SMALL RURAL WATER SYSTEMS PROJECT EVALUATION

THE YEMEN ARAB REPUBLIC

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One may not doubt that somehow, good
Shall come of water and of mud
And, sure, the reverent eye must see
A purpose in liquidity

But somewhere, beyond space and time,
Is wetter water, slimier slime.

Rupert Brooke (1887-1915)
"The Hill"

INDEX OF CONTENTS

Chapter	Title/Subtitle	Page
I	Executive Summary	1
II	Findings, Recommendations and Lessons Learned	
	Findings	4
	Recommendations	6
	Lessons Learned	8
III	Background and Purpose of the Evaluation	
	Brief History	9
	Summary of Results of 1982 Evaluation	11
	The Current Evaluation	13
	Evaluation Methodology	14
IV	Engineering Analysis	
	Adequacy of Staffing	17
	Subproject Designation	18
	Surveys	19
	Plan and Preconstruction Report	20
	Construction, Inspection and Followup	20
	Design Criteria	21
	Organization	22
	General Observations	22
V	Social Impact Analysis	
	Innovative Spin-off effects	24
	Water Rights and Allocation	28
	Use of Gate Valves	29
	Project Selection	30
	Conclusions	31
VI	Health and Sanitation	
	Health Impact	32
	Sanitation	32
	Cooperation with the Ministry of Health	33
VII	Institutional Development	
	Technician Training	35
	Village Maintenance Course	36
	Other Training/Manpower Issues	36
	Related Issues	38

VIII Economic, Financial and Policy Considerations
Subproject Construction Costs 40
Capital Cost Recovery 41
Recurrent costs 43
AID Domestic Water Policy 47

IX Other Issues
The Role of the Peace Corps 52
Comparative Projects 55
AID and NTF Project Management 56
Toward a Water Sector Assessment 57

TABLES

I - Recurrent Costs 45
II- Project Design Factors 50

APPENDICES

A - Evaluation Team Field Visits
B - Bibliography
C - Individuals Interviewed
D - Subproject cost summary
E - Scope of Work for Evaluation

List of Abbreviations

MPW - Ministry of Public Works
YARG - Yemen Arab Republic Government
RWD - Old initials for RWSD
RWSD - Rural Water Supply Department, MPW
NTF - The New TransCentury Foundation
AID - The Agency for International Development
USAID - The AID mission in Yemen
PC - Peace Corps
PCV - Peace Corps Volunteer
lcd - liters per capita per day
gpm - gallons per minute
COP - Chief of Party
O&M - Operations and Maintenance
M&R - Maintenance and Repair
YR - Yemeni Rials 4.6YR = $1.00

CHAPTER I
EXECUTIVE SUMMARY

The purpose of project 044, Small Rural Water Systems, is dual: to improve the quality of life of the rural poor through improved access to potable water for domestic use and to improve the Ministry of Public Works, Rural Water Supply Division's (RWSD) capability to carry out the tasks associated with the development of these systems.

As with most projects, the evaluation team found it easier to measure and quantify outputs in concrete terms than impacts. This was especially true for project 044 since the last evaluation had recommended dropping attempts to collect socio-economic baseline data.

With respect to verifiable indicators of project progress:

- TransCentury/RWSD have complied with the requirements of the 1982 evaluation:

  -- TransCentury has provided an excellent Chief of Party for the team.
  -- RWSD has provided a counterpart whose time is freely available to TransCentury. (In addition, RWSD, has provided high level part-time training and engineering counterparts.)
  -- RWSD has provided technicians to be trained (five were required, now there are thirteen).

- Project 044 has constructed 29 small water projects of good to excellent quality through October 1, 1983 with three more completed during early October, putting it right on schedule for the planned completion of 55 non-earthquake related projects by September 1984

- Project 044 has conducted on-the-job and classroom training for 28 trainee/technicians and for village operations and maintenance personnel.

- In the villages where projects have been completed, the villagers have created adequate maintenance and repair systems and are collecting funds and managing recurrent costs in a satisfactory manner

With regard to general project operations:

- management of the survey, design, and construction of subprojects is excellent as evidenced by: quality of

- completed projects, construction being on schedule, and survey/design work being ahead of schedule.

- the Ministry's rate of presentation of subprojects, and the geographical grouping of subprojects (which permits more economical surveying and a better opportunity for site selection under the site selection criteria) has improved immensely and is quite sufficient for proper management and timely implementation.

- TransCentury has established excellent relationships with the Ministry and the Rural Water Supply Division through both the quality of its work and the appropriateness and characteristics of its staff, particularly the Chief of Party.

- The institutionalization focus on the training of technicians in construction supervision skills, which was prescribed in the 1982 evaluation, has produced three Yemenis who are now almost fully qualified to independently supervise construction.

- the Peace Corps Volunteers involved in the project play a vital role and have helped reverse the YARG's/Ministry of Public Works' attitude toward volunteers in general.

<u>With regard to social, health, and economic benefits, the team must be more cautious about conclusions but feels the following statements can be made</u>:

- the quality of life resulting from both increased availabity of water (health implications) and reduction of female and child time spent carrying water (social, educational and productive implications) has been improved as measured through:

  -- Observably cleaner children.

  -- People's statements that they are drinking more water.

  -- People's statements that they are washing their children more often.

  -- Measurable time saved for getting water.

  -- Villagers' expressions that their lives have been improved by the new water systems.

However, actual improvements in health status are impossible to substantiate given the lack of both baseline and longitudinal data. The newness of most of the completed systems (about 18 months) also makes it difficult to measure social impact although it appears that, contrary to the expectations of the project designers that, given more easily accessible water, people would use water in new and innovative ways, people are basically doing the same things as before, only more of them. It is quite possible that the original project designers overestimated the speed with which change occurs in such a traditional society.

In summary, the team feels that the project is going well, is producing appreciated, tangible evidence of U.S. involvement in Yemen's development, and conforms to AID policy. Further, we recommend that the project be extended for five years in order to continue and expand the institutionalization which has been begun and which now, given the excellent working relationships TransCentury has established and the increased emphasis the Ministry is putting on building up their own capabilities, has an excellent chance of succeeding. In order to do this the project will need to continue to build small water systems but the focus should change to one where the systems become the "classrooms" for technician training and small, innovative health and sanitation interventions.

CHAPTER II
FINDINGS, RECOMMENDATIONS AND LESSONS LEARNED

Findings:

1. Rate of Presentation and Selection of Subprojects. The rate of presentation and selection of subprojects by the MPW has improved greatly since the 1982 evaluation and is now quite satisfactory.(p.19)

2. Planning and Data Gathering: Planning and data gathering related to the technical details of subprojects is good. (pp.19&20) Data gathering relating to health and socio-economic information was deemphacized as a recommendation in the 1982 evaluation and therefore is very limited.(p.32) Financial planning and data management needs improvement.(p.56)

3. Final Project Inspection, Payments and Startup, Initial Operation and Acceptance: Final project inspection is satisfactory.(p.20) Contributions to investment costs are made by the village/LDA's before the project begins.(p.41) While initial start-up problems have occurred in a few instances (e.g. the pump and engine have not been delivered from RWSD), this is the exception rather than the rule.(pp.22&23) Acceptance by villagers of the completed systems is excellent as demonstrated by their own efforts to finance recurrent costs and system maintenance and repair.(pp.43&44)

4. Project Survey Data Questionnaire Effectiveness: TransCentury has not been using a standard survey document. However, the information they are gathering is sufficient from an engineering standpoint and we do not feel there is any advantage to having a single format at that stage.(p.20) TransCentury does use a standard preconstruction report. On the recommendation of the 1982 Evaluation it does not contain any socio-economic or health data. Before any decision to increase the amount of data gathered, more thinking needs to be done about the main purposes of the project (health? village development? political unification?) and the uses to which such information would be put.

5. Project Replicability by the MPW: The Ministry of Public Works cannot yet replicate the quality of TransCentury's work because of the shortage of trained staff.(p.35) As TransCentury is very highly throught of by the Ministry of Public Works and the Minister is already talking with Transcentury about a substantially expanded training

program, we feel that at the end of the proposed five-year extension that the Ministry will have the capability to do what Transcentury is doing.(Ch.VII)

6. Reporting Proceedures: The quarterly and semi-annual reports and reporting proceedures are adequate for AID oversight.(p.56)

7. Appropriateness and use of Peace Corps Volunteers and their Impact on the Project: The use of the PCV's is appropriate and plays a key role in the success of the project.(pp.52-54)

8. General Assessment of the Overall Long Rance Requirements for Similar Rural Water Projects in Yemen, Together with Order of Magnitude costs and Institutional Requirements for Implementation. By Ministry of Public Work's estimates they have completed only 14% of the small water systems needed. UNICEF estimates that there are 5000 villages or combinations of villages which have water systems and that almost all of them need improved systems. Presuming that 14% of these have now been helped, 4300 systems remain to be aided. At the current implementation rate of 150 to 200 sytems or system improvements a year for the RWSD and all donors, the YARG cannot possibly aid them all within the current five-year plan. Even if it had the institutional capacity to expand rapidly, the costs of such expansion would be prohibitive. (Assuming villagers and other donors would contribute two-thirds, the Yarg would still have to supply between $70 million and $110 million, an amount beyond their current means.)

9. Terms of Reference for the Water Sector Assessment to be Conducted in Early 1984: The team feels that development of the terms of reference should be delayed until the Spring.(p.57)

10. Assess the Extent to Which Women are or have been involved and the Effects on Women of the New Water Systems. Women appear to be actively involved in decisions such as the location of "tee" connections and provide food for the workers and sometimes labor during construction. In two of the water systems, women are in charge of operations and maintenance. While the project has clearly reduced the amount of time women spend gathering water, the women use the time gained to do more of what they did before (cooking, cleaning, child care, animal husbandry, etc.), the time does not all suddenly get allocated to financially productive activities.(Ch.V)

Recommendations:

There is no need to make any major substantive changes in operations under the current Cooperative Agreement; the overall performance of TransCentury against planned activities and outcomes, as amended by the 1982 evaluation, is very good. However, any of the recommendations regarding extension and/or expansion of the project could be incorporated as amendments to the current project as long as they do not require additional funds before any AID commitment to extension.

Project Design

1. The project needs to focus more on institutional development now that it has established a smooth process for water system survey design and construction.(Ch.VII)

   - The subproject survey, design and construction should be viewed as field "classrooms" even more than is currently done.

   - Technician training should be expanded to cover a second technician category who would learn to do survey, design and estimation work under this project.

   - Consideration should be given to topping off salaries of recent Yemeni graduates of U.S. engineering schools

   - The on-the-job training now afforded to private contractors should be systemetized and disseminated for other donor and RWSD use.

   - The Chief of Party of TransCentury should be permitted, if the Ministry of Public Works formally requests it, to act as a senior advisor to the Ministry with an emphasis on institutional development and planning systems..

2. The project should continue to conduct small scale health, sanitation and village development interventions, but any major expansion should be tempered with an analysis of the expected benefits and executed in a carefully planned manner.(Ch.VI)

3. AID should review its thinking on the use of village financed house connections and meters(or a metering function) and permit TC/RWSD to discuss alternative systems

with the villagers during the initial survey with it being made clear to the villagers that they themselves will have to finance additions beyond common taps but that TC/RWSD are willing to provide technical assistance. (Chs. V and VI)

4. The current system of capital cost recovery and recurrant cost coverage works well and conforms to AID policy and should continue in its present form.(Ch. VIII)

Project Management

1. The project should add two more direct hire expatriate staff.(Ch. VI & VII)

   - One additional senior person is needed to pick up the day to day administrative and planning functions of the Chief of Party.

   - The current deputy/planner/training slot should become a full time training and institutional development slot.

   - The project should hire, for at least a one-year period, a public health/sanitation specialist.

2. The Peace Corps should be encouraged to continue to rpovide technically qualified technicians, through project funded special recruitment if necessary.(Ch.IX)

3. TransCentury should install a managerial accounting system.(Ch.IX)

4. Project 044 should schedule follow-up visits at regular intervals to advise villagers on O&M problems and provide feedback data for quality control and planning for both TransCentury and the RWSD.(Ch.IV)

5. TransCentury should continue its efforts to design simpler systems.(Ch.V)

6. Project 044 subproject construction design would benefit from short term consulting advice from a water supply engineer.(Ch.IV)

Lessons Learned

1. Having fairly quickly achievable, visible products strenghtens AID's and an AID financed contractors credibility and provides the basis for insitutional development.

2. The personal and working relationships between contractor and Ministry personnel are as equally important to institutional change as the visible products.

3. Peace Corps Volunteers can contribute immensely to small scale development projects and, conversely, projects like Project 044 which permit volunteers to hold responsible positions doing meaningful work in the field are likely to produce satisfied, productive volunteers.

CHAPTER III
BACKGROUND AND PURPOSE OF EVALUATION

Brief History of Project 044 and the RWSD

The Rural Water Supply Department was created within the Ministry of Public Works in 1972. That same year USAID returned to Yemen and set up Project 022 to help the infant department establish itself. This project had several aims including the establishment of a well drilling division and a mechanical section (for the latter, forty Yemeni technicians were trained in Cairo), the setting up of a workshop and warehouse, and the provision of materials for the construction of small water projects. Peace Corps Volunteers were used to supervise subprojects. Although there were some problems with 022, it does seem to have resulted in a considerable strengthening of certain RWSD activities.

Project 022 was run directly by USAID and it is reported that villagers, carrying their AK-47's, used to haunt the USAID office, demanding water projects for their respective villages. The project was scheduled to end in 1978. In the Autumn of 1977, USAID, which was eager to continue to support RWSD activities, but felt unable to carry direct responsibility for that support, contacted various PVOs and asked two groups to send representatives to Yemen. In 1978 New Transcentury Foundation, one of the two groups involved, submitted a Project Paper, which was found in essence, to be acceptable to USAID/Yemen and USAID/Washington.

