 81	OTHER FY 82	TOTAL	BUDGET	PERCENT SPENT
Liwonde	100	100	100	95	96	136			52		222	
Nanyangu/Kasinje	70	90	85	40	40	174			59		75	
Iponge	95	90	5	20	15	22	20+	365+	7	877	184	128%
Chitipa	100	30	10	0	0	*			42		67	
Mwanze	20	0	0	0	0	431	20	0	128	579	136	75%
Chimaliro N.	95	95	60	10	4	148	10	0	46	204	777	86%
Mwansambo	100	80	40	0	10	81	4	0	56	131	236	83%
Misuku	80	80	0	0	0	13	1	0	8	22	157	54%
Sumulu	100	100	100	30	13	103	8	0	16	127	41	49%
Mirala	100	20	0	0	0	0	0	0	0x	0	261	0
Makwawa	0	0	0	0	0	0	0	0	0	0	108	0
Zomba S.	0	0	0	0	0	0	0	0	0	0	93	0
Chimaliro S.	0	0	0	0	0	0	0	0	0	0	1,610	0
Zomba W.	0	0	0	0	0	0	0	0	0	0	400	0
Msaka	0	0	0	0	0	0	0	0	0	0	590	0
									TOTAL	1,940	5,007	39%

* Pipeline (MK 600,000) supplied by Japanese International Co-operation Agency.
x Due to an administrative error expenditures at Mirala were attributed to other projects.
\+ In FY 81 expenditures were not accounted for by sub-project.

TABLE 4: SUMMARY OF PROJECTED AND ACTUAL CONSTRUCTION EXPENDITURE FROM USAID BUDGET INCURRED IN FIRST AND SECOND YEARS OF PROJECT (IN UNITS OF 1000)

	YEAR ONE (APR '81 - MAR '82)					YEAR TWO (APR '82 - MAR '83)					YEAR ONE & TWO		
	Direct by USAID (MK)	USAID Through GOM (MK)	Total (MK)	Total ($)	Projected ($)	Direct by USAID (MK)	USAID through GOM (MK)	Total (MK)	Total ($)	Pro-jected ($)	Expend-iture ($)	Proj-ected ($)	Expend Proj (%)
Commodities	K333	K166	K499	$480	$584	K777	K213	K990	$951	$762	$1,431	$1,346	106%
Vehicles and Equipment	K10	K55	K65	$63	$176	K43	K3	K46	$44	$140	$107	$ 316	34%
Field Staff	0	K20	K20	$19	$102	0	K27	K27	$26	$124	$ 45	$ 226	22%
Operating Costs	0	K82	K82	$79	$100	0	K151	K151	$145	$125	$224	$ 225	100%
Miscellaneous	0	K41	K41	$39	$50	0	K20	K20	$19	$ 63	$ 58	$ 113	51%
	K343	K364	K707	$680	$1,012	K820	K414	K1,234	$1,187	$1,214	$1,867	$2,226	84%

because a bureaucratic delay in formal approval for the Mirala Project caused some expenses incurred at Mirala to be attributed to other projects.

(2) Actual expenditures on commodities were higher than foreseen in the Project Paper, while actual expenditures on vehicles, miscellaneous items, and, especially, field staff, were well below the projected levels. Expenditures on operating costs were slightly higher than those foreseen in the Project Paper.

(3) Overall progress, whether measured in terms of either completed structures or expenditures, is satisfactory, suggesting that if the present pace is maintained the construction targets will be met at the end of the project.

4.1.2 Maintenance Program

The aim of the maintenance program is to develop appropriate institutional and engineering solutions to the maintenance and operation problems experienced in gravity-fed rural water supply schemes in Malawi. The USAID inputs into this program consist of salaries, office equipment, per diem for training courses, and operating costs.

In Table 5, actual and projected expenses are compared for the first two years of project life. It can be seen that research and training expenditures have taken place more or less as predicted, but that actual expenditures for staff salaries and especially for the purchase of water meters have been considerably less than planned. For the program as a whole, expenditures have run at about 68 percent of the level foreseen in the Project Paper.

The exchange rate and project payments have been as follows:

	1980	1981	1982	1983	Total
MK per 1 US$	0.81	0.90	1.08	1.14	
Payments ($10^3$$)	700	1000	2000	2300	6,000
Equivalent (10_3MK)	567	900	2160	2622	6,249

The effective exchange rate is thus 1.04 MK per 1 US$. This effective exchange rate is used in this and subsequent tables. The cost estimates in the Project Paper are listed by the U.S. Fiscal Year, running from October to September. The actual expenditures are determined for the Malawi Fiscal Year running from April through March. Although the project paper was based on the expectation that the project would begin in October 1980, in fact expenditures only began in April 1981. Because of this difference it is possible to deal not with fiscal years but with "year of the project life," which corresponds to the Malawi fiscal year.

TABLE 5: PROJECTED AND ACTUAL EXPENDITURES ON MAINTENANCE AND RESEARCH PROGRAM (x 1000)

	YEAR ONE (APR '81 - MAR '82)				YEAR TWO (APR '82 - MAR '83)				YEAR ONE & TWO		
	Direct by USAID	USAID Through GOM	Total	Projected	Direct by USAID	USAID through GOM	Total	Projected	Actual	Projected	%
Research Activities	0			$20	0			$20		$40	
Office Equipment	0			$15	0			$10		$25	
Library and Publications	0	K54	$52	$ 4	0	K17	$16	$ 2	$68	$ 6	81%
Per Diem for Training Courses	0			$ 6	0			$ 7		$13	
Staff Salaries	0	K9	$ 9	$20	0	K16	$15	$20	$24	$40	60%
Motor Cycles	0	0	0	$ 1	0	0	0	$ 1	0	$ 2	0
Water Meters	$7	0	$ 7	$22	0	0	0	$16	$ 7	$28	18%
Operating Costs	0	K5	$ 5	$ 6	0	K17	$16	$ 6	$21	$12	75%
			$73	$94			$47	$82	$120	$176	68%

The categories used in the accounting system of the DLVW for this budget do not correspond to the categories used in the Project Paper. Thus it is difficult to compare the budgets item by item without a very detailed analysis of the actual accounts, a task beyond the scope of the present evaluation. Allocation of actual expenditures to each category is thus somewhat speculative, and detailed comparisons of actual and projected expenditures by category are pointless.

4.1.3 Monitoring, Coordination, and Evaluation Program

This program has two major objectives: to introduce health education and sanitation activities in the areas served by piped water supplies and to provide data and analysis for project monitoring and evaluation. The USAID contribution is for the salary of a Public Health Coordinator, the vehicle and operating expenses for the health education activities, the services of a Senior Evaluation Specialist, and evaluation studies.

The actual and projected expenditures for this program are presented in Table 6. The expenditures on the Public Health Coordinator and supporting facilities are low, primarily because the Public Health Coordinator was not appointed until July 1982, a year later than planned. With respect to evaluation activities, the Senior Evaluation Specialist was not hired by the RWS and only about half the budget designated for evaluation research by local consultants was spent. A major new item was introduced into the project in the form of $99,000 worth of equipment for the Water Quality Laboratory of the DLVW.

Overall inputs into this program were 84 percent of the inputs foreseen in the Project Paper. It is expected that the overall level of public health inputs foreseen in the Project Paper will be met under the current level of activity of the Public Health Coordinator. If present policies are followed, however, the expenditures on evaluation will be well below the levels budgeted in the Project Paper.

4.1.4 Payments by USAID

USAID makes two kinds of payments in this project. For commodities and equipment, USAID pays the suppliers directly. Such payments have been made promptly, facilitating the flow of materials for the project operation. The second type of payment is direct reimbursement to the GOM for expenditures incurred on the other items which form part of the USAID contribution. There have been serious problems with the procedure for such payments, and therefore, it is worthwhile outlining this process in some detail.

When the GOM purchases goods or services which are to be reimbursed by USAID (other than pipes, vehicles and equipment), it issues purchasing orders (in some instances a Local Purchase Order, or LPO) or makes salary payments, as the case may be. When purchasing orders are issued, the supplier is reimbursed rapidly by the GOM. This process has worked well and materials and services are generally obtained by the RWS without delay. To be reimbursed by USAID, the DLVW fills out a statement of expenditure, which usually covers a three-month period. This reimbursement claim is sent to Treasury which in turn sends the claim to USAID for payment.

TABLE 6: ACTUAL AND PROJECTED EXPENDITURES ON THE MONITORING, CO-ORDINATION AND EVALUATION PROGRAM (X 1000)

	YEAR ONE (APR 81-MAR 82)		YEAR TWO (APR '82 - MAR '83)				YEAR ONE & TWO		
	Total Expenditure	Projected	Direct by USAID	USAID through GOM	Total	Projected	Total	Projected	Percent
Senior Evaluation Specialist	0	$54	0	0	0	$30	0	84	0
Data Collection	K6 = $6	$ 8	0	K2	$ 2	$ 8	8	16	50
Water Laboratory	0	0	$99	0	$99	0	99	0	0
Public Health Co-ordinator	0	$25	$24	0	$24	$27	24	51	47
Vehicles	0	$15	$18	0	$18	$ 5	18	20	90
Operating Expenses	0	$ 6	0	K8	$ 8	$ 8	8	14	57
	$ 6	$108			$151	$78	$157	$186	84

During the first two years of the project, only two such claims were filed; the first for the period April-July 1981 and the second for the period August-December 1981. Despite the fact that DLVW and Treasury have continued to pay for the goods and services which are the obligation of USAID, no further submissions from DLVW to Treasury and then to USAID have been made. There are two reasons for this.

The first reason involves the question of the documentation required by USAID for such reimbursement claims. All other donors require only a single summary page for reimbursement claims (see Appendix B). Since the accounting system followed at DLVW is simple and well-maintained, there is no difficulty in giving immediate replies to any subsequent queries by the donors. Furthermore, the accounts are audited annually by the Auditor General and are accessible should USAID or any donor have queries about any item of the reimbursement claim. The documentation required by USAID in support of such reimbursement claims is excessive and requires large amounts of time by the Assistant Accountant in DLVW. For example, each item presented to USAID for reimbursement, whether involving the purchase of a MK20,000 truck or payment of a MK3.50 bicycle allowance, must be separately described on an accounting ledger containing ten columns of information. This is the fundamental reason why there has been such a backlog in the claims made on the USAID funds.

The second reason involves the fact that this backlog was not known to the management of RWS, to USAID, or, presumably, to Treasury who have been paying the claims. It is recommended that regular meetings involving the management and accounting sections of the RWS, the administrative section at Treasury, and the USAID Program Officer be convened so that problems like this do not persist.

4.1.5 Remaining USAID Inputs

In Table 7, estimates of the anticipated expenditures by USAID on the project are presented. If the Kwacha price of pipes and fittings remains constant over the life of the project, anticipated expenditures will be $600,000 less than the $6,000,000 provided. If the Kwacha price of pipes and fittings increases by 20 percent, anticipated expenditures will only be $100,000 less than the $6,000,000 budgeted.

4.2 Government and People of Malawi Inputs

The actual inputs by the Government and people of Malawi are compared in Table 8 with the inputs foreseen in the Project Paper. The DLVW payments for project staff have been much higher ($97,000 instead of $64,000) than foreseen in the Project Paper because a number of temporary positions have been elevated to establishment positions, with the result that their salaries are now paid by the GOM rather than by USAID. (As is evident from Table 4, there have been corresponding reductions in the salaries paid by USAID).

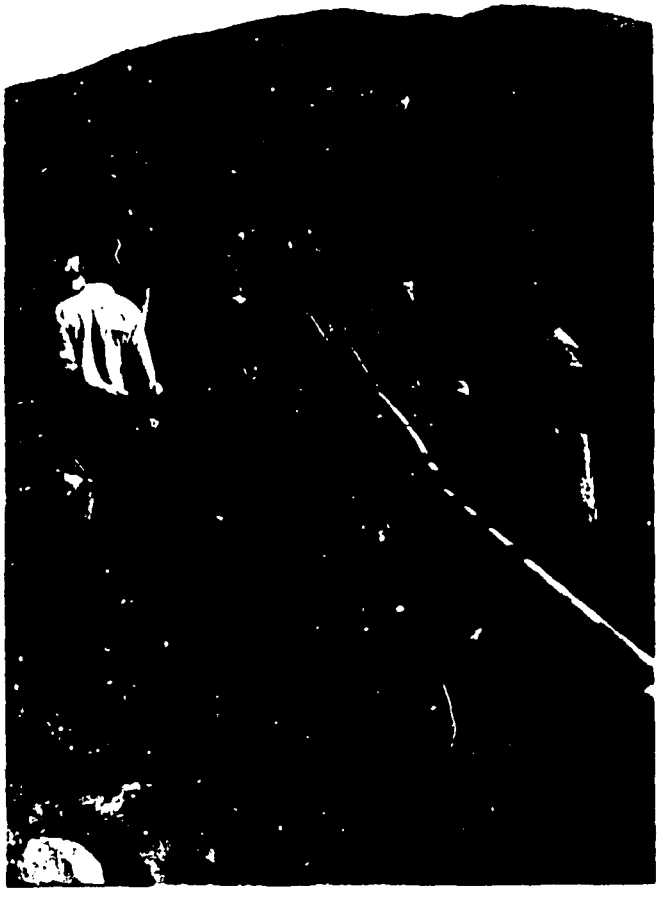
TABLE 7: ANTICIPATED USAID EXPENDITURES ON RURAL WATER SUPPLY PROJECT (x 1000)

	Expenditure as of March 31 1983	Projected Expenditure Apr '83-Sept '85	Total Projected Expenditure
Construction Program	$1,865	$2,949 ($3,450)[2]	$4,814 ($5,315)[2]
Maintenance Program	$ 120	$ 150	$ 270
Monitoring Co-ordination and Evaluation	$ 157	$ 125	$ 282
		TOTAL	$5,366 ($5,867)[2]

Notes on Table 7:

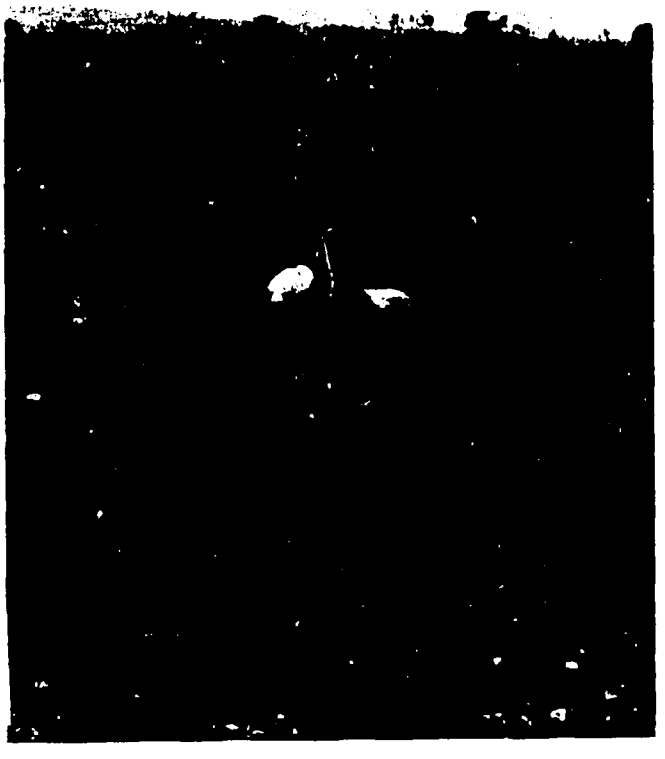
1. It is assumed that annual expenditures on the maintenance program will run at $60,000 per annum (slightly higher than the levels in the Project Paper) and that expenditures on the monitoring, co-ordination and evaluation components will run at $50,000 per year, the level foreseen for FY '83 and FY '84 in the Project Paper.

2. Projected expenditures on construction are calculated, first assuming that present prices for pipes and fittings stay constant in Kwacha and, second, assuming that prices for pipes and fittings (in Kwacha) increase by 20 percent.



PVC Pipe about to be laid and connected

Trench digging at Mirala



Trench and storage tank foundation digging- Zomba West Project

TABLE 8: PROJECTED AND ACTUAL CONTRIBUTIONS BY GOVERNMENT AND PEOPLE OF MALAWI (x 1000)

	YEAR ONE (APR '81 - MAR '82)					YEAR TWO (APR '82 - MAR '83)					YEAR ONE & TWO		
	From GOM	From Villagers	Total (K)	Total ($)	Projected in PP	From GOM	From Villagers	Total (K)	Total ($)	Projected in PP	Actual	Projected	%
DLVW: Staff	K45	0	K45	$50	$31	K51	0	K51	$47	$33	$97	$64	152
RWS Office Space	K5	0	K5	$ 6		K5	0	K5	$ 5		$11		
Effecting housing subsidy	K11	0	K11	$12	$38	K12	0	K12	$11	$38	$23	76	
Office Equipment & supplies	K2	0	K2	$ 2		K2	0	K2	$ 2		$ 4		54
Easement costs	0	K1	K1	$ 1		0	K2	K2	$ 2		$ 3		
MOH: Staff	0	0	0	0	0	K19	0	K19	$18	0	$18	0	-
Other expenses	0	0	0	0	0	K5	0	K5	$ 4	0	$ 4	0	-
SELF-HELP LABOR	0	K306	K306	$340	$343	0	K374	K374	$346	$392	$686	$735	93
				$411	$412				$435	$463	$846	$875	97

The cost of housing for RWS staff is estimated to be MK100 per month less than the market cost of similar housing. The effective housing subsidy is therefore calculated at MK100 per month for the 10 staff allocated government houses. The RWS staff occupy about 1/40th of the office space in Tekwere House, for which the Government of Malawi pays an annual rent of MK184,000.

By transporting supplies directly to the project sites where the materials are stored in temporary warehouses (where necessary) which are paid for by project funds, the program manages to avoid either paying for or using any other storage facilities.

Approximately one square meter of easement is required for each meter run of pipeline. This land is donated by the villagers. The total easement cost is using an average land value of MK30 per hectare, a figure supplied by the Principal Valuation Officer, DLVW.

From this table, the self-help labor contributions can be estimated as follows. Using figures on the total length of pipeline in each project and the proportion of pipeline laid by April 1, 1983 (as calculated by the Development Division of the Office of the President and Cabinet), it is estimated that 827 kilometers of pipeline were laid by April 1, 1983. It is estimated that approximately 45 percent of this work was completed in the first year and 55 percent in the second year. Since digging preceded the laying of the pipelines, it is assumed that 50 percent more trench was dug than pipeline laid, giving a total of 1,240 km of trench. DLVW figures indicate that on the average each villager digs approximately two meters of trench per day, and backfills about 1-1/3 meters of trench each day. Assuming that 1,240 km of trench were opened and 827 km of trench backfilled, approximately 1,030,000 person days of work were expended in digging and backfilling pipelines.

The villages also carry out other tasks on the site, such as the transportation of materials. It is assumed that these activities increase the labor input by 10 percent and thus 1,133,000 person days of labor were contributed. The minimum wage paid by contractors for unskilled labor in rural Malawi is MK0.70 per day. It is assumed that the shadow price of labor is lower than this, and is assumed to be MK0.60 per day. The total value of the self-help labor is thus estimated to be MK680,000, of which MK306,000 were contributed in Year One and MK374,000 in Year Two. The exchange rates used were US$ MK0.90 in 1981 and MK 1.08 in 1982.

Under the HESP program, the MOH pays salaries of 16 health assistants, 64 surveillance assistants, and 14 supervisors. The first two cadres spend 60 percent and the supervisors 10 percent of their time on HESP activities and are paid average monthly salaries of MK117, MK22, and MK333. It is estimated that these cadres had been working approximately six months on the HESP project prior to April 1983, giving a total MK13,466 for FY '82. The MOH also pays the Public Health Coordinator a salary of MK583 per month, or MK5247 in FY '82, giving a total MOH contribution of MK18,715 for staff salaries. It is estimated that other MOH expenses amount to about 25 percent of the expenditures on staff salaries.

Although no mention is made of inputs by the Ministry of Health in the Project Paper, these inputs have been substantial, with expenditures for personnel on the HESP project amounting to $22,000 in FY 1982.

The major contribution of the project beneficiaries, namely their self-help labor, has occurred at about the levels foreseen in the Project Paper. As shown in Table 8, actual self-help contributions over the first two years of the project totalled $686,000 against an anticipated figure of $735,000. The overall contribution of the Government and people of Malawi has been at anticipated levels, and project targets are likely to be met.

4.3 Other Inputs

Although not included in the Project Paper, the sub-projects funded under the USAID project have benefited by inputs from other sources. In the interests of a full accounting of the actual project costs, estimates of these costs are presented in Table 9. Over the first two years of the project these inputs have accounted for over $800,000. The level in subsequent years is expected to be much lower since no other contribution to commodity purchases is expected from such sources.

Inputs by other governments and other agencies were not considered in the Project Paper. They are included in this analysis since they provide inputs to the projects supported by USAID. The input by the Japanese International Co-operation Agency is in the form of MK600,000 for the pipes for the Chitipa project. The inputs by the Governments of the Netherlands and the United Kingdom and by the Voluntary Services Overseas (UK) and Peace Corps (US) programs are in the form of "topping up" of the salaries of the Principal Water Engineer and the Senior Water Engineer and for additional expenses incurred in placing four "volunteer" engineers in the Rural Water Section. The "topping up" inputs are estimated at $33,000 per senior officer per year, while the expenses for "volunteers" are estimated to be $10,000 per person per year.

4.4 Summary of Project Inputs

The inputs by USAID, the GOM, the beneficiaries of the scheme, and other agencies over the first two years of the project are summarized in Table 10. The USAID component and the self-help component occurred at levels slightly lower than those foreseen in the Project Paper, while the GOM inputs and inputs from other agencies occurred at much higher levels than those foreseen in the Project Paper. Overall inputs into the USAID-funded projects exceeded those foreseen in the Project Paper by 11 percent.

4.5 Summary of Recommendations

USAID, DLVW, and Treasury should hold regular meetings to discuss invoicing and payment issues.

TABLE 9: PROJECT INPUTS FROM OTHER SOURCES (x 1000)

	YEAR ONE		YEAR TWO	YEARS ONE AND TWO
	Materials	Salary Augmentations	Salary Augmentations	
GOVERNMENT OF JAPAN	$670	0	0	$670
GOVERNMENT OF NETHERLANDS		$30*	$30*	$ 60
GOVERNMENT OF UNITED KINGGOM		$30*	$30*	$ 60
VOLUNTARY ORGANISATIONS		$40*	$40*	$ 80
				$870

* Aapproximate Figures

TABLE 10: SUMMARY OF USAID, GOM, SELF-HELP AND OTHER INPUTS OVER FIRST TWO YEARS
($ x 1000)

	Actual Inputs	Projected Inputs	Actual Projected
USAID	$2,144	$2,588	83%
GOM	$ 160	$ 140	114%
SELF-HELP	$ 686	$ 735	93%
OTHER	$ 870	-	-
TOTAL	$3,860	$3,463	111%

Chapter 5

PROJECT OPERATION: INSTITUTIONAL DEVELOPMENT

5.1 Project Development Activities of the Department of Lands, Valuation and Water

5.1.1. Water Systems Planning

Planning consists of the decision-making processes necessary to prepare project proposals for funding and to establish implementation schedules for project development activities. These processes include project identification, the determination of technical feasiblity, proposal preparation, and construction scheduling.

The Rural Water Section (RWS) of the DLVW has responsibility for project planning, although several other GOM organizations and local authorities are involved in the decision-making (for an organization chart of the Rural Water Section of the DLVW, see Appendix C). The planning process in the RWS has gradually evolved over the past 15 years into a well-established set of procedures, which since 1980, have incorporated USAID review, approval, and funding requirements. Overall project development follows a seasonal cycle because DLVW budget approvals are controlled by the GOM fiscal year and some field activities are avoided during the November-April rainy season. Large projects may take three years or more from initial project identification to final facility commissioning, although smaller schemes are often completed in less than two years.

The following represents the main planning elements in the Malawi rural piped water program. New projects are proposed to the RWS by either (a) a request from a district development committee, (b) a request from the Ministry of Agriculture and Natural Resources as part of its program for areas of agriculture potential, or (c) on-going investigations within the RWS itself. The RWS investigates all such requests and prepares a preliminary feasibility report on the technical aspects of the proposed project. This report includes field estimates of service area and current population, minimum available streamflow, agriculture potential and likely future population, and approximate costs. The report also includes a sketch plan of the system and a recommendation regarding project feasibility. Following departmental review plus whatever additional field studies are required, recommended projects are forwarded for funding review. In the past, proposals for large projects were routed via Treasury to international funding agencies while small projects were generally earmarked for internal GOM financing.

Since the advent of the USAID program, project planning involves the preparation of an Annual Construction Plan by the RWS for review and approval by USAID. This plan includes the following:

1. Design reports for each proposed scheme

2. Engineering designs and population estimates for each scheme

3. Justification for any changes in the previous plans

4. Discussion of special environmental concerns

5. The previous year's quarterly progress and financial reports

6. Implementation schedules for each scheme.

Preliminary field studies are normally carried out by the RWS during the July-September dry season. The results of these studies are reviewed within the DLVW during October-November, and preliminary engineering design on selected schemes is performed during January-February. In January, the DLVW submits preliminary estimates for new schemes for the next fiscal year to Treasury (the Ministry of Finance), and in February it submits the Annual Construction Plan to USAID. Technical review of the plan is normally carried out in a matter of weeks by the USAID Mission in Lusaka, Zambia. Final approval by USAID for funding the plan is given to Treasury in the form of a Project Implementation Letter. During this same period, detailed estimates for the proposed schemes are developed within the DLVW and are approved by Parliament in March for the fiscal year starting 1 April.

In general, there has been a high degree of approval by USAID of the Annual Construction Plans. All five schemes proposed by the DLVW in both 1981 and 1982 were approved. Among the schemes proposed in 1983, one was fully approved (Zomba West), one was conditionally approved (Zomba South), and two others were deferred because of problems with their catchment areas that need to be resolved. USAID approval of the Zomba South scheme was conditional because of the need to construct a dam rather than the simple stream intakes of other sub-projects. (See section 6.1.2 for a further discussion of the Zomba South scheme.)

