A.I.D. EVALUATION SUMMARY: PART I

PD-AAY-270

A. REPORTING A.I.D. UNIT:

USAID/EGYPT
ES#: 88-6

B. WAS EVALUATION SCHEDULED CURRENT FY EVALUATION PLAN?
Yes x Slipped ___
Ad hoc ___

C. EVALUATION TIMING:
Interim ___ Final ___
Ex Post ___ Other x

D. ACTIVITY EVALUATED: Basic Village Services (263-0161.02): Assessment of Village Water Systems in Egypt.

E. ACTION DECISIONS APPROVED BY THE MISSION DIRECTOR:	OFFICER	COMPLETION DATE
1. Institutional Issues:	F. Zobrist, AD/DR	
- Open policy dialogue with appropriate GOE organizations.	G. Kerr, DR/LAD	10/88
- Draft concept paper for Local Development II Governorate Utility Component.	D. Wadley, DR/LAD	10/88
2. Increase Financial Resources/Project:	D. Wadley, DR/LAD	
- Focus LD II resources on fewer water/waste water projects.	C. Doggett, DR/LAD Dr. Goueli, AMANA	12/88
- Review issues on meters, household connections, and standpipes.	Provincial Local Contractor	6/89
- Continue work on local resource mobilization.	AMANA TA Contractor	5/89
3. Improve quality of projects:		
- Expand use of 2 year planning/implementation cycle for water/wastewater projects.	D. Wadley, DR/LAD	6/89
- Strengthen requirements for water system designs.	Provincial Local Development Committees Provincial LD II Contractor	6/89
- Incorporate target of service standards in the planning and design process.		6/89
- Develop governorate wide plans.		12/89
- Train governorate engineers to manage contracts with the private sector for plans, designs, and construction supervision.		12/90
5. Health Education:		
- Include health and sanitation education in operator and staff training.	R. Flashpoler, DR/LAD	12/88
- Ask HRDC/H to review recommendations on national health education program.	J. Sarn, HRDC/H	12/88
6. Evaluate LD II pilot maintenance program in 1990 prior to expansion.	D. Wadley, DR/LAD	12/90

F. CLEARANCE/APPROVAL OF EVALUATION SUMMARY AND ACTION DECISIONS:

Technical Directorate	Program Development and Support Directorate	Deputy Director
D. Wadley, DR/LAD	A. Laudato, PDS/P	J. Patterson 8/19
G. Kerr, DR/LAD	D. Leaty, PDS/P	DD (A)
F. Zobrist, AD/DR	V. Molldrem, AD/PDS (A)	

Approved: Marshall D. Brown, DIR Aug 14 1988

G. EVALUATION ABSTRACT

1. Purpose: During 1980-86, the Basic Village Services Project disbursed about $104 million through 22 governorates to about 920 village councils for local infrastructure projects. This study assesses the status of water projects in the Nile Valley and makes recommendations to improve the performance, reliability and sustainability of village water systems under Local Development II.

2. Major Findings and Conclusions:

a. Benefits: The project has had a significant impact in improving quantity and quality of water in Egyptian villages. Functioning water systems existed in all 36 villages visited. Household connections increased from 5% to 31% and reached an additional 7 million people. Impact of BVS water/wastewater funds made "significant" or "helpful" contributions to the physical system in 86% of the villages surveyed.

b. Water System Issues:
- No clear institutional responsibility assigned for village system O & M.
- Broad allocation of funds results in inadequate funds per village.
- Inadequate engineering planning and design creates avoidable problems.
- Operations suffer from power outages, insufficient funds for fuel or electricity, and lack of trained operators. Severely inadequate maintenance contributes to service interruptions and shortens life of equipment.
- Quality of water. Even when water sources were unpolluted, half the samples in the distribution system were contaminated. Alternative sources were worse.
- Number and quality of standpipes are inadequate.
- Water tariffs cover only a small part of operating costs. Tariffs are low; the revenue base, small. Collections are late and less than assessed.

c. Wastewater Issues:
- Expansion of village water systems will increase wastewater disposal problems, particularly in areas with a high water table. Excreta and sullage disposal systems are grossly inadequate.
- Solutions will be difficult since many alternatives, including piped sewer systems, are too expensive to be widely used.

3. Key Recommendations.
- Encourage regional systems and confirm governorate responsibility.
- Focus LD II Water/wastewater funds on fewer villages for better management and development of more effective/efficient systems.
- Improve the quality of planning, design and construction by requiring pre-feasibility studies, developing standard designs and training.
- Improve system capacity by adding water storage and standby diesel pumps to village systems and providing tools and O & M training to village operators. Initiate governorate managed leak detection programs.
- Financial: Drop requirement for meters in most cases. Expand revenue base with more connections and charges for standpipe use.
- Expand technical assistance significantly.
- Develop national health education program on water use and sanitation.

H. Evaluation Costs

1. Evaluation Team	Contract # OR TDY Person Days	Contract Cost OR TDY Cost (US $)	Source of Funds
Water and Sanitation for Health Project (WASH) Don Cullivan, Team Leader			BVS Project (263-0161.02)

A.I.D. EVALUATION SUMMARY: PART II

I. SUMMARY OF EVALUATION FINDINGS, CONCLUSIONS AND RECOMMENDATIONS.

BACKGROUND: During 1980-86, the Basic Village Services Project disbursed about $104 million through 22 governorates to about 920 village councils for local infrastructure projects. Water and wastewater projects accounted for 46% and 9% of these funds, about $57 million.

PURPOSE: To assess the status of water projects in the Nile Valley and make recommendations to improve the performance, reliability and sustainability of village water systems assisted under Local Development II.

METHODOLOGY: From 16 governorates in the Nile basin, six were chosen to represent the special groundwater characteristics affecting water systems. Within these, a total of 10 districts (markaz) and 36 villages were covered in field visits. Teams included an environmental engineer, a financial/public administration specialist, and a social scientist as well as professionals provided by the Government of Egypt's Organization for Reconstruction and Development of the Egyptian Village (ORDEV).

FINDINGS AND CONCLUSIONS:

1. **Background.** The principal source of income for the rural villages surveyed was agriculture. Their average size was slightly more than 30,000; however, they ranged in population from 6,800 to 66,700. Villages consist of a "mother" village, plus an average of 3.3 satellite villages and other settlements.

Villagers obtain their water from two sources.

- **Groundwater** is obtained from deep wells (village systems), shallow wells (private hand pumps), and from shallow dug wells.
- **Surface water** is obtained either as treated water from the Nile or canals (usually village or city systems, sometimes by private tanker trucks), or untreated directly from canals.