Unfortunately, prior to this, relations between USAID and the Ministry of Public Works had cooled and began to grow positively chilly. USAID/Yemen personnel had not been able to maintain the rapport that prior personnel had had with several key Ministry figures. One controversial issue that arose was the role of Peace Corps Volunteers, who were incorporated into project 022. The issue was not one which was specific only to the Peace Corps but concerned all voluntary agencies. It was the YARG's suspicion that volunteers, who were frequently young and recently out of school, could not locate jobs in their own countries and had therefore come to Yemen to gain experience at the expense of Yemenis. This was a major obstacle in getting all the agreements necessary to project start-up signed. In addition, project-related issues occasionally were raised to the Cabinet level and became a focus for East-West rivalries. In August 1979, when it appeared that all problems, including the above-mentioned, one, had been resolved, USAID/Washington

decided that the precise role of the Peace Corps Volunteers had been inadequately defined and so declined to sign the Cooperative Agreement. This cost the Project another year in lost time and USAID/Yemen still more credibility in Ministry eyes. The end result of these difficulties was that Project 044's gestation period lasted from roughly January 1978 to August 1980. To prevent a major hiatus in support activities from occuring, USAID/Yemen designed a Limited Scope Grant Agreement of $144,000.00 and put an ex-PCV, who had excellent relations with the Ministry, in charge. The project formally started in August 1980.

There were, however, several Conditions Precedent which were attached to the Cooperative Agreement. One was that TransCentury negotiate a Letter of Agreement to determine its relations with the YARG and the Ministry of Public Works within sixty days. This Letter went through approximately eleven drafts before it was finally signed on 20 January, 1981.

The Cooperative Agreement precluded TransCentury beginning construction until the above Letter was signed. However, in December 1980, TransCentury, in conjunction with American Save the Children Federation, began training five Yemeni construction technicians as counterparts for Peace Corps Volunteers who had not then arrived. This exercise lasted through the Spring of 1981. All five men are still with Project 044 and several are on the verge of being able to supervise the field construction of subprojects on their own.

RSWD assigned the first five subprojects to Project 044 in April/May 1981. All were in the Bayt-al-Faqih area and required the construction of elevated tanks. Construction began that summer in spite of the typical 120°F Tihama weather... By this time, five Peace Corps Volunters had arrived and had begun working with Yemeni counterparts. Those Volunteers have now completed their Peace Corps service and been replaced by others. Over the past year, around fourteen Peace Corps Volunteers and two Dutch Volunteers have been working with approximately twenty-eight trainees and technicians. As of early October, thirty-two subprojects were fully completed. The construction of six new subprojects began this past summer and are continuing, and a further eight were started in the fall. Project 044 staff have established excellent relations with RWSD and MPW officials who appear happy with the project progress. The Ministry's attitude toward Peace Corps Volunteers has changed significantly and the Volunteers' usefulness is now more generally recognized.

TransCentury initiated water-related earthquake relief activities in the Dhamar Province in January, 1983, using Project 044 funds. These funds were subsequently supplemented by a $500,000 amendment to the Cooperative Agreement. In August of 1983, the Mission received an initial draft unsolicited proposal from the Acting Chief of Party, David Garner. This proposal asked for an additional $10,000,000 to fund a five year extension of the project. Half of the funds would support continued design and construction of small water systems and half would be used for training and institutional development. MPW and NTF are currently working together to develop a less general proposal which is expected to be completed by March 1984.

Summary Of The Results Of The Last Evaluation

An earlier evaluation of Project 044 was carried out in February-March 1982. It included participants from USAID, TransCentury, the Ministry of Public Works, the Central Planning Organization and the Peace Corps. The evaluation team focused on three questions:

1) Has progress toward project objectives been satisfactory?
2) Is TransCentury capable of organizing and administering a technical project of this nature?
3) Should USAID continue to be involved in implementing small rural water projects and, if so, are there more efficient ways to do so?

The first question, which arose in part due to the lengthy start-up delays discussed above, was answered by the evaluators in the affirmative. They suggested that the number of subprojects to be completed be reduced from 140 to 55. Additionally, they found that Project 044's second objective of "providing the means for institutionalization of the project" within the Rural Water Supply Division was written too broadly for current circumstances and that it needed to be revised with a more realistic eye. It was proposed by the evaluation team that the institution building component of the project focus on creating, through training, a cadre of Yemeni technicians. These technicians would eventually be able to work with RWSD in supervising the construction of subprojects, either by local subcontractors or village labor. The evaluators found that TransCentury's efforts in training technicians were particularly praiseworthy.

The second question was raised because of the initial lack of senior engineering staff either in TransCentury/Yemen or TransCentury/Washington. At the time of the evaluation, the Acting Chief of Party, a senior engineer with a wealth of experience both in Yemen and in development, and his highly competent team satisfied the evaluators that TransCentury was indeed competent to carry out technical projects and Project 044 in particular. The evaluation team's USAID engineer concluded that TransCentury was designing and constructing water systems that would last for forty years with little maintenance. One recommendation of the team, however, was that TransCentury recruit a qualified engineer to serve as Chief-of-Party. TransCentury filled this requirement in April 1982, although this engineer was later replaced by the current Chief-of-Party in August 1982.

It was the opinion of the evaluators, in addressing the third question, that USAID should be involved in small rural water projects. owing in part to the strong interest of both the YARG and the rural Yemenis in developing water systems. The transportation of water is both time-consuming and physically difficult, particularly for the women and children. The government has great difficulty in meeting the rural demand for water, and rural communities do not have the resources to construct adequate systems on their own. Project 044, to quote the evaluation report, is one of the few in Yemen to have "a direct impact on the most disadvantaged people...(and to deliver) an immediate improvement in their quality of life." The evaluators concluded that Project 044 could provide better and longer lasting water systems than could the local people or government services. Local people had proved receptive to operation and maintenance training and had participated adequately in the construction of water systems. USAID, by assisting with the development of rural water projects, had also added to the credibility of both the Ministry of Public Works and the central government, an important task in a country that has only in recent years tried to create a sense of national unity.

A number of options related to whether there was a better and less costly way of assisting rural villages with water projects were considered. It was decided that Project 044 should be continued as it was then composed, subject to some conditions. Among the more important were:

1) RWSD name a full time counterpart to Project 044 on or before 30 June 1982 (a counterpart was named before that date).

2) RWSD assign five technicians on a rotating basis to Project 044 (there are currently thirteen such technicians).

3) Subproject sites be assigned to Project 044 in groups of ten at a minimum (the last list given to Project 044 contained eighteen sites; the previous list included approximately thirty-five).

4) The project should move to the new RWSD office in al-Hasaba (this move was accomplished in August 1982).

5) Village site selection should concentrate on higher village populations of 800 to 900. (in the non-earthquake subprojects 044 has been obliged by RWSD interests to select sites with populations that range from 250 to 2000).

6) TransCentury should recruit a sanitary or environmental health engineer to develop a plan for wastewater disposal and the sanitary use of water (such an engineer was recruited in the winter of 1983; now a Peace Corps Volunteer sanitary engineer and a Yemeni technician are assigned to this component of the project. They have received additional assistance from two women, a Yemeni and a British consultant).

The Current Evaluation

Project 044 is scheduled to end in September 1984. In the Spring of 1983, during the FY'83 budget review, the Near East Bureau indicated it would reconsider the previous decision to get out of water projects based on a positive evaluation of the project. The basic purpose of this current evaluation is to assess the continuing validity of Project 044 strategy and management and to determine the progress that has made in meeting Project goals. In order to consider an extension, it was necessary to examine project performance in two main areas:

1) The construction of fifty-five small rural water systems and
2) The strengthening of the Rural Water Supply Division of the Ministry of Public Works in order to improve its ability to implement and maintain rural water systems.

With respect to question one, the team was asked to keep in mind the need to assess: a) the adequacy of TransCentury staffing (p. 17); b) the rate of RWSD presentation of new projects and TransCentury selection of them (pp. 17 & 18); c) the survey, well-testing

design, standardization, cost estimation and consideration of alternatives for each subproject (pp. 18 & 19); d) the contracting, supervision and construction of subprojects; and e) the inspection, acceptance and operation of completed subprojects. The team was asked to consider solutions that have been developed in response to any drainage or sanitation problems that may have occurred after the completion of a subproject.(p.32) The team was asked to review YARG's attitude toward the project and to consider whether it would be possible to expand data collection to cover the socio-economic and health aspects of water use.(p.34)

In terms of the second general area of concern, the evaluation team was specifically directed to examine the Rural Water Supply Division's ability to design, construct and operate subprojects.(p.35) It was suggested that the team could also assess institutional development by researching the following areas: a) the training of technicians and counterparts (p.35); b) the ability of private contractors to construct small water systems (p.38); c) the use of other training facilities.(pp.36 &37) The team was also asked to address the feasibility of long-term degree training in the United States.(p.38)

Another issue for the team was the involvement and effectiveness of Peace Corps and third country volunteer involvement in Project 044.(p.52) The team, in addition, was directed to look at Project 045 (Local Resources for Development) water systems and to apply the same evaluation criteria in the hope that the evaluation would benefit by having a point of comparison.(p.55) In addition, the team was asked to compile a list of "lessons learned" and recommendations which would be of use in considering an extension of Project 044.(p.8) There was particular interest in the feasibility of attempting a greater direct strengthening of the Rural Water Supply Division's institutional capabilities and in what ways this might best be accomplished.(Ch.VII, pp.6&7) The team was also asked to examine the water sector generally and to set the terms for an overall analysis planned for the Spring of 1984.(p.57)

Evaluation Methodology

USAID/Yemen, with support from AID/W/NE, determined that the questions that needed to be answered would be best addressed by a team with expertise in economics, public health, anthropology, social science and sanitary engineering. AID/PPC provided an economist/public health advisor as team leader who had had previous experience in Yemen. WASH provided an anthropologist with substantial experience in Yemen as Peace Corps Director and a sanitary engineer with worldwide experience with small water systems. USAID provided a social scientist with three years experience in Yemen. Three of the

four team members were moderately competent in Arabic. For site visits the team was also accompanied by the senior engineer of the Ministry of Public Works , Peace Corps Volunteers, the Chief of Party of TransCentury, and a female Yemeni translator/interviewer.

The evaluation took place during the month of October 1983. The team's initial work consisted of reviewing the fairly substantial body of information relating to water resources and projects in Yemen and to Project 044 specifically. (See Bibliography, Appendix B). The 1981 WHO assessment of the water sector and the 1982 IBRD Water Sector Assessment provide a good overview of the sector as a whole. The 1982 evaluation of project 044, NTF's quarterly reports and individual subproject files were the key documents for reviewing TransCentury's engineering activities. Both the Dutch Rada'a Integrated Rural Development Project and Chemonix (Project 045) were kind enough to provide cost figures for their projects for comparison. From the available information and from discussions with USAID personnel, the team determined that base line socio-economic data for the villages did not exist.

Before visiting the subproject sites the team also met with key individiduals connected directly with the project or working in similar areas (see Appendix C) and, following the site visits, reviewed their tentative conclusions with some of the same key individuals and additional people who had been identified in the course of the site visits.

The team visited, individually or as a group, 23 subprojects outside the Dhamar earthquake area, 13 subprojects in Dhamar , two Dutch projects and two Chemonix projects. The subprojects were selected as a representative cross sample of: completed projects, projects partially through construction, and projects just beginning in four different regions of the country (Sana'a plateau, the Dhamar, Han Han (a mountainous region with relatively few plateaus southeast of Taiz) and the Tihama. Several of the subproject sites had sanitation components completed or planned. (See Appendix A for a complete list of sites and team visits.)

The site visits identified one common characteristic which directly affected the team's ability to generalize from their observations -- Yemeni villages tend to vary immensely in general income level, community cohesiveness, sanitation and cleanliness, and cooperative attitude, even when physically

only a few kilometers apart. When the regional agricultural and climatic differences were added to this, it became obvious to the team that any attempt to set general standards or rules for individual subproject implementation would be without substantive basis and would hinder subproject implementation. (TransCentury has clearly realized this and, while it has managed to standardize construction forms for the various regions, has had to adapt each system to the characteristics, physical and social, of each village.) Therefore, the conclusions and recommendations of the team are amalgams and cannot be expected to hold true in all cases.

Before writing the draft report, the team presented its general findings to the misssion, the director of RWSD and the Minister of Public Works. Individual reports were then compiled by the team leader, reviewed by the mission, and the evaluation was put in final draft form before the team's departure.

The final draft was reviewed by the Mission, RWSD, MPW, and the CPO and comments cabled to Washington. The arrival in December of NTF's request for a funding amendment to the original project and the subsequent PRC and NEAC reviews identified several areas of bureau interest which were then taken into account in the final report. As the other three team members did not have a chance to read and comment on the final report, the team leader assumes full responsiblity for the contents.

CHAPTER IV
ENGINEERING ANALYSIS

Adequacy of TransCentury Staffing

NTF originally proposed in the project paper that the project have five long term expatriate staff. This was, however, reduced to four in the signed agreeement. In March 1982 the Evaluation Team recommended an increase of one additional long term expatriate staff, to a total of five, and this is the approved number today.

The team's engineer met with four of the five NTF long term staff members, and either discussed their work with them in some detail or watched them operate. In his opinion the NTF engineers are qualified professional civil engineers. Their water supply engineering experience has been obtained primarily in Yemen, which is not a bad place to get it, under the circumstances. One of the four engineers has since left the project and one was on leave in the USA during the evaluation.

The COP is functioning efficiently in his primary dual role, that is, in dealings with the government and in administering an engineering project.

The Deputy for Planning and Training apparently functions to some extent as a project Administrative Officer. He appears to be functioning effectively.

All of the five expatriates can communicate effectively in Arabic. All five have excellent relations with government officers and with village people and officials.

NTF staff also include technically-qualified Peace Corps Volunteers, technicians assigned by the RWSD to the project, and Yemeni technicians hired locally. The Yemini technicians are used primarily to assist in the surveys and to supervise construction. Three or four or these have reached a state where they can function completely independently as construction supervisors.

The Peace Corps Volunteers have been, and continue to be, essential to the proper functioning of the project. A number of them have been graduate civil engineers, or graduate architects, though generally without much professional experience when they arrived. The expatriate staff member, who

left in October, came to Yemen as a PCV. He was a new graduate civil engineer at the time. He was hired by NTF as an expatriate engineer when he completed his assignment with the Peace Corps.

The Dhamar reconstruction effort is headed by a sixth qualified engineer supported by a similar mix of Peace Corps, RWSD and TransCentury technicians. The Dhamar staff appear to be stretched thin and are hindered by a shortage of vehicles (four newly purchased second-hand vehicles were in Sana'a awaiting licenses, which the Government has run out of), while the team was in Sana'a.