Overall, the planning procedures of the RWS appear to be well-suited to the technical conditions in the field, the personnel resources in the DLVW, and the fiscal cycle of the GOM. Cooperation between the DLVW and USAID has been good, and project reports and requisite review and approvals have been carried out in a timely manner. For the future it is advisable that close coordination occur between the surface water and groundwater activities of the DLVW.

5.1.2 Water Systems Design

Design consists of the engineering techniques necessary to determine final technical feasibility and to prepare construction drawings and estimates of materials needed and costs. This work is done within the RWS by project engineers who are stationed either in the regions or at headquarters. Project design is undertaken after review and approval of the preliminary feasibility report by the DLVW.

The procedures for project design are based upon accumulated program experience and are well documented in a field handbook (first produced December 1977, revised May 1982) used by RWS personnel. Although not a definitive engineering text, the handbook provides reasonable and clear guidance on the main technical elements of the piped gravity schemes. System elements, such as intakes, tanks, and taps, are based on standard designs and

type drawings. The task of the designer, therefore, is primarily one of fitting standard designs to variable field situations. Many cost elements are also standardized. Storage tanks, for example, are built by contractors with paid labor using materials supplied by the DLVW. A contractor is paid a fixed amount based on the size of the storage tank for supplying the laborers and carrying out the construction.

The design criteria in the handbook appear to be appropriate for the schemes undertaken with USAID financing. Random checks of both project design plans and actual systems in the field showed that the design criteria in the field handbook are closely followed in project implementation.

A typical piped gravity project consists of one or more simple concrete intakes on a protected mountain stream leading to a small concrete screening tank, then to a larger concrete sedimentation tank, and finally to a series of concrete storage tanks of various sizes depending upon the flow rate. Pipe mains connect the tanks and smaller branch lines carry water to one hundred or more communal water taps located throughout the service area at points of population concentration and at schools, health units, etc. Being gravity powered, the scheme is designed for continuous flow, whereby water enters the stream intake throughout the day. The system components are conservatively designed to allow all taps to operate simultaneously at the design flow rate. Some of the key design criteria and procedures used on the USAID-financed schemes are the following:

(1) water consumption = 6 gal/cap/day (27 lit/cap/day) all from public taps (no house connections)

(2) water tap flow rate = 1 gal/min (0.076 lit/sec)

(3) storage tank volume = tank inflow over 8 hours

(4) water tap service population = 120 to 160 people per tap

(5) service populations

existing population = 1977 census population + 2.6% annual increase; potential population = 100 to 300 per km^2 (based on traditional agricultural practices)

(6) pipe sizes = 12 to 20 mm for taps; generally 25 to 160 mm for mains and branches

(7) pipe material = PVC for most lines; some steel for intakes, tanks and around taps

(8) break pressure tanks = used when pressure head exceeds 330 ft. (class 10 pipe)

5.1.3 Water Systems Procurement

1. Tenders: Where goods and services are to be purchased, the project generally follows the relevant USAID and GOM procedures. In the case of

the major commodity (PVC pipe), the RWS obtained quotations at the beginning of the USAID project from suppliers in Germany, Holland, Zimbabwe, and Kenya and from the single producer in Malawi. (U.S. pipe could not be used because the metric system is in use in Malawi.)

Delivered to Lilongwe, materials from all foreign suppliers were found to be more expensive than from the local manufacturer. The decision was thus made to purchase PVC pipe from the local manufacturer. Over the two years of the project the price for pipes has not increased. Service continues to be satisfactory. It is recommended that quotations be obtained again from other suppliers and that the purchase of the remaining pipes be subject to a comparison of all relevant costs. It is expected that the transport problems and costs of shipping goods to Malawi through the port of Beira will continue to give the advantage to the local pipe manufacturer.

With respect to the purchase of other equipment, a variety of procedures are followed and appear to be adequate to ensure both competitive prices and the necessary flow of goods and services.

2. Availability of Funds: After the project designs are prepared and approved by both USAID and the DLVW, USAID issues a Project Implementation Letter (PIL) to Treasury so that funds for the project may be made available. In most of the sub-projects this process has worked smoothly and the projects have been initiated as planned. In a couple of cases, however, there have been long delays between the issuing of the PIL and approval by Treasury. In the case of the Mirala sub-project, for instance, the PIL was submitted in August, but approval from Treasury came only in May. Because of the seasonal nature inherent in project scheduling, it was necessary to start both the Mirala and Zomba West projects prior to formal approval from Treasury. As with other problems involving Treasury (see section 4.1.4), it appears that regular meetings involving USAID, the DLVW, and Treasury would minimize such delays.

3. Payment: As outlined in Section 4.1.4, there are two major mechanisms for payments to the project. USAID can make direct payments first to suppliers of pipe, vehicles, and equipment where USAID is responsible for such payments and second to the GOM for its reimbursable expenditures. Where goods or services are paid by the GOM, payment is either made directly by DLVW (as in the case of salaries) or by the DLVW issuing a purchase order, as in the case of the purchase of commodities or payment of contracts. Where such expenditures are part of the USAID contribution, the DLVW prepares a reimbursement claim. Aside from the problem of excessive documentation required by USAID for the reimbursement claims, this process has worked and continues to work smoothly. As long as USAID and the GOM continue to pay bills promptly the smooth flow of goods and services necessary for the implementation of the project is assured.

4. Inventory Control: Due to the smooth functioning of the private sector suppliers and the excellent cooperation elicited by the water program, inventory control is a relatively simple process. For the major item (pipes), ordering is done several months in advance and the pipes are transported directly to the contruction site. No serious delays due to

unavailability of materials on site have occurred, and no costs have been incurred for storage or warehousing of supplies.

5.1.4 Water Systems Construction

Construction activities are highly dependent upon seasonal factors. In general, intake construction occurs in the dry period, August-October, before the rainy season. Marking of the pipeline route takes place in October, before planting, and the main trench digging program begins in February-March during a lull between planting and harvesting. In the normal course of events, the main program of pipe laying begins in May-June and continues as long as necessary in the dry season. Self-help village labor is used for pipeline marking, trench digging, pipe laying, and backfilling. Contractors with paid laborers are used for the construction of reinforced concrete tanks.

A significant feature of the RWS program is that the project manager in charge of overall construction is also the engineer who designed the scheme. This integration of theory and practice provides project engineers with a rapid and automatic feedback on the results of their designs. Given the greater flexibility required in rural system designs, the linking of design and construction emphasizes technical proficiency and professional motivation in project engineers.

Day to day construction supervision and direction of construction activities are carried out by a water supervisor with the assistance of one or more water project operators. These individuals are responsible for directing both the self-help activities of villagers and monitoring the progress of paid contractors. During construction, weekly progress reports are prepared by the water supervisor and sent to the project engineer. After completion of construction, one of the water project operators becomes a monitoring assistant who is permanently posted to the scheme and is responsible for routine inspections and training of the villagers in maintenance and minor repairs.

Water supervisors and water project operators work through volunteer leaders in directing the numerous self-help activities in the projects. Given the uncertainties often found in self-help activities, this procedure appears to work extremely well. Construction schedules are rarely unduly delayed, and a visit to several project sites revealed generally high quality construction work.

5.2 Project Development Activities of the Ministry of Health

5.2.1. Environmental Health Personnel Staffing

MOH personnel involved in the Health Education and Sanitation Promotion (HESP) component of the Project include regional and district health inspectors, health assistants, and health surveillance assistants. Together, these personnel constitute a significant proportion of the health inspectorate of the Environmental Health Services Division. The health inspectorate is headed at present by an experienced Senior Health Inspector who is filling in temporarily for another man who is studying in England. When the latter

returns, he will occupy the position of Chief Superintending Environmental Health Officer.*

The head of the Environmental Health Services Division reports at present to the Chief Medical Officer (CMO) who also supervises the Principal Health Coordinator, (see chart in Appendix E). In the future there may be a Deputy Chief Medical Officer interposed between the CMO and the head of various divisions. The overall organization of the Ministry of Health remains, however, rather uncertain.

Personnel of the Environmental Health Services Division assigned to the HESP component of the rural piped water project represent only a small proportion of the total number in each category. Of a total of 277 health surveillance assistants, only 64 are assigned to HESP. Similarly, only 19 of 87 health assistants and seven of 60 senior health assistants are assigned to the project. In each of the twelve districts (out of a total of 24) in which the HESP component is found, the district health inspectors serve as overall supervisors. Regional health inspectors are responsible for all activities in their respective regions in a general sense.

5.2.2 Activities of the Principal Health Coordinator and the Health Education and Sanitation Promotion Component

The Principal Health Coordinator (PHC), called the Public Health Coordinator in the Project Paper, occupies a pivotal role in assuring the inputs of the MOH in support of the rural piped water program. In his line position in the Ministry, the PHC reports directly to the Chief Medical Officer and laterally to the Principal Health Officer who heads the Environmental Health Services Division.

The Project Paper defines the following objectives relevant to the HESP component of the Project:

(1) to strengthen and coordinate the rural piped water program with the MOH

(2) to expose up to 202,000 rural villagers to health education relating to improved sanitation and hygiene practices

(3) to focus health education activities in sanitation and hygiene within each of the locations receiving rural piped water

(4) to train Malawians in basic health and sanitation education

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* Under a proposed scheme expected to be approved in the next few weeks Health Inspectors will be called Environmental Health Officers and Health Assistants will be called Environmental Health Assistants. The title Health Surveillance Assistant will remain unchanged (see chart in Appendix E).

These objectives were developed in view of the loosely organized health education and sanitation activities carried out in the rural piped water areas prior to the USAID project and the deep conviction that simply providing clean water could not alone assure improved health status without concomitant health education and sanitation inputs. The MOH had the personnel resources capable of providing these inputs but had not been called upon to assist the RWS prior to the USAID project.

The Principal Health Coordinator has been in his post since July 1982, a year later than anticipated by the Project Paper. After a familiarization trip throughout the country in August, 1982, he began preparing definitive plans for the HESP component. A 1982 first quarter report referred to 23 USAID-funded water schemes (now 16) in which HESP activities were to be initiated. Ten of these projects were under construction at the time. The report also listed 37 water schemes, most of them completed, which had been funded by other sources. The results of a December 1982 survey of the number of village health committees found in water project areas is shown in Table 11.

Table 11. Number of Villages with Village Health Committees by Piped Water Project (as of 29 December 1982 with 15 of 53 projects reporting)

Project	AID Financed?	No. of Villages	No. with Village Health Committees
Mulanje West	No	149	81
Lifani	No	88	?
Makwawa	Yes	56	14
Kawinga	No	134	?
Muhuju	No	79	?
Lingamasa	No	69	?
Kasinje	No	10	2
Nanyangu	No	25	5
Mwansambo	Yes	30	1
Sumulu	Yes	46	1
Liwonde	No	34	3
Chagwa	No	25	?
Dedza	No	2	?
Chinkwezule	No	1	1
Karonga	No	48	?

Although the results of this survey were incomplete, they nevertheless indicate that in December 1982 only a relatively small number of health committees were left over from the cholera epidemic of 1974 when such committees were widely established. Since the village health committee is intended to become the main vehicle for the delivery of HESP services, it was apparent that much attention had to be given to methods of community organization. Coupled with this initial problem was the relative insufficiency of field personnel, principally health surveillance assistants. Some districts with rural piped water projects (particularly those financed by USAID) had no health surveillance assistants.

A National Health Education Seminar, held February 7-11, 1983, was used to kick off the HESP component. This seminar emphasized the need for all field workers to possess the skills necessary to work with village committees. Workshops for the training of trainers and field worker training (held with support from the WASH Project) in April-June 1983 enabled personnel of the Environmental Health Services Division to become actively involved in health education and sanitation activities related to the rural piped water project. These training activities occupied most of the time of the Principal Health Coordinator during the first six months of 1983. Aside from this training, other accomplishments have also been noteworthy:

(1) Thirteen of the 16 USAID project areas have been reached by the HESP program.

(2) An overall HESP project strategy has been developed (see Appendix F).

(3) A project recording and reporting system has been developed and is undergoing field trial.

(4) The production of visual aids has begun and some pre-testing has been initiated.

(5) There has been some experimentation with improved pit latrines.

(6) Some demonstration laundry slabs have been constructed.

The main strategy of the HESP component under the leadership of the PHC has been to work through village health committees (VHC). Each field worker is assigned ten target villages (ultimately slated to be 25) in which he is to encourage the formation or the strengthening of village health committees. After the committee has been established, members are given some orientation in order to increase their understanding of health problems and to encourage them to take more responsibility for the health and well-being of their fellow villagers. Every attempt is made to enhance community participation, an approach essential to all forms of primary health care.

There are several problems confronting the HESP component. The shortage of field workers remains unchanged since the beginning of the USAID project. Some districts with piped water schemes have only one or two field workers; still others have none as yet. An estimated 56 additional health surveillance assistants are needed. There is a shortage of transport for field workers and their supervisors, but especially for the former. Most still move about on foot. Furthermore, the work schedule of the PHC is extremely demanding. It has become virtually impossible for him to both manage the HESP component and give adequate supervision to training activities. There is a relatively slow pace to the development of relations between the MOH and the DLVW. And last is the problem of visual aids. They need to be carefully pretested before they are produced in quantity.

Despite the above problems, the evaluation team believes that the Project Paper objectives will be achieved if the present pace of activities remains the same. By 1985, all 16 USAID project areas should have on-going health education and sanitation activities. In addition, it is recommended that the

HESP component be strengthened along the lines of a project supplementation amendment now being prepared by the MOH for submission to USAID. With this improved capability, HESP should be able to reach 480,000 rural villagers (120 field workers x 10 villages x 400 inhabitants/village) by the end of the USAID project; a total twice that anticipated in the Project Paper.

In summary, the Principal Health Coordinator has done a remarkable piece of work in getting the HESP component off and running in only one year. Most of the project objectives for this component have been at least partially achieved. Greater assurance of achieving these objectives can be obtained by taking the following recommended steps:

(1) give full support to that portion of the proposed HESP project amendment that would finance additional health surveillance assistants and continuing training activities;

(2) provide every field worker with a bicycle that he/she can ultimately purchase; and

(3) establish a protocol for pretesting visual aids and follow it carefully with every new aid.

5.2.3 Role of Village Health and Tap Committee

Village health and tap committees are the chief instruments of promoting changes in health and sanitation related behavior in the rural piped water program.

Prior to the USAID project, tap committees were already in existence in the completed projects. With memberships varying from four to ten, composed mostly of women, but with a man frequently as chairman, these committees had limited roles in promoting sanitary practices. Among their duties were enforcing the rules regarding the use of tap water, ensuring the cleanliness of the apron and surroundings, seeing to the periodic cleaning of the soakaway pit, replacing the washer at intervals, and collecting money to replace a broken tap or repair a cracked apron. Instructions for carrying out these functions were given by the monitoring assistant during the tap opening ceremony and reinforced during periodic visits (on average twice a year). Enforcement lay also in the project committee in case of non-compliance of the tap committee or negligence on the part of the monitoring assistant.

Health committees also existed prior to the USAID project, most dating from the cholera epidemic of 1973-74. It is difficult to determine the proportion of project villages with health committees but undoubtedly the number varies a great deal from district to district. As noted above, a survey to determine this proportion produced only incomplete results. These proportions were high in Mulanje but low in districts where cholera was not such a problem or, as in Machinga District, where health surveillance assistants were too busy treating cholera cases to spend time organizing committees.

The Project Paper called for "careful study of the values, attitudes and practices, and identification of the best way to exchange existing practices for healthier ones; and the inclusion of local residents in health education

activities." The promotion of these activities was to be based upon the utilization of well-established community organizations.

The present status of the education activities at the village level gives rise to a number of questions regarding future directions. The paper, Water by the People, by L.A.H. Msukwa and B.F. Kandole (1981), which is based on observations in the Zomba East project areas, reported a relatively low level of activity of tap committees. Most persons interviewed were not aware of the committee and did not know the names of its members. According to the paper, most tap committees were not having regular meetings and some in fact had been reduced to a single member living near the tap.

Observations in the field by the evaluation team resulted in the impression that tap committees in the newer project areas tended to be more active and have regular meetings. Tap committees in older project areas seem to be relatively inactive.

Health committees, too, had become inactive in many instances. A primary task of MOH field personnel is frequently to revive an old health committee rather than to form a new one. Field staff have currently revived or formed an average of six health committees each, for a total of at least 450 health committees in the overall rural piped water area. All committees have ten members each with women comprising from four to seven members in the few that were visited during the evaluation. Most health committees are chaired by men. In terms of the HESP strategy (see Appendix F), most health committees have progressed to the problem-analysis stage where committee members list and prioritize perceived health problems. It was observed that there is at least one tap committee member on each health committee, although there may be several. There is no apparent conflict between the committees, since the responsibilities of the tap committees are relatively restricted while the health committees have a broader set of duties. In one village, for example, a health committee had helped to revive eight dormant tap committees. In general, all health committees appeared to have taken seriously their role as the health educators of their neighbors.

Problems are relatively minor. Health committee members appear reluctant to suggest activities and projects, perhaps waiting for MOH and DLVW personnel to make suggestions. Only one village health committee had any funds, although most could see some use for them.

At the end of the USAID project there should be a total of 1,200 or more functioning health committees with 120 field agents having 10 committees each. They will promote sanitation and related health practices, such as latrines, refuse pits, protected water storage, proper dish drying, washing slabs and oral rehydration. Most committees should have achieved a degree of strength through improved organization, better management of activities, and increased confidence in their abilities to solve problems.

To strengthen further the above committees, it is recommended that:

(1) the HESP program continue as planned,

(2) simple fiscal and management training of village health committees be added,

(3) inactive tap committees continue to be revived, and

(4) selected tap committee members be included in village health committee training.

5.3 Water Systems Maintenance

5.3.1 Routine Operations and Maintenance

Evaluations of water projects normally address the issues of operation and maintenance (O&M) together. In the case of the rural piped water program in Malawi there are virtually no operational activities requiring constant attention. There are no mechanical pumping devices or machines which need fuel and close attention. There does exist, however, a maintenance program as well as a monitoring program for the completed schemes.

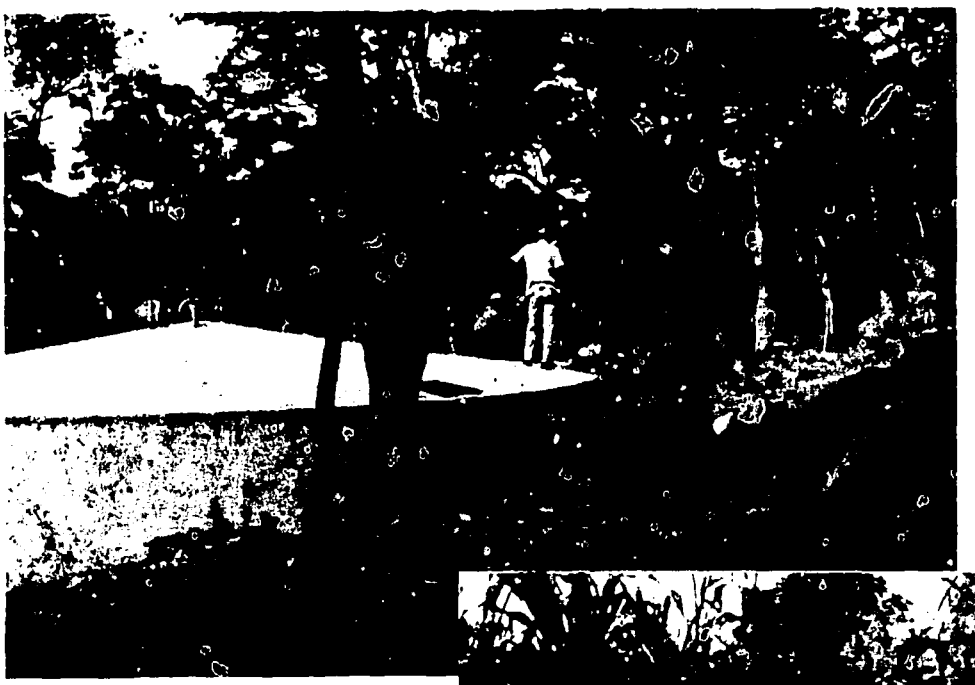
The maintenance program refers to the periodic inspection of taps, aprons, pipes, intakes, tanks, and sluice valves; the replacement or repair or damaged or worn parts; and the cleaning of tanks by non-paid users. The monitoring program assists this local self-help maintenance program by providing project-wide periodic inspections, technical back-up in major repairs, training of the users, provision of supplies, and collection of information by paid employees of DLVW.

The maintenance and monitoring programs of the DLVW originated in Mulanje District (460,000 users) prior to the initiation of the USAID-financed project. These programs are carried out by a small staff of former construction field assistants in Mulanje. Additional staff have also been proposed for Zomba District and the North region.

The Project Paper called for the improvement of the maintenance program "for completed sub-projects." The USAID project supported this effort with over $230,000 for staff salaries, operating expenses, equipment, training, and transport. Research activities (amounting to $100,000) were listed in the Project Paper under the maintenance program but they are not included in this discussion since they do not relate to the existing maintenance program.

After two and a half years, the maintenance and monitoring program within the rural water section of the DLVW is well established. A one-year study of self-help maintenance organizations in Mulanje District indicated an average of nearly 90 percent level of service for six sub-projects or schemes. In other words, water was available at the community taps almost 90 percent of the time. The average time to repair the pipe or tap took under five days.

The volunteer maintenance program at the village level consists of a tap committee, a repair team, and a watchman. The tap committee is responsible for enforcing rules, keeping the apron clean, replacing faucet washers, repairing or replacing the tap itself and reporting system breakdowns. The repair teams consist of elected volunteers who receive basic training in pipe repair from DLVW staff. They are responsible for repairs, any pipe breakages, and tap replacements. The watchman is responsible for the periodic cleaning of the main intake for the total system. He is generally paid some compensation by the community, project committee, or local chief. Table 12 summarizes the



30,000 Gallon storage tank- Mirala Project

New top and apron-Kasinje Project Villagers with Richard Ainsworth Public Health Coordinator, Ministry of Health

Clothes washing slab

Table 12

Community Maintenance Inputs: Mulanje District

A.	Money - Annual		
	1. Salaries of Watchman 4 Watchmen x MK 180.00/yr	MK720.00	
	2. Purchase of new faucets 250 faucets x MK 4.00	1,000.00	
	3. Purchase of cement to repair aprons 50 aprons x 1 bag of cement x MK 10.00/bag	500.00	
		MK2,220.00	
	Annual Total Cash Paid		
B.	In-Kind-Volunteer Labor		
	1. Volunteer Watchmen 5 Watchmen x MK 180.00/yr x 50% time	MK450.00	
	2. Project Committee Members 10 projects x 5 members x 12 days/year x MK 1.00/day	600.00	
	3. Branch Committee Members 46 Branches x 5 members x 12 days/yar x MK 0.50/day	1,380.00	
	4. Tap Committee Members 2400 taps x 4 members 6 days x MK 0.50/day	28,800.00	
	5. Repair Team members 460 repair teams x 12 days/year x MK 0.50/day	MK2,760.00	
		MK33,990.00	
	Annual Total Contribution Labor		MK33,990.00
	Annual Total User Contribution to Maintenance in Mulanje		MK36,210.00

estimated money and in-kind contribution the people in the Mulanje area provide annually to maintain their systems.

Table 13 summarizes the estimated yearly costs for maintaining the ten Mulanje District water projects. The communities have been contributing a major proportion (66 percent) of the costs through payments for materials and new faucets and through self-help labor. The GOM is providing the salary for one established position, the senior technical advisor, through its recurrent budget. Funds from the USAID project cover the salaries of nine monitoring assistants, transportation, and materials. It is expected that the costs covered by USAID will be brought under the DLVW recurrent budget at the end of the project.

The critical element in this maintenance program is the user's sense of commitment to and ownership of the water system. If it is viewed as their system, then the on-going care and upkeep of it will be assured. This appears to be the case in Mulanje District where much of the day-to-day maintenance of the system has been done by users themselves and the systems have operated 90 percent of the time.

The monitoring program of the DLVW is set up to assist the user's maintenance program. The core staff at present consists of two monitoring supervisors, 16 monitoring assistants, three enumerators, and a monitoring officer based in three locations: Mulanje, Zomba, and the North. The 1983 budget for this monitoring maintenance organization is roughly MK60,000 of which MK10,000 is for materials, MK30,000 for staff salaries and MK15,000 for transport. The true cost figures are probably below these figures since the number of actual staff is below the projected figure.

The monitoring assistants follow a yearly inspection program, prepare monthly reports, provide training to community self-help repair teams, monitor supplies, and provide technical assistance to user when needed. They have also been responsible for collecting data from water meters on flow rate and for determining the frequency and length of breakdowns of the systems and individual taps. The monitoring supervisors oversee the work of as many as nine monitoring assistants and two enumerators who compile data, prepare a summary of the monthly reports, and report to the monitoring officer.

A weakness in the current DLVW maintenance program is the absence of a comprehensive program of water quality monitoring. Because of a combination of inadequate laboratory facilities, a reliance upon protected stream intakes, and a desire to minimize costs, the DLVW and its predecessors did not view water quality monitoring as an integral part of the rural piped water program. Except for an occasional water sample taken from a proposed stream intake site, little has been done to determine the bacteriological or chemical characteristics of the water supplied by a system. The program emphasis has always been on improved water quality through source protection and increased water quantities through pipelines and taps. Water treatment, other than initial screening and simple sedimentation, has been avoided, and water testing has been viewed as a costly, and generally unnecessary, undertaking. In making no reference to water quality monitoring, the Project Paper essentially accepted this view. It was assumed that the quality of project water provided by a protected source is better than that of traditional water sources, such as shallow wells, rivers, and water holes. The lack of

Table 13

Estimated Annual Maintenance Costs - Mulanje District (1982): Communities and Government

			Kwacha	Percent
1)	Community contributions		MK36,210	66%
	a) Labor	MK33,990		
	b) Cash	MK2,220		
2)	Government of Malawi:			
	A) DLVW - Recurrent Budget			
	a) Staff Salaries			
	1 - S.T.A.		2,000	4%
	B) Development Budget (from USAID project)		16,000	30%
	a) Staff Salaries 9 Monitoring Assistants	7,500		
	b) Transport	7,000		
	c) Materials	2,000		
		TOTAL	MK54,710	100%

continuous water quality monitoring, however, means that unanticipated changes in water quality within a piped system cannot be easily detected or corrected.