Piped water is also supplied through public standpipes and taps at public buildings and mosques. Villagers primarily judge water on the basis of taste and suitability for washing clothes. Canal water is often used for washing and occasionally carried home for later use. **The absence of wastewater disposal systems limits household water use.**

The project has had a significant impact in improving quantity and quality of water in Egyptian villages. All 36 villages surveyed had functioning water systems, usually operating 6 - 8 hours per day. In 1979, only [illegible] of household had connections; in surveyed villages, 31% are now being served directly. These households supply another 22% with treated water. This impressive increase has occurred despite population growth. The number of people receiving water from village systems has increased 8 fold, by around 7 million people. **Impact of BVS water/wastewater funds was "significant" in 56% and "helpful" in 30% of the surveyed villages.**

2. **Decentralized Decision Making.** Although village councils must approve BVS funded projects, their choices are affected by governorate guidelines on use of funds and the amount of funds made available. In three of the governorates, Village Councils select subprojects in consultation with the Chairman of the Executive Council and an district Ministry of Housing engineer. The Ministry of Housing generally sets broad requirements, i.e. that new water networks are built in heavily populated areas along wide streets. In the other three governorates, the role of Village Councils is more limited. One governorate plays a strong role in determining specific project selection. Two governorates have regional piped networks and integrated BVS allocations into broader sector development plans.

Allocation of funds in three governorates is made on the basis of population; in a fourth, an equal amount is given to each village. In two others, the governorate makes a determination based on need and access to other resources. Broadly dispersed allocation of funds results in numerous small systems inadequate in comparison with village needs with limited distribution systems and revenue base.

3. **Capacity Development.** Although decentralized decision making is taking place, local capacity to implement and maintain water projects has not developed.

a. Institutional Issues. Problems are exacerbated by the lack of clear assignment of responsibilities to local government officials and employees of the national ministries. Since the Local Government Law of 1980, governorate level units of national ministries are under administration of the Governor, but report professionally and technically to Cairo. At the village level, two sets of employees are responsible for operation and maintenance: Department of Housing station operators and Village Council plumbers, clerks, and workmen. No one is clearly responsible for village systems and conflicts are difficult to resolve.

Below the level of governor, little interministerial coordination exists between employees of the Ministries of Health and Housing to identify dangerous water contamination and take appropriate corrective steps.

b. Water Systems. Two basic types of systems exist: individual village systems with groundwater from deep wells and regional systems with piped water from treatment plants.

Design. Individual village systems typically consist of a well, a small pump building, and sometimes an elevated tank. Although the GOE has developed standard plans, designs for water systems, construction drawings, and other documents are rarely found even at the governorate level. Selection of components is often based on equipment available, not standard engineering practices. Poor system design often creates problems that could have been avoided such as:

- Location of wells based on village land ownership sometimes results in substandard water quality or inadequate yields.
- Mismatch of pump capacity to village needs, safe yield of wells, and storage tanks results in less return on investment.
- Absence of standby power and adequate storage limits water supply during power outages.
- Construction of independent village systems occurs, even when expansion adjacent systems would have been more economical.

4

The allocation process often results in systems being planned and constructed piecemeal, rather than as part of an overall plan. Allocated funds are often insufficient to construct adequate storage. Several villages constructed a single storage tank over two years. Neither the village or markaz personnel have sufficient skills or experience to ensure that water projects are a logical part of a comprehensive plan to meet village needs, properly designed or adequately specified for competitive tendering.

Operational Problems. Most village water systems are operating fairly well considering the system limitations, untrained operators, and insufficient technical support. Leakage is a major problem. "Compact" surface water treatment plants face the additional need for regular supply of chemicals as well as additional equipment to operate the units correctly. Actual operating hours vary between 6 to 8 hours, depending on factors such as power outages, low voltage, equipment failure, pipeline breaks, tank cleaning, operator absenteeism, and lack of operating funds.

Village units lack the skills, tools, spare parts and workshop facilities to perform anything but the most minor maintenance and repairs. None of the systems had useful operating manuals. Records are not being kept. Housekeeping of pump stations is very poor. Pump rooms are often poorly lit, dirty, and unpainted. Operators rarely even have rags to clean plant and machinery. This minimal maintenance shortens equipment life and contributes to service interruptions.

Unfortunately, markaz engineers lack transportation and resources to supervise and assist villages. LD II is providing funds to construct a workshop in each village, but skilled trades people and workshop tools are also necessary. Skills for major overhaul are usually found in the private sector and rarely in district repair centers. As a result villages tend to operate equipment until it fails.

Water Quality. Most water projects sampled produce water that is acceptable to villagers. In a few cases, villagers find the taste of village system water unacceptable and use other less safe sources for drinking and cooking. Surface water is disinfected at source. Village well water is not treated, but most deep wells are unpolluted. Bacteriological contamination in water distribution systems was present in over half the samples taken, even when sources were clean. The two principal causes are probably intermittent flow of water and direct contamination during repairs or pipeline breaks.

c. Wastewater Disposal. Water use is limited because of lack of disposal. As few houses have vaults, wastewater must be either carried to the nearest drainage canal or thrown outside the house onto unpaved streets. Excreta disposal is a major problem. Most homes have some form of toilets, but few meet acceptable standards. Defecation in canals contributes to high rates of bilharzia and generally low levels of sanitation.

Piped wastewater systems are being developed in Damietta Governorate. Although such systems may be desirable in this area because of high population densities, high water table and other factors, these systems are prohibitively expensive as a general solution for rural Egypt. Total costs including household connections are expected to be more than LE 100 per capita. In addition, these systems require scarce skilled manpower and funds for operation and maintenance. Piped sewer systems will lead to increased use and demand for water.

Existing laws require a relatively high degree of treatment prior to discharge of wastewater to irrigation drainage canals. Land for treatment systems is expensive and difficult to obtain, especially in the Delta where problems are more severe. A few community sullage systems exist, some funded by BVS. Successful systems are characterized by a sufficient number of well designed vaults and daily collection of wastewater. These may offer a lower cost, technically manageable alternative.

3. **Financial.**

a. Capital Funding. USAID has contributed over two thirds of all capital water and wastewater funding in the 36 villages the past seven years. GOE funding was low and probably will not increase significantly. For all villages in the six governorates sampled,

	Avg./Village	Avg./Person
BVS Water	LE 121,000	LE 4.71
BVS Water and Wastewater	LE 159,000	LE 5.51

If village water and wastewater systems are to be upgraded, considerable additional funding will have to be obtained: an estimated LE 50/per person for water and minor improvements in septage and sullage disposal plus an additional LE 100 per person for piped sewerage systems.