From an engineering point of view the staff is adequate to survey, design and construct both regular and Dhamar reconstruction subprojects at the current rate. (Other staffing needs are discussed in Chapters VI and VII.)

Subproject Designation

The criteria for designation of a subproject have been discussed with the RWSD but never formally agreed to. They include:

- Access: either a road to the village or not over 1 1/2 hours walking distance from a road.

- Source: The village must have a source available which will provide either 15 lcd (mountains) or 30 lcd (Tihama)

- Village contribution: The village must have workers and supply local materials

- Maintenance capability: The village must have maintenance capability or be willing to send at least one person to be trained in simple maintenance

- Water rights: Water rights must be assured

- Project cost: A maximum cost of YR900 ($196) per person

- Population Limits: between 250 and 2000

In actual practice, NTF has informally altered the informally agreed to criteria, and now tries to get 60 lcd (the amount recommended by WHO) both in the mountains and the Tihama. On occasion the RWSD has ordered NTF to proceed with construction when 60 lcd could not be obtained.

The presentation of a group of subprojects arrives in the NTF office in the form of a letter from the Director General RWSD to the NTF COP. This contains as attachments outline reports by WHO engineers working with RWSD on the water supplies in question. The WHO report includes an estimate of costs and a list of required materials but has never yet been found completely acceptable by NTF. Usually the WHO plans were made some years ago, even though the letters of transmittal from WHO show recent dates. The rate of subproject presentation has been fully satisfactory since the 1982 evaluation with groups of subprojects presented in a timely fashion and in quantities of 10 or more.

The Survey

The NTF COP then designates a NTF engineer to go to each village to make a survey. If the village meets the criteria he/she stays to obtain data sufficient to design a water system. After the survey a design is made and also a decision is made as to what portion of the cost the village should pay. The design and the village contribution to the construction are then discussed with the village people. This often requires some bargaining. NTF never provides a source of water or the pump and driver. NTF may install pumps and drivers furnished by others, e.g. by the Local Development Authority, (LDA), the village or by RWSD.

If the source is a well, NTF will test the well for adequacy and quality before proceeding with the rest of the survey. If the well does not have sufficient water, NTF stops all work until an adequate source is arranged by the village. To insure adequacy of the source the village people may deepen an existing well or they or RWSD may arrange drilling of a new one.

It sometimes happens that in one day's work, NTF can complete the survey, the design on the ground, the estimate of costs, the allocation of costs between NTF and the village, an explanation of the system to the village people and an informal agreement. At other times, this process can take months. Sometimes the ownership of the source in dispute, and then work cannot start until the dispute is settled.

The survey includes estimating the population which is done by counting homes or compounds (Tihama). Originally, a figure of eight persons per home was used for upland villages and five persons for lowland villages but both RWSD and NTF now

use five for both. No particular form is used in the survey and NTF staff are not familiar with the term "activity survey." However, the surveys are acceptable from an engineering standpoint and there is no obvious engineering advantage to switching to a standardized format.

The Plan and Preconstruction Report

Upon return to the office the NTF engineer who made the survey will make, or supervise the making of, plans and engineering drawings for the water system as agreed between NTF and the village people. At about this point a Preconstruction Report is made. This report includes the following headings:

- Description Summary (of village and present water supply)
- Proposed Improvements
- Design Criteria, including yield of source, population, projected water consumption, distribution pipes, and water test results.
- System Layout Description
- Preconstruction Cost Estimate, including cost of NTF staff and support costs.
- Draft Sub-Project agreement among the village, the LDA, the RWSD, NTF and Governor.

A memo certifying the feasibilty of the proposed village water system is prepared. This is sent to the RWSD with a copy of the Preconstruction Report, a draft sub-project agreement and the plans. Often the memo is accompanied by a suggestion for meeting in the village on a definite date for signature of the sub-project agreement.

Construction, Inspection, and Followup

After the agreement is formally signed and agreed money contribution have been received, materials are delivered and cnstruction is begun. Work that cannot be done by the villagers, such as concrete towers, is contracted out to private entrepreneurs who bid for the jobs. Work difficult or expensive to redo, such as construction of concrete structures is ordinarily not done without the daily supervisory presence of an expatriate, either a NTF engineer or a Peace Corps Volunteer or one of the project trained RWSD technicians.

A formal inspection is conducted by a TransCentury engineer and a senior MPW engineer within thirty days of subproject completion. The USAID engineer may or may not be present but does inspect the system at the time of its formal opening. The villagers take over operation at that time.

NTF does not presently do any followup. While the completed systems which were visited appeared to be working fine except for the valve boxes in several projects, a regular schedule of followup visits, say every six months, to advise on any operation and maintenance problems, would help protect the investment and identify future problems (the emmigration of the trained maintenance and repair people, standing water, etc.) as well as institutionalize the collection of followup data as a tool to quality improvement and management.

Design Criteria

Criteria presently used for engineering design include the following:

- Quantity - 60 lcd for 150% of present population
- Pipes are steel B.S. "Light", design pressure 700 psi
- Flow in pipes - H&W flow formula with C=100
- Distribution Design
  1 - First used, peak flow assumed 2 or 2.5 times 24 hour average of design flow
  2 - Now used - peak flow assumed to be design flow delivered in 5 hours.
  3 - Also design one inch pipe to provide 20 liters per minute for a single group of 3 or 4 houses.
- Design population obtained by counting homes or houses - use 5/family in lowlands & 8/family in mountains, but temper this with judgment as have observed 80 persons in one mountain house.
- No allowance for animals or for gardens.
- Ordinarily accept 60 gpm for well yield.
- Concrete stress in elevated tank about 2900 psi as tested in cubes.
- Import U.S. rebars & may approach 40,000 psi steel stress.

- Like to provide 1/2 dmp storage in elevated tank, but may provide less for larger villages.

- Provide public fountains if the village desires.
- Do not provide house connections, but do provide frequent "tees" so village may make own house connections.
- Minimum distribution pressure 5 meters.
- Maximum distribution pressure not specified.
- Reservoirs receiving gravity flow sometimes have float valves depending on village preference.

Organization

The work is organized so as to insure sound design and efficient operation as much as possible.

Standard designs have been developed for concrete elevated tanks in several capacities and to several elevations. Reinforcing bars are bent in Sana'a, color coded and sent to the site. Standard public taps are put together in the central warehouse for installation in the field. Standard reusable shuttering has been made for the standard elevated tanks. A standard daily material consumption form is used on the site. These are compiled at the end of the project into a standard completion form. The drawings (plans) of the village system have been standardized. They no longer include profiles, but do include elevation of pipe junctions in boxes at the bottom of the plan.

General Observations

As of October 1, 1983 NTF had constructed water supplies in 29 villages (exclusive of the Dhamar reconstruction efforts). Three more were completed five days beyond schedule. Survey and design efforts are ahead of schedule.

The writer reviewed the water supply engineering of a number of subprojects. As might be expected, he found a number of things which he would have done differently. (Details are given to both the USAID and Transcentury but were not considered of sufficent significance to append to the formal evaluation report.) Subproject construction would benefit from more (and somewhat better) water supply (as opposed to construction) engineering. This may require some short term consultation by a water supply engineer to review designs and discuss alternatives.

The village water supplies constructed are satisfactory. All those seen were providing a reasonably good quality of

water, in fair quantity (with the exception of Beni Sheikh*) conveniently to the village. General cleanliness of persons, clothing and utensils should now be much easier and sanitation and public health should be improved. Certainly many hours of labor carrying water are saved daily.

The project appears well administered. Relations with the RWSD are excellent. Project staff understand what is expected of them and try to do it well.

Engineering activities of the village surveys, cost estimating, construction and construction supervision including supervision of contractors, appear well done.

In the villages seen where work is in progress, relations with the village people were obviously good. Unpaid labor is available and a substantial share of the cost of the work is paid by the village. It is a reasonable presumption that this situation is general.

Relations with village people in the villages with completed system visited are also good.

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*In the exception noted, NTF reported that the source was inadequate and recommended a new well be drilled. RWSD decided not to drill the new well because the drilling would have to be through rock at a virtually inaccessable location on the edge of a cliff. NTF complied on the basis that the system they would construct would be an improvement over the existing one, which was inadequate even before the earthquake destroyed it.

CHAPTER V
SOCIAL IMPACT ANALYSIS

Innovative Spin-Off Effects

When the project began broad assumptions were made that, with the advent of piped water, people would do all kinds of new things as well as more of the old. Not only would they drink and wash more, but plant more trees, grow spices in their courtyards, do more with animals and by and large develop stakes and interest in a more modern way of life. These changes, it was hoped would lead to better health, more productive use of time and the beginnings of progress. While these changes were observable in some of the villages, they were by no means universal.

It is important to keep in mind that Yemeni villages differ from one another in enough ways that makes it difficult to generalize about them. One factor, however, seems to be a key independent variable in determining things such as level of village cooperation with the project, degree of interest in the project, and degree of innovative behavior exhibited in making use of water once the project is completed. That factor is leadership. In villages where there is a strong authority (not always located in the formal role of Sheikh or Agil or Amin), things get done. This variable is more important than either money or proximity to resources. Identification of village leadership and potential village leadership should therefore be an important part of future project activity, particularly for choosing sites for pilot or experimental programs.

Another factor appears to be the level of exposure to alternatives, either through working abroad or even through working in the larger cities in Yemen. Presumably, the presence or absense of educated young people may also play a role. In any case, in the absence of leadership, male or female, water alone is unlikely to cause major behavioral changes beyond the two consistantly observed during the site visits:

- Children are cleaner in the villages where the projects have been completed than in the villages where the projects are not completed.

- People claim to be drinking more water in the villages where the projects have been completed.

All villages involved in the evaluation were unanimous about the project's importance. They were more than pleased to have the projects and expressed similar feelings about water in general. The most common statement heard was something to the effect that "Water is Life." Variations on that theme were: "Water is everything", "Now that we have water everything is fine". In villages which have had completed systems for some time (up to two years) when people were asked to tell us how life had changed, they said things like "Before we had a little water. Now it is always there" or "Always ready". "It's right there, ready to be used".

In those villages in the Tihama where changes were taking place -- Mejamala (a shower and a vegetable garden), and Hosnia Ulna/Hosnia Sufla (flower gardens, a novel "bath house") -- an explanation for the motivation behind these changes can only be made for Mejamala, where the Agil appears to be powerful and insightful (it was he who imitated the PCV's shower and garden arrangement). In the mountainous areas the major innovations seemed to be the introduction of water meters.

In the other villages observed, people do not seem to be making the cognitive connections between piped domestic water and innovations which can easily go with it - e.g. better storage of water in the home, construction of showers, construction of watering troughs for animals, etc.

In short, in more cases than we would have expected, people do not seem to be moving very far from the traditional uses of water and seem to remain cognitively confined within the perceived limits which existed before the advent of the new system.

For example, in Khadariya (a project finished in early '82), a slightly poorer village than others we saw, the same frustrations were voiced as before the project. People want water for irrigation so they don't have to be at the whim of the rains. They want more jobs outside the village so they can bring in more money. They are delighted to have piped water but they use it only to do more of the same in two areas - drinking and washing. Women's time is clearly saved (as in all cases where women no longer need to go to the well) but the implication in the terms of reference for this evaluation that women may be free to do more productive things was not borne out dramatically in this village. (In Qarn Attah, where the time saved was approximatly two and one-half to three hours per day, one woman whose

husband had been part of the Dutch construction team, says she now uses this time, roughly, one third for animal care, one third for household activities, and one third for visiting friends or just resting.) This is not a failing, however. Rather it is cause to rethink assumptions. Basically what seems to happen is women are freed of one important burden, but as it is only one of many, it may not represent a gain of very much relative to the whole. If a woman works 16 hours a day and one hour is saved by no longer having to have water, that hour may go to providing a rest (a good thing) or watching TV or doing more washing, more cooking or more work in the fields. In short there are still many other constraints in village life which affect the potential for greater productivity. We ought not to expect very much added female productivity as the result of a piped water system, particularly where the water gathering task did not occupy a major portion of a woman's day.

In Muradhiyah, another Tihama village exhibiting little change, we saw similar things. Again there seemed to be little interest in planting flowers or trees (the excuse given was that the animals will eat them; a spurious excuse since trees planted before the project were growing). We saw storage of water being done as before - in plastic containers or clay storage jars. The washing of the children was conducted in front of us -- just as before with water from a tin can repeatedly dumped over the head . Clothes were also washed with as economical use of water as before. There were no obvious visible changes in the village.

We raised a question about the making of cement blocks (which we suspected might be on the increase due to water proximity). We were told that those who make blocks now made them before but that they may make more of them now because of convenience. Even so, cement costs money and this may be why a significant increase in block production wasn't observed.

In contrast, in another Tihama village, Mejamala, the Agil had constructed an outdoor shower with a concrete runoff which watered a fairly sizeable vegetable garden. While he had very clearly imitated the system set up by the PCV who had supervised construction, the interesting point was that the other villagers we talked to, men and women, knew exactly how much the system had cost (90 YR) and where to have it made. The villagers interviewed individually claimed to be saving up money for building their own compound showers. The Agil's shower was not enclosed and is currently used only to wash the village children. The Agil plans to enclose the shower for his own family's private use once the majority of compounds have their own showers.

As a test to see whether the absence of spin off effects was due to a lack of motivation or a lack of knowledge, we asked the people in Hosnia Ulna (in a different LDA), who had already planted flower gardens and created an imaginative bath house, whether they planned to construct a shower. They did not know what a shower was so we drew pictures and told them how much it cost and where they could go see one. They indicated a strong interest. The village of Wisa'ba, located near Mejamala, also indicated interest. Hopefully, TransCentury will follow up to see whether anything actually happens.

In general, then, while village expectations are being met as far as their desires for water, the hoped for spin-off effects (although we are measuring over a very short period) are not occurring in either the quantity or with the frequency which was expected when the project was designed. If we are correct in asserting this, there are some interesting possible reasons to explain it:

1- People here, as elsewhere in the world, usually can focus on only one important matter at a time. What they wanted first and foremost in a water system was greater availability of water - and that means, water in the home rather than at the public tap - secondly they wanted cleaner water. These they believe they have received. They did not, and for the most part now do not - see beyond these two things. This may explain why both poorer <u>and</u> wealthier villages have done little in the way of certain improvements with water such as showers, or gardens or more storage containers. (Money is a constraint but not the key one. People can't make certain improvements in their lives without it but at the same time they may not necessarily do so with it).