Recent changes in laboratory facilities will make it possible soon to set up a more effective program for water quality monitoring. With the help of $99,000 of USAID project funds, the DLVW has established a modern water laboratory in Lilongwe. Bacteriological tests of total and fecal coliforms have been carried out at this laboratory since May 1982 but, because of a lack of both transport and an operating budget, very few tests have been made on water samples taken from rural piped schemes. In the future it is expected that laboratory facilities will be further increased with the establishment of regional water laboratories by the MOH. (See section 6.2.2 for further discussion on water quality monitoring.)

In summary, routine maintenance and monitoring of the DLVW has been strengthened by the USAID-financed project. The level of service of the system has remained high, staff are being trained, and their numbers increased to meet the expanding number of completed water schemes requiring assistance. The users are providng the basic front-line maintenance at the tap and pipeline.

The substantial in-kind contribution of the users has kept the annual DLVW monetary costs of the overall monitoring and maintenance program to a reported MK 0.10 per capita. Although the DLVW has two established positions under monitoring, most of the expenses of this program have been met by the USAID project. The project is due to end in December 1985 and there is need to consider where additional recurrent funds will come from at that time.

It is recommended, therefore, that the DLVW begin planning the gradual phasing in of these recurrent costs by including in the GOM revenue account 10 to 15 monitoring staff per annum starting in 1984. This modest initial expenditure for recurrent costs and the establishment of premanent monitoring/maintenance positions within the rural water section of DLVW could do much to allay concerns for the future upkeep and maintenance of these systems. It would also be more likely to attract future donor assistance for rural water supply projects in Malawi. DLVW should also consider investigating further methods of community financing to cover recurrent costs. And lastly, it is recommended that the DLVW, in conjunction with the MOH make greater use of the DLVW Wtaer Laboratory and establish a program of water quality monitoring for the USAID-financed rural piped water projects.

5.3.2 Major Maintenance

Major maintenance in the rural piped water program is undertaken by the DLVW with assistance of users and includes repairs to damaged intake weirs, repair and replacement of storm damaged and corroded steelpipes, replacement of cracked and/or weakened asbestos cement (AC) pipes, and repairs to storage and sedimentation tanks. Major maintenance is distinguished from "augmentation," which is a program to expand existing services by adding night storage tanks, increasing the size of main pipelines and adding new taps where population growth has occurred. In some cases, replacing steel pipes at intakes and replacing AC pipes with PVC pipes are also included under augmentation.

Under major maintenance, the DLVW provides materials, technical supervision, and payments to contractors. The users are responsible for reporting any breakdowns and for providing labor for pipe repairs and replacements.

Very little major maintenance had occurred prior to the beginning of the AID-funded project in 1980. The following is an estimated list of the major maintenance activities of the DLVW in all the rural piped water projects since USAID-financing began:

(1) weir intakes repaired - none

(2) tanks repaired (out of 150 constructed) - 2

(3) meters of steel pipe replaced - 120

(4) meters of AC pipe replaced - 270

The materials for major maintenance have been provided from a number of different sources. Replacement pipes have been obtained from commodity aid assistance from the Danish, German, and Japanese governments. In addition, most pipe orders have an extra three percent of length added for breakage.

Cement, shuttering, and stone come out of the general construction materials account of the RWS. In 1981, the GOM budgeted MK50,000 for maintenance under a rehabilitation account. This was reduced to MK26,000 in 1982 and to zero in 1983. The apparent reason for the reduction is that much of the budget was not spent in 1981 and 1982. The staff responsible for major maintenance are the same monitoring engineer, supervisors, and assistants handling routine maintenance.

Since none of the USAID-funded schemes are yet fully completed and since major maintenance problems tend to occur only after a period of time, there have been very few major maintenance activities within these sub-projects. Nevertheless, USAID funds for maintenance support have definitely strengthened and enhanced the ability of the DLVW to respond to and implement major maintenance in the older piped rural water projects.

As the projects age, the need for major maintenance will definintely increase. It is, therefore, recommended that the DLVW and Treasury reinstate the rehabilitation/maintenance account as budgeted in 1981 to cover any unanticipated major breakdowns of intakes, main lines and tanks. It is also recommended that additional monitoring staff positions be established by DLVW in its revenue budget.

5.4 Staffing and Training

5.4.1 Department of Lands, Valuation and Water

In September 1980, the staff of the rural water section (RWS) of the DLVW totalled 85 men. It was expected that by 1983 the total of senior staff and field personnel would have increased to 123. Table 14 summarizes the actual 1980 and 1983 staff totals as well as the projected staff estimate for 1983.

Of the 114 staff in the RWS as of August 1983, 20 were in established posts (supported by the GOM revenue budget) and 94 were in non-established posts (supported by the development budget). The established posts include ten senior staff, eight field construction staff, and two supervisors in the monitoring staff and seven evaluation staff.

As shown on Table 14, it is evident that the number of actual senior and foreman grade staff are on target with that projected three years ago. However, the number of mid-level staff (charge hands and water project operators grades I and II) have fallen short by 25. One possible explanation is that there have not been enough training opportunities for advancement. As explained below, that is clearly not the case. It appears that there probably are a variety of reasons, including limitations on governmental promotions and grade advancement tests, which do not relate to the work.

USAID-financed training within the DLVW involves both formal and informal activities. Formal training courses include senior staff seminars, supervisor workshops, a wide variety of upgrading training courses for junior and mid-level technical staff, refresher courses, and recruitment/selection courses. The project staff courses cover organization, management, supervision, construction monitoring, and maintenance training. Training activities also

Table 14: RWS Staff

	1980 Actual	1983 Projected	1983 Actual	Difference
Senior Staff	9	10	10	0
Foreman - Senior Technical Assistant	6	10	10	0
Charge Hand - Junior Foreman	9	16	8	-8
W.P.O. - Grade I	10	18	11	-7
W.P.O. - Grade II	11	23	13	-10
W.P.O. - Grade III	20	26	28	+2
W.P.O. Trainee	20	20	34	+14
Totals	85	123	114	-9

encompass less formal on-the-job training of local villagers in simple construction and maintenance procedures by RWS staff.

Prior to the start of the USAID funding in 1980, the Malawi rural piped water program had a reasonably well established training component. Having evolved over more than ten years, the training focused on the specific skills required to carry out project jobs, such as operators/field assistants, construction supervisors, and project engineers. By 1979, the period of January-March had been set aside every year for in-service training of all project staff. The training staff were drawn directly from the project staff or from a variety of local resources within Malawi.

To emphasize the importance placed on training, the Project Paper called for the establishment of a Training and Research Unit headed by a Training and Research Officer under the Principal Water Engineer of the RWS. To date, a formal training and research unit has not been established. Instead, the Senior Water Engineer has been responsible for training and research, as well as evaluation, monitoring, and projects development.

A number of specific training outputs were called for in the Project Paper. When combined with the training of MOH staff, the project has exceeded its training targets in terms of numbers of Malawians trained. Since late 1980, as shown in Table 15, the RWS has carried out at least six training courses involving over 90 participants and instructors each year and at least one monitoring and maintenance course each year.

Table 15

Training Courses Held by the Rural Water Section of DLVW, 1981 - 1983

	1981	1982	1983	Totals	Average Year
Number of Participants in Training Courses	92	101	85	278	92
Number of Training Courses	5	7	7	19	6
Number of Participants in Recruiting Courses	30	30	-	60	20
Number of Recruiting Courses	1	3	-	4	1
Number of Participants in Maintenance/Monitoring Training	32	20	-	52	17
Budget for Training (MK)	12,600	16,300	15,000	43,900	14,600

Main training activities take place during the months of January-March at the Zomba Training Center. The instructors have been primarily senior project staff. The methodology has emphasized participant interaction and involvement through small group discussion, role playing, and group projects.

The objectives of the training courses have been:

(1) to review the technical and organizational routines of the job with the field staff;

(2) to introduce new developments and ideas learned in all fields over the past year;

(3) to provide an opportunity for the participants to sit for their operator tests provided they qualify on the basis of length of service. These tests are:

   (a) Grade III test for two years of service as an upgraded water project operator.

   (b) Grade II tests for 2 years of service as a Grade III operator.

   (c) Grade I test for 2 years of service as a Grade II operator.

In addition, annual two-week recruiting/selection courses are held for approximately twice the number of candidates as there are new positions required. This has produced a highly motivated and well screened group of new

employees to the program. The field handbook produced by the RWS in 1977 was revised in May 1982 to reflect current field practices. It provides the project staff with some guidance for in-service and on-the-job training activities. The pages of the handbook are loose leaf in order to allow for periodic up-dating and revisions.

The one major training issue that appears problematic is the overall workload of the office responsible for training. The Senior Water Engineer (SWE) based in Zomba is responsible for planning, designing, and conducting most of the training courses in addition to his other duties as senior project engineer, research officer, and senior evaluation and monitoring officer. Although he has been assisted by his staff in much of the planning and implementation of training courses, it is questionable whether one person can adequately direct and personally carry out all of these duties without having the quality of the work compromised. It is recommended that the training officer have fewer responsibilities in the future.

Although there have been some collaborative training attempts between the DLVW and the MOH, it appears that a great deal more could be undertaken. In particular, the supervising and field staff of the DLVW should be invited to participate as resource people in MOH training courses on community development approaches. Similarly, the MOH staff should be invited to participate as resource people in DLVW public health and user education courses.

The quality of preparation and implementation of the DLVW training was not assessed. However, the training staff stated that they were in need of some assistance in training methodology. It is recommended that the DLVW consider obtaining the services of a training methodology professional to run a training of trainers course prior to the beginning of the next training cycle.

If training activities continue over the life of the project as they have during the first 2-1/2 years, it is reasonable to assume that the proposed project outputs will be met. A tradition of yearly in-service training that is continually revised and updated for all staff has been established. The major questions that need to be addressed are whether the position will continue to be handled by someone with three other major responsibilities and whether training will continue to be given the emphasis and priority it receives at present.

5.4.2 Ministry of Health

The contributions of the Ministry of Health to the Project are channeled largely through personnel of the Environmental Health Services Division with outputs focused on health education and sanitation promotion in villages served by rural piped water schemes. To fit these personnel for their roles, a major training effort had been undertaken within the HESP program.

According to the Project Paper, the MOH in 1980 had 52 health inspectors, 134 health assistants, and 220 health surveillance assistants. There was little relationship at that time between these personnel and the gravity water systems of the DLVW. Only very limited health education activities were being carried on by the DLVW. Health inspectors were sometimes invited to tap-opening ceremonies, but little coordination followed.

In addition, the Project Paper noted a relative deficiency among MOH personnel in their knowledge of the socio-cultural aspects of human behavior related to health, water, and sanitation.

Health inspectors and health assistants are the only categories of environmental health personnel with a background of formal training. Health inspectors follow a three-year course at the Polytechnic Institute in Blantyre after receving the "O" level certificate of secondary studies. Health assistants, on the other hand, are given two years of training at the School of Health Sciences in Lilongwe. Health surveillance assistants, however, had only on-the-job training prior to the USAID-financed project.

Since the commencement of the HESP component of the project in July 1982, three types of training sessions, as listed in Table 16, have been held for environmental health personnel assigned to the project.

Table 16

Training of Environmental Health Personnel Assigned to the Project Since 1982

Date/Place	Course	No. of Participants	Category of Personnel
Feb. 7-11, 1983 Chilema	National Seminar for Health Education and Sanitation Promotion	14 14 5	DHI HA PCV
April 6-8, 1983 Msamba*	Training of Trainers for Supervisors	5 1 2 4	DHI HI SHA HA
April 18 - May 6, 1983, Ntcheu*	Training Workshop in Community Organization	1 2 25	SHA HA HSA
May 17 - June 3 1983, Mangochi*	Training Workshop in Community Organization	1 2 23	SHA HA HSA
June 11 - July 1, 1983, Karonga	Training Workshop in Community Organization	2 16	SHA HSA

* Involved a WASH training consultant

The first training session was held to sensitize environmental health personnel identified as project supervisors and managers to the methods of

promoting community participation in the sanitation aspects of the rural piped water program. Two major purposes were enunciated:

(1) to inform project managers and supervisors of the basic strategy and techniques to be used in the project,

(2) to solicit their ideas on improving these strategies and techniques.

The training of trainers workshop was designed to inform selected health inspectors and health assistants of training methods and techniques in order to form an ongoing training resource for the project. Three subsequent training workshops were held to enable health assistants and health surveillance assistants serving as field workers to acquire certain specific skills related to village level organization of health education and sanitation activities. WASH project assistance was used in the preparation of all of these workshops.

Although the above training sessions were judged to be successful by the participants and trainers alike, certain problems emerged even after the training of trainers sessions. The participants were deficient in leading and participating in discussion groups, and there was a need for specific training in supervisory skills as distinct from training skills. In addition, there is a continuing need for a full-time trainer in the MOH to make follow-up visits and to organize and administer workshops and refresher courses.

Other problems were identified at these training sessions with respect to the training of field workers. There were difficulties in calculating percentages in the results of village inspections, visual aids were unavailable in sufficient quantities, and more health surveillance assistants were needed in the field. Moreover, assistance in designing training for newly recruited field workers is needed. In addition, low levels of coordination between the DLVW, and the MOH, and local personnel of other ministries engaged in village development efforts decreased the effectiveness of field workers. There is some doubt as to how effective an all male cadre of field workers can be in promoting better sanitation practices which are largely the responsibility of women. And lastly, the absence of any transport for field workers has hindered their work.

No training of village health committees (VHC) has taken place as yet in the USAID projects but some committee members have participated in MOH-sponsored one-day seminars. Field workers have been instructed to follow a series of steps to ensure that village health committees have actual models of sanitation practices to refer to before they attempt to train their fellow villagers. Upon the selection of the village, field workers must meet with traditional and party village leaders, have an overall village meeting, elect the village health committee, establish a regular series of health committee meetings, and carry out a baseline village inspection.

The training planned for village health committees is in three stages: one stage on water and sanitation-related disease, another on health education approaches, and the final one consisting of a series of refresher courses. Notably absent are training in group work, leadership, management, and elementary accounting which are all necessary for a successful sustained community organization.

The MOH is currently preparing a proposal for USAID for an expansion and strengthening of the HESP program. Judging from the present and proposed levels of activity, the USAID project should have no difficulty in reaching the following end-of-project objectives in training:

(1) 120 (as opposed to the present 64) health surveillance assistants and a few health assistants, all serving as field workers fully trained to perform project functions with respect to the village health committees

(2) 29 supervisors and managers trained in management

(3) 16 supervisors trained in supervisory methods

(4) 10 persons trained as trainers

(5) 12,000 village health committee members (10 VHC x 10 villages per field worker x 120 field workers trained)

In support of these objectives, there are plans to recruit an additional 56 health surveillance assistants and to train them for work in the project. The MOH is planning a twelve-week training course later this year for all health surveillance assistants in order to achieve a common level of competence among the group. Three weeks of this course will be contributed by the project in return for admitting the 56 additional health surveillance assistants on a first priority basis. In addition, the project plans a three-week special course for these new health surveillance assistants.

For existing health surveillance assistants and project managers and supervisors, a series of workshops and seminars are foreseen.

In summary, the training of environmental health personnel of the MOH has made remarkable progress in the year since the Principal Health Coordinator took office. A total of 73 field workers including 64 health surveillance assistants have been trained for the initial phases of the village level strategy. Except for the notable absence of training in social analysis skills (assessment of leadership, communication and decision-making patterns, for example), this training has completely and effectively equipped field workers to begin work in the villages having water taps.

In addition, 12 managers and supervisors have been trained as trainers of field workers. Their chief deficiencies lie in the areas of group work and supervisory methods. A full-time MOH trainer should be identified and appointed to relieve the PHC of some of this responsibility.

In the future, the field workers will need more training in dealing with the village health committees, plus training in effective group work, use of visual aids, and better coordination with DLVW and other GOM personnel engaged in village-level development. To achieve the latter, some training of MOH and DLVW personnel together should be considered.

Village health committee training had not taken place as yet, but much is planned. In addition to what is planned, however, there should be added

training in management, leadership, and simple accounting. The secretary and treasurer, in particular, need special training.

Most of the training needs of both MOH personnel and the village health committees will be covered in the course of the present project. One concern not covered is the general absence of women field workers to approach village women on sanitation practices. Some consideration might be given to training either homecraft workers of Community Services or some enrolled nurse midwives in techniques related to sanitation promotion.

5.5 Community Support Responsibilities

Community participation in the piped water systems is the keystone of the entire rural piped water program. It is assured by the smooth functioning of a series of interrelated committees, which is nurtured, in turn, by a team of supervisors and monitoring assistants.

This network of committees existed in Mulanje and Zomba long before the current USAID-financed project. At the apex of the network is the project committee composed of experienced and respected village leaders who oversee the long period of construction and continue to oversee the operation and maintenance of the system. These project committees tend to retain their original membership even after the passage of many years. In larger projects there are section or branch committees that perform similar functions for major parts of the system. Under these are tap committees of which there may be several in a village. This network of committees provides workers for digging trenches and tank sites, for carrying, laying, and fitting pipes, and for constructing tap aprons.

After the completion of a water system, tap committees enforce the rules surrounding water use and are responsible for care of the tap, its surroundings, and the replacement of washers and broken tap parts. Branch committees (composed of representatives of all the taps on the branch) often provide the personnel for repair teams that handle minor repairs of gate valves, pipes, and joints. Repair teams receive training for this function from the monitoring assistant. Project committees oversee and provide back-up for both the lower-level committees and repair teams on the one hand and the DLVW field personnel on the other. They ensure compliance with rules, cooperation among the differing levels in the system, and the effective maintenance of all parts of the system.

In some schemes, all local participation is voluntary. In others, the caretaker of the stream is paid from a fund to which households contribute the equivalent of MK1.00 per tap/per year.

Both project records and field observations suggest that the above network of committees and teams continues to grow and flourish in new project areas. To this network are now being added village health committees with their links to area health committees and MOH personnel. This linking with health committees suggests that there is potential for the health and hygiene education activities of the tap committees to be increased from their present rudimentary level.

In order to take full advantage of the existing committee structure, it is recommended that training be provided to select tap committee members along with village health committee members. Furthermore, the DLVW should continue to recruit personnel at all levels who are capable of working with and sustaining the present decentralized functions of project construction and maintenance.

5.6 Information Systems

Engineering data of three major types are routinely collected by the Rural Water Section of the DLVW. First, there are data collected for the purpose of facilitating the construction of new schemes (construction data). Second, there are data collected for the purpose of improving the operation and maintenance of existing schemes (monitoring data). Finally, there are data collected for the purpose of deciding on augmenting the capacity of existing schemes (metering data). In the HESP program, the collection of routine data is just beginning. These data will help evaluate the impact of the program on health and sanitation activities.

In this section, the data collection, storage, and analysis activities carried out under the USAID-funded project are described and future developments in these information systems recommended.

5.6.1 Data Collection

1. Construction Data: Monthly reports are sent by the project engineer (or supervisor) to inform the superintending engineer (the Senior Water Engineer or the Principal Water Engineer) of progress on the construction of the project. The basic tool in the transmission of such information is a Sketch Layout Plan, an example of which is included as Appendix G. Different codes are used to indicate lines which have been marked, lines dug, lines laid, lines flushed, tanks under construction, tanks completed, tap sites prepared, and taps constructed.

2. Monitoring Data: Routine monitoring data are collected on the performance of the water supply systems in Mulanje District and, more recently, Zomba District. In Mulanje, nine monitoring assistants, each covering a population of about 30,000 people and an area of about 100 square miles, collect descriptive and diagnostic data on intakes, pipelines and taps, on consumption of materials, and on work done by the community. The forms used for collecting these data are presented in Appendix H.

   The quality of these data is assured through two mechanisms, namely, periodic spot-checks by the monitoring supervisor and by informing communities of the duties of the monitoring assistants and encouraging community members to report any irregularities to the monitoring supervisor.

In addition to these routine monitoring data, self-help enumerators in five projects in Mulanje District have recently started collecting data on the frequency and duration of interruptions in supplies at each tap.

3. Metering Data: Through the use of the routine monitoring data and by considering the age of different systems, systems with existing or potential problems in meeting demand are identified. For these systems water meters are installed in the main pipeline and at the head of each branch line. Initially self-help enumerators were used to read the meters every second day. The quality of the data was found to be poor and, as a result, meter readings are now done weekly by monitoring assistants.

4. Health Data: A set of forms for use by the health surveillance assistants has been developed for recording baseline information on village conditions, routine information of committee membership and functioning, and progress on health education and sanitation activities. Field testing of these forms is currently underway. (Copies of the forms are available in the WASH Library.)

5.6.2 Data Storage

1. Construction Data: Copies of the data are filed both in the project office and with the superintending engineer in Lilongwe or Zomba.

2. Monitoring Data: The data collected by the nine monitoring assistants in Mulanje are submitted monthly to the monitoring supervisor in Mulanje. The raw data are stored in the Mulanje Project Centre. Every six months a summary quantitative report on the performance and findings of each monitoring assistant is prepared by the Supervisor and his two clerical assistants and forwarded to the Senior Water Engineer.

3. Metering Data: The weekly meter readings in systems being considered for possible augmentation are submitted directly to the Senior Water Engineer and stored in Zomba.

4. Health Data: When the health and sanitation monitoring process is established, copies of the raw data will be stored and analyzed by the health surveillance assistants themselves, by their supervisor, and by the Principal Health Coordinator.

5.6.3 Data Use

1. Construction Data: The updated Sketch Layout Plans provide a monthly snapshot of progress on each project under construction. These data are used both by the project staff and by the Senior Water Engineer and Principal Water Engineer to monitor actual against planned progress on specific aspects of construction. This facilitates rapid identification of problems encountered in project construction.

2. Monitoring Data: The monthly reports of the monitoring assistants are used in improving the operation and maintenance of the project in several ways. First, the reports provide a mechanism which is used by both the monitoring assistants themselves and by their supervisors to identify, on a monthly basis, specific maintenance problems. Second, the six-month summary reports are scrutinized by the Senior Water Engineer and Principal Water Engineer and specific problems identified. The data have proved vital in improving all aspects of maintenance, ranging from the repair of slabs and taps to identification of blockages and line deficiencies in specific repair teams. The data are also an important tool in identifying the problem of excessive pipe breakages and low flow in certain areas, thus giving rise to the research on mitigating the aggressiveness of the mountain waters.

   The obvious next step in monitoring activities is the replication of the model developed in Mulanje to all project areas. It is also suggested that consideration be given to expanding the information collected by the monitoring assistants to include weekly measurements of the water levels in all storage tanks, since detailed studies suggest that these data are useful in identifying areas in which demand for water is approaching the capacity of the system to supply it.

5.7 Research Activites

5.7.1 Engineering Research

Under the direction of the Senior Water Engineer in Zomba, the RWS has carried out an active, appropriate, and highly successful research program aimed at improving the design and performance of the water supply systems. The three major engineering research activities are discussed below.

1. Research on Pipe Breakages: Through an examination of the operation and monitoring reports, it became evident to the RWS that unusually high breakages in the asbestos cement (AC) pipes and rapid corrosion of the galvanized steel pipes were occurring in the Mulanje area. Whereas an acceptable breakage rate for the project as a whole was considered to be less than one breakage per kilometer per year, in Mulanje breakages were reaching 2.7 per kilometer per year. The causes of these breakages and rapid corrosion were investigated by the Senior Water Engineer and his staff. They identified several contributing factors, including the effects of unstable dambo soils, poor quality control in the manufacture of some of the AC pipes, and, most importantly, the chemical aggressivity of the waters in Mulanje and Zomba.

   Working with the Chemistry Department at Chancellor College in Zomba, it is estimated that 15 kilograms of AC pipe were being lost per day in the existing systems and that this loss could be greatly reduced by passing the raw water through limestone at the headworks. Laboratory experiments confirmed that the retention times in existing preliminary treatment units (screening tanks and sedimentation

tanks) would be sufficient for the neutralization of the acidity in the raw water.

Accordingly, limestone was purchased and installed in the screening and sedimentation tanks in the Mulanje and Zomba supplies. Subsequent tests confirmed that the pH of the water was indeed raised from about 6.4 to 7.2. Through subsequent evaluation of the monitoring reports it will be possible to assess the future effects of this practical research on pipe breakages and corrosion in the affected systems.

2. Research on Intake Design: In a number of intakes, problems were encountered with excessive siltation in the top sections of the pipelines and in the sedimentation tanks. Some simple experiments on intake design were carried out in Zomba and the standard design was modified to both reduce the size of the holes in the intake pipe and increase the open surface area per unit length of intake pipe. Subsequent monitoring of the performance of the new intake design indicated that the problem has been largely overcome, and thus the new design has become standard in the RWS.

3. Research on Appropriate Water Treatment Methods: To date, the rural piped water supplies have tapped only protected sources of water in the mountains. The turbidity of the raw water is low and the bacteriological quality good. Accordingly, treatment has been confined to simple screening and sedimentation tanks which require only periodic maintenance. As the gravity piped water schemes spread even further, more serious water quality problems, in both turbidity and bacteriological terms, are being encountered. In the Mwanza scheme which has been proposed as part of the USAID-funded project, for instance, turbidities reach up to 600 NTU and total coliform counts up to 10^5 organisms per 100 ml.

   Accordingly, the most important research activity of the RWS has been aimed at identifying simple treatment methods which are capable of effecting the required quality changes while being within the economic, technical, and manpower constraints operative in Malawi.

   From the experience of other countries, it was apparent that the appropriate method for improving the bacteriological quality of the finished water was treatment in slow sand filters. The problem, however, is that while slow sand filters cannot operate with an influent turbidity of more than about 50 NTU, the turbidities in some sources were seasonally about an order of magnitude greater. The primary focus of the research effort, then, was to identify appropriate methods for pretreating the water prior to final treatment on a coventional slow sand filter.