Villagers pay for household connections, including a meter. Metering is supposed to result in fair charges based on actual water use and to discourage waste. Many meters are broken and not functioning, but no repair facilities exist. Metered systems result in higher billing costs for local governments and little value to consumers. **A non-metered system would permit these funds to be better utilized.**

b. Maintenance. The limited funds available to the village for O & M are drawn primarily from the governorates manpower (BAB 1) and commodities and services (BAB 2) budgets. Resources available at the village are usually under the control of the district. **The probable reason for limited data on maintenance and repair costs is that very little is being spent.**

BVS maintenance funds were established at the village level to ensure the adequate resources to cover preventive maintenance and repair of equipment purchased under the project. Studies by the technical assistance contractor show that less than half these funds have been used. Some villages prefer to use the interest earned, while others save these funds for an emergency. Some villages are unaware these funds exist. Village officials and operators lack an understanding of maintenance , its' importance, and necessary technical and institutional support.

c. Rates and Revenue. The current national water rates are very low. An additional 10% surcharge can be levied to cover sanitation systems. Villages have little interest in collection because revenues are returned to the central government. Some villages have added and retain additional fees to cover the cost of household connections or operation, repair and maintenance expenses. The team estimated that 75% of village households could pay without difficulty nearly four times the highest rate being charged now; however, the survey found that improved service would also be expected. One governorate utility charges roughly twice the national rate, but revenues are still insufficient to cover operating costs and maintenance. Repairs have been deferred and villagers are angry about the lack of service.

Although rate levels are still very low, total revenues have increased 600%, from an average of LE 1,000 per village in 81/82 to about LE 6,000 in 86/87. The primary reason is the dramatic increase in the number of household connections have increased the revenue base.

DISK Janna V, DOC (BVSEV), 08/02/88.

RECOMMENDATIONS:

The report presents an interrelated, prioritized list of recommendations for use within the current LD II system of decentralized project selection. To compensate for the limited skills at various levels of local government, the report recommends additional technical assistance at the governorate level, intensified training to upgrade selected skills at all levels and increased reliance on the private sector to provide specialized, high quality skills. The major proposed change in the current process would be to focus funds on selected villages. Villages would receive funds on the basis of participation in prefeasibility studies and needs. Prefeasibility studies and designs would be required for all water/wastewater projects. This would permit funding of an overall design including storage, pumping and well capacity, and an adequate distribution capacity. Additional distribution could be provided later as villages expand and funds permit. Such an allocation process would permit better utilization of scarce technical and managerial capacity. More efficient systems with a broader distribution would provide a larger revenue base and a higher quality services. Although the technical solutions for governorates using treated surface water and those utilizing deep wells are quite different, the recommendations apply to both.

1. General. Expand the level of LD II technical assistance significantly in order to assist the AMANA in implementing the following recommendations.

2. Maintenance and Repairs. Give highest priority to improving maintenance of village water systems. Clarify responsibilities for maintenance and repairs and make the necessary vehicles, tools, equipment, parts and supplies available. Develop appropriate maintenance manuals and expand training programs. Utilize the private sector for major maintenance and repair tasks.

3. Focus LD II Water and Wastewater Funds. Limit funds to fewer villages to:

- develop more complete systems in relation to village needs, and
- focus scarce management and technical skills for better design construction, and maintenance.

In addition, some funds could be made available for loans to villages willing to borrow funds.

4. Organizational Issues. Confirm the Governorate as the primary unit with responsibility for water and wastewater in villages. Clarify responsibilities and strengthen capacity. Expand the role of the private sector.

The following division of responsibilities is suggested:

Village:
Operate, maintain and repair systems.
Collect revenues.

District:
Monitor village performance in operation and maintenance.
Contract for complex repairs with the private sector.
Provide support in emergencies.
Supervise construction.

Governorate:

Provide technical support through training and advice.
Contract with the private sector for specific planning, design and supervision of complex construction projects, and for preparation of O & M manuals.
Approve private sector planning reports, engineering designs, and O & M manuals.
Coordinate allocation of capital funding to villages.
Monitor district services.

5. **Encourage Regionalization.** In accordance with national policy, identify areas where regional provision of water and wastewater services appears feasible and desirable. Regional systems can provide economies of scale and focus trained and experienced personnel for improved operation and maintenance. LD II funds for such regional systems should be limited to planning, leakage detection and control, and revolving funds for household connections.

6. **Planning, Design and Construction.** Require feasibility studies, preferably carried out by private sector firms, as a precondition for receiving LD II funds for water and wastewater. Develop improved, appropriate designs for basic components of village water and wastewater components as well as standard tender documents for civil works and for purchase of commodities. Contract with the private sector for design of approved capital works based on approved design standards.

Upgrade the capacity of district engineers to supervise village construction through establishing procedures and training.

7. **Water Supply Systems.** Improve the capability of water supply systems establishing targets of service (75%), reducing leakage and waste (30%), increasing system reliability by increasing storage and standby power capacity, and improving water quality.

8. **Develop Alternatives for Wastewater Disposal.** Identify priority needs in wastewater collection and disposal, develop alternative approaches to piped sewerage systems and test these through pilot programs, implement a program to upgrade toilet facilities, and continue to monitor costs and operation of pilot piped sewerage systems.

9. **Tariffs and Revenues.** Simplify the village tariff systems by discontinuing meters for most village houses. Expand the revenue base by increasing piped connections and charging for access to public standpipes where sufficient number exist. Combine water and wastewater tariffs and increase rates to recover operation and maintenance costs.

10. **Health Education.** Develop and implement a national program to increase the knowledge and understanding of the relationship between water, sanitation and health. Include education for water system operators about the public health implications of their work.

MISSION COMMENTS:

This assessment has significantly broadened USAID's field of vision by evaluating the rural water systems assisted by BVS funds, not just use of BVS funds. Although many rural water delivery systems have problems, BVS funds have had a positive contribution. In the 36 sites studied, 60% of the dollars invested (totalling $8.0 million) through BVS, made a significant improvement in the system, 36% resulted in "helpful" improvements and only 4% made "minor" improvements. This report has provided many recommendations that the GOE and Mission can use to improve water systems in Egypt through the Local Development II (LD II) Project and increase impact of USAID's funds.

Focus on the overall functioning of village systems led the team to include comments and recommendations on wastewater disposal although this topic was not included in the scope of work. The evaluation's recommendations on wastewater disposal have generated lively discussion within the GOE and USAID/Egypt. Solutions for treatment of wastewater are being developed through a pilot project testing six technologies in twenty villages. An important aim of the project is to adopt systems that will be low in capital cost and land use, simple in operation and maintenance, and efficient.

This report verified the situation that was outlined in the technical analysis of the Local Decentralization II program paper and steps have already been taken to deal with many of the problems described in the report.

Operation and maintenance of basic service systems, primarily water and roads, is a primary focus of LD II.

- The Ministry of Finance is contributing more than LE 50 million for maintenance of LD II investments.