2- A common sense explanation may simply be that people don't know what the possiblities for improvement are.

3- The most unexpected reason for the limited change in village life may be that villages are faced with something new vis-a-vis water rights and do not as yet know quite how to deal with the problem. Some background is necessary to understand this ---

Water Rights and Allocation

Whereas in irrigated areas of Yemen (the highlands) methods of allocation and control of irrigation water have been worked out over centuries, water rights and allocation have only been issues with respect to domestic water (both in the mountains and in the Tihama) in times of drought or when a source is insuffient for the population (e.g. Hosnia Ulna). Domestic water, in the normal case, was in effect regulated at the source by the self-limitation of the amount one woman and her female children could carry in the available time. Furthermore, in Yemen the source of water cannot be owned. Rights and control issues can only exist with respect to transport of water (as in irrigation ditches). And drinking water is something that everyone (strangers included) has a right to.

Now with the introduction of piped distribution systems and storage tanks with mechanical control possibilities (valves, keys to valve boxes) new elements have been introduced which may affect social organization. We know, for example, that the coordination of irrigation water activities is based on the potential for conflict in times of scarcity. Thus systems evolved whose aim was avoidance of conflict.

It is reasonable to guess that with people now receiving domestic water in the privacy of their homes (through pipes), there is again potential for conflict in that one may not know how much water one's neighbor is using and, since the water is more readily available than before, it could be used more easily for more purposes.

To avoid this kind of conflict people may be disinclined to plant trees, flowers, and spices or set up showers and watering troughs or large household storage tanks. It is possible that the relatively low level of such innovations is motivated by a desire to avoid potential conflict until a system of allocative rights is worked out.

If this is valid, and it may not be, then a major addition to the project - in the form of the metering function (not necessarily meters themselves, possibly a system of roof tanks filled once a day, for example) - may cut short the problem.

The same speculations about water allocation and conflict avoidance may serve as additional reasons why house connections are usually made immediately after the distribution

lines are laid. Of course, the primary reason is the common sense reason; people want water in its most convenient state. The main constraint with respect to house connections is not money, but the difficulty of the terrain. Thus in mountain projects where it is much harder to dig the pipe under ground, it is less sensible to do house connections. Even so the NTF people report to us that people want to do these connections above ground, in the way they do now,in spite of the risks (easy breakage being a primary one).

In the projects completed over one year ago, the public taps were not being used except by people from hamlets nearby who were not on the distribution network. In the Tihama village subprojects which have been finished for 18 months or more, close to 100% of the compounds had connections, public taps were little used and in most cases faucets on the public taps were completely non-functional and/or leaking. In Qarn Attah and Melah in the mountains, houses have house connections with meters.

TransCentury Peace Corps Engineers and construction supervisors with whom we spoke, tell of the speed with which people connect their houses to the system. Given that and the misuse and underuse of public taps they feel strongly that NTF should move away from public taps (certainly in the Tihama and perhaps also in certain mountain projects).

Use of Gate Valves

Generally, there is in addition a growing "anti-valve" feeling among some NTF people. Their reasons are related to the maintenance problem. They take the view that the system should be as simple as possible.

There is a second reason for having fewer or no gate valves which has to do with water allocation and control. Traditionally, women have been in charge of domestic water from the source to the home. With the new systems, involving tanks, pumps, motors, pumphouses and valve boxes, men have taken a position of control of these things, in many cases keeping the pumps and motors and often the valves under lock and key. It should be noted, however, that in two of the villages, women are operating and maintaining the systems. Both villages are in the highlands.

This is not necessarily a problem, however. What this (and the prior discussion of water right issues) suggests is that social organizational factors surrounding water use may be

changing or are presently in flux and that, to the extent the project is aware of these things, (and can further investigate their validity) it can make better decisions (including certain engineering decisons like fewer valves) which may have justifications on social grounds as well as technical grounds.

Project Selection

One of the questions asked of this evaluation was to determine the Modus Operandi of the RWSD, in particular to describe the criteria used to select projects. Basically the answer to the question of how the RWSD operates is politics. (In theory, a village asks its LDA for help with a water project and the LDA transmits a formal request to both the RWSD and CYDA and then CYDA transmits a separate letter endorsing the project to the RWSD.) All along the line politics enter in.) In fact, given Yemen's situation and the RWSD's mandate, it cannot be otherwise. If, as RWSD itself claims, it has been able to make only a partial inroad into rural water supply needs, i.e. 12 to 14% of all the villages in Yemen, then one can conclude that no matter how it selects a village it is fulfilling its mandate. There are so many villages in need of projects that the idea of prioritizing these needs is somewhat spurious. With respect to the 044 project in particular there are some fundamental criteria of selection which are regularly and consistently met: Projects must have a pre-existing source and villages must not be smaller than 200 nor greater than 2000 in population. But aside from that they are chosen on the basis of who can get to whom. Example: The de facto power in the Beit al Faquih LDA is a man who is said to have very great powers of persuasion. If he thinks a village merits a project he has been known to get the YARG's signature on the dotted line by actually placing his own pen in a government official's hand and physically moving the official's arm to the paper. This is not necessarily bad. It is no doubt recognized that if this particular LDA leader thinks X or Y village deserves a water system then he has already identified that village's position in the greater scheme of assistance (e.g. schools, mosques, clinics), need, and political clout. Neither the central government or AID are in a position to do such fine analysis.

Given the earlier assertion that the critical variable in Yemen which determines interest, cooperation, and innovation in a village water project is authoritative leadership, then one could argue further that not only is a political method of project selection inevitable, but probably also a good thing.

Conclusions

An important aspect of social impact is the extent to which people's expectations are changed as the result of the projects. As with other changes, one should not expect to see much in the way of dramatic change in the short period of two or less years. If there is leadership in a village and vision on the part of that leadership then expectations about what can be done about the future may be high but it is likely that such expectations were high before the projects. Again the variable that seems to make the difference is not the project alone but the combination of the project and the nature of the leadership in the village.

We cannot expect to see major changes in such areas as women's productivity, utilization of women's time, innovative behavior, increased variety in the use of water for small gardens, etc. in such a short time. Indeed even given the original five year life of the project, many of the large scale hoped for changes were unrealistic. AID should guard against those expectations which find their way into project plans either explicitly or implicitly and which may be the projection of themes current in our own society and may be more appropriate for us than for others. For the short term, one should aim instead at goals which are less grand. Ironically, accomplishing those may well be the best route to larger hoped for gains in the long run.

To sum up the discussion of social impact, the most important conclusion to be drawn is that even a highly successful project, as this one assuredly is by all reasonable criteria, cannot produce significant social change in two short years. We are reminded, or should be, that in traditional societies like Yemen, for all the seeming rapidity of change, fundamental (especially traditional) things change very slowly. To the degree that social impact is seen as a project output, more attention should be paid to long term study of social impact issues.

CHAPTER VI
HEALTH AND SANITATION

Health Impact

One of the goals of the project was that of improving people's health. To the extent that people are washing more and drinking more and cleaner water, it can be fairly safely presumed that the project has had a positive impact on health. In this project, as with most water projects, however, it is not possible to go beyond this assumption without a major commitment of funds to baseline and followup morbidity and mortality data collection.

As with social impact, one should keep in mind that change is slow. Nonetheless, the changes thus far noted in positive behaviors which affect health are totally appropriate given the time involved and especially given that the project has not yet emphasized health education (or had any mandate to do so).

Sanitation

In the March 1982 evaluation concern was raised about health hazards generated by the new systems, in particular, standing water around standpipes and used cooling water from engines. NTF has experimented with a variety of runoff systems for standpipes including watering troughs for animals and concrete culverts leading to vegetable plots or small horticulture efforts. No single model can be considered ideal since individual village variations are great. NTF should continue to anticipate standing and runoff water problems and moreover, as part of the regular monitoring excercise (Chapter IV) any new, unanticipated problems should be noted and resolved.

In addition to dealing with standing water problems the consultant hired by NTF also initiated several sets of latrines as pilot sanitation projects in the Tihama. In the pilot projects, the nature of the sanitation experiment was the same: a cement block enclosure had been constructed which contained a shower in one part, a Turkish toilet in another and a dry hole latrine in the third. In one of the projects, the Turkish toilet was an obvious failure in that it had backed up with feces so the villagers had placed a tile over the hole and put a layer of sand over that to discourage children from playing with the tile. several others appeared to be still

functional but appeared to be used for ablutions rather than as toilets. The showers were used in all three cases, and the dry latrine holes were used but appeared to be receiving relatively little use. In all cases the sanitation project was near a mosque, where ablutions form a preparatory action to prayer.

It is difficult to say exactly why the toilets failed and/or were underused. This stems from a lack of coherent experimental design. Presumeably the basic intent was to reduce fly-borne disease. It may also possibly be assumed that the cultural acceptability of one type of toilet over the other was being tested. A third variable may have been the engineering. The Turkish toilets we saw, however, may initially be judged to have failed not on any of the more obvious criteria but more simply because NTF relied on the villagers to provide a bucket. Without a bucket (on a chain perhaps) to convey the water from the tap to the hole, in combination with a disposal pipe with a very slight slope, the system quickly filled up right below the hole. This problem could have been identified as early as a week or two after construction and, as with the systems themselves, periodic follow-up visits would identify such problems.

Cooperation with the Ministry of Health

In the 1982 evaluation PES, one of the actions was that "USAID will request the Ministry of Health to appoint a person from each village, or cluster of villages, to be trained as a primary health care worker within the coming year." This has not worked out and those familiar with the Tihama Health Project would probably agree that the potential for this in the near future, particularly outside the Tihama area, is extremely limited.

It is important to keep in mind that the MPW and the RWSD do not put health issues at the top of their list of priorities. MPW and RWSD are by definition (and inclination) involved in the business of cement and bricks. Thus on the face of it they have no great motivation to have a constructive relationship with the Ministry of Health. The MOH, in its turn, is not one of the YARG' stronger ministries. As in most countries, Yemeni ministries are concerned with turf and visibility, particularly with the limited government resources available. They are generally not interested in projects, much less interministerial cooperation within projects, which will not have a tangible pay-offs for them and/or their own ministry or department. (Tangibility can mean anything from a visible

water project to a scholarship or a high degree of publicity.) However, the head of the RWSD did indicate a willingness to cooperate in the areas of health education and sanitation if the MOH would supply a doctor.

In the team's judgment the project has been able to successfully accomplish what it has (the timely, orderly and high quality construction of small water systems) precisely because it has proceeded in a focused way on a one-thing-at-a-time basis. It has not sought to do too many things simultaneously, being aware of the need to build significant credibility at every level in the Yemeni context (from Government to village). However, now that the construction side of the project is running smoothly, a decision needs to be made as to whether NTF's mandate should be expanded to include activities which, if successful, will greatly increase the project's impact on village health.

There is a danger of overloading the project, and thus diffusing its efforts and reducing its effectiveness in the key areas of institutional development, training, and delivery of water. There is also the possibility of missing a golden opportunity to make modest efforts in health education and sanitation which may greatly improve the health impact of the project which is particularly important given the low possibility of an effective national health system being set up in the near future. While the team proposes that any future interventions the project decides to undertake in the health and sanitation area be encouraged but not mandated by AID, it feels that the possibilities are best explored by adding one additional staff member to the TransCentury team, preferably a Public Health specialist, whose job would be to explore, and bring in consultants to assist, a limited number of priority areas where a small investment could make a major impact. For example, additional work along the lines of Ansell and Tutweiler's (see bibliography) would identify the prime areas of household contamination of water; fly and mosquito control experts could help determine whether lack of latrines and standing water are health problems or not. Someone needs to oversee and coordinate the initial work so that a very limited number of priority but simple interventions can be designed and then implemented in connection with the construction process where villages are receptive. This person could also act as liason with the Tihama Health project and the MOH. The TransCentury team as currently composed has neither the time or the training to carry out this task.

CHAPTER VII
INSTITUTIONAL DEVELOPMENT

The TransCentury Cooperative Agreement, after being amended at AID's request, called for TransCentury to " provide the means for institutionalization of the project within RWD [sic]". An assumption underlying this was that the RWSD would be receptive to institutionalizing capability. A second assumption by AID was that TransCentury would be in a position to influence the RWSD. At the time of the 1982 evaluation, noting that getting the project started had stretched credibility on all sides, the evaluation team concluded that both assumptions were unfounded and that other donors had met with the same lack of receptivity.

RWSD has basically four key functions: surveys, drilling, warehousing (principally of donoted pumps and engines) and donor coordination. In addition, the RWSD performs limited hydrogeological functions (with expatriate staff), subcontracting of private contractors, and general planning and management functions. Two-thirds of the money spent on rural water supply improvements and construction comes from foreign donors so the donor coordination function is not negligeable. RWSD continues to rely heavily on the UNDP/WHO for its design and survey work but does appear to capably manage drilling and warehousing (which reflects the success of AID's earlier 022 project in institutional development). At the time of the 1982 evaluation the MPW and RWSD appeared to recognize the need to strengthen the skills of its technicians so that they could supervise construction work of the private contractors. The evaluators recommendation was that the project should focus only on this element.

Technician Training

As of October 1983, this project had 28 Yemeni construction supervisors trained or in training; 6 trainees, 15 junior technicians and 7 senior technicians. Of these 13 are MPW employees and 15 are NTF employees. Of the senior technicians, three are capabable of construction supervision at this point. NTF tops off the salries of the MPW technicians.

The construction supervisors in-service training includes on-the-job training as well as short courses offered during Ramadan, a time when fasting makes construction work very difficult. In June 1983 approximately 10 construction supervisor trainees participated in a one week sanitation

training course. Special English language training was also offered over Ramadan to interested construction supervisors and materials were compiled to allow construction supervisors to study English independently.

The trainees are selected by means of a test course of several days duration. (A group of candidates were invited to take a "mini" course and were observed and judged by their performance in it.) This is an extremely realistic and useful way of selecting candidates in a place where paper qualifications and references may mean little. Moreover, the policy of mixing the technicians and the expatriates in the project in proportion to their experience is a good one. New Yemeni technicians are placed with senior expatriates and new expatriate technicians are placed with senior Yemeni technicians. Thus the maximum transfer of knowledge, skills, attitudes, and other motivational components is assured. In theory at least, the RWSD's capacity to maintain and operate systems as well as construct systems unaided is being significantly enhanced.