   On the basis of a literature review, two promising preliminary treatment technologies were identified, namely inclined-plate sedimentation tanks and horizontal roughing filters. Pilot units were constructed in Zomba, and experiments conducted using the turbid and polluted water from the Bhuila River. These experiments

indicated clearly that neither of these technologies was appropriate. The plate settlers were able to effect little reduction in turbidity due to the highly colloidal nature of the turbidity in this and other waters in Malawi. The horizontal roughing filters were more effective in reducing turbidity, but clogged rapidly and required an enormous amount of work to clean. Upon considering the size of roughing filters which would be required and the labor required in cleaning them, these methods were rejected as a practical option under Malawian conditions.

In addition to these experiments with technologies suggested by the literature, the Senior Water Engineer experimented with the use of a slow sand filter itself as a first-stage treatment device. Experiments were conducted using different size aggregates and different loading rates. Both bacteriological quality and turbidity were monitored. As expected, the units did not function as biological treatment units, however, turbidity was reduced to levels such that subsequent second-stage slow sand filtration was feasible, giving a finished water of low turbidity. Interestingly, despite the absence of biological action in the first state, colied by about one order of magnitude. Coupled with a two orders of magnitude reduction in the second-stage filters, the coliform count of the finished water was three orders of magnitude (i.e. 1,000 times) less than that of the raw water. The experiments indicated that with a relatively coarse aggregate in the first filter, reasonably long-run lengths could be maintained. Finally, when head losses became excessive, the first-stage filter could easily be restored to operation by removing, washing, and replacing the top 5 cm of sand.

It thus appears that the RWS has developed a water treatment technology appropriate to conditions in Malawi. Two such units will be installed, one at the CIDA-funded Dombole project and one at the USAID-funded Mwanza project. Routines for monitoring the operation and performance of the filters have been developed and will be incorporated into the systems.

5.7.2 Social and Health Research

It is important to distinguish social and health research from the evaluation of social and health impacts (see sections 8.1 and 8.3). Both can make use of similar data collected in the field but they have distinctly different purposes. Rned to answer specific questions and test specific hypotheses, in this case, those pertaining to the relationship of water supply and sanitation improvements to specific aspects of health status, social behavior, and social organization. In most cases the answers to research questions have been little explored or have been explored inconclusively. Many hypotheses also have been inconclusively tested. Research should be designed to add some degree of clarity to the understanding of these relationships.

Evaluation on the other hand has a specific program focus. It uses data collected to answer questions about the quality of a program with regard to both its operation and its outcomes. It may be used to decide whether or not

to continue a program. In this case outcome measures are more useful. Alternatively, it may be used to improve a program, in which case, intermediate or operational measures are most useful.

One health-related research project will be carried out in an existing project area. A Swedish team comprised of a geographer and a physician (whose work is financed by Swedish funds) has designed an impact study for the Zomba West area.

In this research project, data will be collected from eight project villages located within two areas, one which will receive hygiene education, the other which will not. All villages will have taps. Data include population, household composition, socio-economic status, and water, sanitation, and hygiene conditions. The following correlative data will be collected on children under age five: date of birth and immunization and feeding histories. Diarrheal incidence, anthropometry, and stool cultures will be used as outcome measures. Some baseline data have already been collected but the study will not be completed until late 1984 when taps will have been installed and health education activities initiated. This study should produce valuable results, however, it is not a part of the USAID-financed project and should not be seen as an evaluation of the project. Nevertheless, information emanating from the study should be used in developing an end-of-project evaluation plan.

Social research has been limited to that carried out by the Center for Social Research (CSR) of Chancellor College of the University of Malawi in Zomba. The research questions investigated by the CSR concentrated on the household consumption of water in four project areas--Nalipili, Chambe, Namitambo, and Zomba East. Three factors related to water consumption were studied: distance to the tap (in minutes or in steps), household size, and occupation. Means and correlation coefficients were calculated for each. According to the report, none of these factors could explain the observed variance in water consumption. Although inconclusive at present, such research has great potential and should be continued.

It is recommended that both types of research efforts described above be continued on a small scale and that other research questions be formulated by all organizations involved in the project and developed into studies for possible funding. Possible research subjects include water and sanitation-related behaviour (for example, looking at the outcome of specific health education efforts), community participation (especially issues of community financing of maintenance), and, as suggested by the Project Paper, health effects and time savings. These studies should not be perceived as a part of the project evaluation. Instead, they should be viewed as part of the research efforts associated with the USAID project. As an adjunct to the implementation of those research proposals, greater use of the CSR is recommended.

5.8 Evaluation of USAID-Financed Project

5.8.1 Evaluation Activities

Since inception of the USAID Project in late-1980, a large number of activities have been carried out under the general classification of evaluation. These activities have included a variety of investigations and

studies into different aspects of project performance and impact. With few exceptions, however, most have been focused on specific questions and are better defined as research, monitoring, and impact assessments.

Research activities consist of the engineering, social, and health investigations described in section 5.7. Engineering research includes investigations by the DLVW into pipe breakages, intake design, and water treatment methods, while health and social research includes the impact study of the Zomba West area by Per and Ulla Lindskog (with Swedish funds) and the household water consumption investigations of the Centre for Social Research (with DLVW funds). All of the efforts have been designed to answer specific questions or clarify poorly understood relationships.

Monitoring activities consist of both routine and special data collection activities associated with the operation of project facilities. Routine monitoring is carried out by the monitoring assistants of the DLVW, who report on taps, pipelines, tanks, and intakes, and by the health surveillance assistants of the MOH, who report on local environmental conditions and community health activities. In addition, special monitoring efforts occasionally are established. Over 1982-1983, the DLVW monitored water supply interruptions in the Mulanje area and collaborated with the CSR in studies of water use in the Mulanje and Zomba areas (see section 6.2.3).

Impact assessment activities emphasize the occurrence of project benefits. The most comprehensive impact assessment of the Malawi rural piped water project to date is the study carried out for the DLVW by the CSR in 1981 in the existing Zomba East project area and the proposed Zomba South project area (Msukwa and Kandoole, 1981). A further refinement of the Zomba water consumption data was performed by the CSR at the request of the DLVW in late 1982 (Ettema, 1983). Although of value in understanding dynamics of project activities, both studies were limited to the Zomba area and, therefore, represent neither the entire country nor the overall piped water project.

In late 1982, the U.S. General Accounting Office carried out a field review of the project. The GAO looked at the financial plan and implementation schedule, social and economic benefits, operation and maintenance, level of technology, and water quality, and quantity. Their preliminary report concluded that:

> The project appears to be progressing very well. Both GOM and AID inputs are approximating planned objectives. The target population is providing volunteer labor as planned and, based on experience with earlier similar projects, it is likely the systems will be maintained when completed. Health and sanitation segments of the project have been initiated and also seem to be progressing satisfactorily. While there are existing and potential problems (e.g., fuel shortages and possible budget shortfalls), the GOM and AID have recognized them and are already taking actions to remove or prevent them. Repair/replacement parts are being stockpiled. The system is designed to be a

low-cost and easily maintained system. Fuel costs are minimized by limited use of power pumps and the use of some bicycles rather than motor vehicles.*

5.8.2 Evaluation Program

Despite the large number of evaluation-related activities which have been undertaken by the DLVW within the context of the USAID-financed project, there is no systematic plan for the evaluation of either specific technical issues or overall project performance. Both types of evaluations were foreseen by the Project Paper and the Grant Agreement and both were to be carried out by the RWS Training and Research Unit.

The Grant Agreement provided for $326,000 of USAID funds for monitoring and evaluation over the life of the project. As described in the Project Paper, $84,000 of the total was to be reserved for a Senior Evaluation Specialist, who would make three visits totalling six months in Malawi to assist in developing an information system in the RWS and in establishing procedures for gathering baseline data for the evaluation of impacts of safe piped water.

The implementation schedule in the Grant Agreement programmed the visits of the senior evaluation specialist to occur in the eighth, thirteenth, and forty-third months of the contract. In addition, the formative, or mid-term, evaluation was scheduled for month 17 and the summative, or final evaluation, for month 57.

Unfortunately, a senior evaluation specialist was not hired for the project. The reasons for this omission are not fully understood, but probably were linked to (a) the desire of the USAID Mission to reduce project expenditures, (b) the general belief that the RWS could organize and carry out the necessary evaluation activities itself, and (c) the assignment of a Peace Corps Volunteer in early 1981 to head up the monitoring and evaluation activities in the RWS.

Evaluation activities during the first year of the USAID project were carried out by the Training and Research Unit of the RWS which was located in Nachimango in Mulanje District. These activities included the development of monitoring procedures for both project facilities and RWS activities and the initiation of a water consumption and use study. The emphasis was on rapid performance feedback in order to incorporate changes in the project that might be warranted. In order to supplement these efforts, the DLVW contracted with the CSR to carry out a socio-economic evaluation of water use in Zomba District (Msukwa and Kandoole, 1981). Project evaluation activities, however, were unexpectedly slowed down by the early departure of the Peace Corps Volunteer heading up the RWS evaluation efforts.

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* Summarized in a letter to Malawi Secretary to the Treasury from David J. Garms, USAID/Malawi, 25 January 1983.

In July 1982, the DLVW carried out an internal reveiw of the progress of the monitoring and evaluation component of the project. A DLVW economist interviewed the evaluation staff, visited several tap sites within the metering program, and surveyed the monitoring data. He concluded that the on-going evaluation efforts were not based on clearly defined objectives and, therefore, it was impossible to assess the social, economic, and health impacts of the project on rural communities. According to his report, the principal weaknesses of the evaluation program were inadequate design and insufficient skilled staff (Appleby, 1982).

The evaluation deficiencies noted in the Appleby report caused considerable concern within the DLVW over the possible non-fulfillment of the USAID-GOM project agreement. In August 1982, the DLVW requested the CSR to carry out further statistical analysis and some data collection of project sites in Mulanje and Zomba districts. The resulting report of the CSR concluded:

> "the main problem of the DLVW data is the apparent absence of any conscious design for data collection and processing, as well as the absence of any documentation regarding objectives, methodology and execution of the data collection exercise.
>
> This indicates ignorance of the procedures current in social research, which is also apparent from the way in which the raw data had been arranged for processing" (Ettema, 1983).

The CSR recommended the appointment of a qualified social researcher to head the RWS evaluation office. In late 1982, the RWS moved the evaluation office (in effect the entire staff of the Training and Research Unit) to Zomba. In addition, the DLVW made a request to the Peace Corps for a new evaluation officer to replace the one who had left earlier in the year. At about this same time (late-1982), the U.S. General Accounting Office carried out a field review of the overall project. The conclusions of the GAO report were discussed in the previous section.

It is clear from the above information that project evaluation has been actively pursued within the DLVW but that the efforts have been poorly directed and are not meeting the requirements of the Project Paper and Grant Agreement. The evaluation team considers the decision not to engage a senior evaluation specialist at the start of the project to have been a serious mistake. Despite large scale metering and general project monitoring efforts, overall evaluation design is weak and is not leading to an eventual assessment of project impacts. The DLVW has attempted to correct these deficiencies by contracting with the CSR, but these investigations have been limited in scope and have not dealt specificially with the USAID-financed project.

The evaluation team recommends two concurrent courses of action. First, a senior evaluation specialist should be immediately engaged to provide advice and guidance to the DLVW evaluation and monitoring staff. This individual should be provided by USAID and should give attention to the overall information system, monitoring procedures, and, most importantly, the design of the

final project evaluation. Second, a comprehensive research and evaluation plan should be developed for the remainder of the project. This plan should incorporate all anticipated laboratory and field research investigations, as well as the required monitoring activities, data collection and analysis, and final project evaluation. Both the Rural Water Section of the DLVW and the HESP staff of the MOH should be involved in the preparation of this plan, but assistance should also be sought from the CSR and the new senior evaluation specialist.

5.9 Interministerial Coordination

5.9.1 Role of the Principal Health Coordinator

It is widely recognized that responsibility for coordination of MOH inputs to DLVW projects is vested largely in the Principal Health Coordinator (PHC). This section will review the methods of coordination and how well they are operating.

Prior to the USAID-financed project, the MOH had no official role in any phase of the rural piped water projects. District health inspectors were occasionally invited to tap-opening ceremonies, but the personnel and experience of the MOH were not generally available to the organizers of water schemes. It was recognized, meanwhile, that these MOH inputs would be necessary to bring about the variety of potential health benefits that were inherent in bringing clean accessible water into villages.

The Project Paper outlined two objectives with respect to this coordination function: the rural piped water program was to be coordinated with the MOH and on-going health and sanitation education programs were to be more closely coordinated with the introduction of piped water systems.

The PHC has established active linkages with the DLVW. There have been letters from both organizations to their field staffs urging closer cooperation and coordination. Health assistants and health surveillance assistants sometimes travel with monitoring assistants during their inspection activities. In addition, RWS supervisors have participated in HESP training activities. At the national level, both the PHC and the DLVW Water Engineer in Chief participate in an interministerial committee for the International Water Supply and Sanitation Decade.

The overall strategy of the PHC within the HESP component has been to start work with the village health committees after the formal tap opening ceremony. In this way MOH personnel are able to avoid any possible interference in the already substantial community organization work carried on by the RWS during the planning and construction phases of a water scheme.

Despite the above coordination activity, a great deal more progress is needed if an effective working relationship among MOH and DLVW personnel is to be achieved. Concern has been expressed that environmental health personnel at the district level are not kept sufficiently informed of plans and projections of the DLVW ground water program and, to some extent, the piped water projects in the district. With better coordination, environmental health personnel

might possibly participate in project siting, water quality, surveillance, and system maintenance. The MOH has the personnel to perform these functions.

If the PHC follows his present strategy and if the DLVW seeks a fuller involvement of environmental health personnel at the district level, then a better working relationship between the MOH and DLVW will develop. This will lead to a more effective use of MOH personnel not only in the rural piped water program but in other rural water programs as well.

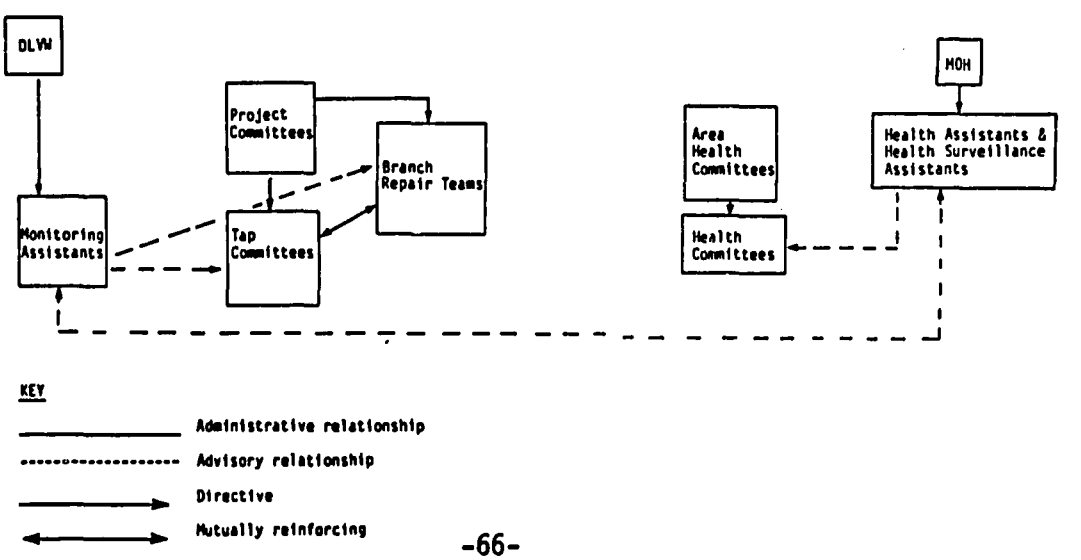
The evaluation team believes that the PHC has made an excellent beginning on what has always been a difficult proposition. Ministries of health are usually held in low regard by technical and public works ministries. The personnel resources of environmental health divisions, however, are frequently considerable. Rural water programs often overlook this resource to the detriment of their programs.

In the USAID-financed project, a genuine attempt to initiate the difficult process of inter-ministerial coordination has been made but the process could be enhanced. Regular communications should be encouraged between the PHC and the Principal Health Officer on the one hand and the Principal Water Engineer of RWS and his deputy on the other to review plans, monitor progress, and identify problems. Ideally, this communication should be in the form of face-to-face meetings but could also take place by telephone and by exchanging key correspondence. DLVW field personnel should be involved in the training sessions planned for MOH field workers and vice versa. Not only would each learn some of the other's skills but valuable personal relationships afforded by the training would also result.

5.9.2 Role of Community Organizations

This subsection concerns the interministerial contributions made by organizations at the community level within the Ministry of Health and the Department of Lands, Valuation and Water. Figure 4 depicts the interministerial relationships of these organizations.

Figure 4: Committee Relationships at the Community Level



Prior to the USAID project, scant attention was paid to intersectoral coordination at the community level. Coordination was seen most often when district health inspectors were invited to tap opening ceremonies to give health education talks.

The Project Paper called for a close and necessary coordination of the MOH health and sanitation education promotion (HESP) program with the introduction of piped water systems. These ideas are now being implemented at the community level where members of village tap committees sit on village health committees and health committee members, in turn, participate on repair teams. It appears that each committee is keenly aware of the responsibilities and activities of the other.

Some health surveillance assistants have begun accompanying monitoring assistants on their inspection rounds, while others have declared their intention to do so. Work programs are being mutually exchanged between health assistants and health surveillance assistants and their DLVW counterparts. The effectiveness of this coordination, however, is limited. Since there is usually only one monitoring assistant for 300 taps, each monitoring assistant will be able to visit each tap on the average of twice a year. On the other hand, village health surveillance assistants have ten villages each, with each village having an average of three taps. A typical health surveillance assistant, therefore, may have only about 20 contacts per year with the monitoring assistant, or one every three weeks. If health field workers are in short supply, as is the case in several project areas, coordination becomes even more problematic. Since health field staff work on HESP activities only 60 percent of the time, contacts with monitoring assistants are limited still further.

At the village level, tap committees maintain their activities without much continuing training, whereas the MOH provides fairly elaborate training for the village health committees. Moreover, project committees and repair teams receive technical training, but they receive little or no exposure to health matters that would enable them to participate more effectively in the promotion of improved sanitary practices.

Projections of current programs show a high degree of coordination (in terms of numbers of contacts) between field staff of the MOH and DLVW. Similarly, some tap committee members will be trained in health education, and some project committees and repair teams will be sensitized to health and sanitation issues. It will be important to provide adequate support for MOH field staff (health assistants and health surveillance assistants) in project areas and to encourage meetings and the exchange of information among them. Tap committee members should be encouraged to participate in village health committee training. Finally, sensitizing sessions on health issues for project committees and repair teams should be organized.

5.9.3 National Action Committee for the Water Decade

In November 1980, the United Nations Organization declared the 1980s as the International Drinking Water Supply and Sanitation Decade (IDWSSD) with the goal of providing safe water and adequate sanitation for all by 1990. Member nations were called upon to establish National Action Committees (NACs) with

representatives from every appropriate ministry to develop a plan of action for achieving the Decade goals. The UNDP representatives in each country were to coordinate all international agencies and donors and provide technical assistance if called upon by host governments.

In Malawi, the need to develop water supply and sanitation policies and guidelines was recognized in 1978 following a joint WHO-IBRD sector study which called for the development of a National Water Resources Master Plan. A decision was made in late 1979 to integrate the water-related functions of 14 departments in six ministries under a new Department of Lands, Valuation and Water (DLVW) within the Office of the President and Cabinet. This reorganization marked Malawi at the same time as one of the leading countries in terms of its planning for the Decade.

The USAID Project Paper for the Malawi rural piped water project was developed prior to the official launching of the Decade. It pointed out the need for greater centralized planning and coordination among various water supply programs, but no project outputs were related specifically to the Decade or the NAC. With the DLVW as the secretariat of the NAC, the Project Paper assumed that interministerial collaboration regarding the Decade goals would be enhanced and strengthened.

The effect of the NAC activities on the USAID-funded rural piped water project is difficult to measure but is probably only marginal. The effectiveness of the NAC seems to be limited by a current lack of interest in specific Decade activities and goals. In its own way, Malawi is pursuing major water supply and sanitation goals, although not necessarily those of the Decade. The country had made a commitment to the Decade, had developed organizations to fulfill this commitment, and has not seen the need to make subsequent organizational changes to fit the general Decade mold.

5.10 Summary of Recommendations

5.10.1 Recommendations for the USAID Project

1. Obtain new quotations from pipe suppliers for the remaining pipes and fittings to be purchased for the project (5.1.3).

2. Strengthen the HESP component by providing additional USAID funds for training (5.2.1, 5.4.2).

3. Provide each HESP field worker with a bicycle he can ultimately purchase (5.2.2).

4. Establish a protocol for pre-testing all new visual aids (5.2.2).

5. Continue the HESP program as planned (5.2.3).

6. Select some village tap committee members to be included in village health committee training (5.2.3).

7. Establish a program of water quality monitoring of the USAID-financed systems (5.3.1).

8. Encourage joint training activities between the field staff of the DLVW and the MOH (5.4.1).

9. Establish training-of-trainers workshops within the DLVW (5.4.1).

10. Expand information activities in the DLVW in the areas of system metering, water quality monitoring, and the sharing of data with the MOH (5.6.1).

11. Closely monitor the operational performance of slow sand filters at the Dombole and Mwanza schemes, as is planned by the DLVW (5.7.1).

12. Continue on-going research on pipe breakages, intake design, water treatment, and other aspects of water systems that may be appropriate (5.6.1).

13. Continue to investigate the behavioral changes associated with water and sanitation facilities such as laundry slabs, water use, etc. (5.7.2).

14. Make greater use of the Centre for Social Research in the preparation and conduct of research studies (5.7.2).

15. Recruit a senior evaluation specialist to assist the evaluation activities of the DLVW (5.8.2).

16. Prepare a comprehensive research and evaluation plan for the remainder of the project (5.8.2).

5.10.2 Additional General Recommendations

1. Appoint a full-time training director in the MOH (5.4.2).

2. Provide for simple fiscal and management training of village health committees (5.2.3, 5.4.2).

3. Gradually phase in the recurrent costs of water system maintenance by including 10-15 monitoring staff positions in the DLVW revenue account every year (5.3.1).

4. Investigate methods for community financing of the recurrent costs of water systems (5.3.1, 5.6.2).

5. Make greater use of the DLVW Water Laboratory in Lilongwe for water quality monitoring of rural piped water systems (5.3.1).

6. Reinstate the DLVW rehabilitation/maintenance account as budgeted in 1981 in order to fund major maintenance activities (5.3.2).

7. Consider encouraging more women to become field health workers (5.4.2).

Chapter 6

PROJECT OPERATION: STATUS OF PROJECT SCHEMES

6.1 Construction Status

6.1.1 System Status

Between 1968, the start of the Malawi Rural Water Supply Program, and 1981, the start of the current USAID-financed project, a total of 34 gravity water schemes were undertaken in Malawi. These schemes were located within 15 of the 20 districts of the country and were designed to serve a total of 753,300 people. By mid-1983, construction of the 34 schemes were completed at a total materials cost of MK4,468,400. Overall program funding came from a variety of sources, including the GOM, USAID, OXFAM, Christian Service Committee of the Churches of Malawi, UNICEF, DANIDA, ICCO, CEBAMO, and CIDA. In combination with the self-help efforts of the affected communities, these funds resulted in 3,737 kilometers of pipes and 4,951 water taps. A summary of the initial 34 schemes is shown in Appendix I.

Construction of USAID-financed water schemes began in April 1981. By April 1983, 12 schemes were under construction and a thirteenth (Zomba West) was begun two months later. A total of 16 schemes is proposed for the USAID-project.* Approval has not yet been obtained for Zomba South, Chimaliro South, and Msaka. As shown in Appendix J, these 16 schemes have a design (1990) population of 462,800, total USAID costs of MK5,007,200, and will contain 2,450 km of piping and 3,200 taps. On a per capita basis, the USAID-financed schemes are projected to have a capital cost (exclusive of self-help labor) of approximately MK12.00 per person served and a materials cost of approximately MK10.00 per person.

6.1.2 Selection of USAID Schemes

The Project Paper identified 23 schemes or sub-projects which were proposed for implementation under USAID financing. No details were given on either the formulation of this list or any requirements for implementing the specifically-named schemes. In practice, the RWS has viewed this list as an example of the types of projects to be undertaken rather than a directive for specific schemes. Few of the original schemes had undergone detailed investigations at the time the Project Paper was prepared. Subsequent investigations have caused some of the proposed schemes to be rejected and others to be replaced by more promising schemes. To date, ten of the original 23 schemes have been dropped from the list, according to the Principal Water Engineer, because they were either too small, not sufficiently cost effective, or located in areas more suitable for borehole development.

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* The Nanyangu and Kasinje schemes in Ntcheu District are sometimes considered together as a single scheme, thus making a total of 15 USAID-financed schemes.