- Every Governorate has prepared maintenance plans for their basic services during this present planning cycle. These include contracts for after-sales service for the compact treatment units discussed in this study. (TA task F, G1, G2, G5)

- Four governorates are participating in a pilot maintenance program which will develop and install an entire maintenance system and primary facility for basic services maintenance. The system will be developed and installed during 88/89 and will be under private management. After the pilot is completed and evaluated, these systems will be extended to 12 more governorates. (TA task G3)

- Every village built a maintenance center in 1988 and it will be equipped in 1988/89.

- One of the TA contractor's principal tasks is to assess the capacity of local units to operate and maintain local services (TA tasks f.2. and g.1). Training programs for operators and maintenance staff are being designed to build capacity at the local level (TA tasks f.1., f.3., and g.2.) and will be carried out from 1988 through 1990. The training program will include provision of appropriate manuals for both operators and maintenance staff.

- A water system leak detection survey and repair capacity will be developed at the local level during 1988/89 in both public and private sector. (TA task G5ii, G5iii, G7) This activity will be coordinated with similar work being done by ORDEV with WHO assistance.

10

RECOMMENDED ACTION DECISIONS:

1. A principal objective of the LD II program is improvement of water/wastewater services in rural Egypt. One issue is institutional: no one organization or level of government clearly has the authority and responsibility for different aspects of water/wastewater services is dispersed, and the government agencies involved are not assuming the responsibilities assigned to them. This evaluation provides the Mission with an opportunity to review institutional issues within USAID and with the GOE.

Action 1a: Develop a short position paper on institutional problems and use it to open a policy dialogue with the LD II Amana, Ministry of Local Government, ORDEV, NOPWASD, and the Ministries of Housing and Health. This paper will identify the problems of the appropriate division of responsibilities between the governorate, districts, and villages, and ways to make the organizational structure efficient and accountable to local water users.

Action 1b: Draft a joint GOE-USAID concept paper concerning potential water/wastewater Utility Component to LD II.

2. To increase financial resources available for water system infrastructure and maintenance, the following actions are recommended:

Action 2a: Continue to focus the Local Resource Mobilization team, currently working with the Ministry of Finance, on wastewater issues and on tariffs. The contractor will identify resources that can be kept at the local level and legal changes needed to recover capital and O & M costs. Request the contractor to provide USAID with interim studies as these are completed.

Action 2b: Concentrate LD II resources for water and wastewater projects on fewer villages. Develop guidelines for selection of village water/wastewater projects and indicate what proportion of each governorate's allocation should be reserved for more comprehensive projects by September 1988. These guidelines will be used for the planning process that will begin this Fall. This strategy will also have the effect of focusing technical resources on fewer, larger projects. Encourage local resource mobilization by making grants as a multiple of the amount that local units are willing to contribute.

Action 2c: Raise the local issues of meters, household connections, and standpipes in an implementation letter to the AMANA so that these issues can be considered immediately by the governorates.

The evaluation recommendations concerning service targets will be incorporated into the planning and design process. Attainment of service targets will increase revenues.

3. Lack of technical resources affects planning, design, construction, operation and maintenance. Operation of water and wastewater plans require more systematic emphasis. Special training in treatment processes and process control test should be instituted. To address these weaknesses, the following are recommended:

Action 3a: Improve planning and design by going to a two year planning cycle to allow for both planning and implementation, requiring studies and designs for all water/wastewater systems and projects over a specified size, and developing governorate wide water/wastewater plans that incorporate regional water system concerns as appropriate. (TA task a. and b.)

Action 3b: Improve projects by having the Provincial TA contractor assist the Governorates to contract with the private sector for water/wastewater plans, designs, and construction supervision, rather than try to do these tasks themselves. (TA task b.3, c.3., e.1., and e.3.) Each governorate will have its own team of water/wastewater consultants. The evaluation Team produced a useful set of guidelines for the implementation of the water and wastewater systems in rural Egypt. These will be modified by the current Provincial TA contractor and used by the local consultants.

Action 3c: Strengthen the capacity of governorate engineering offices to manage and review contracts with the private sector through extensive training, i.e. observation tours in India, continuing education, etc.

Action 3d: Institute training programs in water and wastewater treatment plant operations to enhance operator's knowledge of treatment plant processes and enable the operators to run process control tests and trouble shoot operational problems.

4. Design standards including service targets, leakage, storage and standby power will be incorporated into the planning and design process at the governorate and local level.

Action 4: Write an implementation letter to the AMANA recommending that these standards be incorporated into guidelines issued to governorates and local units each year. Reinforce with letter to Provincial TA consultants. These standards of service will be also addressed in the concept paper (Action 1a).

5. Health and sanitation education is seriously needed in rural areas, but is outside the scope of the LD II project. The following actions are recommended:

Action 5a: Send an implementation letter to the AMANA and the contractor emphasizing that health issues must be covered in operator and staff training.

Action 5b: Forward a copy of the report to the USAID/Health Office for review of the recommended national health education program.

DISK Janna V, DOC (BVSEV), 08/02/88.

USAID: OFFICE OF LOCAL ADMINISTRATION
AND DEVELOPMENT

ORDEV: ORGANIZATION FOR RECONSTRUCTION AND
DEVELOPMENT OF THE EGYPTIAN VILLAGE

REPORT ON

ASSESSMENT OF VILLAGE WATER SYSTEMS IN

EGYPT

10 MARCH 1988

WATER AND SANITATION FOR HEALTH PROJECT
ENVIRONMENTAL QUALITY INTERNATIONAL

14

SUMMARY

BACKGROUND

Purpose of Assessment

* Determine the status of village water projects funded under the USAID BVS Program from 1980 to date.

* Make recommendations to improve the quality of such projects to be funded under the follow-up LD II Program.

Assessment Sample

* A total of 36 villages were visited. The average size of these villages was 31,000.

* These villages were in six representative governorates, from the northern delta to upper Egypt.

* These villages represent 4% of Egypt's current rural population of 27 million.

FINDINGS

1. Positive Aspects of Village Water Situation

* All 36 villages had a functioning water system.

* About 31% of the people are directly served by connections, up from 5% ten years ago. This means 7 million more people are now directly connected to village water systems.

2. Institutional Issues

* Responsibility for village water was transferred from the central government to the Governorates in 1981, but the lines of authority are still unclear.

* The present process of allocating funds broadly results in inadequate funds per village in comparison to needs.

3. Water Supply Systems

* Villages in areas of salty groundwater are served by regional systems. Most others are independent systems using wells. Their needs and problems are considerably different.

* Engineering planning and design of systems is inadequate which led to many problems which could have been avoided.

* Operation of systems suffers from power outages, lack of funds for fuel and electricity, and lack of guidance and training of operators.

* Maintenance is severely lacking and contributes to service interruptions and shortening the life of equipment.

* More water is lost to leakage and waste than is used by the people.