Village Pump and Motor Maintenance

RWSD/NTF/WHO also runs a pump and motor maintenance course in Sana'a for representatives from villages which otherwise don't have this capability. In general the village nominees do attend the course. These course are given about twice a year (one was in progress while the team was in Yemen) and last 24 days. The course is designed for a maximum of twenty participants. WHO provides two instructors; NTF, one; RWSD, one instructor and one coordinator. The team was impressed by the motivation level of the villagers being trained and of the instructor in the session visited.

Other Training and Manpower Issues

The training lab itself is poorly equipped. The MPW, RWSD, and NTF all agree that hands-on training is best, not just for the villagers but also for the technicians. Upgrading the facility and institutionalizing it as a central facility to which other ministries might eventually send students (MMH, CYDA, Regional Development associations such as the Tihama Development Authority) makes sense at this stage. It would also probably benefit the overall manpower situation if the course content were standardized for use in other centers such as the Rada'a one. The WHO unit which started the training project in the RWSD is being dissolved now that the courses have been designed and tested. This means that either NTF or

some other donor will probably have to take on additional responsibility, particularly in terms of increased course offerings and replication outside Sana'a. There are no similar training programs in country although the Ministry of Education is scheduled to open a center in Rada'a in 1984 with some aid from the Netherlands and one or two volunteers.

In addition to these courses, NTF is funding RWSD employees to attend training courses in the region. One is being sent to study surveying at Wadi Magboulox Institute in Khartoum for one year beginning December 1983. One will study public administration-public relations in Cairo for three to four months beginning January 1984. Five will study to become mechanical technicians (e.g. installation/maintenance of pumps/motors/generators and well tests) in Egypt or Sudan for three to six months beginning some time in the early spring.

The engineering capacity of RWSD appears to be limited. That is to say that, thus far, its Yemeni engineers are not highly trained or, if well trained in basics, have little field experience. The capacity to determine requirements and evaluate alternatives is likewise limited. To the extent that RWSD and MPW have these capacities the resources have to do with WHO's long involvement with the department, one which buttresses it but does little to build internal capacities for the future. It is inherently a dependent relationship.

There are two possible ways of dealing with the problem. The first would be to hire a large number of the graduates of American engineering schools who are expected to return over the next two to three year period. The problem with this solution is money. During their mandatory government service, these graduates can get much better jobs with NWSA which has the flexibility to pay going market rates. This problem may be resolved during the next year or so if RWSD becomes an independent agency. In the meantime, the team recommends that AID seriously consider topping off the salaries of a few young engineers to get them "on board" and NTF should take responsibility for field and on-the-job training. AID should continue to support the development of engineers through its regular participant training program and not add that function to this projects tasks.

There are only a limited number of such graduates so, in addition to the above recommendation the team recommends that a new training program or programs be initiated in the areas of survey, design, and estimating, functions currently performed by expatriates. The training should be at a technician level

and the trainees need not even be high school graduates. They would eventually pick up the bulk of the small system work and would be supervised by the U.S. trained engineers.

As the prior evaluation also noted, the RWSD is heavily concerned with coordinating other's efforts and has yet to be convinced of any need for personnel upgrading at the senior level. There is one area of effort which would appear to be non-threatening and at the same time effective. That is to encourage the senior employees to get out in the field more, both so they better understand what their own programs are like and to deal with problems that arise in the field. For example, the evaluation team was accompanied by a senior engineer from the MPW. In the village of Yafa'a in the Dhamar the water system was completed but the villagers had been waiting two months for the engine and pump to be delivered and in Beni Mansour the pump and engine were not compatible so the system was not working. The senior engineer called Sana'a while we were still in the Dhamar and the problems were resolved promptly.

As has been noted elsewhere, since the arrival of the current Chief of Party, NTF's working relationships with the RWSD and the MPW have blossomed and there appears to be a greater scope for institutional impact that existed previously. While the team recommends that the bulk of institutional development in the future focus on technicians, it is now possible to work in management and planning areas. The Chief of Party has already been asked to assist the Ministry in a number of areas not directly related to this project. This role could be formalized by establishing an advisor slot in the Ministry (downtown) and having NTF bring in a capable administrator, separarate from the person charged with planning and training, for the day-to-day project activities. This would regularize the current situation and also recognize the reality of the Yemeni situation where immediate physical proximity affects the degree of influenc. (AID presently is the only donor without a key advisor in the Ministry itself.)

Related Issues

The private sector, in the form of construction contractors, is heavily involved in Project 044's work and in other donor and RWSD projects. The team was unable to interview any of the contractors. From verbal accounts, those contractors that work with 044 have improved their skills with each successive project, presumably due to the quality of

construction supervision. At present this OTJ instruction appears to be ad hoc. NTF needs to document what's happening, draw up a list of common deficiencies and how best to change these practices. This guide could then be effectively transferred to all the other projects in RWSD's domain and move this critical strengthening of the private sector from a personalized, opportunistic basis to an institutionized process without having to create formal courses or institutes or to increase government involvement with the private sector.

The WASH project has specifically asked whether or not a high quality of construction is really necessary. There is no question that NTF's strong emphasis on quality of construction (it is generally agreed that while there may be less than perfect methods used in NTF's construction, relative to similar projects undertaken by others, its overall construction quality is high) is a key variable in both its institutional building successes and in terms of its delivery of the product (water to the village). The policy of high quality construction should be continued.

A final comment, more in the way of a hypothesis to be considered than a recommendation: the TransCentury project seems to have made somewhat stronger progress once RWSD was physically separated from MPW and moved out to Al Hasabah. The question is raised therefore (and not only because of RWSD's physical move) whether or not strengthening of government institutions via centralization is an appropriate approach to institution building at this stage. It may be that a conscious effort to "balkanize" large central institutions (in this case by further promoting those inclinations to autonomize RWSD) may be a more appropriate approach. By separating smaller units through a process of separating them (temporarily) from their parent agencies, one may achieve in the end more efficiency and less waste (though not necessarily less duplication of effort).

CHAPTER VIII
ECONOMIC, FINANCIAL AND POLICY CONSIDERATIONS

While it would be instructive to examine the benefits and costs of this project, the benefits side is not conducive to quantatative analysis. The absence of data on measureable health changes, even given the difficulty of then quantifying the value of such changes, makes measuringg the health benefits directly impossible. Even measures or measuring such benefits indirectly, such as the costs of supplying services which would bring about similar changes, are not available. In the case of training, a fairly complex calculation comparing the cost of a PCV's construction supervision with the amortized training investment costs and salary of a Yemeni technician could be conducted. However in this case, the training costs cannot be reconstructed from the existing accounting systems. Measurement of more emphemeral benefits such as community development and institutional development are also beyond the scope of this evaluation. In consequence, this chapter focuses on water system costs, capital cost recovery and recurrent costs and the relation of the current financing proceedures to AID policy..

Subproject Construction Costs

For the design populations, which are 50% larger than the curent estimated populations, the fifteen smallest sub-projects cost, on the average, $75 per capita; the fourteen largest, $55. The overall average was $65 per capita on a design basis, or $97 per capita using the present population as the base. A detailed list of actual costs to date and estimated costs for projects in process is attached as Appendix D. (These costs are consistant with the average RWSD project costs determined by WHO in 1981, with costs under the Local Resources for Development project and with costs under the RIRDP. Using WHO's figures from NWSA's current water expansion programs in Sana'a, Hodeida, and Taiz, the comparative per capita investment costs are $1,081, $443, and $145 respectively.) These amounts include survey costs, design, and construction but do not include overhead or central office administrative costs in order to be as consistant as possible with the way other donors calculate their costs. (The Dutch include only the cost of their turn-key contractors. Chemonix adds in-kind contributions.).

In looking at the sub-project costs under this project, the most critical omission is the cost of drilling new wells or deepening existing sources. This cost has been

excluded by NTF in its calculations since the project itself does not provide the source. However, since the majority of villages are required to pay for this form of activity as a prerequisite to sub-project activity, it is a valid project cost in terms of village, and often RWSD, contribution. Since a drilled well can add as much as $160 per capita to the cost it is not a negligeable amount.

Household connections, which are not done by the project but which are often put in by the villagers themselves and thus also become part of the "sub-project" costs to the villagers add about $28 per household. A meter adds about another $22.

Villagers, with assistance from the LDA's, covered, on the average, 32% of sub-project costs. TransCentury (AID) paid the balance. This compares favorably with the Dutch projects (now set at 30% but initially at 20%). However in the two Chemonix projects we saw the village contribution was supposed to be 50% (one project had provided water for three months and the pump had broken shortly before our arrival; in the second, Chemonix is still owed money by the villagers and is refusing to put in the distribution system until they pay).

The average capitol cost contribution per household in the subproject villages has been $115 per household or 5% of the average household income of $2300 (based on per capita income of $460). This amount may not seem like very much but if one estimates the cost of daily Qat consumption, which affects 99% of those households where men are present, a calculation of the cost per household, at the lowest currently available price of YR 25 per day, results in a per household expenditure on Qat of $1982 per year. One can hypothecize that $115 probably represents nearly 100% of discretionary family income after food and Qat. (The YARG is not unaware of this serious constraint to village and national development. However, since Qat is habituating, if not addictive, and it also represents a sizeable proportion of agricultural income in many areas, the solution will evolve only slowly through education and changes in traditional practices. The current substantial switch from food grains to Qat production may also increase household discretionary income as Qat prices drop.

Capital Cost Recovery

While AID policy requires only a contribution to investment costs by either the individual recipients, or, in some cases, by the concerned governments, it is reasonable to

explore the options for full or at least greater investment recovery.

One of the methods of financing which has been used by the Japenese is a soft loan to the government. This returns the investment cost to the donor, but since the government does not then collect it from the individual recipients it does not relate the beneficiaries with the costs. A decision to loan finance part or all capital elements of projects in Yemen is an AID policy decision which relates to the availability of YARG budget in cases where the government cannot or won't recover from the recipients.

At the village level, while there is a history of individuals from within the same family or tribe advancing money to others, the idea of community borrowing against a future "thing" which may, or may not, occur is not in the cultural tradition. The direct payment for something which will rapidly become physically visible (the villagers buy the local materials, or contribute the pump or engine or both), leaves them with a resaleable item should other events not transpire. Villages sophisticated enough to contemplate bank loans are also generally educated and wealthy enough to collect sufficient funds in advance and to not ask for assistance through CYDA/RWSD.

Loans further raise questions of a contractual nature. Current methods of collecting the advance payments and labor commitments for sub-project construction as well as for major and unusual repair costs consist of an initial village concensus on a amount per family, moderated by family circumstances, and then the physical collection of money. Only when all the money is in hand does the village leader indicate the village is ready to begin. Whether a village leader would be willing to commit himself to future collections, which he might have to finance for defaulters, is open to question but seems unlikely in the cultural context.

Both the Dutch and the Chemonix experiences indicates that there is less money available in the villages than has been hypothecized. While some villages have substantial expatriate remittances flowing in, a substantial number do not. Requiring more than the current approximately %30 up front could often leave RWSD with incomplete systems (as in the Chemonix project). If the decision were made to require more money up front for this project, since the %30 per cent rule is fairly standardized, would also probably result in AID being asked to help with projects in the middle or upper income

villages while the other donors worked with the poorer villages.

It might be possible, however, to increase the monthly rates by a small amount which would go into some sort of LDA pot until the capital costs were paid off. This would work where an organized LDA exists, which keeps good records, and where villages are not terribly poor.

The result of such a "mortgage" system, would be to add, albeit slowly, more money to the LDA system for projects (or to the YARG budget). This would presumably enhance the LDA's role (if the revenues were additive to the government funds) but would do it at the expense of the community's development. Alternatively, the villages could be encouraged to increase rates to cover not only recurrent costs, and even sinking fund costs for extraordinary repairs, but also to charge enough to build up an investment fund which could then be used to co-finance, say a school, with the LDA. This places the village in a decision making position and prevents them from being subject to the politics of LDA decisions.egative effect.

The villages of Han Han are already planning to charge enough to create an investment fund with which to co-fund (with the LDA) additional village improvements. Similarly the Beit Al Fiqih LDA, an excellent one, is encouraging villages to do the same thing. Since one of the original purposes of this project was to encourage village development and self-help, it is recommended that AID investigate alternatives for encouraging this type of village development fund. One way might be to work with the LDA's to increase their support for such activities and then for those dealing with the villagers as the systems near completion to be able to put the idea in their heads. Perhaps it would be possible to set up a small matching fund for villages which they themselves would then control. As with many other things, the adoption and success of such things depends on having strong, good leadership at the village level.

Recurrent Costs

The system being followed by the LDA/RWSD/Donor configurations forces the villages to figure out for themselves how they will handle recurrent costs. The system is turned over to the village at the time of completion. Even the most simple, gravity fed systems still tend to have gate values that

someone must open and close. An individual is selected for this function. When a pump and engine are involved, the salary of someone to run and maintain the pump and engine and the costs of diesel fuel and oil must be covered by the villagers. Table I, below, summarizes the findings in the 17 villages covered by the team economist.

As may be noticed from the table, the village leaders do not really decide in advance what to charge people. In two cases of new systems the village leader himself was financing the first few months operation until they knew what the costs looked like. In two cases the M&R men had not been paid for a month or so but did not seem to be worryied that they would not get the, as yet unspecified, back pay. Villages like Melah and Han Han which install meters from the beginning are unusual. Melah has a heavy proportion of Yemeni-Americans, which perhaps explains its choice. Han Han has an unusually visionary set of leaders and experience with electicity metering. The experience with the electricity shows the flexibility possible in cost coverage. (Forty houses are connected to a generator brought in by one individual. Originally he charged 10 YR per fixture or socket. People left their lights on all the time and the cost of running the system was more than the income. Then he put in meters and people started to live by the light of the television. Now there is a minimum charge of 50 YR/month and the costs and expenditures are coming together. The man who runs the generator is paid 700YR plus free lighting equal to 100-200 YR.)

Villages like Qarn Attar, which had a system of per head charges for over a year, are now installing meters because of perceived overuse by individuals and the problem that the tank would have to be filled more often under current unrestrained demand to satisfy everyone. This would cost more than income so they were getting by by letting the water run out and waiting until the next day to fill the tank again.