The planning and design process plus the inclusion of several new sub-projects to the list has caused the remaining 16 schemes to have a projected 1990 service population of 462,800 compared to the design population of 201,500 shown in the Project Paper for the 23 original schemes. The Project Paper figure was based on 1977 census data with no increase in future growth. Thus, the net effect of the changes has been to reduce the number of schemes but to increase the population served by the USAID project. Table 17 compares the proposed schemes shown in the Project Paper with those currently in operation,

Table 17. Comparison of Actual with Proposed Sub-Project Implementation Program

Project Paper Proposals			RWS Current Program		
Sub-Project Name	District	Design Population (1977)	Sub-Project Name	District	Design Population (1990)
Nanyangu	Ntcheu	15,000	Liwonde	Machinga	23,000
Liwonde	Machinga	6,000	Nanyangu	Ntcheu (See Kasinje)	
Chimaliro North	Mzimba	10,000	Kasinje	Ntcheu	34,000
Chimaliro South	Mzimba	15,000	Iponga	Karonga	5,000
Zomba South	Zomba	85,000	Chitipa	Chitipa	36,000
Kasinje	Ntcheu	10,000	Mwanza	Chikwawa	40,000
Iponga	Karonga	3,000	Chimaliro North	Mzimba	25,000
Misuku	Chitipa	1,000	Mwansambo	Ntchisi	15,000
Nyungwe	Karonga	4,000	Misuku	Chipita	4,000
Tukomba	Nkhatabay	2,000	Sumulu	Machinga	24,000
Mlowi	Nkhatabay	2,000	Mirala	Machinga	13,000
Lufutazi	Nkhatabay	2,000	Zomba South	Zomba	120,000
Usisya	Nkhatabay	8,000	Chimaliro South	Mzimba	32,000
Ruarwe	Nkhatabay	1,000	Zomba West	Zomba	75,000
Msaka	Mzimba	2,000	Msaka	Mzimba	5,000
Ifumbo	Chitipa	1,500			
Mlowe	Rumphi	2,000			
Dwambazi	Nkhatabay/ Nkhotakota				463,000
Tsavuche	Dedza	2,000			
Chiradzulu	Chiradzulu	8,000			
Sankhulani	Nsanje	10,000			
Mbonechela	Machinga	8,000			
Maona	Thyolo	2,000			
		201,500			

under construction, or being considered by the RWS under the project financed by USAID. The location of the schemes within Malawi is shown on the map in the frontispiece of this report.

Given the uncertainties regarding the list of proposed schemes in the Project Paper, it is reasonable to expect the RWS to have exercised its technical expertise and judgment in the preparation of actual proposals for USAID approval as they have done. This is the proper function of engineering management, and neither USAID/Malawi nor the USAID engineer in Lusaka have objected to the modification of the original list of schemes or the process through which individual schemes have been identified and selected. Although fewer schemes are being proposed, the more than doubling of the total design population, with no increase in overall costs, underscores the soundness of the selection process.

Special attention, however, must be given to the scheme proposed for Zomba South, the largest of all sub-projects in the USAID program. The scheme is designed to supply water to 120,000 people who live in an area where there are serious problems with both the availability and quality of water. The USAID-funded part of the Zomba South scheme includes 550 kilometers of pipes and 1,000 taps and will cost MK1,610 million to complete over a three year period.

The Zomba Sub-project was included in the Annual Construction Plan for 1983-84 with the start of the project planned for April 1983. At present (August 1983), however, approval for the scheme has not yet been obtained. Since the Zomba South scheme accounts for 32 percent of total USAID project expenditures on construction, delays in the Zomba sub-project constitute a serious threat to the timely completion of the overall USAID project.

There are two related causes for delay in the initiation of the Zomba South scheme. The Water Resources Board has not yet issued the water license which is a pre-condition for approval of the scheme because further drawing of water from the existing reservoir on the Mulunguzi River for rural piped system would threaten the water supply of Zomba Town. Accordingly, the DLVW has prepared a prefeasibility study for the construction of a second reservoir, the Mulunguzi Marsh Dam, which would ensure that adequate supplies of water are available for Zomba Town, for the Zomba South scheme, and for the irrigation abstractions downstream until 1997. The storage required is one million (10^6) cubic meters of water and the estimated cost of the dam is MK510,000.

In May 1983, Treasury submitted a proposal for the dam to the German Kreditanstalt fur Wiederaufbau (KFW) for consideration. The KFW was informed that the matter was urgent. Preliminary indications are that KFW will grant the money required for the dam, but no definitive response has yet been received by Treasury.

Once funding for the dam has been secured, the Water Resources Board should be encouraged to expedite the issuing of the required permit for the Zomba South Scheme, and the DLVW and Treasury should be pressed to approve the scheme as rapidly as possible. Construction of the reticulation system will take longer than construction of the dam and, therefore, could begin well in advance of the initiation of construction of the dam itself.

If construction of Zomba South is not started in the near future, it is unlikely the scheme can be completed before the end of the overall USAID project in September 1985. USAID has an informal policy of not financing dams because of the difficulties in obtaining environmental and social clearances. The inclusion of the Zomba South scheme in the USAID project, therefore, is dependent upon the DLVW finding another donor for the dam itself. In the event that the KFW or some other donor does not undertake the financing of the dam, the evaluation team suggests that USAID review its policy towards dams and give consideration to financing the Zomba South Scheme as long as the dam is technically feasible and cost effective.

6.1.3 Construction Schedule

The typical USAID-financed scheme requires a construction period of approximately two years, as shown in the bar chart in Appendix K. Some large schemes, such as Chitipa and Mwanza, will require four to five years to complete and will most certainly extend beyond the termination date of the USAID Project. Zomba South, if approved, will also extend beyond project termination unless provisions are made by USAID to ensure continuity in the implementation of all approved schemes.

One way is to extend the project termination date to allow completion of all USAID-financed schemes. Another way is to provide new funding and either extend the current project agreement between USAID and the GOM or develop a new project, but one which incorporates all unfinished schemes into a new agreement.

6.2 Operational Status

6.2.1 Water Quantity

As described in section 5.1.2, the rural water schemes are designed to supply 1.0 gal/min (0.076 lit/sec) to each tap. In addition, the number of taps must be sufficient to meet a demand of 6 gal/cap/day (27 lit/cap/day) from the design population. If these design criteria are unrealistic, the actual supply of water is likely to differ greatly from the anticipated level. One measure of performance of a water system, therefore, is the degree to which actual supply rates approach the design criteria.

Only a limited number of metering studies have been carried out on piped rural water schemes in Malawi, and no information on supply rates or quantities is available for USAID-financed schemes. USAID project funds are available for such studies and for the installation of water meters in both existing and future schemes. To date, a total of 50 meters, ranging in size from 1/2-in diameter for individual taps up to a maximum of 8-in diameter for mains, have been installed. The installation and monitoring of water meters is not a standard practice in the project. Those few studies which have been carried out recently by the RWS in Mulanje District represent pioneering efforts to understand the actual performance of selected schemes.

In late 1982, the RWS initiated a program of water metering in the Mulanje West project area. This scheme was constructed between 1973 and 1975 and currently serves an estimated population of 80,000 people from some 500 taps.

Sixteen meters were installed and read weekly from November 1982 through May 1983. These meters were located on pipelines which supplied 254 taps.The results showed a relatively uniform distribution of water among the metered areas in proportion to the number of taps in each area. The total flow measured in all the meters over this period averaged 188.7 gal/min, compared to design flow of 254 gal/min (based on 1.0 gal/min for each of 254 taps). Actual flow, in other words was 73 percent of design flow.

A master meter placed at the outlet of the main sediment tank at Likhubula in the Mulanje West area recorded an average flow rate of 253 gal/min (1,643,285 lit/day) for the period January - May 1982. The monthly averages observed at this site progressively rose from a low of 236 gal/min in January to a high of 270 gal/min in May. In terms of its 300 gal/min design flow, the Likhubula supply was operating at 84 percent capacity. On the basis of these data, it was estimated that the population of the Mulanke West project area was supplied with an average of 18.6 lit/cap/day.

There is little specific information to explain why the above supply rate is only two-thirds of the design rate of 27 lit/cap/day. Available information indicates that actual per capita water consumption may be considerably less than the 18.6 lit/cap/day supplied to Mulanje West.

A comparison of the metered supply with actual water consumption was carried out in Tambala Village in Mulanje District in 1981. Over a seven-day period, a water meter recorded an average of 2,657 lit/day supplied to a tap during the daylight hours while an enumerator observed an average of 1,514 lit/day carried away from the same tap. Although the enumerator did not measure the water used to wash the containers, it is not clearly understood why the two measures differed so widely nor why the per capita consumption rate was so low (14.0 lit/cap/day for the meter and 8.0 lit/cap/day for the enumerator). Such low per capital consumption rates may not be uncommon. Other investigations have found water consumption to average between 9 and 13 lit/cap/day (see section 7.1.3 for a further discussion of household water consumption).

It can be seen that more information is required on actual system performance in order to confirm design criteria, monitor operations, and plan for system expansion. The RWS intends to expand the above metering investigations to all areas of the country as soon as possible. It is recommended that a systematic approach be adopted and that metering be established as a routine feature in all USAID-financed schemes. At a minimum, a single master meter should be installed on all systems and be read on a weekly basis. If conditions allow, it would be very useful to place meters at the outlet of every major storage tank, and at strategic points where water shortages or unusual water use patterns are likely to occur. In this manner, routine metering can contribute to both current operations and future pipeline extensions and water tap additions.

6.2.2 Water Quality

Water systems in the Malawi rural piped water program are designed to operate without treatment with the exception of screening and simple sedimentation which occurs in either a sedimentation tank near the intake or the first storage tank below the intake. Additional treatment, such as filtration or

disinfection, is perceived by the GOM as both expensive given the low-cost nature of the program and unnecessary given the careful selection of protected intake sites. Water intakes are from mountain streams flowing through forests above the areas of human habitation. The RWS and its predecessors have long maintained that the careful siting of protected intakes on streams within restricted forests assures a quality of water that is acceptable for rural communities without any treatment other than simple sedimentation. Emphasis has been placed on the overall improvement of water supplies, in both quantity and quality terms, without resorting to inappropriate urban standards or the often unrealistic standards for rural areas found in the the development literature.

Recently, the DLVW has begun to incorporate additional forms of water treatment in the rural piped schemes. As a result of pilot tests by the Senior Water Engineer at the Zomba Training Centre, it has been established that slow sand filters can be used effectively to reduce turbidity in waters containing high amounts of suspended solids (see section 5.6.1). A slow sand filter is currently being constructed (August 1983) on the CIDA-financed Dombole scheme and another is planned for the USAID-financed Mwanza scheme, which was begun this year.

This emphasis on protected intakes and the general lack of accessible water testing facilities in Malawi has relegated water quality testing to a minor role in system planning, design, and operation. The RWS has no requirements for either source testing during the initial reconnaissance phase or routine system sampling during the subsequent operational phase. When possible, a sample is taken from a proposed source and analyzed at the nearest available laboratory. In the past, some analyses were performed at hospital laboratories, and some efforts have been made to use portable field kits (Millipore) for bacteriological testing. Since May 1982, the DLVW has been able to carry out full chemical and bacteriological water analyses at its new USAID-financed water laboratory in Lilongwe (see section 5.3.1 for a further discussion of water quality testing.)

Although some water testing has been done, not all schemes have been sampled and tested. Water analyses reports, when available, are kept in the project file. Because of the relative unimportance attached to water quality testing by the RWS, the evaluation team did not determine the extent of water quality analyses on USAID-financed schemes.

Some indication of water quality in the completed (non-USAID) schemes is available from the records of the DLVW Water Laboratory in Lilongwe. This laboratory began operation in May 1982. Between May 1982 and July 1983, a total of 20 samples from eight rural water schemes were analyzed for either total coliforms or fecal coliforms. The samples were taken from stream intakes, storage tanks, and taps. Of the six tests for total coliforms, four were recorded as "too numerous to count." Moreover, 13 of the 14 fecal coliform tests were positive, and four had fecal coliform counts exceeding 150 per 100 milliliters of sample. The Senior Water Chemist is empowered to recommend, and in some cases require, corrective action on poor quality water supplies, but as far as can be determined effective procedures for imposing corrective action on rural water schemes have not been established.

There should be more concerted effort in water quality sampling, testing, and data review in overall system planning and operations. The results of the analyses performed at the Water Laboratory point out the need for more information on water quality at existing schemes as well as the need for closer scrutiny of the water sources for proposed schemes. As populations increase and per capita water consumption rises, the health hazards arising from the potential contamination of untreated piped water supplies will correspondingly grow also. A program of water quality monitoring is essential for the selection of new sources, the design of appropriate treatment facilities, and the determination of unexpected changes in operations.

It is recommended that the DLVW establish a program of water quality monitoring at all USAID-financed schemes. At a minimum, this program should include bacteriological and chemical testing of all proposed water sources during the initial planning phase plus routine bacteriological testing of water from the intakes and selected taps during the operational phases. Although the frequency of sampling will depend upon the personnel and transport resources of the DLVW, it is not unreasonable to expect at least annual sampling from intakes and selected taps in each scheme. The results of these analyses should be reviewed by the RWS and corrective action taken whenever unacceptable bacteriological or chemical conditions are found.

It has been reported that the Senior Water Chemist intends to develop a water testing program for all rural piped water schemes. The evaluation team strongly endorses this effort and further suggests that both the DLVW and the Ministry of Health, which expects to establish bacteriological water testing in three regional centers in the future, be included in the overall program.

6.2.3 System Reliability

System reliability is primarily the capability of a water system to provide uninterrupted service throughout the year. In any water system, service interruptions can occur for a variety of reasons: inadequate source, demands greater than the capacity of the reticulation system, pipe breakages, clogged pipes and fittings, and poor design of tanks and pipelines. The monitoring assistants (described in section 5.3.1) follow a yearly inspection cycle in the rural piped water program in which pipelines, taps, tanks, and intakes are inspected for leaks, breakages, and inadequate flow rates. Reports are sent on a monthly basis to a monitoring supervisor who reviews the progress of the work and compiles a six-month report for the Senior Water Engineer. Minor repairs are attended to by the self-help village repair team with the assistance of the monitoring assistant. More difficult repairs are referred to the supervisor.

Although the monitoring reports contain a great deal of information regarding the operating status of systems, they do not allow a ready determination of system reliability. A field study by the RWS over the period March 1982 to March 1983, however, attempted to assess the frequency and length of supply interruptions in the Mulanje area. Five schemes--Namitambo, Muloza, Sombani, Chilinga, and Phalombe--were included in the study. On selected non-looped pipelines in each scheme, meters were placed at the last tap, where the cumulative effect of pipe breakages, supply shortages, and pressure reductions would have the most effect. Self-help enumerators recorded the periods when the taps were out of service.

At the Namitambo scheme, six taps were monitored at the end of AC pipelines. The enumerators reported that all six were simultaneously out of service for a period of one or more days during August 1982 and February 1983. A total of 80 separate service interruptions ranging from one to 26 days were recorded for individual taps during the year. Three-fourths of these interruptions were restored to service within five days. All six taps were out of service between 7 and 15 percent of the time.

For the other five schemes, the observation of a single tap at each scheme showed that a total of 44 interruptions in service, lasting up to ten days each, occurred during the year. Most (38 interruptions) were restored to service within five days. Service from PVC lines, however, was significantly better than that from AC lines. The taps at the end of the two AC lines were out of service 15 and 24 percent of the time, while taps at the end of PVC lines were inoperative only 1, 3, and 4 percent of the time.

Although limited to only a few pipelines in the Mulanje area, the above studies highlight the need for further information on service interruptions in the rural piped water system. The results of such studies can aid in the selection of pipe materials, the design of system components, and the management of maintenance services. It is recommended that the RWS develop procedures for monitoring the reliability of systems. In particular, the frequency and duration of service interruptions should be recorded. This work may be done by either monitoring assistants or self-help village labor, whichever is more appropriate. Data may be recorded through direct observation by enumerators, periodic inspection visits by monitoring assistants or selective metering of problematic areas. In addition, summary data of all schemes should be prepared and stored in a single location so that comparisons between schemes can be easily made.

6.2.4 System Accessibility

System accessibility can be simply defined as the walking distance from the house to the nearest tap. The RWS designs schemes such that taps are located no further than one-half mile (0.8 km) apart. This allows a maximum one-way walking distance of a quarter mile, which normally requires less than five minutes to walk.

Since taps are located along pipelines in a more or less linear manner but reticulation networks often follow non-linear patterns in traversing population concentrations, some people in the service area are inevitably more than a quarter mile from a tap. Officials of the RWS believe such populations to be relatively small and to constitute no more than a few percent of the total served.

Specific information on actual tap spacing is not immediately available. An inspection of several pipeline layouts on 1:50,000 scale maps showed tap spacings within the one-half mile criterion. In areas of high population concentrations, taps are spaced even closer in order to limit the service to about 150 people per tap. Site visits to several schemes (Dambole, Liwonde, Mirala, Namitambo, and Chambe) confirmed the above spacing limits. In the more densely populated areas, taps were often found within 200 meters of each other.

6.2.5 System Sanitation

Water systems sanitation refers to proper drainage of waste water away from the tap, the design and construction of the standpipe, the apron, the gutter, and the soakaway pit at each tap. In the Malawi piped water programs, these aspects have had only minor modification since first introduced in the early schemes. The modifications that have occurred include: reinforcement made from a section of PCV pipe filled with cement for the standpipe, the increase from one to three bags of cement for the apron, and different soakaway models depending on soil conditions.

All of the sanitation systems that were visited appeared to be in good working order. However, a number of earlier non-USAID project systems were having problems of apron deterioration and poor drainage. The apron deterioration for the most part was a result of insufficient cement. This has now been corrected and all aprons are required to have at least three bags of cement. With respect to drainage, it appeared that the standard gutter and soakaway design was not performing well in certain types of soil. It was observed that in another Malawi project dealing with handpumps, water loving plants had been successfully cultivated at the end of the drainage system. It was also observed that clothes washing slabs were being constructed with separate drains near these handpumps.

At present the USAID-funded projects are estimated to include nearly 3,000 taps. Each tap requires the standard apron, gutter, and soakaway. In addition, the MOH has recently instituted a pilot program of constructing clothes washing slabs. These are being built within 20 yards of the tap and have their own drainage system.

By the end of the project, it is anticipated that each of the project taps will have a firm concrete apron, a proper draining surface, and a soakaway that effectively absorbs waste water. In order to ensure that all soakaways function properly the DLVW should consider pilot testing some other forms of design, such as infiltration trenches and water loving plants. The MOH and DLVW should continue investigations into the design of laundry slabs, with particular emphasis upon drainage.

6.3 Summary of Recommendations

6.3.1 Recommendations for the USAID Project.

1. USAID should review its policy towards financing dams and give consideration to funding a dam on the Zomba South scheme as long as it is technically feasible and cost effective (6.1.2).

2. Extend the project termination date as needed to allow completion of all USAID schemes (6.1.3).

6.3.2 Additional General Recommendations

1. The senior water chemist of the DLVW should involve the MOH in the development of a program for water quality testing of rural piped water schemes (6.2.3).

2. The DLVW should develop procedures for monitoring the reliability of rural piped water systems (6.2.3).

3. The DLVW should consider testing some new soakaway designs such as infiltration trenches and the use of water-loving plants (6.2.5).

Chapter 7

PROJECT UTILIZATION

7.1 Household Water Use

7.1.1 Sources of Household Water

The rural woman in Malawi is frequently confronted with a series of choices among water supplies for her family. Because of the great variation among regions, choices may include a tap belonging to the piped water system, a borehole with any of several varieties of pumps, a shallow well either protected or unprotected and either with or without a pump, or any of several perennial or seasonal surface sources such as rivers, streams, lakes, ponds, dambos (rainwater collection areas), or water dug from a dried river bed. In any given locality, one or more of these possibilities may exist. The choice a woman makes will be determined mostly by the convenience of the water source itself, which is largely a matter of distance to the source, but also by the use to which the water is put, the reliability of the source itself, and the terrain she must traverse to get to it.

The USAID-financed schemes provide one clean source of piped water to groups of 150 inhabitants living, in general, within a walking distance of 500 meters. A total of 463,000 people are scheduled to be served in this manner by the end of the project in 1985. The fact that the taps are located in villages, are more accessible than other water sources, and are generally reliable should assure their use for most purposes. Is this in fact the case? To what extent have water use patterns changed since taps have been installed?

The study of Msukwa and Kandoole (1981) in Zomba East indicated that the mere installation of a tap was not enough in most cases to assure exclusive use of the tap for all purposes, particularly for those living some distance from the tap (more than five minutes away). The greatest amount of water (38.8 percent of the total) is used for bathing followed by washing utensils and food (15.5 percent) and cooking (15.7 percent) and drinking (8.4 percent). Only a small proportion of the tap water is used for washing clothes, probably because most people wash their clothes at a river, either because it is more convenient or because washing at the tap site is forbidden.

The study also showed that 96 percent of all drinking water and 93 percent of all water used for cooking was from the tap. Some selected households were observed not to draw any water from the tap because they considered it too far from their households.

The evaluation team visited several villages which had both a borehole and a tap. The boreholes had become important alternative sources in case of system breakdown or for women who found the tap too far away to carry water for washing clothes. Rivers and shallow wells were observed to serve the same purpose in other villages. In all visits, however, it appeared that the longer the tap had been in a village, the more it became the exclusive source for everyone. In the few instances where washing slabs were observed, women also seemed inclined to use the tap for all purposes.

If problems of system reliability and of the imposition of water use rules can be resolved, exclusive use of the tap water for all domestic purposes should be an attainable goal for households living within a reasonable distance from the tap (less than five minutes). Beyond that limit there seems little to assure exclusive use of the tap as a source of household water.

It is recommended that borehole and shallow well pumps in proximity to taps should be kept in repair as alternate sources in case of system breakdown. In addition, washing slabs should be encouraged as an inducement to use the tap for washing clothes.

7.1.2 Use of Water Systems

No clear picture of water system coverage emerged during the evaluation visits. The health committees which ever interviewed declared that all households in the village use the tap. The Msukwa and Kandoole study, however, to indicate that at least partial use of tap water extends to those living within 20 minutes of the tap. Beyond that limit, which is approximately one mile, apparently no one uses the tap.

7.1.3 Water Consumption

Water systems are designed by the DLVW to deliver 27 lit/cap/day to a population based on the agricultural capacity of the land. This figure, which is lower than most standard design rates, appears to be based on the experience of the DLVW rather than on actual measures of water consumption or land carrying capacity. In addition, somewhat higher figures for water consumption are usually deemed necessary to preserve health. Depending on the author the development literature generally cites consumption levels of 20-50 lit/cap/day for health purposes. In Malawi, suprisingly, available information indicates that water systems are not subject to inadequate supply but rather an unexpectedly low demand.

The study of Msukwa and Kandoole (1981) revealed that the volume of water collected per household declines with distance from the tap. As mentioned above, households living more than 20 minutes from the tap (1 - 1 1/4 miles) will not come to the tap to draw water. The volume drawn by those living nearer the tap ranges from 13.3 lit/cap/day for those less than three minutes from the tap to just over 2 lit/cap/day for those at 16-20 minutes away. Seventy-seven percent of users were observed to live from 0-5 minutes from the tap. For those households the average daily per capita water consumption was observed to be 12 liters. (Per capita consumption is also significantly related to occupation of the family head and household composition as discussed in section 5.7.2).

Ettema (1983) calculated per capita figures for groups at Mulanje and Zomba East villages and compared them with those of the Msukwa and Kandoole study. In the former group of villagers, the daily consumption was 11 lit/day for those nearest the tap and in the latter group 17 lit/day.

These varying figures point out the need for further studies based on both metering, tap surveys, and household surveys. In any case, current consumption of water appears to be far below standards generally cited for health reasons.

The shortfall of per capita water consumption in comparison with a possible health-based goal should not be ignored but must be approached with extreme care. Because of both custom and regulations regarding the use of a tap, an attitude of water conservation has marked the Malawi rural piped water project. This attitude has allowed large numbers of people to be served with relatively limited water sources. Nevertheless, future development will bring inevitable demands for greater water use, which is an intrinsic aspect of economic progress. The DLVW needs to find constructive ways to encourage more use of water while preserving the water conservancy mode.

A second problem is the assumption held by some that education by itself can bring about increased water use. The DLVW needs to combine its educational approach with the introduction of technologies that facilitate increased water use, such as laundry slabs.

7.1.4 Types of Water Use

The Project Paper mentioned that certain uses can lead to desirable economic outcomes, such as brickmaking, poultry raising, and livestock raising. It also assumed that increased water use in domestic activities would lead to further benefits.

As shown in Table 18, Msukwa and Kandoole (1981) found that tap water is being used for almost every imaginable purpose. What is remarkable is that 76 percent of all water used comes from a tap. Considering only routine daily domestic uses, 84 percent of all water is drawn from a tap. Cursory field observations confirm this impression, particularly in the older systems, where the percentage is probably higher.

Economic development calls for an increasing use of water, not only for simple domestic purposes but also for enhancement of the local economy. Malawi is faced with the dilemma of attempting to encourage such developments while striving to preserve the present equity of the system. A fair estimate of end-of-project-status would be that taps will supply 90 percent of purely domestic water and 50 percent of water for economic purposes.

It is recommended that the DLVW and MOH should continue to promote diversified domestic uses of tap water through such facilities as washing slabs as well as the economic uses of tap water for brick making and beer brewing.

7.2 Household Sanitation Practices

Rural sanitation comprises a number of important concerns, including the construction and use of adequate latrines, the safe transport and storage of water, the use of a dish drying rack, the use of an adequately constructed bath house, and the use of a well-dug refuse pit. Other sanitation practices of importance are adequate food and grain storage, improved house construction, and overall village cleanliness. In this section the presence of all these practices will be considered together rather than separately.

Table 18. Water Use in Zomba East Piped Water Project

Water Use	Total Amount of Water		From Tap		Tap Water as percent of total
	Amount (litres)	Per-cent	Amount (litres)	Per-cent	
Drinking	957.64	6.58	919.37	8.35	96.00
Cooking	1,882.64	12.93	1,754.02	15.73	93.17
Washing utensils/Food	2,205.43	15.15	1,861.54	16.70	84.4
Bathing	5,657.66	38.87	4,448.41	39.90	78.63
Washing clothes	988.30	6.79	765.30	6.86	77.44
Soaking maize/cassava	441.35	3.03	325.85	2.92	73.83
Watering garden	16.10	0.11	9.10	0.08	56.52
Smearing houses	443.40	3.05	230.90	2.07	52.07
Watering animals	134.90	0.93	68.45	0.61	50.74
Brewing	130.50	0.90	42.00	0.38	32.18
Brick making	943.55	6.48	72.50	0.65	7.68
Other	753.43	5.18	652.83	5.86	86.65
Total	14,554.90	100	11,149.77	100	76.60

Source: Msukwa, L.A.H. and B.F. Kandoole, Water by the People, Zomba, Center for Social Research, 1981.