* Iron, manganese and hardness are sometimes unacceptably high, leading people to use less safe waters.

* Even when sources were unpolluted, half the samples in the distribution system were bacteriologically contaminated.

* Water from handpumps was often polluted. All canal waters sampled were heavily polluted.

* The number of functioning public standpipes is totally inadequate to serve the 69% of the people not connected to the system, and the quality of the existing standpipes is very poor.

4. Wastewater Disposal

* None of the villages had piped sewerage systems but three in Damietta were under construction.

* Removal of excreta from homes is inadequate and there are few acceptable means of disposing of these wastes.

* Sullage (washwater) is supposed to be discharged into drainage canals but in reality most of it is thrown on the streets. The reason is that drains are often distant and there are no feasible alternatives for most people.

* The piped sewers and treatment systems under construction in Damietta and Menoufia cost in excess of LE 100 per person to construct. Such systems are too expensive to be used widely as the solution to wastewater problems in rural Egypt.

* Wastewater problems are much more serious in the northern delta than in central and upper Egypt.

* Some villages have installed community sullage vaults which have led to improvements in wastewater disposal.

* Existing laws require a relatively high degree of treatment prior to discharge of wastewater to irrigation drainage canals.

* Land for treatment systems is expensive and difficult to obtain, particularly in the delta.

* The increasing expansion of village water systems will increase the problems of wastewater collection and disposal.

17

5. Financial Matters

* The average capital expenditures for water and wastewater nationally amounted to a total of about LE 200,000 per village over the past seven years.

* USAID contributed about two-thirds of this funding.

* For the 36 villages surveyed, total water and wastewater expenditures averaged LE 13 per person.

* Operation, maintenance and repair expenditures could not be determined but are believed to be very low and inadequate.

* Water tariffs are very low in most villages. They were highest in Damietta at LE 12.50 per connection per year. The average for the other five Governorates was LE 3.00 per connection per year. This level covers only a small portion of operating costs.

* Collection of revenue is late and less than amounts charged.

* The revenue base is very low since only 31% of households are connected and others pay nothing.

* Meters cost about LE 60 each, are frequently out of order, and provide no useful benefits for most village houses.

6. Impact of BVS Funding

* In the 36 villages surveyed, total BVS water and wastewater funding amounted to LE 7.23 per person for the total population of those villages.

* Nationally, BVS water and wastewater funding amounted to about LE 4.60 per person, and LE 140,000 per village, 85% of which was spent on water.

* Of the 36 villages surveyed, the relative impact of BVS funding in terms of serving the villages water or wastewater needs was judged as follows:

"Significant"	for 56%
"Helpful"	for 30%
"Minor"	for 14%

RECOMMENDATIONS

1. Focus LD II Water and Wastewater Funds

- * Limit funding to fewer villages to allow more effective use of funds. BVS funds were spread too thinly which made projects less effective and difficult to manage.

  * Allocate some funds for loans and make larger amounts available to villages willing to borrow some of their funds.

2. Encourage Regionalization

- * Investigate the possibility of providing sector services on a regional basis for as many villages as possible.

  * Limit LD II funding for regional systems to such purposes as planning, leak detection and control and expansion of house connections.

  * Require regional water companies to assume responsibility for wastewater.

3. Clarify Institutional Responsibilities

- * Confirm that the Governorate is the primary governmental unit with responsibility for water and wastewater.

  * Strengthen the Governorates as required to fulfill this responsibility.

• Priority Recommendation

19

* Clarify the relative responsibilities for other levels of government.

* Expand the role of the private sector.

4. Improve the Quality of Planning, Design and Construction

• * Require the conduct of pre-feasibility studies as a pre-condition for receiving capital funding for water and wastewater facilities.

* Establish criteria for target levels of service for water supply.

* Develop improved standard designs for typical water and wastewater facilities, and require their use.

* Prepare handbooks for supervision of construction procedures and train people in their use.

* Make greater use of local, private sector consulting engineers in all phases of planning, design and supervision of construction.

5. Improve the Capability of Water Supply Systems

* Incorporate the recommendations of Item 4.

• * Develop programs to reduce leakage and waste to 30% or less of total production, and train operators to use them.

• * Extend operations to provide water under pressure for 24 hours per day.

• * Increase system reliability by increasing storage capacity and adding diesel engines for systems without them.

• Priority Recommendation

20

- * Improve water quality through improved source selection, and better disinfection.

- * Extend piped water connections to more people - set a target for 75%.

  * Increase the number and quality of public standpipes to serve those people not directly connected to the system.

  * Develop and distribute appropriate operation manuals, and expand operator training programs.

  * Establish a program for periodic monitoring of the performance of water systems.

6. Develop Alternatives for Wastewater Disposal

- * Identify areas of priority needs for making improvements in wastewater collection and disposal.

- * Develop alternatives for piped sewerage systems and conduct pilot programs of promising alternatives.

- * Implement a pilot program for upgrading toilet facilities in homes and public buildings.

  * Continue to monitor costs and operation of ongoing pilot tests of piped sewerage systems.

7. Maintenance and Repairs

- * Establish the need to improve maintenance of village water systems as an activity of the highest priority.

- * Develop and distribute appropriate maintenance manuals, and expand maintenance training programs.

---

* Priority Recommendation

- • * Clarify specific responsibilities for maintenance and repair tasks.

- • * Identify specific vehicles, tools, equipment, parts and supplies needed for maintenance, and make them available.

  * Develop guidelines for carrying out common repairs such as pipeline breaks.

  * Utilize the private sector for major maintenance and repair tasks.

8. Tariffs and Revenues

- • * Adopt a policy of not requiring meters for houses with two taps or less, that are not connected to a piped sewerage system.

- • * Expand the revenue base by means of increasing the number of households connected to the system, and, where an adequate number of public standpipes have been constructed, levy a charge for access to these standpipes.

  * Increase tariffs to a level at least sufficient to cover operation and maintenance costs.

  * Improve procedures to ensure that amounts due are fully and promptly collected.

  * Defer major increases in tariff rates until the water systems have reached an acceptable level of performance.

  * Consider a pilot program for selected villages under which villages retain their collected revenues in return for agreement to pay all their O&M costs.

• Priority Recommendation

22

9. Health Education

- * Develop and implement a national program for increasing the awareness of the relationships among water usage, good sanitation practices and health.

* Develop specific programs to educate water system operators about the public health consequences of their work.

10. General

- * Expand the level of LD II technical assistance significantly in order to assist the Amana in carrying out these recommendations.

  * Translate the full assessment report into Arabic to assist Egyptian officials in addressing the problems related to village water and wastewater.