In one case, the villages of Hosia Ulya and Hosia Sufla, the villagers do not manage the money themselves but give it to the local LDA (whose president is from one of the two villages). They rightfully resent this as no public accounting of use of funds seems to occur and it deprives them of their ability to reduce or lower rates. This type of situation should be discouraged, both from an economic and social standpoint as well as from a village development standpoint.

TABLE I

Village*	Status**	Type***	Charges for Recurrent Costs
Beni Sheikh/Dhamar	C	Spr.,grav.	No charges. Will appt. one of number of men to collect funds and repair.
El Karaba (4) Dhamar	NC	2 eng., 2 pumps	not decided as NC.
Dhawran Anis(4)	C,NF	eng., pump	system cannot begin until fees established Families from El Lahq collecting water by hand at pump house pay 10 YR/3 months, 2 m trucks pay 20 YR per fill
Dreibah/Rada'a (Dutch)	C	pump,eng. resevoir	25-30 YR/ month/ household
Qarn Attah/Rada'a (Dutch)	C	pump,eng. tower	Was 25-35 YR. Instal-meters 2 months ago and will now read to figure appropriate unit charges.
Melah/Rada'a (RWSD)	C	pump,eng. tower	Meters from beginning Average charge for family of eight inter-viewed was 150 YR/3 months.
Yafaa' Dhamar	NC	pump,eng. resevoir	System waiting for pump and engine from RWSD No fee structure yet.
Han Han, Taiz	C	2 engs. 2 pumps 2 res.	System startup awaiting procurement by village of meters. Electric meters already in use. Maintenance person & asst. will get 3,000 YR per mon., big system

TABLE I (cont.)

Turba Hodeida	NC	eng.pump tower	System not ready
Majamala Beit El Fiqih	C	eng.pump.	Agul paying so far. costs per month: 500 for Amin (M&R), 400 for diesel, 100 for oil. 170 families
Wisa'ba Beit El Fiqih	C		offshoot of Majamala 15-20 YR per compound
Unayziah Beit El Fiqih	C	tower	M&R receives 700/month Families pay 15-20/mon.
Sa'adia Beit El Fiqih	C	tower	M&R receives 600 or 650 Families pay 25/mon. Costs are 920/mon. for fuel/oil
Jerba,Hod. Chemonix	C,NF	Tower	Pump fell in bore hole. System was working 3 15-20/mon./family 800-1000 to M&R 30-50 YR for 2 m ,truck
Schegen,Hod. Chemonix	NC	Tower	Village still owes 57,000 YR to LDA so one tap at tower, no distribution.
Hosia Ulya/Sufla Mansouria	C	1 tower 1 tank	Rich 25/family/mon.; Poor 20. 2 M&R Money goes to LDA which issues chits for fuel and oil, pays M&R.

Because each village is unique, the current system of recurrent cost coverage (except the Mansouria LDA) appears to be the best in the Yemen context. While it may be tempting to set up some kind of common procedures to either recover costs or set percentage contributions for revolving fund proceedures, this concept of standardization is highly unlikely to succeed, and if made a requirement of a project will simply cause the village to turn to one of the other donors.

AID Policy on Domestic Water and Sanitation

Project 044 was conceived and begun well before the AID Policy Paper on Domestic Water and Sanitation was issued in May 1982. Since one of the purposes of this evaluation was to determine whether the project should terminate in September 1984 or be continued/expanded into the future, a brief review of the policy criteria and guidance for the development of such projects is appropriate in support of the evaluation team's recommendation that the project, with modifications, be continued.

Criteria

The following criteria have been established to guide AID's investment in domestic water and sanitation.

1. Evidence of need

   " The need for improved water and sanitation is clearly indicated by high prevalence of disease caused by a) insufficient water, b) consumption of highly contaminated water or c) inadequate or inappropriate sanitation systemns (p.1)"

   In the absence of any published, comprehensive surveys of water sources for any rural section of the country, need can be hypothesized from several related indices and from sub-project initial survey findings.

   - the infant mortality rate of 159/1000 implies a high diarrheal dehydration death rate

   - enteritis and amoebic dystentary account for over half of the communicable diseases reported by all health establishments during the period 1975-1979. (WHO, July 1981)

- the majority of Project 044 sub-projects require prior well deepening or new source boring to provide an adequate quantity of water.

- improperly protected sources, including both wells and cisterns, are noted in a number of the project survey reports.

2. Effective Demand

"Consumers are willing to a) support recurrant costs through some combination of fees, contributions, and local or national budget allocations and b) cover some portion of the investment costs to improve traditional systems (p.1)"

In all cases under this project the villagers themselves have provided, on the average, thirty percent of the investment costs and they support 100% of recurrant costs without local or national assistance.

3. Institutional Capacity

"The local or national institutions responsible for national domestic water supply and sanitation policy must have the responsibility, personnel, and budgetary resources to ensure the construction, expansion and continued operation and maintenance of the improved water and sanitation sytems. At a minimum, there must be evidence that the institution can be strengthened to the point where it can assume such responsibility with only modest outside support."

RWSD has responsibility for the design and construction of water systems outside Sana'a, Taiz and Hodeida (and several cities recently assigned to NWSA). The majority of its personnel and budgetary resources are provided by a number of donors which enable it to design and construct of systems. Expansion (in the form of household connections) and continued operation is the responsibility of the villages themselves and, as noted elsewhere, appears to be quite successful for systems constructed under Project 044 (WHO notes in it sector study that since the projects are implemented in response to village requests and, that, in many instances the village contribution in cash or in kind is substantial, that the implementation of unwanted or unappreciated facilities which subsequently suffer from lack of utilization, disinterest or maintenance does not occur.)

4. Infrastructure

"[Where roads are insufficient for routine maintenance and delivery of fuel] the technology adapted in the improved systems must be such that the system can be maintained by the community without outside assistance or supervision".

As noted above this is the case. The training of village pump and engine operators contributes to this community control and independence.

TABLE II

Factors Guiding Project Design	Project -044
-a minimum of 20-40 liters a day of relatively safe water per capita per day.	Yes. Generally brought up to WHO standards.
-improvements in water quality (as opposed to quantity) where improvements can be introduced at reasonable cost without compromising reliability.	Yes. All sources are protected from contamination.
-selection of a technology that can be maintained and .operated easily and is acceptable within the local culture.	Yes. Both pumps and engines are known and maintainable. NTF has fabricated and tested standpipe controls for sturdiness and maintenance and reduced the number of, or eliminated, valve boxes, which are subject to sand infiltration.
-measures to promote water conservation and reuse.	Open. Villagers have been installing meters. Meters or metering functions are recommended by this evaluation where household connections exist. Common taps involve water carrying which limits quantity and promotes reuse. (See Chapter VI.)
-project design and implementation which responds to the needs of the community and and whenever feasible, encourages active community involvement in all phases of the project.	Yes. NTF team members negotiate "T" locations and standpipes with villagers who then provide labor, local materials, STET as well as shelter and food for the supervisors

-sustained educational efforts to instruct users in proper water use and hygiene.	No. See Chapter VI.
-a demonstrated means of financing and ensuring operations and maintenance of the project over the long term.	Yes. The various systems of household or head rates per month, or meters where they exists appear to be working well.
-training of community level workers and personnel at the regional and national level in maintenance, operation, and repair of water supply and sanitation systems.	Yes. Training of village M&R personnel is part of project as is RWSD technician training. (However, LDA or GCC personnel were to be trained under LRD. Results are not known.)
-technical assistance or training, as required, to improve the administration of water supply and sanitation systems	Somewhat. Institutional development was limited by the recommendations of the March 1982 evaluation to technican training See Chapter VII

CHAPTER IX
OTHER ISSUES

The Role of the Peace Corps

The Peace Corps has been directly involved in the 044 project for over two years at this writing. It is generally accepted that project 044 is one of the few Peace Corps project in Yemen with consistently high morale and close to zero attrition. The lessons to be learned for Peace Corps policy and planning from this relative success are truisms but worth repeating, as it often seems these things are forgotten over and over again.

The first is that Peace Corps Volunteers are most effective and happiest when they have meaningful work to do and when that work fills their time. In Yemen so far this is the most likely to come about when Peace Corps Volunteers are under the supervision of a third party (like an AID contractor) in their relationship with the YARG. The second truism is that they do better when treated like professionals, as adults, and are given real responsbilities.

If we take as a given that one of the most important aspects of NTF's relative success in this project is quality control and that quality control is an essential element in 044's influence on institution building, then it is easy to see the role of Peace Corps Volunteers in the project as directly related to quality control. In the field they have primary responsibility for that quality control. Their ability to enforce quality control (their "authority", in "political" terms) seems to have much to do with the nature of Peace Corps Volunteers (as thus far recruited and trained for the 044 project.) The following characterists are significant:

1. Peace Corps Volunteers are positively motivated in this project because:

   a. they feel they were specially recruited for it.

   b. the project has developed a reputation as a "premier" project.

   c. TransCentury is highly appreciative of the Peace Corps Volunteers.

d. they are young Americans, who inspite of differences in personal reasons for joining the Peace Corps, still share the same overall ideology that motivated PCVs to join in the Kennedy era. This factor is more than mere soft headed fluff. It is directly related to their effectiviness.

2. PCVs are oriented to live and work in the field. This is central. People everywhere generally like it when strangers make efforts to come to their level. Yemenis appreciate this especially.

3. PCVs speak Arabic (and in one or two instances have approached mastery).

4. PCVs are energetic and have relatively open minds vis-a-vis learning water engineering - due to the fact they are largely freshly out of school. Instead of being a liability - being freshly out of school is an advantage in 044 - because the level of field construction in 044 doesn't require experienced engineers.

5. The PCVs in this project seem to have great rapport both with co-workers and villagers as a result of the above factors.

This combination of characteristics may not be easily duplicated by using other sources for the role. Possibly Dutch and German volunteers could qualify but it is likely that PC's contribution to the 044 project is a unique one,

A couple of anecdotes serve to illustrate these points: In the villages where projects were completed first, (about 18 months ago). The only names remembered are those of PCVs or ex-PCVs. ("Do you know Jack?" "Do you know Mike?" were often asked questions.) Anecdotes about Larry's dog, or Jack's enthusiasm for Qat, may seem to indicate only the lingering presence of American good will. But it is possible that whatever may have been learned in the way of technique, method, or overall orientation to construction, depended on having a positive relationship first - on liking the person who was sent to the village and most importantly coming to respect him as an authority.

Observation of two PCVs At Turbah village confirmed their being taken as authorities on construction. At one point villagers took one of the PCVs aside to question him about the

use of two inch pipe for the distribution line as opposed to three inch. The PCV carefully explained that there was no problem; two inch pipe would work fine. The key, he explained, was that each step in the distribution system had to be a smaller dimension and that as they were going to use half inch pipe for the house connections the pressure would be fine. His interlocutors immediately said to him: "OK, if you say so, then we're satisfied."

A common assumption made by the more cynical in the development community is that the "natives" tend to stick to their (own version of) common sense in making technological judgments. Thus they view piping systems in terms of "big is better". Some observers note that it is hard to change their minds (examples of failure in pump and motor systems often tend to end with a description of the villagers concluding that the problem is that either the pump or the motor (or both) is "not big enough." The PCV's evident authority in the above anecdote questions that assumption.

If the above conclusions about PCV's role in 044 are correct then that role is not to be taken for granted as long as the Peace Corps remains involved. There are critical conditions without which PCV involvement would be worth considerably less.

1. Peace Corps Washington in its overall policy ought to recognize (if it hasn't already) that recruitment of PCVs for specific projects in specific countries is the appropriate way to go. (At one time, just two years ago, PC policy was against this - The prevailing belief was that the essential nature of volunteerism was threatened if an individual was recruited for a specific purpose, project and place)

2. Peace Corps/Recruitment <u>must</u> continue to emphasize technical skills. The mix of construction supervisors (with experience), engineers and architects, should be kept.

3. Peace Corps/Yemen staff, TransCentury/Yemen staff and most importantly MPW and RWSD must have the right to accept or refuse candidates for PC service. Along with this goes the right to ask PCVs to leave - a right which (it should be noted) has been exercised very rarely and then only with extreme caution by MPW in past history.

Comparable Projects

A number of other donors are working in the area of small rural water systems. The Japanese, through a soft loan, are funding somewhat larger programs than AID. The Netherlands are funding (under the Ministry of Agriculture) systems similar to AID's under the Rada'a Integrated Rural Development Project (RIRDP) and more recently intiated an additional project which is supposed to do much of what 044 is doing. This project has had unexplained (to the team) problems in getting started. UNICEF provides pipes and pumps for general RWSD project as well as complete supplies for systems in the villages where UNICEF is providing Primary Health Care centers. West Germany is financing systems in the Mahabisha area and water and sewerage studies in Manacha and Mareb. IDA and Kiwait are financing small systems in the Wadi Mawi area.

The team was unable to meet with the West Germans but did visit subprojects sites and talk with personnel at both RIPDP and the Project 045 Tihama area since these projects were most similar to 044.

The RIRDP headquarters are located about 1/2 hour from Dhamar City. The team interviewed the Dutch advisor in charge of water projects. He had arrived slightly over two years ago and as with most of the team is scheduled to leave soon since the Yemeni officially took over the project in January of 1983 and the past year has been considered a transition year. (It would appear that little has changed during this period and that the Dutch team's departure may not leave behind the institution they had hoped for.)

RIRDP does about 12 projects a year with a waiting period of about 1/2 year after the village request. The key differences between their project and 044 is that the villages provide no unpaid labor, only cash, and the village contribution is collected against an estimate which is later adjusted to actual cost. The villagers agree to pay a flat 30% of the actual cost of the contractor and labor (design, survey costs, and local overhead are excluded). For the first few projects RIRDP had to charge only 20% since the project was unfamilier and the villagers were unwilling to commit such large amounts to an unknown entity. Collection problems have arisen when actual costs exceeded estimated costs. Now RIRDP does not put in the distribution system until a second estimate (actuals plus estimated costs to completion) is done. RIRDP also handles development of sources (drilling) which is done through private contractors theoretically (in actuality one always gets the

award). They use about twenty different contractors for pumphouses and conduct informal on-the-site training much as NTF does. Quality of construction looked as good as NTF's.