Since the cholera epidemic of 1973-74, health surveillance assistants have been promoting the construction and use of simple unventilated pit latrines. By 1980, national coverage was estimated at 40-50 percent, with variations among districts depending on the intensity of deployment of the health surveillance assistants. There is little or no data available on the prevalence of the other sanitation practices cited above.

The Project Paper did not deal with sanitation except to cite the importance of proper water storage, food handling, garbage disposal and personal hygiene for the control of food and fly-borne infections (p.30) and to give recommendations for carrying out these practices through village health committees (p.41).

The study of Msukwa and Kandoole (1981) revealed a latrine ownership rate ranging between 61.9 percent in the northern part of the Zomba East Project area and 44.7 precent in the southern part, with an overall rate of 53.5 percent. In Zomba South the figure was 51.3 percent. No observations were made of other sanitation practices.

Visits of the evaluation team to villages selected for HESP activities by MOH field personnel did not produce any quantitative estimates but there seemed to be latrines, covered water pots, bath houses and soakaways, dish drying racks, and garbage pits at almost every household.

A few laundry slabs with soakaway pits have been constructed in target villages, and some experimentation with ventilated latrines is taking place in several localities. All health committees interviewed expressed keen interest in having a washing slab.

If the activities of the HESP program can be continued and enhanced in villages with piped water, then it is possible to expect that 90 percent of all households will have adequately maintained latrines (one-third of them ventilated), garbage pits, bath houses, dish drying racks, and safe water carrying and storage pots by the end of the USAID-financed project. In addition, there should be adequately drained and maintained laundry slabs for 80 percent of all taps.

It is recommended that USAID support MOH efforts to augment and improve the HESP program. It is further recommended that the MOH assure careful monitoring of the sanitation practices mentioned in this section.

7.3 Community Support Practices

7.3.1 Enforcement of Water Use Practices

Rules surrounding water use practices are centered on the conservation of water, the cleanliness and repair of the tap and apron, the cleanliness and drainage of the surrounding area, the maintenance of the soakaway pit, and the avoidance of undesirable activities at the tap such as clothes washing, bathing, washing pots and pans, washing food, and any other practice that may lead to soilage or damage of the apron. Most important is the rule against house connections, which has been strictly enforced by tap committees, project committees, DLVW personnel, and the district commissioners for many years.

In 1976, the Minister for Community Development officially stated the policy that no house connections would be allowed. Despite great pressures, sometimes coming from Parliament, this rule has been maintained. In March 1981, the Minister for the Northern Region reiterated in Parliament the policy against house connections.

The Project Paper stressed the USAID commitment to these rules and to the mutually reinforcing community-based network that supports them.

The water use rules have been enforced primarily by the tap committees with the backing of project committees and village headmen, when necessary. In the Msukwa and Kandoole study (1981), the regulations were cited as a reason why some people did not use the tap for clothes washing, bathing, or washing food and utensils. The same study, however, revealed that 65 percent of those interviewed thought that the rules had been made by DLVW personnel and not by their local water committee. While this is probably an accurate perception, it indicates, nevertheless, a sense that the rules may be imposed rather than arrived at by consensus.

Observations of villages with USAID-financed water systems and conversations with village health committees indicated a strict observance of rules by the community as a whole. There is little reason to believe that the present rule structure and supporting network of organizations will not continue in new project areas as it has in the past.

It is recommended, therefore, that the DLVW promote the present regulations in all new project areas together with the enforcing structure of committees and field personnel. It is also recommended that the DLVW and MOH jointly encourage the construction of laundry slabs for each tap in order to promote clothes washing near the tap.

7.3.2 Provision of Self Help Labor and Local Commodities During Construction

Self-help labor provided by the potential users during construction includes a wide variety of activities. The digging and backfilling of pipelines is the major self-help activity, but others include the digging foundations for tanks and tap aprons, the loading and unloading of sand, stone, and materials, the carrying of water, materials, and equipment to project sites, the breaking of stones for aggregate, and the assisting of DLVW field operators in pipeline construction. Local commodities provided by the community include sand, some stone, and digging tools.

These self-help contributions were well established prior to the USAID-financed project. In fact, the truly impressive enthusiasm and work by rural Malawian communities has drawn world-wide recognition. Some projects have required over 300 kilometers of trench to be hand dug and backfilled by volunteer village laborers! In some cases, communities worked one day per week for over a year to complete their portion of the pipeline.

There has been no major change in the local contribution of self-help labor and commodities from the period of the early projects to the present AID-funded schemes. Although the projected estimate of self-help labor during

the first two years was higher than the actual contribution ($735,000 projected vs. $686,000 actual-fee; Table 8 in Chapter 4), much of this was caused by delays in pipe delivery.

The evaluation team noted that one or two projects had not had as much community support as the other piped water schemes. This could be attributed to a number of factors, including their readily available water sources and the fact that some ethnic groups do not allow women to dig trenches. The latter explanation is significant since it is estimated that women provide up to 70 percent of the self-help labor in most of the piped water schemes.

In addition to the labor provided by the local community, it is worth mentioning that a significant amount of time is volunteered by local leaders and community members in organizing and managing groups of workers and in communicating daily work schedules.

There is no reason to conclude that the long tradition of self-help labor and local commodity contributions will not continue through the end of the USAID-financed project. It is strongly recommended, therefore, that the DLVW maintain the current practices involving community support in project construction and maintenance.

7.3.3 Community Provision of Labor for Maintenance

One of the most significant underlying strengths of the Malawi rural piped water program is the extent of community involvement after the systems have been constructed. As has been discussed under 5.3.1 and 5.3.2, the community is responsible for a number of routine and major maintenance activities. The various groups in the community having some duties for maintaining the systems include the project committee, the branch committee, the individual tap committee, and the repair team.

The project committee is responsible for the overall management of the project, for paying intake watchmen, for resolving conflicts, for enforcing rules and procedures, for organizing labor for major maintenance, for keeping local government authorities informed about any water system problems and issues, and for liaison with the monitoring assistant of the DLVW. The project committees normally consist of five members who volunteer their time amounting to approximately one day a month per member.

The five-member branch committee is responsible for an average of 10,000 people and is recruited from the various villages along a single branch of a pipeline network. It is responsible to the project committee for its section of the system and has similar management and coordination functions. In addition, it is responsible for the inspection of the branch and for supervising an average of ten repair teams. Each member also volunteers approximately one day a month for project- related activities.

The tap committees are responsible for the overall functioning of the tap, the apron, and the soakaway as well as enforcing rules for the care and use of the tap. The specific duties of the committee were discussed in section 5.5. Most tap committees are comprised of an average of one man and three women. It is estimated that they each volunteer one-half day a month in carrying out their duties.

The repair teams are responsible for routine repairs and replacements of pipes and values. They are trained and supplied with repair materials by the DLVW monitoring assistant and are responsible to the branch committee. They provide most of their own tools, although they have access to a hacksaw blade and repair materials. Their volunteer time averages approximately one day per month per team.

The intake watchman is the final member of the community maintenance organization. In some of the completed water projects, watchmen receive pay from the project committee but in the majority of cases they are volunteers. Intake watchmen are responsible for regular inspection and periodic cleaning of the intake and the storage and sedimentation tanks. This can amount to 10-12 days work per month.

Only a few AID-funded schemes have been completed. It is still too early to say how the maintenance of these systems by community labor is working. The transition between the construction phase and the on-going maintenance phase requires a new set of responsibilities and duties for the project and branch committees. This transition along with the formation of tap committees and repair teams is now taking place.

In the older non-AID funded schemes, self-help maintenance is occurring as was shown in Table 12. The fact that these completed systems are functioning and that breakdowns are quickly repaired with a minimum of supervision by DLVW staff is a clear indication that the communities are effectively carrying out their maintenance responsibilities. The key ingredient to this whole program is the fact that the communities have acquired a true sense of ownership of these systems through their hard labor during the construction phase and through the community development orientation of the DLVW staff during the planning, construction, and monitoring stages of the project. This program of water system maintenance by the community has attained such widespread success that all who have been associated with it should be justly proud.

Due to this sense of local ownership in the systems, there is every indication that community labor for maintenance will continue into the indefinite future. It is recommended that this process of community involvement in system maintenance be maintained in all current and future schemes.

7.4 Summary of Recommendations

7.4.1 Recommendations for the USAID Project.

1. Continue MOH efforts to improve latrine designs, promote latrine construction, and promote safe practices for water transport and storage (7.2).

2. Encourage the construction of a laundry slab at each tap in order to promote clothes washing near the tap (7.3.1).

3. Maintain current practices involving community support in project construction and maintenance (7.3.2, 7.3.3).

7.4.2 Additional General Recommendations.

1. Borehole and shallow well pumps in proximity to taps should be maintained in good repair as alternative sources in case of system breakdown (7.1.1).

2. Consider ways to encourage an increase in water consumption over time (7.1.2, 7.1.4).

Chapter 8

PROJECT IMPACTS

8.1 Health Impacts

8.1.1 Current Impacts

No actual data exist to support an objective evaluation of health impacts of the project, but a qualitative assessment obtained through talking with health and tap committees and isolated groups of women can be made. There emerges a genuine perception on their part that small children are having less diarrhea since the installation of taps and since the inception of health committees.

Prior to the project, a study was made of cholera incidence in areas with and without piped water systems. It was reported that cholera incidence was reduced in areas served by gravity-fed piped water systems (Chipungu, 1983), but the data have not been analyzed completely.

8.1.2 Possible Evaluation Indicators

The question of health status indicators of water supply and sanitation improvements continues to perplex those involved in planning, implementing, and evaluating various programs. Many behavioral as well as social, economic, and technical variables are interposed between the actual improvements in systems and any health benefits that accrue to users.

The reviews of Hughes (1981) and McJunkin (1982) conclude that despite wide variation in the results of individual studies there is a steady trend of improvements in health status as water supply and sanitation improvements are made. Both also point out that improvements in quantities of water appear to be more important than improved quality alone.

A few useful indicators of health status emerge from the above reviews: (1) diarrheal morbidity, (2) skin infections, and (3) nutritional status.*

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* Other indicators such as the prevalence of dracunculiasis and schistosomiasis are not recommended here because dracunculiasis does not occur in Malawi and the means of combating schistosomiasis and verifying the changes are insufficient. Reductions in schistosomiasis, for example, would require that far fewer people come into contact with water from ponds, lakes, and slow-moving streams. This might occur if piped or otherwise protected water supplies were provided, barriers were placed between people (especially children) and contaminated pools, and bridges were built over streams and ditches.

Each of the three indicators can be examined from two basic points of view:

(1) The prevalence of the health problem that the indicator reflects, and

(2) The responsiveness of the indicator to program inputs.

Diarrheal Morbidity

According to National Health Statistics (1981), diarrheal diseases are either the third or fourth most frequent cause of death in the under-five population in Malawi. The marked prevalence of under-nutrition (34 percent) in under-fives is probably also a reflection of the frequency of diarrhea. Diarrhea, however, represents a syndrome with multiple etiologies, only a few of which are actually waterborne and most of which are more responsive to personal hygiene measures. These include hand washing before handling food and after defecating and a thorough cleaning of food and cooking utensils. Unless water in sufficient quantity and of some minimally acceptable quality is available and accessible to households and is used for washing hands, food, and utensils most diarrheas will be difficult to control. Thus, the program may have to supply a sufficient quantity of water (at least 20 liters per capita per day or more) in order to affect diarrheal morbidity.

Skin Infections

Skin infections such as scabies, impetigo, and furunculosis all respond to the increased frequency of bathing which is a result of greater quantities of water.

Anthropometry

Anthropometric measurements (length and weight) in infants and small children may be potentially the most useful health status indicators for estimating the impact of improved water supply and sanitation. These measurements offer several distinct advantages:

(1) Undernutrition, most frequently manifested as deficient weight for height, is prevalent among infants and young children in rural areas of Malawi. Thus, it satisfies the requirement of measuring a prevalent rather than an esoteric health condition.

(2) The measures themselves require a minimum of equipment for field use, can be readily applied by persons with a minimum of training, and give reasonably reliable results.

(3) The validity of anthropometric measures as indirect estimators of reduced diarrheal morbidity is strongly suggested by studies reported in the literature.

(4) A general baseline exists in the data generated in the National Sample Survey of Agriculture for Customary Land in 1981-2. These data suggest criteria for field application of anthropometry.

(5) Anthropometry as a measure of nutritional status can reflect several benefits of improved water supply and sanitation combined in a single measure: decreased diarrheal prevalence, increased women's time for child care, and the development of kitchen gardens because of better use of wastewater (Chen, 1980).

Sources of Data

Primary Data

With respect to collecting primary data, health surveillance assistants and health assistants in the field represent are the only available personnel who could feasibly collect data on the three indicators suggested above. Procedures would have to be kept extremely simple so as not to require either excessive time or excessive additional training. All three indicators should be measured at six-month intervals in order to have both wet and dry season readings.

Secondary Data

With respect to secondary data collecting, other methods might be followed. For diarrhea, hospital data from institutions with good record systems could be used to assess diarrhea as a proportion of total admissions from project and non-project villages. Where specific diagnoses such as Shigella, V. Cholerae, and Salmonella are made, these categories of diarrhea might also be compared.

For collecting secondary data on anthropometry, the existence of baseline data from the 1981-82 National Agricultural Sample Survey might prove to be extremely useful. A preliminary assessment indicates that perhaps only the weight-for-age data may be useful. If data from this survey can be derived from areas where the piped water project is also active, then a potential baseline of anthropometric data already exists. The follow-up survey planned for 1986 could likewise produce outcome anthropometric data from the same areas. The degree of geographic and coincidence of piped water and survey areas needs to be explored. In addition, there is a national committee considering the establishment of a national nutritional surveillance system. Ways of focusing this surveillance on areas served by piped water should be explored.

Finally, despite the precautions cited above, there is a possibility of incorporating some schistosomiasis data from a single project area, Zomba South. Here the national schistosomiasis control program is open to the possibility of being divided into four study areas or quadrants (molluscicides, chemotherapy, piped water and washing slabs, and control) to compare the efficacy of these approaches. One might expect in these areas a reduction of S. haematobium in adult females and young girls but not in young boys in the piped water area.

Summary

In the area of health impacts it is recommended that water quality and household water consumption data be obtained from completed schemes. In addition, MOH field workers should continue to collect sanitation data, such as the presence of latrines, dish-drying racks, covered water storage containers, garbage pits, and bath houses. Where adequate records exist, hospital data should be gathered to compare diarrheal conditions. It also would be useful to have the health surveillance assistants collect some primary data on diarrheal morbidity and skin infections on a limited basis. Another useful approach would be to review the nutrition data contained in the National Agricultural Sample Survey of 1981-82 to determine their potential as baseline data for project evaluation. And finally, a review of the data on the cholera outbreak of 1973-74 to determine its relevance to the health aspects of water supply is suggested.

8.2 Economic Impacts

8.2.1 Current Impacts

The USAID-funded rural piped water supply has almost certainly had a variety of economic impacts on local, regional, and even national economic growth. The assessment of most of these impacts, however, is a complex task which remains beyond the scope of the present enquiry and, it is suggested, should not form a focus of attention in the final project evaluation.

In the light of the explicit USAID and GOM policy encouraging the development of private sector enterprises, it should be noted that the project has had an important positive impact on two private sector industries. First, the project is the major customer of the PVC extrusion factory in Lilongwe, contributing significantly to the continued economic viability of the factory. Second, the construction of tanks and intakes in the supply schemes is contracted out to local contractors, thus stimulating the development of small private sector enterprises in the rural areas.

A major direct impact of the project is expected to be the reduction in the time required for carrying water in the project areas. This would particularly affect women by increasing the time they could spend on income-producing or other gainful activities. One measure of the significance of time savings is that it is the most important factor mentioned by the population in explaining their desire for piped water projects and their willingness to work very hard to make such projects possible. As outlined in section 7.1, some preliminary studies have been conducted on time savings in several project areas. The data from these studies indicate that there were significant time savings in the project areas and suggest that the effects will be even greater in some of the drier areas (such as Zomba South).

8.2.2 Possible Evaluation Indicators

It is suggested that the final evaluation of the USAID-funded rural piped water supply project focus on documenting three of the many economic impacts.

First, through a case study of the pipe extrusion factory, an indication can be obtained of the effect of the project on stimulating an important local private enterprise undertaking.

Second, through the use of aerial photographs, it should be possible to document the increase in acreage under cultivation in project areas where agriculture had been previously hindered by a lack of domestic water supplies. Chitipa is an obvious project where such impacts may be documented.

Third, considerable attention should be given to collecting data of the sort gathered by the Centre for Social Research in Zomba East and to documenting the effect of the project on the time taken for collection of water. Assuming that it will not be necessary to collect data from all project areas, care should be taken to ensure that the projects selected for intensive study are representative of the full range of conditions encountered in areas served by the project. That is, care should be taken to document these effects in water-scarce areas as well as in areas in which the availability of water was relatively good prior to the USAID-funded project.

8.3 Social Impacts

8.3.1 Current Impacts

The Project Paper suggested several categories of expected social impacts from the project that normally would be difficult to realize within the short span of the project or are difficult to measure accurately. Of these, the most readily measurable impacts appear to be the spread effects of community participation.

No one doubts that the social impacts of the project have been and are being realized. Social impacts can be used as a basis for evaluation, and several relevant indicators are detailed below. The enthusiastic responses of villagers to the RWS program, the vitality of the health and tap committees, and their performance in the construction and maintenance of sytems are to be noted.

Since its inception there also seems little doubt that the program has affected the participation of women. Most tap committees are composed of women. Branch repair teams may have 10-20 percent women. At the same time only an occasional woman is to be found on a project committee. Health committees may have four to seven women out of ten members and may even be chaired by a woman. These numbers indicate that women are actively involved in project operation and maintenance but only minimally involved in project planning.

At a more profound level, there has been little examination of either intermediate or ultimate project impacts because, to some extent, of the absence of an evaluation officer backed up by a senior-evaluation specialist (see section 5.7.2 above).

8.3.2 Possible Evaluation Indicators

It is appropriate to keep the end-of-project evaluation emphasis focused on the use of intermediate indicators related to the functioning and use of water supply and sanitation installations rather than indicators of ultimate health, social, and economic outcomes (see WHO, Geneva, Minimum Evaluation Procedures and WASH Technical Report No. 10). The two categories of social benefits suggested here, namely the involvement of women and the spread effects of community participation, also should be of an intermediate rather than an ultimate nature.

Persistence of Organization at the Village Level

The assumption underlying this evaluation indicator is that the participatory experiences of villagers in planning, installing, operating, and maintaining the piped water supply systems have led to the formation and strengthening of local organizations which later help in solving problems, making decisions, and communicating important information among villagers, community organizations, and government institutions.

Since the development of self-sustenance in an organization is usually slow and gradual, it is recommended that observations be continuous but that analysis and interpretation of data be carried out on a cumulative basis at yearly intervals. Critical incident reporting would be useful. Interviews with key individuals in selected villages could be used to carry out a more in-depth study of factors contributing to the persistence of committees over time. Comparisons also could be made with health committees outside project areas.

The Proportion of Women in Various Project-related Committees.

While the level of women's participation in committees is already high, as indicated above, there is still room for improvements. Of particular note for comparing old and new project areas are the proportion of women on health committees, the number of women who are chairpersons of health and tap committees, and the proportion of women on repair teams and project committees. This data could be recorded by health surveillance assistants and health assistants during routine visits to villages or by monitoring assistants with the help of branch repair teams and project committees.

8.4 Summary of Recommendations to USAID

The following are recommendations for possible end-of-project evaluation indicators:

1. Obtain water quality and household water consumption data for each scheme (8.1.2).

2. MOH field workers should continue collecting sanitation data such as the presence of latrines, dish drying racks, covered water storage containers, garbage pits, and bathrooms (8.1.2).

3. Have the health surveillance assistants collect some primary data on diarrheal morbidity and skin infections on a limited basis (8.1.2).

4. Where adequate data exist, hospital data should be gathered to compare diarrheal conditions (8.1.2).

5. Review the data contained in the National Nutrition Sample Survey of 1981-82 to determine its potential as a baseline for project evaluation (8.1.2).

6. Review the data on the cholera outbreak of 1974 to determine its relevance to the health impacts of water supply (8.1.2).

7. Assess the effect of the project upon the local manufacture of PVC pipe (8.2.2).

8. Measure the time savings resulting from decreased water carrying distances (8.2.2).

9. Measure the area and, where possible, the economic value of new agricultural lands brought under cultivation as a result of a water scheme (8.2.2).

10. Assess the longevity and persistence of committees in the project areas (8.3.2).

11. Assess the proportion of women members on various committees (8.3.2).

Chapter 9

CONCLUSIONS

9.1 General Findings

The evaluation team finds that the USAID-financed rural piped water project being carried out by the Department of Lands, Valuation and Water with the assistance of the Ministry of Health is well conceived, competently directed and managed, and adequately supported by the Government of Malawi. Starting in 1980, USAID financing has been the basis for the continuation of the pre-existing and highly successful Malawi rural piped water program which began originally in 1968. The USAID involvement has maintained and reinforced the basic strengths of the previous program and, in addition, has expanded the program scope to include health education, sanitation, and research inputs.

The current overall success of the project is due to several key resources:

First, all project activity is firmly based upon full involvement of the user community. Villagers and their local leaders are consulted and their full cooperation sought in the planning, mobilization, construction, and maintenance phases of individual projects. The voluntary, self-help inputs of labor, often involving several hundred kilometers of pipeline construction in a single scheme, are one of the most remarkable aspects of the involvement of communities. It is estimated that the user communities provide approximately one-fifth of the capital costs and two-thirds of the operation and routine maintenance costs of the projects. As far as the evaluation team is concerned, this full and enthusiastic involvement of communities in a project of this magnitude is unequalled anywhere in tropical Africa.

Second, the field staff within the Rural Water Section of the DLVW and, more recently, within the HESP program of the MOH are sensitive to the needs of a community-based approach to rural water and sanitation development. The rural piped water program traces its origins back to community development activities of the mid-1960's. As a result, the field staff have always had a strong orientation to working with communities rather than imposing upon them solutions developed from afar. Over the years, the projects have grown more complex, and the program has incorporated increasing elements of engineering design, supervision, and control. This blend of community orientation and technical rigor has produced a unique cadre of field staff upon whom most of the work of project development and maintenance is based. In the DLVW, these staff include the supervisors and monitoring assistants, while in the MOH they include health assistants and health surveillance assistants. Mention must also be made of the voluntary personnel provided by the communities, especially the caretakers, repair teams, and the village tap and health committees. It is this overall human infrastructure, so unique in its comprehensiveness and effectiveness, which gives one confidence in the continuing success of these projects.

Third, the Malawi rural water program has been blessed with far-seeing and dedicated senior staff and with political leadership that has recognized the importance of these projects for the country. Since its inception in 1968, the

rural piped water program has come under the authority of numerous GOM organizations, the most recent being the DLVW in 1979. Throughout this period, there has been general continuity of direction within the senior staff, especially that provided by the current Principal Water Engineer, which has lead to a progressive improvement of the program and an accommodation to each new organization over time. At the same time, however, each organization has recognized the strengths of the rural piped water program and has generally allowed it a fair degree of autonomy to carry out its work. Together, these two forces have combined to form a program which has not only survived the vicissitudes of changing governmental structure but also become more effective every year in providing water to the people of Malawi.

9.2 General Conclusions

The detailed findings of the evaluation team are presented in Chapters 4-8, but a few general conclusions are in order. USAID, GOM, and community self-help inputs are being provided in a timely and generally well-coordinated manner. Costs and expenditures are reasonable, and the few minor problems in billing that were noticed can be readily corrected.

It is in looking at the institutional areas that the evaluation team spent much of its time. The technical aspects of project development in the DLVW were reviewed and found to be appropriate for the types of schemes being developed. The RWS has made excellent use of limited numbers of senior staff, volunteer expatriate engineers, and well-experienced field staff. The technical approach has resulted in water systems which are adequately engineered, constructed within a pre-determined schedule, and low cost. Efforts to develop Malawian engineers capable of taking over the program have recently shown some success.

Health education and sanitation inputs are the innovative feature brought to the program by the USAID project. The new Principal Health Coordinator had made a good start in organizing and directing the Health Education and Sanitation Promotion (HESP) component in the MOH. In its one year of operation to date, HESP has developed health-related strategies for the water program, begun training health field staff for work in the water project communities, and started field tests of laundry slabs and improved latrines. The evaluation team notes the crucial role played by the Principal Health Coordinator as liaison between the MOH and DLVW and endorses efforts by both organizations to more fully coordinate their respective activities.

One area meriting increased coordination involves the common needs of committees at the community level. Joint training activities, sensitivity sessions, and sharing of information among village tap and health committees, repair teams, project committees, and field staff of both the MOH and the DLVW are essential to realizing many of the health and social benefits latent in piped water systems. This coordination must be in the context of the current high level of community involvement in project development. As mentioned above, community involvement is the basis of program success, but improved coordination between the MOH and DLVW will allow projects to achieve their full health and social potential.

Maintenance procedures for the piped systems are a major aspect of the current levels of community involvement and the roles of the project field staff. To the maximum extent possible, routine operation and maintenance functions have been taken over by the user communities. Local volunteers are trained by the DLVW field staff to become caretakers, repair teams, and village tap committees. A limited supply of tools and replacement parts are available to these volunteers, while advice on more complicated repairs, or even assistance on the repairs themselves, are provided by DLVW staff. There appears to be a clear understanding within the project communities as to their financial and labor responsibilities for system maintenance. The maintenance responsibilities of the DLVW, therefore, are generally limited to providing simple technical advice and carrying out occasional major repair works. The evaluation team is greatly impressed with this overall approach to maintenance. Not only are the water systems maintained at a high level of operation but the community involvement in routine maintenance limits the direct DLVW costs to approximately MK 0.10 per person per year.

Staff training has been a strong feature of the rural piped water program for many years, and the evaluation team is pleased to note that this function has been reinforced further by the USAID project. Both the DLVW and, more recently, the MOH have formal training programs specifically designed for field staff who must work in a community-based environment. Within the DLVW, these programs differ greatly from the standard engineering training usually given by technical organizations. The evaluation team believes that the current training activities are the key factor in keeping field staff both technically competent and, more importantly, sensitive to the needs of communities in project development.