• Priority Recommendation

ملخص عام

الغرض من التقييم

- تحديد الموقف العام لمشروعات مياه الشرب بالقرى والتى تم تمويلها من الوكالة الامريكيه للتنميه الدوليه من خلال برنامج الخدمات الأساسيه للقرى منذ عام ١٩٨٠ وحتى الآن .
- وضع توصيات من شأنها تحسين نوعية مثل تلك المشروعات حتى يُحسن أستخدام تمويل برنامج " التنميه المحليه رقم ٢ " .

عينة التقييم

- تم دراسة ٢٦ قريه مصريه، حيث كان متوسط تعداد السكان ٢١٫٠٠٠ نسمه للقريه .
- تقع هذه القرى فى ستة محافظات من شمال الدلتا وحتى الجنوب (صعيد مصر).
- تمثل هذه القرى حوالى ٤٪ من اجمالى تعداد سكان الريف فى مصر والذى بلغ سبعة وعشرون مليون نسمه حسب تعداد عام ١٩٨٦.

24

• التخطيط والتصميم الهندسى لنظم المياه حاليا لا تفى بالغرض المطلوب مما ترتب عليه مشاكل عديده كان يمكن تجنبها.

• تعانى عمليات مياه الشرب من مشاكل انقطاع التيار الكهربائى والنقص فى امتمادات الوقود والكهرباء والافتقار إلى ارشاد وتدريب القائمون على التشغيل.

• تفتقر المعدات والآلات إلى الصيانه افتقارا شديدا، كما أنها تهلك قبل نهايه عمرها الافتراضى.

• المياه التى تفقد نتيجة للتسرب والضياع أكثر من التى يستهلكها الأهالى.

• المياه التى بها نسبه عاليه من الحديد والمنجنيز والكالسيوم فى كثير من الأحيان غير مقبوله من قبل الاهالى الامر الذى يدفعهم لأستخدام مياه أقل سلامه.

• حتى وعندما كانت مصادر المياه غير ملوثه، فإن نصف العينات التى تم أخذها من شبكات التوزيع، وتم تحليلها من طريق فريق البحث، كانت ملوثة بالبكتريا.

• المياه المستخرجه بواسطة المضخات اليدويه غالبا ما تكون ملوثه، كما أن جميع العينات التى تم اخذها من الترع، وتم تحليلها من طريق فريق البحث، كانت ملوثه بشده.

• إجمالى عدد الحنفيات العامه غير كاف لخدمة ٦٩٪ من الأهالى الغير مخدومين من شبكات توزيع المياه، كما أن حالة الحنفيات العامه سيئه جدا.

٤- عمليات صرف المياه

• لا يوجد فى القرى التى تمت دراستها نظم شبكات للصرف الصحى على الأطلاق سوى ثلاثه قرى فقط فى دمياط يوجد بها مثل تلك النظم ولكنها مازالت تحت الانشاء.

• نظم نقل المخلفات الآدميه من المنازل غير كافيه، ويوجد وسائل قليلة مقبولة لصرف مثل هذه المخلفات.

النتـــائـــج

١- مظاهر إيجابية من أوضاع مياه الشرب بالقرى

- يوجد فى ال ٢٦ قريه مشروعات مياه شرب قائمه.
- حوالى ٢١٪ من السكان يتم خدمتهم بتوصيلات مباشره، بينما كانت النسبه ٥٪ فقط منذ عشرة اعوام.

وهذا يعنى أن سبعة ملايين نسمه قد أنتفعوا مباشرة بخدمات مشروعات مياه الشرب.

٢- اعتبارات اداريه وتنظيميه

- تم نقل مسئوليات عمليات مياه الشرب بالقرى من الحكومه المركزيه إلى المحافظات فى عام ١٩٨١، إلا أن حدود السلطات مازالت غير واضحه للآن.
- إن الاجراء الحالى فى تخصيص الأعتمادات بصوره عامه نتج عنه أعتمادات غير كافيه بالنسبه للقريه الواحده مقارنة بالإحتياجات اللازمه.

٣- نظم عمليات مياه الشرب

- القرى الواقعه فى مناطق ذات مياه جوفيه مالحه تخدم من خلال نظم مياه إقليميه، بينما القرى الاخرى يوجد بها نُظُم مستقله تعتمد على الآبار الجوفيه كمصادر للمياه و بناءا على ذلك فإن الإحتياجات والمشاكل تختلف بإختلاف طبيعة نظم المياه.

• المفروض أن يتم صرف مياه الغسيل من خلال المصارف ولكن فى واقع الامر يتم صرف معظمها إلى الشوارع مباشرة. ويرجع السبب فى ذلك إلى وجود المصارف على مسافات بعيدة جدا بينما لا يوجد بدائل مجديه أخرى متاحه لمعظم الاهالى.

• ان تكلفة نظم شبكات ومعالجه مياه الصرف الصحى التى يتم إنشائها حاليا بمحافظتى دمياط والمنوفيه تتجاوز مائة جنيه للفرد الواحد، الامر الذى يجعل مثل هذه المشاريع صعبة التعميم كحل لمشاكل الصرف الصحى فى ريف مصر.

• إن مشاكل الصرف الصحى أكثر خطورة فى شمال الدلتا منها فى مصر الوسطى وصعيد مصر.

• بعض القرى قامت بعمل خزانات مياه صرف مجمعه الأمر الذى أدى إلى تحسينات فى صرف مياه الصرف الصحى.

• القوانين الحاليه تشترط درجه عاليه نسبيا من المعالجه مسبقا قبل صرف المياه إلى مصارف الرى.

• الاراضى اللازمه لانشاء نظم معالجه مياه الصرف الصحى غالية الثمن ويصعب الحصول عليها أيضا وخاصة فى منطقة الدلتا.

• التوسع المتزايد فى نظم مياه الشرب بالقرى سوف يزيد من مشاكل تجميع وصرف المياه.

٥- الجوانب المالية

• بلغ متوسط التكاليف الرأسماليه لمشروعات مياه الشرب والصرف الصحى على مستوى قرى الجمهورية حوالى مائتى ألف جنيه للقريه الواحدة على مدار السبع سنوات السابقه.

• وقد ساهمت الوكالة الامريكية للتنمية الدولية بثلثى هذه المبالغ.

• بالنسبه لل ٢٦ قرية والتى تم تناولها بالزيارة والدراسه والبحث ، فإن إجمالى تكاليف مشروعات مياه الشرب والصرف الصحى التى تمت بها بلغت ١٢ جنيه بواقع كل فرد.

• تكاليف التشغيل والصيانه والاصلاح لم يكن بالمستطاع تحديدها ولكن هناك اعتقاد كبير بأنها منخفضه كثيرا وغير كافيه.