The team visited two project 045 subproject sites in the Tihama. In one village, where the system had been working for three months, the pump had fallen into the well so the system was down while we were there. There apparently is no strong leadership in the village but one of the villagers, who acts as the mechanic, worked with an Italian Co. for years. The LDA handles the finances rather than the village. In the second site the villagers had been unable, or were unwilling, to pay the balance of the 50% of investment 045 requires. The villagers still had old wells as alternatives. Tower construction appeared inferior to project 044.

One of the noticeable differences between these two projects and 044 was personnel "team spirit." The Dutch are leaving so it's to be expected that they are beginning to emotionally disengage. The reasons why Chemonix would pick two obviously problem projects to show us was unclear. The PCV did not seem to have the same level of enthusiasm as the 044 PCV's albeit he had been trying to collect money from the one project for some time. Project 045 has also had the task of trying to develop the LDA system, a much more difficult assignment than TransCentury's more straightforward one.

AID and NTF Management

The curent system of quarterly reports combined with informal communications, which are made easier by the RWSD being located right behind AID, have been sufficient for AID management purposes particularly since the new project officer, a contract employee, gets out to the field frequently. To say that the system is adequate means that the USAID knows what is happening, knows about problems, and can reasonable equate money spent with personel and systems costs.

For future activities NTF, as well as AID, needs to consider the value of introducing a managerial accounting system in place of the current bookkeeping system. At present, while the regular 044 subproject costs can be found by subproject the Dhamar subproject costs cannot be tracked. Central overhead and salary costs are calculated in Washington for submission in Sana'a and, while the breakout into salaries, overhead, etc. [normal line items] is sufficient for AID's needs it does not support management decisions and probably was the reason that TransCentury found itself within sixty days of a serious money crunch in November.

An added benefit of a managerial accounting system, using basic cost center concepts, would be the later transference of such a system to RWSD. Personal computer software already exists for construction. Other cost center areas, such as training should not be hard to develop. It is even possible with such systems to account for water system costs in such a way (using labor unit costs) that the donor "surplus", i.e. cost of not using Yemeni's, is provided. This might focus the YARG's attention more strongly on the need to train Yemenis, pay them market salaries, and use donor money for imported pipes and such.

At a minimum NTF needs a better tracking system so they don't arrive at the same position in the future which they faced in December 1983. At a maximum, NTF may be able to set up a system which can be easily expanded to cover RWSD's work (NWSA already has heaily invested in computering costs and financing).

Scope of Work for a Water Sector Assessment

As part of the evaluation's scope of work the team were asked, if there was time, to make suggestions for the scope of work for a water sector assessment to be done as a follow-up to this evaluation, and whose need was felt as a result of the failure and consequent deobligation of Project 0043. The team feels that the water sector as a whole has been adequately studied and reported in the 1981 WHO report and the 1983 IBRD report (see bibliography). In addition, in February 1984, a Doctoral Thesis, A Socio-Economic Analysis of the Water Sector in North Yemen, written by Mr. Mohammed Mallik, who has been in charge of the WHO water activities in Yemen for eight years, will be available. He has developed a whole new approach to investment analysis as part of this document. Also, Daniel Varisco's thesis on Water Rights provides new information in that area.

What is lacking in the literature is the solid analytical work in the politics and power of the various players in the water sector that would enable AID to get involved in the major policy problems facing the Yemeni. Some policy questions, like the expected depletion of the Sana'a acquifer by 1988, require immediate attention and may have to be dealt with outside of the longer term rationalization of water activities. That the High Council for Water Policy has yet to operate effectively since it's inception in 1981 is known and was a major reason for the project's deobligation. What was not known at the time the scope of work for this team was written was that the HCWP chaired a major water symposium, held at the National Institute for Public Administration, in

September. The symposium was composed of key water people from the twenty-seven ministries involved in water/sanitation. The important thing, from both AID's and the YARG's point of view, was that the symposium focused on the question of why the High Council had been unable to carry out it's mandate. It was determined that the High Council had been unable to achieve anything because the law gave it neither the power nor the authority nor the budget to carry out its assigned mandate . It couldn't coordinate without power to do so nor collect data which didn't exist without a staff. The symposium has recommended the creation of two working staffs, one technical and one legal. The by-laws and organizational structure have already been drawn up. The symposium has also recommended that the representatives from each Ministry be the Ministers themselves since in the past Ministry representatives have had no real authority to make decisions. The High Council would also be located in the Office of the Prime Minister or the President to give it clout.

Since these changes require review and approval by the People's Assesmbly, it may be several months before the results start to appear. The YARG representatives interviewed expressed their intention to request some funds from AID and regretted the loss of the $1.4M which was deobligated. The minutes of the symposium are being typed and will be provided to AID/Sana'a, which has agreed to translate them into English. Until this situation is clarified further, the team is recommending that USAID delay making a decision on a scope of work for a sector assessment. If all works out as planned, USAID's desire for additional information would dovetail nicely with the High Council's need for the same information and some form of mutual cooperation could be established.

APPENDIX A

EVALUATION TEAM FIELD VISITS

KEY TO TEAM MEMBERS

L - Emily Leonard, Team Leader
D - Tom Dichter, Anthropologist
A - Jim Arbuthnot, Engineer
C - Lynn Carter, USAID/Sana'a

044 COMPLETED PROJECTS

Village	Governate	Evaluation team visits
01. Al Hillah	Hodeidah	D
02. Al Saadia*	" "	L,D,C
03. Muradifah*	" "	D,C
04. Khadariah	" "	D,C
05. Muhad	" "	
06. Marwah	Dhamar	
07. Bayt Al Hindi	" "	
08. Bayt Al Ansi	" "	
09. As Sayh	" "	
10. Unayziah*	Hodeidah	L,D,C
11. Bayt Muftah	Maswar Haaja	
12. Al Maweer	" "	
13. Dar Al Qadhi*	Beni Matar,Sana'a	A
14. Nub	" "	A
15. Bayt Ithaga	Maswar Haaja	
16. Bayt al Faqih	" "	
17. Bayt Kahan	Bani Matar,Sana'a	
18. Marbak**	Jehana, Sana'a	A
19. Husayah Al Ulya	Hodeida	L
20. Husayah Sufla	" "	L
21. Mahala	" "	A
22. Saulah	" "	A
23. Adamegh	" "	
24. Dar Ahdam	" "	
25. Mujamallah	" "	L
26. Wisabah	" "	L
27. Dumnah	" "	A
28. Han Han	Taiz	L,D,C

* Sanitation project also completed
** Sanitation project surveyed, designed and proposed for construction

044 PROJECTS UNDER CONSTRUCTION, SUMMER SCHEDULE

29. Maeenah Meswar	Jihana, Sana'a	C
30. Maeen Yemenia	" "	
31. Rabadh	" "	C,A
32. Sethan	" "	C
33. Kohlan	" "	

044 PROJECTS UNDER CONSTRUCTION, FALL SCHEDULE

34. Nabahina	Taiz	D,C
35. Murabaa	Bayt Al Fagih,Hod.	A
36. Turba	" "	L,D,A,C
37. Mawha	Mansouria, Hod.	
38. Saba	Hais, Hod.	
39. Jaruba	Hodeida	
40. Quba'a	Taiz	
41. Dar Daood	Jihana, Sana'a	

WINTER SCHEDULE

42. Suq Al Ithnane	Aps Naiyha,Haaja	
43. Dar Al Hisi	" "	
44. Beni Kudaysh	" "	
45. Lubadah	" "	
46. Maakfah	" "	
47. Watiyah	" "	
48. Al Hawgari	" "	
49. Maakhadh	Amran, Sana'a	
50. Al Dhaef	Taiz	

DHAMAR, COMPLETED

01. Dhawran Ans		L,D,A,C
02. Dhawran Village		L,D,A,D
03. Al Jabal		
04. Al Bustan		
05. Bayt Al Awsady		
06. Muthab Ulia		
07. Muthab Sufla		
08. Bayt Hudram		L,D,A,D
09. Maqadeha		
10. Al Lahj		L,D,A,C
11. Bayt an Mushairi		
12. Bayt Us Samad		
13. Bayt Al Hisam		

14. Addarb	A,C
15. Addarb village	A,C
16. Al Kharaba	L,D,A,C
17. Beni Mohin	L,D,A,C
18. Beni Sanid	L,D,A,C
19. Al Qaria Ulia	
20. Dhur'a Assayh	
21. Beni Sabir	L,D,A,C

DHAMAR, 90% COMPLETED

22. Assayh	
21. El Kharaba Ul.	L,D,A,C
22. Beni Shaikh	L,D,A,C
23. Yafa'	L,T,C
24. Alam Sheer	
25. Al Hawajer	
26. Al Ma'laaf	

DUTCH PROJECTS, RADA'A

01. Dreibah	L,D,C
02. Qarn Attah	L,D,C

CHEMONICS PROJECTS

01. Jerba	L,D,A
02. Al Shejem	L,D,A

APPENDIX B

BIBLIOGRAPHY

Adra, Najwa. Local Perception of Breastfeeding, Fertility and infant Care in Ahjur, Yemen Arab Republic, August 1983

Agency for International Development. Domestic Water and Sanitation, Washington, D.C., May 1982.

The American Institute for Yemeni Studies. Social and Institutional Profile of Rural Yemen, 1983

Ansel, Christine. The Benefit of Rural Water Projects - An Impact Survey of Five Villages, New TransCentury Foundation, October 1981.

Ansell, C. & Burrowes, R. "Communicating Hygiene/Sanitation Messages to Villagers. An Experiment in Wadi Ayyan," American Save the Children, June 1981.

Carter, Lynn. "Site Visit Report to 044 Subprojects in Han Han (South-East of Taiz), 28 September - 1 October, 1983.

Carter, Lynn. "Sit Visit to Three 044 Water Projects in Kowlan at-Tiyal. (Jihana), on 14 September 1983".

Carter, Lynn. "Site Visit to Project 044, Dhamar on Saturday, 1 October, 1983.

Cassanos, James G. "Memo on Project 279-0044 Small Water Systems in Yemen." 1982.

Coleman, Susan. "Current USAID Funded Projects. The Role and Participation of Women." 1983.

Garner, David & Sediq, Muh'd. Draft Memorandum, Future' Activities Under a Possible Extension of Project 044 (044/II), 27 August 1983.

Garner, David. Memorandum of Conversation, Meeting at the Ministry of Public Works. 13 September, 1983.

Garner, David. Memo on History and Background of 0044 Project to Weden and Thomas, 21 September, 1983.

Garner, David. Summary List of TC Projects, 4 October, 1983.

Herrmann, Jens. Ambition and Reality Planning for Health and Basic Health Services in the YAR, Frankfurt, Peter Lang Verlag, 1979.

Project Paper (Project 044/New TransCentury Foundation):
Volume I - OPG with Summary Budget
Volume II - Schedules for Budget
Volume III - Appendices

Technical Proposal, Yemen Rural Water, New TransCentury Foundation, August 1978.

Yemen Rural Water Cost Allocations, Revised Submission New TransCentury Foundation, May 30, 1979

Quarterly Report, Small Rural Water Projects 044, New TransCentury Foundation, July-September, 1983

Quarterly Report, Small Rural Water Projects 044, New TransCentury Foundation, April-June, 1983.

Monthly Report Small Rural Water Project 0044. New TransCentury Foundation, October 1982

0044 Project Evaluation (USAID, New TransCentury Foundation, Peace Corps, Ministry of Public Works), March 1982.

0044 Quarterly Report File.

General 0044 Project Files.

The New TransCentury Foundation. Rural Development Experience, Staff Available for Yemen Rural Water Needs and Other Support Capabilities, March 1978.

"Evaluation of an Integrated Rural Development Project-Local Resources for Development". November, 1982, Project 0045.

Agricultural and Cooperative Credit Bank.

Health Sector Work Paper.

Tihama Development Authority, A Record of Achievements

Working Paper, The Agricultural Sector.

Working Paper #1, Ministry of Health.

Johnson, Reuben J. "Water Resources Planning and Development Policy Recommendation YAR 5/80 Prog.

McVey, Paul "Project 045 Private Sector Involvement," 1983.

Mullick, M.A. "Environmental Health Promotion and Community Water Supply: An Outlook After Ten Years of WHO Assistance" Yemen Arab Republic, February, 1982.

Muncy, D. Evaluation Project 279-0004, Small Rural Water Systems, 1983

Peace Corps/Yemen, "Current Projects," April 1983.

Peace Corps/Yemen, "The Peace Corps Program in Yemen, 1983".

RIRDP. "Study into Water Resources at Al Beyda Province: Progress Report for April to August 1983"

Rosenberg, Leonard G. "Water/Wastewater Pricing and Financial Practices in the U.S.", 1983.

ROC International, Tariff Study for NWSA, Sana'a, January 1983.

Ryder, Colm. "A Pilot Sanitation Study: Yemen Arab Republic," August, 1983.

Tutweiler R. ASTC/Yemen Applied Research Report #2 "Domestic Water Use in a Subdistrict of Mahweit Province," November, 1980

Varisco Daniel. The Adaptive Dynamics of Water Allocation in Al-Ahjur, Yemen Arab Republic. Doctoral Dissertation, University of Pennsylvania, 1982.

Yemen Arab Republic Case Study and Analysis.

"Yemen Arab Republic Water Supply and Sanitation," World Bank Sector Memorandum, March 25, 1983. Fairly Detailed Overview of YARG and Donor Activities in the Water Sector.

WASH Field Report #22. "Evaluation of Yemen Water Supply Systems Management Project," September 1981.

WHO. Yemen Arab Republic: Water Supply and Sanitation Study, Geneva, July 1981.

Ziegler, James R. "Data Processing System for NWSA, Sana'a March, 1983.