The Project Paper proposed setting up a Training and Research Unit in the DLVW to carry out training, research, information management, and evaluation. Because of staffing problems and departmental reorganizations, a special unit having its own staff and its own office has not been established. Much of the work proposed for this unit, however, has been undertaken by the Senior Water Engineer with the assistance of Peace Corps Volunteers, field staff, and the Centre for Social Research in Zomba. The evaluation team believes that the DLVW erred by not engaging a short-term Senior Evaluation Specialist as described in the Project Paper and Project Grant Agreement. The result has been a series of relevant and operationally useful, but largely uncoordinated, investigations into technical design, system operations, and water-related behaviors. The work done to date is impressive, but more could have and should have been done. There is need at this time for expert guidance in developing a comprehensive research program, including a design for a final end-of-project evaluation.

Although the Project Paper proposed 23 possible water schemes, subsequent investigations led to a revised list of 16 sub-projects having a design population more than double the original estimate. The evaluation team finds the revised list of projects, which has been approved by the DLVW, Treasury, and USAID, to have actually strengthened and expanded the effectiveness of the project. A major question mark resides over the Zomba South scheme, but if USAID and the GOM can resolve the problem of financing a dam needed to impound water for the system, Zomba South will eventually become the flagship scheme in the project.

Operationally, little information is available on completed USAID schemes. Projects undertaken before 1980 show high levels of reliability and equity of access to users. Recent metering and water use studies show some completed systems to be supplying water at about 70 to 85 percent of design capacity but per capita consumption rates to be a surprisingly low 10 to 12 liters per capita per day instead of the 27 liters per capita per day used in system design. The implications of these consumption rates are not fully understood, and further research into system operations and water-related behavior patterns is needed before further conclusions can be drawn. One valuable area of inquiry the MOH has been pursuing is the importance of additional water use facilities such as laundry slabs.

Impact assessment has been the most difficult aspect of this evaluation. The Project Paper called for an assessment of the economic, technical, health, and social impacts of the project, with particular reference to the measurement of these impacts by the end of the project. To measure these impacts, however, a great deal of time, personnel, and money is necessary. Impact assessments of water supply projects are still in the realm of research investigations rather than accepted procedures for project evaluation. In impact investigations, there is no general concensus on research design, primary variables, or measurement parameters. Because of this, the evaluation team strongly believes that the final evaluation of the USAID-financed project should concentrate on the more easily measurable operational, performance, and utilization variables rather than the elusive and difficult-to-assess impact variables. Such an approach will allow an evaluation within the personnel and monetary resources of the current USAID project, will provide immediate feedback to project operations, and will lead to an end-of-project evaluation which answers the questions of project accomplishments and the future of USAID involvement. Suggested measures for continuing and future evaluations include system operations, per capita water consumption, household water use, community and committee participation, hygiene practices, simple morbidity data, water carrying time savings, and agricultural cultivation.

In summary, the evaluation team concludes that the USAID-project has helped to make a pre-existing, basically sound, and highly successful rural piped water program even better. At this mid-point in the project, progress towards planned outputs and targets is either on or ahead of schedule. No major deficiences or problems occurred during these first two years. The recommendations presented in Chapters 4-8, therefore, should be viewed primarily as suggestions for further strengthening of the USAID project in particular and the overall rural piped water program of the GOM in general. Since the project is clearly benefitting large numbers of people and strengthening GOM and community institutions, the evaluation team strongly supports this type of development assistance and suggests that it is a good investment for continuing support by the U.S. taxpayer.

Chapter 10

KEY RECOMMENDATIONS FOR USAID

10.1 Recommendations Regarding Project Design and Implementation

Specific recommendations arising from the evaluation of the Malawi rural piped water project are listed at the end of Chapters 4-8. The recommendations are grouped into those directed at USAID and those of more general relevance to the GOM. Overall, five key recommendations to USAID for project design and implementation can be abstracted from this evaluation.

1. Delete the requirement of the Project Paper and the Grant Agreement for a formal Training and Research Unit within the Rural Water Section of the DLVW.

   The DLVW has neither the personnel nor the facilities to set up a formal Training and Research Unit within the RWS. Despite these limitations, a considerable amount of work has been carried out by the RWS over the first two years of the project. These activities have included annual training programs for field staff, routine data collection on system operations, metering studies on pipeline and tap supplies, research on technical designs, and evaluation studies on project impacts. The departure of key senior staff and the impending reorganization of the DLVW makes it even more difficult to establish and maintain a separate unit to carry out the above functions. It would be far better for USAID to allow the important functions of training, monitoring, research, and evaluation to be carried out anywhere within the DLVW as long as they properly support the needs of the rural piped water project.

2. Prepare a comprehensive research and evaluation plan for the final years of the project.

   There have been a number of highly useful research and evaluation activities undertaken with USAID project financing to date. The main deficiencies in these efforts are the lack of an overall program for the entire project and the absence of a sound evaluation design and related set of procedures leading to a final project assessment. USAID should require that a comprehensive plan for all project-related research and evaluation be developed as soon as possible. It is recommended that this plan be prepared primarily by the Rural Water Section of the DLVW and the HESP staff of the MOH, but with the assistance of the Centre for Social Research of the University of Malawi and under the general guidance of a short-term USAID evaluation specialist. The plan should include a description of proposed studies, likely scheduling, estimated costs, and institutional involvement (DLVW, MOH, CSR, etc.) over the remainder of the project. It should also include an operational design and detailed set of procedures for an end-of-project evaluation satisfactory to USAID. To fully support these efforts, the evaluation specialist may have to return to Malawi for several follow up visits.

3. De-emphasize the role of ultimate impacts in the end-of-project evaluation and stress instead the assessment of intermediate-level indicators of system performance, water use behavior, and community support.

   The evaluation team believes that a thorough evaluation of the ultimate health, economic, and social impacts is far too complex and costly for the needs of the present project. Because of the essential research nature of impact evaluations, such studies could easily cost several million dollars and still fail to produce conclusive results. What USAID needs is an on-going evaluation which provides information on current progress and leads to a final assessment in terms of project outputs, purpose, and goal. Such an evaluation process will assist USAID in making decisions regarding mid-course corrections and future project funding. It is recommended that this evaluation design focus on measures of project operation, behavioral patterns involving water use in the villages, and the degree of community support for project development and maintenance.

4. Strengthen the HESP component in the MOH in order to bring more health education and sanitation elements into the project.

   Within its one year operation, the HESP component has proved to be highly effective in introducing health and sanitation concerns into the rural piped water areas. The Principal Health Coordinator of HESP has been actively involved in setting up new training programs for health field staff, initiating field studies and pilot tests of sanitation facilities, and encouraging village committees to have a greater health orientation to their water systems. The evaluation team believes that the HESP component has proved itself to be a valuable adjunct to the rural piped water program of the DLVW. This component can effectively use increased support, especially in the area of training, and it is recommended that USAID seek ways to strengthen and expand its work over the remainder of the project.

5. Provide continued support to the Malawi rural piped water program as long as the GOM maintains its commitment to the community-based development approach which has been so successful to date.

   The Malawi rural piped water program, as represented by the current USAID-financed project, is probably the most successful large-scale rural water supply development program in the world. As discussed previously, the success of this program derives from its community-based self-help approach, well trained and sensitive field staff, and solid pragmatic leadership. In financing the current project, USAID has significantly contributed to the effectiveness of the program by incorporating health and sanitation elements into project utilization. The evaluation team is convinced that the USAID investment of $6 million is being well used and that the planned outputs and objectives of the project are being achieved. The team also believes that in the current context of water supply development in Malawi continuing USAID assistance of this type is worthwhile. Consequently, as long as the GOM and its implementing agency, the

DLVW, maintains its firm commitment to a community-based self-help approach to rural water supply development, the evaluation team strongly supports continued assistance by USAID.

10.2 Recommendations Supporting Project Performance

In addition to the above recommendations, which deal with the basic design and long-run implementation of the project, there are a number of immediate actions USAID could undertake to improve overall project performance and to strengthen project support within the GOM. These additional recommendations go beyond the scope of work of the WASH evaluation team, but they are believed, nevertheless, to be important to the continued success of the project.

1. Re-assess project status in early 1984.

Because of the current and impending changes in personnel and organizational structure of the RWS, USAID should closely monitor the status of the project over the next few months. Future levels of USAID support should be related to the interest and commitment of the GOM to maintaining the community-based development approach which has marked the project to date. It is recommended that USAID carry out a status reassessment early in 1984. This reassessment should include a description of progress to date and, more importantly, an identification of any major changes in project operation that may have occurred since the mid-term evaluation. The ultimate effects of any such changes should be assessed in terms of project objectives. It is estimated that one or two knowledgeable experts could carry out this reassessment within two to three person-weeks of effort.

2. Prepare a high level manpower plan for the DLVW.

The impending reorganization of the DLVW is a reflection of the need to reallocate the senior-level managerial, professional, and technical personnel resources of the department. USAID could assist the DLVW by helping to prepare a manpower plan for its professional and senior technical staff. In so doing, USAID would be able to suggest ways in which the Malawi rural piped water project could be maintained at a high level of effectiveness. It is recommended, therefore, that USAID consider such assistance as a means of protecting and possibly strengthening the project. It is estimated that one expert in human resources development and another in institutional development could develop a utilization plan for the managerial and technical staff of the DLVW over a period of four to six person-weeks of effort.

3. Sponsor study trips of DLVW officials to neighboring African countries

Further USAID assistance to the impending reorganization of the DLVW could include sponsorship of inspection visits by DLVW officials to water and sanitation agencies in neighboring African countries. The purpose of these visits would be to acquaint the DLVW officials with rural water and sanitation programs in the nearby countries. It is expected that such visits would indicate the strengths and weaknesses of differing types of water and sanitation approaches. In each of the visited countries, the DLVW officials should be encouraged to explain the Malawi program to their hosts. This will provide

greater awareness of the successful Malawi model and, most importantly, will help the DLVW officials to become fully conversant with and proponents of the Malawi rural piped water program. It is recommended that a carefully selected group of four or five senior DLVW officials visit three to five nearby countries, spending one week in each. Countries that might be included in the itinerary are Zimbabwe, Swaziland, Mozambique, Tanzania, Kenya, and Zambia. The total cost of per diem and travel is estimated to be around $25,000.

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APPENDIX A

OFFICIALS CONTACTED

USAID

Sheldon Cole	Representative
Murl Baker	Projects Officer
Clarence Groceman	Engineer - Lusaka, Zambia

U.S. Embassy

John Burroughs	U.S. Ambassador

Department Lands, Valuation and Water

D.T.G. Nyasulu	Controller
B.H. Mwakikunga	Water Engineer in Chief
S.C. deSouza	Chief Water Supply Officer
Lindesay Robertson	Principal Water Engineer (Rural)
H.Van Schaik	Senior Water Engineer
G.M. Musaya	Under Secretary
A.Singini	Project Engineer
N.L.B. Chaya	Engineer
G. Masaya	Under Secretary
Paul Appleby	Economist
R.J.V. Chrwa	Economist
W. Ankersmit	Senior Civil Engineer, Rural Low-Cost Housing Project
W.J. Lewis	Senior Water Chemist
F. Kazombo	Water Chemist
U. Leinum	Rural Low-Cost Housing Project
B.L. Makodeza	Senior Water Supervisor, Dombole Project
D.C. Alimoyo	Senior Technical Assistant Dombole Project
D.K. Kachoronda	Chairman, Dombole Water Project

Ministry of Health

Dr. M. Chirambo	Chief Medical Officer
J.C. Malewezi	Permanent Secretary
Dr. G.W. Lungu	Assistant Chief Medicial Officer
L. Chipungu	Principal Health Officer
R. Ainsworth	Principal Health Coordinator
C.S.C. Mhango	Acting Health Education Coordinator
F.K. Bangula	Primary Health Care Coordinator
Dr. A.R. Msachi	Principal Health Officer for MCH
L. Kadzamira	Chief Nursing Officer
Mr. Chizimbi	Health Planner

Ministry of Health (cont'd)

Dr. M. Gilles	Assistant Medical Officer
C.S.C. Tasankadala	District Health Inspector - Zomba
D.R. Chandiyamba	District Health Inspector - Liwonde
E.B. Mbuka	District Health Inspector - Mulanje
Mr. Majikuta	District Health Inspector - Ntcheu
Mr. Chowa	Mobile Projectionist
H.M.S. Abdul	Senior Health Assistant, Chinyamula
H.J. Oteka	Health Assistant, Ntcheu
S.K.O. Mpande	Health Assistant, Zomba
M.R. Guudo	Health Assistant, Liwonde
Mr. Milanzi	Health Assistant, Liwonde
L.P. Mandala	Health Assistant, Mulanje
S.K. Banda	Health Surveillance Assistant, Chinyamula
G.R. Ntengula	Health Surveillance Assistant, Liwonde
P. Banda	Health Surveillance Assistant, Ntcheu
C.B. Chakwana	Health Surveillance Assistant, Zomba
C.M. Nyrenda	Health Surveillance Assistant, Mulanje
Mr. Kapanga	Health Surveillance Assistant, Ntcheu
Kate West	Public Health Nurse, PCV
D. Davis	Sanitarian, PCV

WHO

Dr. S.W. Yun	Program Coordinator
S.K. Lewis	Health Education Advisor
D. N. Pugh	Schistosomiasis Expert

Private Health Association of Malawi (PHAM)

Dr. A. Klouda	Director

Ministry of Agriculture

M. Chiligo	Senior Food & Nutrition Programs Officer
R. Ayoade	Food & Nutrition Programs Officer

Center for Social Research - Zomba

L.A.H. Msukwa	Research Director
W. Ettema	Research Associate
N. Mkandawire	Research Assistant

APPENDIX B

STATEMENT OF EXPENDITURE FOR THE PERIOD [illegible] TO JULY, 1991 - U.S.A.I.D. - REIMBURSEMENT BASIS

RURAL PIPED WATER PROJECT

Head 086 - Item 035 - SELF HELP RURAL PIPED WATER SUPPLY PROJECTS

003	(a)	Tanks (Cement, Stones, R/Rods, etc.)	83,445.26
	(b)	Pipe fittings:	5,776.89
	(c)	Steel Pipes:	7,668.40
	(d)	PCV Pipes:	
	(e)	Lusalite Pipes:	
	(f)	Railways:	16,222.55
006		Plant and Vehicles:	43,892.28
008	(g)	Personal Emoluments:	5,391.77
009	(a)	Fuel	9,655.46
009	(b)	Repairs:	8,214.93
009		Running Expenses	600.38
010	(a)	Tools, Surveys, etc.	6,358.18
010	(b)	Housing:	
		TOTAL :	K90,255.62

Certified Correct

A.B. Galefo
Assistant Accountant

Certified Correct

for: SECRETARY TO THE TREASURY

APPENDIX C

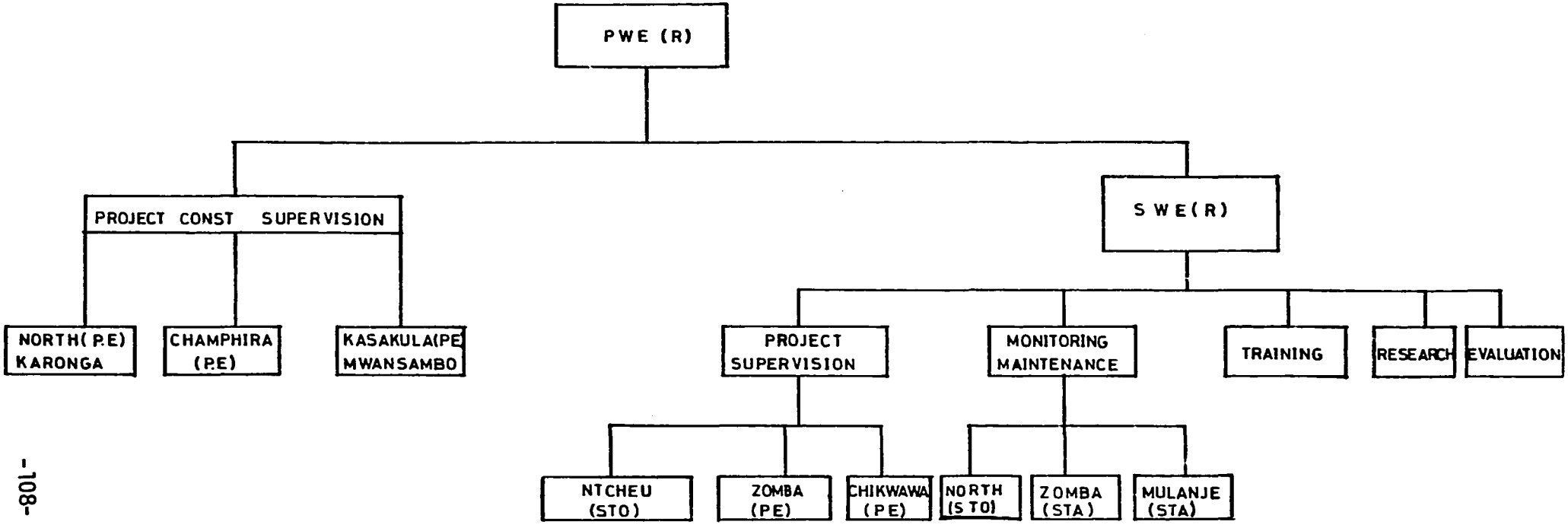
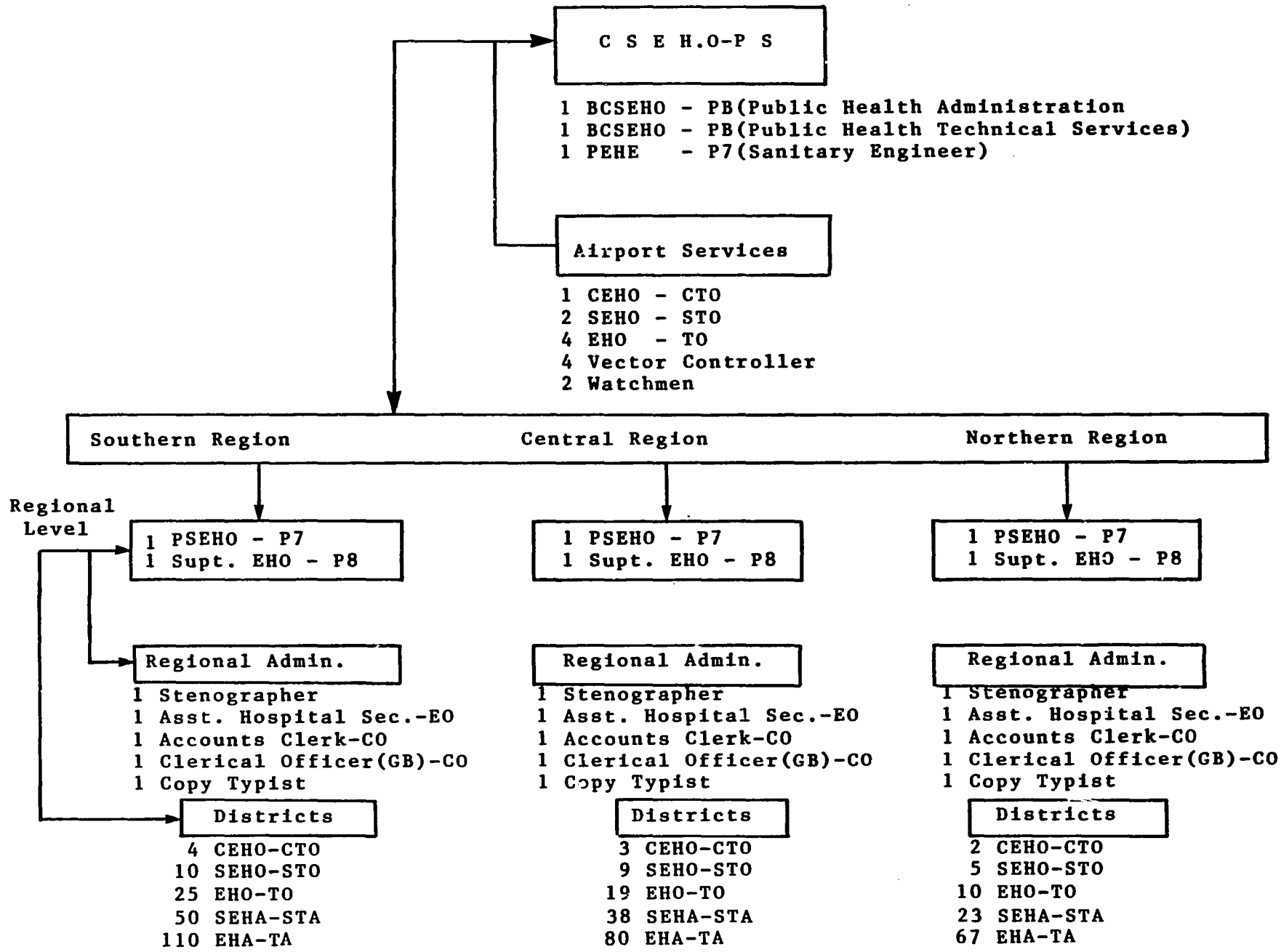


FIGURE: ORGANISATION OF THE RURAL WATER SECTION IN THE DEPARTMENT OF LANDS, VALUATION AND WATER AS OF AUGUST, 1983.

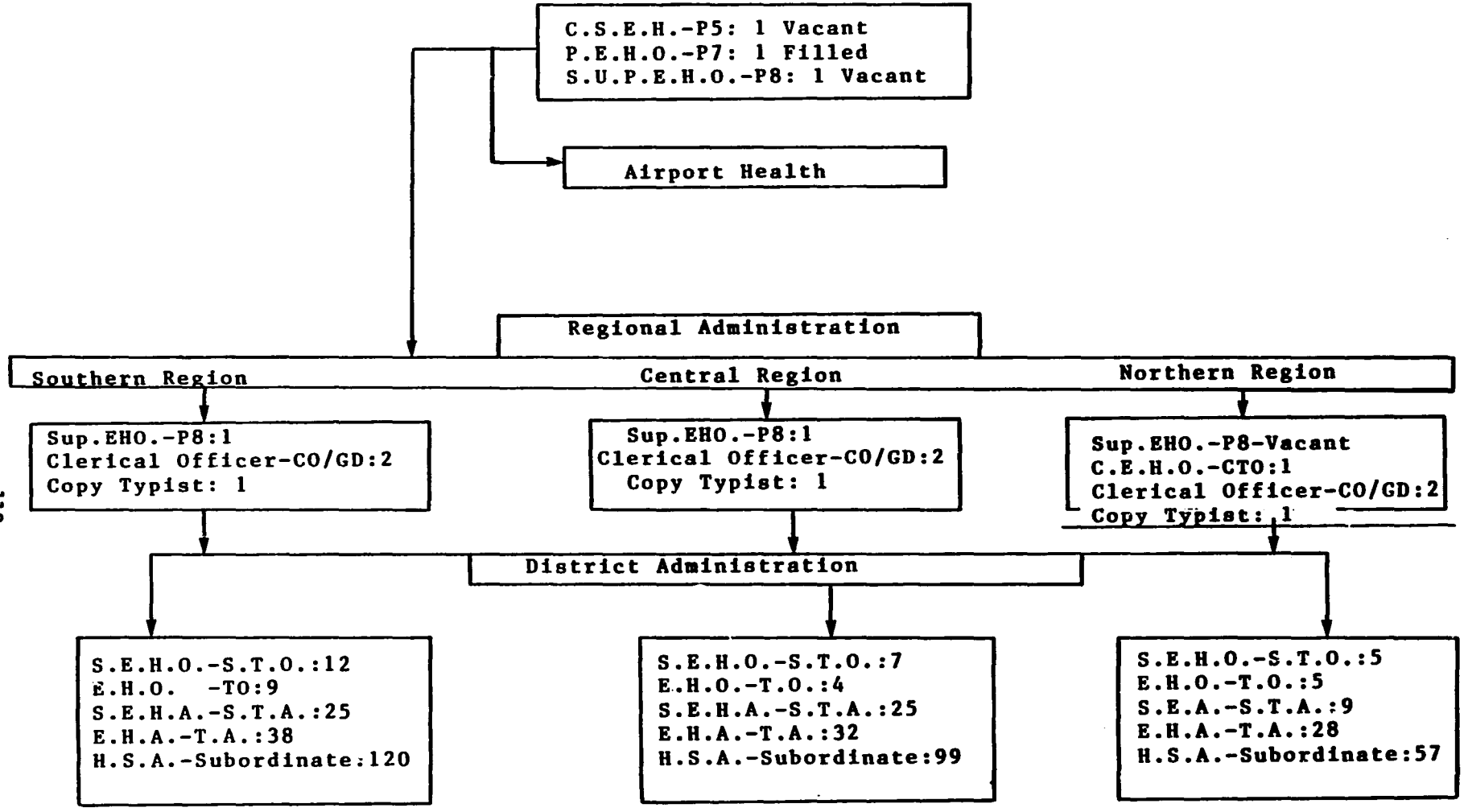
APPENDIX D

Proposed Environmental Health Services



APPENDIX E

Environmental Health Services



APPENDIX F

HESP PROJECT STRATEGY

In this section we will outline the strategy to be used in the Project: this means the steps we will take to achieve our goals and objectives. It is important to understand that this strategy is flexible. There are times when the steps we take may not always be in the same order. This presents no problem as long as everything is accomplished in the end and that confusion is avoided. First we will present an outline of the steps followed by a detailed description of each step of the strategy. Some steps are described in more detail in other sections. Where this is so you will be directed to refer to that section.

Steps in the Project Strategy

1. Selection of Target Villages
2. Meet with Traditional and Party Village Leaders
3. Hold Village Meeting
4. Election of VHC
5. Regular VHC Meetings
6. Baseline Village Inspection
7. VHC Training
8. VHC Follow-up Visits
9. VHC Compliance
10. VHC Health Education Course
11. VHC Assignments
12. Continued VHC Follow-up Visits
13. VHC Refresher Courses
14. Follow-up Village Inspections

The chart on the following page show the flow of these steps.