• إن تعريفه مياه الشرب منخفضه جدا فى معظم القرى، بلغت أقصى حد لها فى محافظة دمياط وهو ١٢٫٥٠ جنيه للتوصيله الواحدة من عام كامل. بينما بلغت فى المحافظات الخمس الأخرى مبلغ ثلاثة جنيهات للتوصيلة الواحده من عام كامل. وعلى هذا النحو فإنها لا تغطى سوى جزء قليل من تكاليف التشغيل فقط.

• قاعده إيرادات مياه الشرب قليله جدا حيث أن ٢١٪ فقط من السكان متصلة منازلهم مباشرة بشبكات مياه الشرب، وباقى الأسر لا يدفعون شيئا.

• يتكلف عداد المياه الواحد حوالى ستون جنيها، وغالبا ما تكون هذه العدادات عاطلة وليس لها فائده مجديه.

٦- أثر تمويل مشروعات الخدمات الاساسيه للقرى

• بالنسبه لل ٢٦ قرية التى تناولتها الدراسه، قدرت مشاركة برنامج الخدمات الأساسيه للقرى فى مشاريع مياه الشرب والصرف الصحى بمبلغ ٧٫٢٢ جنيه بواقع كل فرد من اجمالى سكان تلك القرى.

• على المستوى القومى، بلغت مشاركة برنامج الخدمات الاساسيه للقرى فى مشاريع مياه الشرب والصرف الصحى مبلغ ٤٫٦٠ جنيه للفرد الواحد. أى مائه وأربعون جنيه للقرية الواحدة، أى ٨٥٪ من إجمالى التمويل أنفق على مشاريع المياه.

• فى الستة وثلاثون قريه موضع الدراسه والبحث ، فإن الأثر الحاسم لتمويل برنامج الخدمات الاساسيه للقرى بصدد خدمة احتياجات القرى من مشاريع لمياه الشرب والصرف الصحى كان تقديره كالآتى :

ملموس وملحوظ : لحوالى ٥٦٪
مساعد : لحوالى ٢٠٪
ثانوى : لحوالى ١٤٪

التوصيات

١- تركيز التمويل فى برامج التنميه المحليه على مياه الشرب والصرف الصحى

• • أقتصار التمويل على عدد أقل من القرى مما يسمح بالاستخدام الفعال والامثل.

• تخصيص جزء من التمويل بغرض إقرض الأهالى لعمل وصلات مياه شرب وتخصيص امتمادات بمبالغ اكبر للقرى التى على استعداد ان تقترض جزء من تكاليف المشاريع.

٢- تشجيع المشاريع الاقليميه

• بحث إمكانية امداد قطاع الخدمات على أساس مستوى اقليمى لاكبر عدد من القرى ان امكن

• اقتصار التمويل من برنامج التنميه المحليه للمشاريع الاقليميه على الاغراض الآتيه : التخطيط، كشف التسرب والتحكم فيه والتوسع فى الوصلات المنزليه

• الزام شركات المياه بمسئوليه الصرف الصحى

٣- توضيح المسئوليات التنظيمية والادارية

• • التأكيد على أن المحافظه هى الجهه الأساسيه المسئوله من مياه الشرب والصرف الصحى.

• دعم وتقوية المحافظات حتى تتمكن من تحقيق هذه المسئوليه.

• توضيح المسئوليات المتعلقه بالمستويات الاخرى بالحكومه.

• توسيع دور القطاع الخاص.

٤- تحسين جودة التخطيط والتصميم والانشاء

• عمل دراسات جدوى مسبقا كشرط أساسى لاستلام الأعتمادات الرأسماليه لمشاريع مياه الشرب والصرف الصحى.

• وضع معيار لمستويات الخدمة المستهدفه.

• تطوير تصميمات نمطيه مُحسّنه كنموذج لمشروعات مياه الشرب والصرف الصحى والإلتزام بتطبيقها.

• إعداد كتيبات من إجراءات الأشراف على الأنشاء وتدريب المختصين على كيفية أستخدامها.

• الاستغلال الأمثل لكل من القطاعين العلى والخاص بالنسبه للمجال الاستشارى الهندسى فى مراحل التخطيط والتصميم والاشراف على الأنشاء.

٥- تحسين كفاءة نظم مياه الشرب

• ضم التوصيات المذكورة عاليه فى البند الرابع.

• • تطوير برامج لخفض التشرب والفاقد لتكون ٢٠٪ من إجمالى المنتج من المياه.

• • مد عمليات التشغيل لإمداد المياه لمدة ٢٤ ساعة / يوم.

• زيادة طاقة نظم المياه من طريق زيادة طاقة التخزين وإضافة محركات ديزل لتلك الأنظمه التى لا يوجد بها.

• تحسين نوعيه وجودة المياه من خلال إختيار مصادر المياه ووسائل تطهير أفضل.

• مد شبكات توزيع مياه الشرب لعدد أكبر من الاهالى حتى يصل إلى النسبه المستهدفه، وهى ٧٥٪.

• زيادة عدد ونوعية الحنفيات العامه لخدمة هؤلاء الذين لا يستفيدون مباشرة من نظم مياه الشرب.

• تطوير وتوزيع كتيبات ملائمه من التشغيل ومد برامج تدريب للقائمين على التشغيل.

• إقامة برنامج رقابه دوريه على كيفيه الأداء لنظم المياه.

٦- تطوير البدائل لعمليات الصرف الصحى

• تحديد مجالات الاحتياجات ذات الأولويه لعمل تحسينات على عمليات تجميع وتصريف المياه.

• وضع بدائل لنظم الصرف الصحى وتوجيه برامج رائده لهذه البدائل.

• الإستمرار فى تنفيذ البرنامج الرائد بغرض تحسين المراحيض فى المنازل والمنشآت العامه.

• الإستمرار فى المراقبه على تكاليف وتشغيل الاختبارات الرائدة والتى تحت التنفيذ بالنسبه لمشروعات نظم الصرف الصحى.

٧- الصيانه والاصلاح

• • تأكيد الحاجة إلى تحسين صيانه نظم عمليات المياه بالقرى كنشاط ذو أولويه هامه.

• • تحضير وتوزيع كتيبات صيانه مناسبه وتوسيع برنامج التدريب للصيانه.

• • توضيح إختصاصات المسئوليات المتعلقه بالصيانه والاصلاح.

• • تحديد إحتياجات الصيانه من مربات ومعدات وآلات وقطع غيار وجعلها متاحه.

• وضع مقترحات للقيام بالأصلاحات العاديه مثل اصلاح الكسور فى مواسير المياه.

• الإستعانه بالقطاع الخاص فى اعمال الصيانه والأصلاحات الرئيسيه.

٨- التعريفه والايرادات

• • تبنى سياسة عدم المطالبه بوجود عدادات مياه فى المنازل التى يوجد بها حنفيتان أو أقل والتى لا تنتفع بشبكات الصرف الصحى.