APPENDIX C

INDIVIDUALS INTERVIEWED

USAID

Charles F. Weden, Director
H. Pat Peterson, Agriculture
Howard Thomas, General Development Office
Lynn Carter, General Development Office
Robert Rose, General Development Office
Kaokab Abdullah al Jofi, Translator
Susan Coleman, Program Office
David Frederick, Program Office
Donald Muncie, Program Office

U.S. Embassy

H.E. David E. Zweifel

The New Transcentury Foundation (NTF)

David A. Garner, Chief of Operations, TC/W
M. Mohamed Sediq, Chief of Part
Abdul Sadek, Engineer
Michael Cullen, Engineer
Joseph Moyer, Administrator
Tony Shanley, Design Engineer
Richard Boni, Construction Supervisor & Field Coordinator
Burt Bernard, Construction Supervisor
Timothy Asmore, Architect
Michael Bolster, Architect
Rob de Wayse, Dutch Volunteer/Engineer
Lou Mitchell, NTF/W

Peace Corps/Yemen

Joseph Goughassian, Director
Janice Hagginbotham, APCD/Administrator
Susan Hoops, Peace Corp Volunteer (044)
Andrew Honaman, Peace Corp Volunteer (045 Project)
Beth Ganser, Peace Corp Volunteer (045 Project)
Tom Craveiro, Peace Corp Volunmteer (044)
Gary Thompson, Peace Corps Volunteer (044)
Kevin Griebenow, Peace Corps Volunteer (044)

Peace Corps/Washington

Susan Belmont, Yemen Desk Officer
Chris Pelton, Acting Yemen Desk Officer
Susan Scull, Women in Development Coordinator

MPW/RWSD

H.E. Abdullah Krushumi, Minister
Eng. Mahdi Mohammud Mahdi, Senior Technical Advisor
Engf. Abdulghani al Ghazzali, RSWD
Abdulbari Saleh, Director-General RWSD
Ibrahim as-Shami, Deputy RWSD
El-Said Muwafi, WHO, Instructor, Maintenance Courses
Osman Nuri, Administrator
Yahya al-Sanabani, Director, Reconstruction of Water Projects in Dhamar
Abdullah Abd al-Malik, Director Department of Drilling & Hydrology

NWSA

Muhammad No'man, Asst. Secretary General
Abd al-Karim, Chief Hydrologist
M. Hazza Kassim, Director of Planning, Statistic and Tariff Manager

CHOMONICS

Frank Devlin, Engineer
Dr. Jon Swanson, Engineer
Paul W. McVey, Project Manager
James P. Ginther, Agriculture Engineer

Ministry of Municipalities and Housing

Abd al-Rahman Al-Mo'assib, Sana'a Waste Disposal Project

TMSI

Bill Mayberry

Dutch Project RIRDP

Bert Karpay, Director, Water Projects

TNO (The Hague) (Netherlands Organization for Applied Scientific Research)

Dr. Gerard Jeurissen

Local Development Association/Bayt al-Faqih

Officials

UNICEF

George Kassis

Consultant

Reuben Johnson

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COMPLETED PROJECTS

	PROJECT/VILLAGE	Governorate	POPULATION		PRESENT PER CAPITA COST($)	PROJECTED PER CAPITA COST	TOTAL DIRECT COST	CONSTRUCTION SCHEDULE
			PRESENT	PROJECTED				
1	Al-Hillah ✓	Hodeidah	725	1088	116	78	84100	15 August - 15 December
2	Al -Saadia ✓	Hodeidah	825	1238	87	58	71775	2 October-25 February
3	Muradifah ✓	Hodeidah	594	891	106	71	62964	25 October-[illegible]
4	Khadariah ✓	Hodeidah	645	968	82	55	52890	5 December-25 [illegible]
5	Muhad ✓	Hodeidah	730	[illegible]	54	36	39420	3 January- 8 [illegible]
6	Marwan ✓	Dhamar	750	[illegible]	38	26	28500	31 December-1 [illegible]
7	Bayt Al Hindi ✓	Dhamar	150	[illegible]	169	112	25350	20 January- [illegible]
8	Bayt Al Ansi ✓	Dhamar	200	[illegible]	130	87	26000	14 February- [illegible]
9	As Sayh ✓	Dhamar	600	[illegible]	26	17	15600	27 April - [illegible]
10	Urayziah ✓	Hodeidah	595	935	132	88	78540	15 May-83
11	Bayt Duftah ✓	Maswar Hajja	550	825	110	73	60500	5 May- 82
12	Al Khweer ✓	Maswar Hajjah	495	[illegible]	141	94	69795	16 May - [illegible]
13	Dar Al Qadhi ✓	(Bani Matar)SANA	320	480	93	62	29760	10 August - 82
14	Hub ✓	Bani Matar Sana	420	630	51	34	[illegible]	21 August- 82
15	Bayt Ethaan ✓	Maswar Hajja	1140	1710	39	26	44460	15 April -
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	Bayt Al Faqih ✓	Maswar Hajja	680	1[illegible]	141	94	95880	1 September -
18	Bayt Kahan ✓	(Bani Matar)Sana	455	[illegible]		59.5	27140	Oct-82 -Jan [illegible]
19	Marbak ✓	(Jehana) Sana	1450	[illegible]	92.75		32549	Nov-82 - Feb [illegible]

REPRODUCED

COMPLETED PROJECTS

	PROJECT/VILLAGE	Governorate	POPULATION		PRESENT PER CAPITA COST($)	PROJECTED PER CAPITA COST	TOTAL DIRECT COST	CONSTRUCTION SCHEDULE
			PRESENT	PROJECTED				
10	Ruayah SUFLA	Hodeidah	1250	1875	32.83	$	41038	31-5-83
11	Kehala ✓	"	900	1350	58		52200	31-5-83
12	Qualah ✓	"	850	1275	64		54400	31-5-83
13	Aqmesh ✓	"	730	1095	58		42340	31-5-83
14	Lamamilah ✓	"	868	1302	64		55552	June 83
15	Mrehah ✓	"	516	775	159		82044	"
16	Qaryah Al Ulya	"	770	1155	66.3	58	51051	25-4- 83
17	Lasah ✓	"	532	798	99		52668	20 April - 8 June'83
18	Kirabna	"	720	1080	106		76320	June ' 83
19	Qer Allam ✓	"	1780	2670	49		87620	50% Completed

69

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AIDAC

E.O. 12356: N/A
SUBJ: PROJECT 279-0044 EVALUATION SOW

REF: (A) STATE 239864, (B) MUNCY MEMO TO NE/NENA DTD JULY 11, 1983 W/ENCLOSED EVALUATION SCOPE OF WORK

1. MISSION APPRECIATES COMMENTS NOTED REF (A). IN ORDER TO ALLOW MAXIMUM TIME TO ANALYZE, ASSESS AND PREPARE THE EVALUATION TEAM MEMBERS DR. TOM DICHTER AND YET-TO-BE-DETERMINED WATER ENGINEER SHOULD ARRIVE AT POST O/A OCTOBER 10, 1983. TEAM LEADER/ECONOMIST LEONARD SHOULD PLAN TO DEPART O/A SEPTEMBER 30 AND ARRIVE AT POST O/A OCTOBER FIRST. RATIONALE FOR LEONARD'S EARLY ARRIVAL IS AS FOLLOWS: (1) MAKE PRELIMINARY CONTACTS WITH RWD, TRANSCENTURY AND USAID, (2) ASSEMBLE PERTINENT DOCUMENTS FOR REMAINDER OF TEAM, (3) MAKE LOGISTICAL ARRANGEMENTS FOR IN-COUNTRY TRAVEL PORTION OF TDY AND (4) MAKE ARRANGEMENTS FOR OTHER SUPPORT, AS REQUIRED, SUCH AS SECRETARIAL, REPRODUCTION AND INTERPRETER SERVICES.

II. TEAM MEMBER COMPOSITION (1) TEAM LEADER/ECONOMIST E. LEONARD FOR APPROXIMATELY SIX WEEKS BEGINNING SEPTEMBER 30, 1983; (W) RURAL SOCIOLOGIST DR. TOM DICHTER FOR APPROXIMATELY FOUR WEEKS; AND A WATER ENGINEER FOR APPROXIMATELY FOUR WEEKS. DR. DICHTER AND THE ENGINEER SHOULD BE CONTRACTED THROUGH THE WASH PROJECT WITH REPAYMENT FROM PROJECT FUNDS. LEONARD'S TDY FUNDED BY MISSION OE FUNDS. DITE: APP 72-1131000; BPC CDEA-83-23279-U000.

III. PER DISCUSSIONS DURING MUNCY TDY NOTED REF A, THE FOLLOWING ARE SCOPES OF WORK FOR ALL TEAM MEMBERS. MISSION RESERVES THE RIGHT TO ALTER ASSIGNMENTS AFTER INDIVIDUAL DISCUSSIONS WITH TEAM.

A. ALL TEAM MEMBERS:

1. ANALYZE THE ORGANIZATION AND STAFFING OF TRANSCENTURY AND THE RURAL WATER DEPARTMENT AND THE EFFECTIVENESS OF:
A. RATE OF PRESENTATION AND SELECTION OF SUBPROJECTS,
B. PLANNING AND DATA GATHERING,
C. FINAL PROJECT INSPECTION, PAYMENTS AND STARTUP, INITIAL OPERATION AND ACCEPTANCE.

2. REVIEW AND ANALYZE THE EFFECTIVENESS OF THE PROJECT SURVEY DATA QUESTIONNAIRE IN MEETING PROJECT ENGINEERING REQUIREMENTS AND PRELIMINIARY CONSIDERATION OF AN EXPANDED QUESTIONNAIRE DESIGNED TO BEGIN DEVELOPMENT OF A DATA BASE DESIGNED TO ASSESS THE IMPACT OF THE COMPLETED WATER SUPPLY SYSTEMS ON SOCIO-ECONOMIC AND HEALTH ASPECTS OF VILLAGE LIFE.

3. ASSIS PROJECT REPLICABILITY

4. MONTHLY, QUARTERLY AND SEMI-ANNUAL REPORTS AND REPORTING PROCEDURES BY TRANSCENTURY.

5. APPROPRIATENESS AND USE OF PEACE CORPS VOLUNTEERS AND THEIR IMPACT ON THE PROJECT.

6. GENRAL ASSISSMENT OF THE OVERALL LONG-RANGE REQUIREMENTS FOR SIMILAR RURAL WATER PROJECTS IN YEMEN, TOGETHER WITH ORDER OF MAGNITUDE OF COSTS AND INSTITUTIONAL REQUIREMENTS FOR IMPLEMENTATION.

7. PREPARE, BASED ON THE EVALUATION FINDINGS, THE TERMS OF REFERENCE FOR THE WATER SECTOR ASSESSMENT TO BE CONDUCTED IN EARLY 1984.

I. ASSESS THE EXTENT TO WHICH WOMEN ARE OR HAVE BEEN INVOLVED AND THE EFFECTS ON WOMEN OF THE NEW WATER SYSTEM(S).

APPENDIX E

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B. TEAM LEADER:
1. COORDINATE WITH MISSION ON ALL PHASES OF THE EVALUATION,
2. COORDINATE PREPARATION OF THE EVALUATION FOR MISSION REVIEW,
3. ASSESS RWD ACTIVITIES FINANCING AND LEVEL OF LOCAL VILLAGE FINANCIAL, LABOR AND OTHER IN-KIND CONTRIBUTIONS TO CONSTRUCTION OF THE SYSTEMS.
4. ASSESS ECONOMIC BENEFITS DERIVED FROM THE INSTALLATION, CONSTRUCTION, MAINTENANCE PROCESS TO THE VILLAGS/LDA'S.
5. ASSESS ECONOMIC IMPACT OF WASTED WATER THROUGH MISUTILIZATION AND/OR LACK OF MAINTENANCE.
6. ASSESS THE IMPACT THAT NEW WATER SYSTEMS HAVE, IF ANY, ON VILLAGE HEALTH AND SANITATION.
7. ASSESS RECURRING COSTS IN YARG/VILLAGE OPERATED SYSTEMS.
8. PREPARATION OF SECOND DRAFT EVALUATION AFTER MISSION REVIEW.
C. RURAL SOCIOLOGIST:
1. ASSESS THE PROCESS OF SITE IDENTIFICATION TO INCLUDE THE METHOD RWD USES TO ADMINISTRATIVELY AND LOGICALLY SELECT SUBPROJECTS.
2. ASSESS THE SOCIOLOGICAL IMPACT OF THE PROJECT TO INCLUDE INSTITUTIONALIZATION IN RWD, HOW VILLAGES UTILIZE WATER RESOURCES BEFORE PROJECT INCEPTION AND NOW, ASSESSMENT OF COMPARATIVE COSTS OF ALTERNATE USE OF WOMEN'S TIME SAVED AS RESULT OF AVAILABILITY OF POTABLE WATER FROM THIS PROJECT AS OPPOSED TO HOW WOMEN USED THEIR TIME BEFORE PIPED WATER WAS AVAILABLE.
3. ASSESS EFFECTIVENESS OF COUNTERPART AND TECHNICIAN ON-THE-JOB TRAINING.
4. ASSESS CHANGE, IF ANY, IN YARG ATTITUDE TOWARD THE PROJECT AS WELL AS POLITICAL IMPLICATIONS OF THE PROJECT ACCOMPLISHMENTS, LEVEL OF UNDERSTANDING, GOALS AND PROACTICES.
5. USE OF IN-COUNTRY TRAINING FACILITIES AND OPPORTUNITIES.
6. ASSESS MINISTRY OF HEALTH COOPERATION AND ITS EFFECTIVENESS.
D. WATER ENGINEER:
1. ASSESS YARG AND VILLAGE MAINTENANCE OF THE WATER SYSTEMS AND ANY IMPROVEMENTS MADE BY THE PROJECT.
2. ASSESS ACTIVITY SURVEY, WELL TESTING ENGINEERING DESIGN, STANDARDIZATION AND COST ESTIMATING.
3. ASSESS TC/RWC CONSIDERATION OF ALTERNATIVES, FEASIBILITY AND PROJECT DESIGN.
4. ASSESS CONSTRUCTION, CONTRACTING AND SUPERVISION.
IV. MISSION HAS REQUESTED AND THE RWD HAS NAMED A COUNTERPART TO WORK WITH THE EVALUATION TEAM. THE SCOPE AND EVALUATION HAS BEEN DISCUSSED WITH THE MINISTRY WHICH HAS ASSURED USAID OF ITS COOPERATION.
V. REGARDING THE WID COMPONENT, MISSION CURRENTLY HAS ON STAFF A YEMENI FEMALE WHO CAN ASSSIST IN INTERVIEWING, AS APPROPRIATE, RURAL VILLAGE WOMEN WHO HAVE BEEN AFFECTED BY PROJECT ACTIVITIES.
VI. REQUEST AID/W PREPARE PIO/T BASED ON THE FOREGOING.
VII. ELEMENTS TO BE EVALUATED UNDER PROJECT 279-0045 FOLLOWS SEPTEL.
REISWETTER

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