5.1 Selection of Target Villages

Each piped water project serves a number of villages. Usually a village has one or more taps, but sometimes only part of a village is served by taps especially if the village is large. How a village is defined is up to each field worker. In some cases you will find small villages which are really a group of people

who have split off from a larger village to move to an area where more farming land is available. It should be kept in mind that the reason for identifying villages is that they are the basic management unit we will deal with in this project.

If a village is served by the water project, it is known as a Project Village. Since we cannot begin working in all Project Villages at the same time, we must select certain villages with which to phase-in our activities. As these villages are selected, they will be called Target Villages. Each field worker (HA or HSA) will be assigned a certain number of Target Villages which will make the work loa for the field worker. After an initial assignment (of 5-10 Villages) additional Target Villages will be selected depending on progress in the original group of Target Villages. Target Villages should be selected relatively near to the field worker's duty station. There is no need to choose Target Villages far from the duty station until the nearby ones have been brought into the project.

As Target Villages are selected, they should be entered on Form HESP 1 and the Project Supervisor notified (See section). Such selection will normally follow from instructions from the Project Supervisor to do so.

5.2 Meet with Traditional and Local Party Officials to Explain Project

Before beginning your activities in Target Villages you should meet with the Headman, local Malawi Congress Party Chairman, Ward Counsellors, Village Elders and other important, influential people. Explain to them that their village has been selected as a Target Village in the Health Education and Sanitation Promotion Project. You must do your best to obtain the support and cooperation of these leaders. Do not miss the opportunity to explain the connection between water, sanitation and health. Ask them what the major health problems of the village are. Discuss ways in which these problems could possibly be solved by working together.

It is this group of Village Leaders who will help organize the next step (Village meeting). If you do not believe these Leaders genuinely wish to cooperate, do not force things; instead, consult your Project Supervisor who can help you work out the difficulties of cooperation (possibly by further discussion or by contacting higher authorities such as the Traditional Authority or Area MCP Officials).

Explain to the Leaders what your activities in their village will be (electing VHC, VHC training, Village Inspectors, etc.), and why their active cooperation is necessary.

5.3 Hold Village Meeting to Explain Project

When the Village leadership has agreed to cooperate, you should call together the whole village for a meeting to explain briefly what your activities will be with the Project. This would be a good chance to try some creative health education: tell a story or act out a drama which illustrates an important health concept. You should also explain the need to elect a Village Health Committee; especially important to the village are the characteristics of a good Health Committee member. A discussion of these characteristics is found in the next section.

5.4 Election of Village Health Committee

How this election actually takes place will vary considerably depending on the particular part of the country you work in. The important thing to realize, however, is that this process of election is entirely the responsbility of the village. You should do your best to influence the village as to the characteristics of a good VHC member, but do not try to influence them as to specific individuals. The choice should be left up to them.

What are the chracteristics of a good VHC member? There are some obvious ones such as:

Honest

Hard Working

Active Member of Community

Respected by Community

Lives in Village, not Absent for Long Periods of Time

These characteristics are, of course, essential and should definitely be looked for in choosing VHC members.

There are other characteristics which may not be as obvious and you will need to carefully discuss them with village leaders.

Must be Open to New Ideas

During the VHC training many new ideas will be discussed. VHC members must be willing to openly discuss and consider these new ideas. A certain resistance to change is evident in all people, wherever they come from. Some, however, are more open than others: these are the ones who should make good VHC members.

Education is Not as Important as Other Characteristics

Some years of schooling might be helpful, but not absolutely important. There will be little or no reading and writing required. Most of their training will be through discussion or the use of pictures.

Women or Men

Both should be on the VHC. You should do your best to influence the village that women must be members of the VHC. They are the ones more actively engaged in the health of their families and activities around water. How many members should be women? That is a difficult question and should be left to the village after you have discussed with them the importance of having women as members of the VHC.

Willingness to Cooperate with the Project

To demonstrate their cooperation with the Project, VHC members will be asked to do certain things. These things include:

Constructing a latrine

Constructing a bath house

Constructing a dish rack

Digging a refuse pit

Properly store drinking water

These will be discussed fully during their training course, but they should know before accepting membership or the VHC that these things will be asked of them.

Young or Old

Age is not really important as long as other characteristics are met. It might be argued that a young person will not have the full respect of the village. Do not forget, however, that there are other members and the VHC works as a team. One or two younger members may be useful in dealing with the health problems of young persons in the village.

To summarize, the desirable characteristics of VHC members will be listed again:

- Honest
- Hard Working
- Active Members of Village Community
- Respected by Village Community
- Lives in Village; not Absent for Long Periods of Time
- Open to New Ideas

- Education not as Important as Other Characteristics
- Women as Well as Men
- Willingness to Cooperate with Project
- Young as Well as Old

There are probably other desirable characteristics, but these are the most important.

You should refer to section 6 for more information about Village Health Committees.

5.5 Regular VHC Meetings

Once the VHC is elected, you should encourage them to meet regularly. This means once or twice a month, or something like that. They will possibly want you to be there to meet with them. The purpose of these meetings is to discuss village health problems, think of solutions, and in general help VHC members begin to see themselves as responsible for the health of the village. Where they meet is up to them: a nearby school or church, or under a mango tree.

It is probably best if they stay to very real problems they see around them. For instance: someone's child has died. Why? What was done for the child? Did the parents understand the child's illness? Did they take the child to a health unit? Or another example: some people leave their pigs to wander about freely, their droppings making a mess of the surroundings of all houses in the village. What should be done about this? Who are the people who let their animals roam freely? How could they be asked to control them?

These are a few simple examples, but the type of things which would be valuable for the VHC to discuss amongst themselves. Much of this will make more sense after they have had their training, which is described in 5.7. Nevertheless, even if such meetings take place before their training, this discussion process will make their training even more meaningful. By all means, continue to urge them to meet after their training.

5.6 Baseline Village Inspection

At any time after the village meeting the HA or HSA should perform a Baseline Village Inspection. See Section__ for details as to how to perform this inspection. The information collected will be useful in knowing from where we have started and whether progress is achieved when we perform future village inspections.

5.7 Village Health Committee Training

This step in the strategy is probably the most important: it must be accomplished with imagination, sensitivity and diligence. This is the step which will make our efforts a success or a failure.

The actual training process will be described in Section 6; in this section we will only describe some of the highlights of the training programme.

The important thing to remember is that training must be performed in a way that is acceptable to the VHC members. To do this, we must find out what the VHC members know and then build from there. It will not be possible to treat VHC members as if they are school children who will sit and listen to us lecture them. If you think about how people in villages learn about new ideas, you will realize that the only time they would learn in a classroom setting is when an outsider gets them together to do so. Usually they learn by discussion, telling stories and even gossip. If we can adjust our ways of teaching to their ways of learning, then we have a chance of succeeding.

People will also be much more interested in a training programme that they help to shape. That is why we should proceed in a way which helps them identifying their own problems and priorities. We will be more successful if we begin our teaching with things about which they are already motivated.

It will be necessary, however, to limit our initial training sessions to topics the Project is designed to deal with. These are:

- Water/Sanitation/Health Relationship
- Excreta disposal
- Personal hygiene
- Environmental cleanliness
- Drinking water storage
- Waste disposal
- Diarrhoeal diseases
- Skin diseases
- Eye diseases
- Intestinal worms

In the process of doing so we will be encouraging VHC members to construct:

- Latrines
- Bathing houses
- Refuse pits
- Dish racks

And to learn to treat:

- Dehydration
- Conjunctivitis
- Scabies, lice
- Intestinal worms

After these topics have been thoroughly covered, consideration may be given to additional topics. The purpose of training the VHC is to provide them with informa-

tion which will modify their attitudes and motivate them to change their behaviour concerning water-related illnesses. It is not certain how long this training will take since this depends on how quickly a particular VHC progresses, but most likely 5 days would be necessary (spread over several weeks).

The VHC training will take place in their own village; the field worker will travel to them. They can decide upon a meeting place in the village.

5.8 VHC Follow-up Visits

After the training has been satisfactorily accomplished, it will be necessary for the field worker to make repeated visits. Each time there will be a meeting with the VHC, their households will be observed to see if they are making appropriate changes in their behaviour if not already correct (eg., building latrines, properly storing water). If not, the reasons why will be discussed with them and continued encouragement will be provided.

5.9 VHC Compliance

When VHC members have satisfactorily accomplished certain tasks, they will be said to have complied. This means the following:

- Construct a latrine
- Construct a bath house
- Construct a dish rack
- Dig a refuse pit
- Properly store drinking water.

Since it is probably impossible to expect 100% compliance, we will consider 80% as satisfactory. That is, when 8 of the 10 members have latrines, and 8 have refuse pits, etc., we will consider this satisfactory compliance.

The point of asking for compliance with these tasks is that we must concentrate our efforts on the VHCs. There are too many village families for us to reach them all. Our strategy is that if we can effect appropriate behaviour change in the VHC, then they will help bring about change in the rest of the village. To assist this process, once the VHC has achieved compliance, we will train them to be community educators, as is explained in the next section.

5.10 VHC Health Education Course

After achieving satisfactory compliance, the HA or HSA will provide a further training course, probably lasting two days, which will cover techniques of community health education. Visual aids will be provided to the VHC as well as training in how to develop their own visual aids. The approach again will be shared planning and problem solving.

The strategy is to develop VHC members into effective educators of their neighbors.

5.11 VHC Assignments

After completing the health education course, each VHC member will select an assignment on which to work. Such assignments will vary, but examples are that some members can be assigned latrine promotion, others refuse pits, and others rehydration methods. These assignments will be "specialties" based upon their own specific talents and interests. This should assist them in limiting the scope of what each individual member is responsible for. Some might take a more general assignment, however, which covers several areas. The point here is to give each member a definable responsibility. This should assist them in educating and motivating their neighbours.

5.12 VHC Refresher Courses

As they progress with their work of educating their community, VHC members will need, and undoubtedly ask for, continued inputs in the way of new health information. They may also wish to review what they have already learned and perhaps partially forgotten. HAs and HSAs will provide such continuing education by holding refresher courses. Again, these will be in the VHC's village and conducted by discussion methods.

5.13 Continued Follow-up Visits

To continue to encourage and support VHCs, HAs and HSAs will maintain regular and frequent contact with them. As with the follow-up visits described in section 5.8, these visits will mainly be with the VHC members, but such members should be encouraged to discuss with you what they are doing to educate their fellow villagers. They should discuss specific cases with you and take you to see families with which they are specially concerned. These follow-up visits will continue indefinitely.

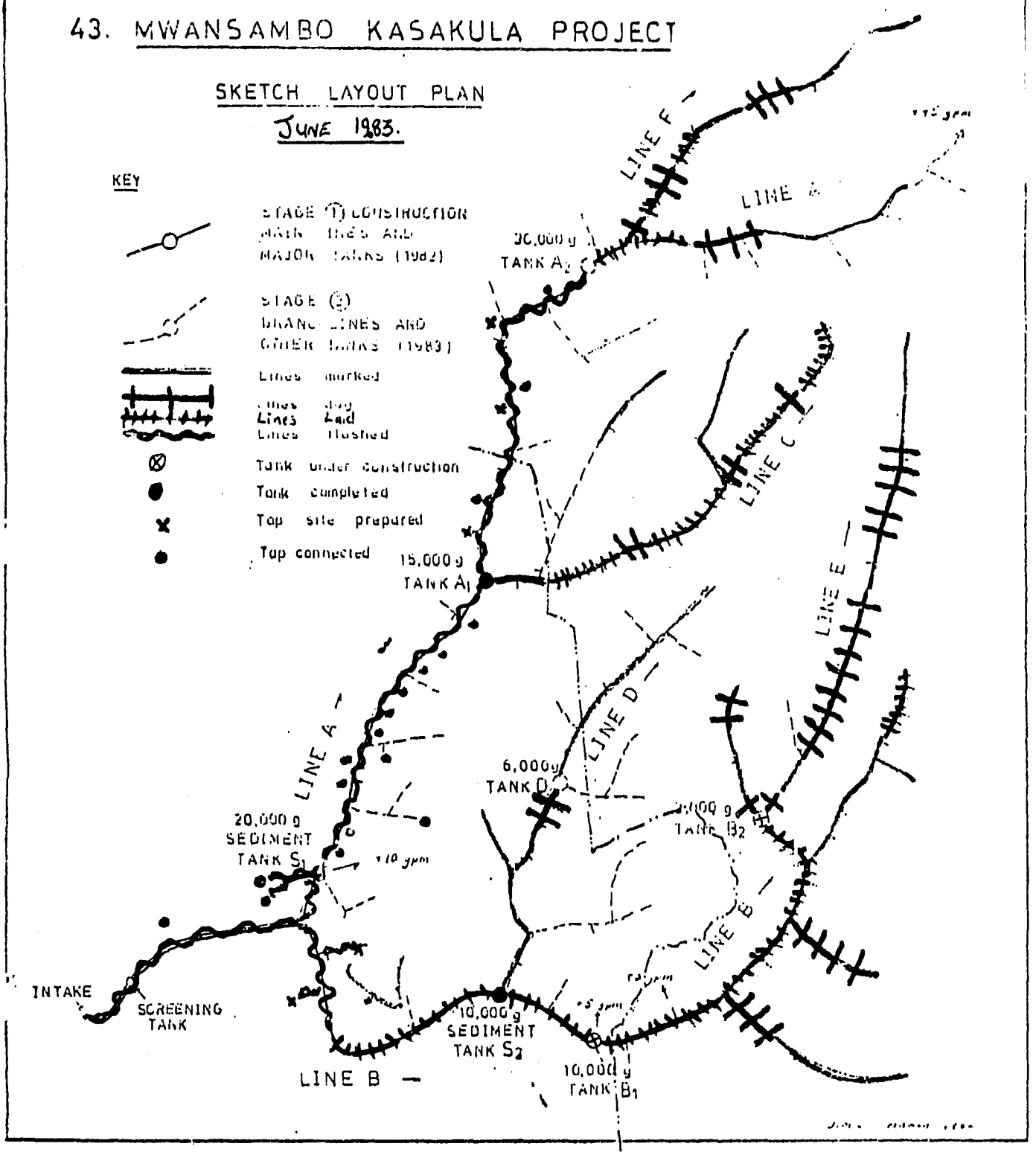
5.14 Follow-up Village Inspections

These Inspections will be conducted in the same way as the Baseline VI described in section 5.6. Such follow-up VIs will allow us to monitor our progress; they will be performed every six months.

5.15 Conclusion

It is the intention of this strategy to put increasing amounts of responsibility on the Village Health Committee. They will become promoters of hygiene and sanitation and know how to and be interested in educating their neighbours. In this way we will have greatly multiplied our efforts in spreading the message about water, health and sanitation. Our role therefore is to facilitate, to help and assist people towards good health; not to do things for them.

43. MWANSAMBO KASAKULA PROJECT



APPENDIX H

Forms for the Collection of Data for Monitoring Systems

Intake
Inspection Report Form

(2)

PROJECT:..... RIVER:.....

S.M.A. :..... DATE:.....

Intake inspection is done by S.M.A. on routine basis four times a year (January, April, July and October).

Inspection covers visual examination on wear of head works (intake up to screening tank) and flow measurements of each intake pipe.

1. GENERAL EXAMINATION

- INTAKE PIPES	1	2	3	4	5	6
DEPTH UNDER WATER (CM)						
HOLES OPEN/CLOSED						
RUST INSIDE INTAKE PIPES YES/NO						
RUST INSIDE HOLES OF PIPES YES/NO						

- Wear on concrete

  Intake box intact : Yes/No, repair required Yes/No.

  Pipe in intake : Yes/No, repair required Yes/No.

  Pipes from intake to screening tank intact/leaking/damaged if replacement required, how many?..... What size .....

- Condition of screening tank
  - Frames - Good/Bad If bad repaired Yes/No
  - Concrete - Good/Bad If bad repaired Yes/No

2. FLOW MEASUREMENT

- Sites of screening tank : Width:..... CM. Length ..... CM, Height Height:..... CM of inlet box only
- No of pipes into screening tank and sizes.....

INSTRUCTIONS:
- Close all gatevalves of inlet pipes
- Drain inlet box of screening tank
- Close scour pipe of inlet box
- Open gate valve pipe No. 1 quickly and record time in seconds
- Wait till inlet box starts over flowing and record time again
- Fill in time to fill inlet box in seconds on record sheet
- Close gatevalve pipe 1 and open scour inlet box
- When inlet box is empty, repeat procedure for pipes 2, 3, 4 etc.
- After having measured the flows in all pipes, repeat whole procedure for all pipes again

TIME TO FILL INLET BOX OF SCREENING TANK

	Pipe 1 Size...inc	Pipe 2 Size...Inc	Pipe 3 Size...Inc	Pipe 4 Size...Inc	Pipe 5 Size...Inc	Pipe 6 Size...Inc.

Department of Lands, Valuation and Water

~~RURAL~~ WATER SECTION

PIPELINE INSPECTION REPORT - M5

Station .... Line ....

Project .... Dates; from .... to ....

Region .... Monitoring Assistant ....

Report on all of the following: 1. Air Valves; 2. Flush Points; 3. Sluice Valves; 4. Gate Valves; 5. Garden Ridges; 6. Check Dams; and, 7. Paspalum. All valves must be: 1. protected; 2. not covered with earth; 3. completely open; and, 4. not leaking. Depress the plunger on PVC airvalves. Pipeline ridge must be connect to garden ridges.

Description of Object	Object is between taps no.		Village	If work is required describe it.	Date for reinspection if required

VILLAGE TAP INSPECTION REPORT

Region: _____ Month/Year _____ copy 1: Station

Project: _____ Name: _____ 2: SPA

Station: _____

Village	Date	Time of Day	Time to Fill 20 Litres (minutes)	Tap Leaking Yes	Tap Leaking No	Concrete Cracked Yes	Concrete Cracked No	S.A. Pit Full Yes	S.A. Pit Full No	Ridge Present Yes	Ridge Present No	Pasplum Planted Yes	Pasplum Planted No	Gate Vlv Protect Yes	Gate Vlv Protect No	Spare Washer Yes	Spare Washer No	Site Clean Yes	Site Clean No	Committ. Active Yes	Committ. Active No	Date You Plan to Reinspect If Required	Additional Comments If Required

-123-

No. TRU 3/2(1) Imp. no. 1 NA

10 MAY 1983

(7)

STORES CONSUMPTION ON MAINTENANCE

MONITORING ASSISTANT:.....STATION:.....PROJECT:.....MONTH:.....YEAR:....

DATE	BRANCH	SOLVENT CEMENT (TINS)	CLEANING FLUID (TINS)	HACKSAW BLADES	RAG YARDS	P.V.C. PIPE		A.C. PIPE		TAPS	WASHERS	GATE VALVES		FITTINGS DESCRIPTION	SIZE	NO.	OTHER
						SIZE	LENGTH (M)	SIZE	LENGTH (M)			SIZE	NO.				

Department of Lands, Valuation and Water

Station .....

RURAL WATER SECTION

Monitoring Assistant .....

Project .....

RECORD OF AC PIPE BREAKAGES - M7

Date Reported	Date Repaired	Location (Give line and place on line by listing the nearest tap numbers or branch lines.)	Pipe Size	Class	Description of breakage							Surrounding Soil				Probable Cause of Breakage									
					Pipe cracked along length	Pipe broken at one end	Pipe broken in middle	Collar broken	Pipe scored	Spigot twisted or pushed out of socket joint		Makande (Clay)	Tuffaceous (Lateritic)	Kalolo (Rocky)	Mchenga (Sandy)	Bad levelling	Pipe laid on rocks	Rocks used in backfill	Rubber not inserted well	Hlisi (Roots) in trench	High pressure	No Central rubber	Pipe was filling	Sluice Valve was being operated	

Department of Lands, Valuation and Water

RURAL WATER SECTION

RECORD OF PVC PIPE BREAKAGES - M8

STATION .....

Project .....

Monitoring Assistant.....

Region.....

Date Reported	Date Repaired	Location	Repaired by-Name	Pipe Size	Class	Probable Cause of Breakage										
						Bad Joint	Too much Solvent cement	Pipe deformed before laying	Eaten by Nafuko	Accidently cut	Vandalism	Pipe laid on rock	Pipe washed out by rain	Roots in trench	Other	

Department of Lands, Valuation and Water

RURAL WATER SECTION

RECORD OF WORK THAT NEEDS TO BE DONE BY THE COMMUNITY - M12

Station .... Monitoring Assistant ....

Project .... Region ....

This form is due one month after the orginal inspection report is due.

Village	Line/ Tap No.	Date of Inspection	Date of Re-inspection	Work Required to be Done	Date Work Completed

COMPLETED PROJECTS
RURAL PIPED WATER PROJECTS IN MALAWI

1983

PROJECT	DISTRICT	REGION	POPULATION INVOLVED	LENGTH OF PIPING (KM)	NUMBER OF TAPS	COST OF MATERIALS	DATE COMPLETED
1. CHINGALE	Zomba	South	5,000	40	35	K 6,000	1969
2. CHAMBE	Mulanje	South	30,000	96	180	64,000	1970
3. MTOTI	Mulanje	South	6 000	24	45	12 000	1971
4. CHILIMA	Mulanje	South	2,000	10	14	4 000	1972
5. NGONGA	Rumphi	North	2 000	17	20	6 000	1972
6. MBUJU	Rumphi	North	1,000	19	21	7 000	1973
7. CHIPEK MULE	Kasupe	South	700	2	7	1,000	1974
8. IGHEMBE	Karonga	North	4,000	17	36	7,000	1974
9. MULANJE EST	Mulanje	South	75,000	237	460	170,000	1975
10. LUZI	Nzimba/Rumphi	North	8,000	59	42	24,000	1975
11. CHIPUNKU	Chitipa	North	4,000	25	51	12,000	1975
12. CHILUMBA	Karonga	North	4,000	17	29	8,000	1975
13. CHILOLE	Ntcheu	Central	1,200	6	12	2,000	1975
14. PHALOMBE	Mulanje	South	100,000	400	600	500,000	1977
15. BOMA	Dedza	Central	1,400	8	10	5,000	1976
16. MCHINJI	Mchinji	Central	20,000	136	116	52,000	1976
17. CHIRA'A	Kasupe	South	7,000	80	95	15,000	1976
18. MALIPSILO	Ntcheu	Central	1,000	6	9	3,000	1977
19. LIFANI	Zomba/Kasupe	South	20,000	100	140	72,000	1977
20. RUMPHI	Rumphi	North	8,000	42	42	30,000	1977
21. MKHAMANGA	Rumphi	North	12,000	75	120	134,000	1978
22. LIPUZU	Ntcheu	Central	6 000	24	25	20 000	1978
23. MANTHEMBO	Chiradzulu/Mulanje	South	60 000	280	360	480 000	1979
24. SOMANI	Mulanje	South	40 000	184	300	240 000	1979
	TOTALS		418,300	1914	2769	K1,874,600	

COMPLETED PROJECTS

RURAL PIPED WATER PROJECTS IN MALAWI 1983

	PROJECTS	DISTRICT	REGION	POPULATION INVOLVED	LENGTH OF PIPING LAID	NUMBER OF TAPS	COST OF MATERIALS	DATE COMPLETED
25.	NTCHEU	Ntcheu	Central	25,000	120	140	120,000	1980
26.	LIMBANGO	Mangochi	South	12,000	43	48	50,000	1981
27.	ZOMBA(DOMASI)	Zomba	South	100,000	448	700	711 000	1981
28.	LUMASI	Mzimba	North	8 000	80	54	70 000	1981
29.	MULANJE	Mulanje	South	9 000	27	55	40 000	1980
30.	MULOZA	Mulanje	South	32,000	150	180	120 000	1980
31.	LIMBIYA/ MULOZA	Mulanje	South	46,000	168	270	190 000	1982
32.	KASONGA	Kasonga	North	30,000	195	250	290,300	1983
33.	MACHINGA	Machinga	South	70,000	571	450	926,600	1983
34.	CHITIPA	Chitipa	North	3,000	21	35	66,500	1983
	Total Carried forward							
	TOTALS COMPLETED PROJECTS			753,300	3737	4951	4,458,400	

APPENDIX J

RURAL PIPED WATER PROJECTS U.S.A.I.D. PROGRAM

APRIL, 1983

	PROJECT	DISTRICT	REGION	POPULATION INVOLVED	LENGTH OF PIPING	NUMBER OF TAPS	COST (K)
1.	(35) LIWONDE	MACHINGA	SOUTH	23,000	118	144	222,000
2.	(36) KASINJE	NTCHEU	CENTRAL	14,000	64	95	75,000
3.	(37) NANYANGU	NTCHEU	CENTRAL	20,000	105	131	184,000
4.	(38) IPONGA	KARONGA	NORTH	5,600	24	35	67,000
5.	(39) CHITIPA	CHITIPA	NORTH	40,000	325	300	136,000
6.	(40) MWANZA	CHIKWAWA	SOUTH	40,000	218	400	777,000
7.	(42) CHIMALIRO	MZIMBA	NORTH	24,000	167	154	236,000
8.	(43) MWANSAMBO/ KASAKULA	NKHOTA KOTA/ NTCHISI	CENTRAL	25,000	60	145	157,300
9.	(44) MISUKU	CHITIPA	NORTH	3,700	17	26	40,900
10.	(45) SUMULU	MACHINGA	SOUTH	23,500	80	100	261,000
11.	(46) MIRALA	MACHINGA	SOUTH	13,000	56	81	108,000
12.	(47) MAKWAWA	ZOMBA	SOUTH	16,000	68	101	93,000
13.	(48) ZOMBA SOUTH	ZOMBA	SOUTH	120,000	550	1,000	1,610,000
14.	(49) CHIMALIRO SOUTH	MZIMBA	NORTH	32,000	221	200	400,000
15.	(50) ZOMBA WEST	ZOMBA	SOUTH	60,000	340	353	590,000
16.	(51) MSAKA	MZIMBA	NORTH	3,000	37	35	50,000
				462,800	2,450	3,200	5,007,200

APPENDIX K

July, 1982

SELF HELP RURAL WATER PROJECT : 612— 0207