• • توسيع قاعده الإيرادات من طريق زيادة عدد المنازل المنتفعه بشبكات مياه الشرب وفرض رسم مقابل الانتفاع بالحنفيات العموميه فى الأماكن التى يوجد بها عدد كافٍ منها.

• زيادة تعريفه مياه الشرب بحيث يمكن تغطية مصاريف التشغيل والصيانه.

• توصيات ذو أولويه

• تأجيل زيادات رئيسيه فى تعريفة المياه إلى حين تحسين ورفع مستوى الأداء بها.

• التفكير فى برامج رائده فى بعض القرى والتى يطبق بها نظام يتيح للقريه الأحتفاظ بإيرادات المياه المحصله مقابل الموافقه على تحمل نفقات التشغيل والصيانه.

٩- الصحه التعليميه

• • وضع وتنفيذ برنامج قومى لزيادة التوعيه عن العلاقات بين إستخدام المياه والصحه العامه والممارسه السليمه لتهيئة المناخ الصحى.

• وضع برامج توعيه خاصه موجهه للعماله المسئوله عن تشغيل نظم المياه، وذلك عن مواقب عملهم على الصحه العامه.

عـــام

• القيام بتوسع ملموس فى نطاق برنامج التنميه المحليه، الاستشارى حتى يمكنه مساعدة الاماله العامه للحكم المحلى فى تنفيذ التوصيات السالفة الذكر.

• ترجمة التقرير التقييمى كاملا إلى اللغه العربيه بغرض مساعده المسئولين المصريين لمواجهه المشاكل المتعلقه بنظم مياه الشرب والصرف الصحى بالقرى المصريه.

• توصيات ذو أولويه

34

TABLE OF CONTENTS

	Page
QUOTATIONS FROM THE VILLAGERS	Preamble
I. INTRODUCTION	
1. Purpose of Assessment	1
2. Field Test Sample	4
3. Assessment Methodology	4
II. FINDINGS	
1. General	5
1.1 Positive Aspects of Village Water	5
1.2 Regional Differences	6
1.3 Village Size and Description	6
1.4 Water Use Factors	7
Sources	7
Methods of Obtaining Water	8
Purpose of Water Usage	9
Amounts of Water Usage	11
2. Institutional Issues	12
2.1 Organization of Village Water Systems	12
Background	12
Organizational Findings	13

25

	Page
2.2 Subproject Selection Process	15
General Guidelines	15
Allocation of Funds to Villages	16
Constraints on Subproject Selection	16
2.3 Subproject Implementation Process	17
2.4 Consequences of Program Focus	18
Slow Pace of Capacity Building	18
Limited Project Resources vs. Needs	19
3. Water Supply Systems	21
3.1 Planning, Design and Construction Procedures	21
3.2 Types and Description of Systems in Use	22
3.3 Operation of the Systems	25
Independent Systems with Wells	25
Systems with Water Treatment Plants	26
General Operation Problems	27
3.4 Maintenance and Repair of Systems	28
3.5 Overall Evaluation of System Performance	30
Levels of Service	30
Quantities and Pressure	31
Water Quality	35

	Page
4. Wastewater Disposal	38
4.1 Existing Situation	38
Excreta Disposal	38
Sullage Disposal	38
Piped Sewerage Systems	39
Community Sullage Systems	40
4.2 Factors Affecting Disposal	41
Legal Aspects	41
Land Constraints	41
Financial Constraints	
Technical and Social Considerations	42
Conclusion	43
5. Financial Matters	44
5.1 Capital Funding	44
5.2 Operation, Maintenance and Repair Expenditures	45
5.3 Water System Tariffs and Revenue	48
Tariffs	48
Connections and Charges	49
Revenues	50
5.4 Financial Record Keeping	52
5.5 Metering	54
6. Impact of BVS Funding	55
6.1 Introduction	55
6.2 Ratings of Relative Impact	56

III. RECOMMENDATIONS

		Page
	Introduction	61
1.	Focus of Local Development Funds	63
2.	Consideration of Regional Systems	65
3.	Organizational Issues	67
4.	Planning, Design and Construction	71
5.	Water Supply Systems	75
6.	Wastewater Disposal	80
7.	Maintenance and Repairs	87
8.	Tariffs and Revenues	91
9.	Health Education	95
10.	Suggested Priority of Recommendations	97

LIST OF TABLES

	Page
1. Governorates, Markaz and Villages Included in the Assessment	2
2. Summary of Basic Data from Village Field Surveys	24
3. Percentage of Population Directly Connected to Water Systems in 36 Villages Surveyed	32
4. Comparison of Data Sources on Percentage of Population Directly Connected	34
5. Annual Revenue From Sale of Water, 1986/87	50
6. Income Distribution in Rural Egypt	51
7. Summary Evaluation of Impact of BVS Funding	56
8. Factors Relevant to Evaluation of BVS Impact	57

LIST OF FIGURES

1. Drinking Water Sources Reported by Water Users	9
2. Bacteriological Analyses of Water Samples	37

APPENDICES

A. Assessment Sampling and Methodogy

B. Summaries of Village Water Assessment Reports

C. Water Quality

D. Unit Cost Data

E. Assessment Questionnaires

F. Consumers Views of Village Water and Sanitation

G. Bibliography

39

DEFINITIONS

Amana	Technical Secretariat for LD II, Ministry of Local Government
adobe	Type of house construction using dried clay and straw
Bab	Category of the Egyptian National Budget
BVS	Basic Village Services (USAID Program)
canal	Canal or ditch bringing irrigation water from the Nile (terah)
drain	Canal or ditch which drains irrigation water from the fields (masraf)
DSF	Decentralization Support Fund (USAID Program)
Ezbah	A settlement within a mother village, usually smaller than a satellite village
GLDC	Governorate Local Development Committee
GOE	Government of Egypt
GOPW	General Organization for Potable Water (no longer exists)
Governorate	Equivalent to a province or state
km	Kilometers
LD II	Local Development II (USAID Program)
LE	Egyptian Pound (US $ 1.00 = LE 2.20, approx.)
lpcd	Liters per capita per day
Markaz	District administrative unit between village and governorate

40

mm	millimeter (100 mm = 4 inches, approximately)
m^3	Cubic meters ($1m^3$ = 254 US gallons)
Mother Village	Name given to the legal entity for village affairs (qariya el om) administered by an Executive Council
Naga	A settlement, similar to an ezbah. The term naga is used more commonly in upper Egypt.
NOPWASD	National Organization for Potable Water and Sanitary Drainage
O&M	Operation and maintenance
ORDEV	Organization for Reconstruction and Development of the Egyptian Village
piastre	One-hundredth of an LE
pt	Piastre
Satellite Village	Name given to villages associated with a mother village (tawaba)
septage	Toilet wastes
sullage	Washwater
UNICEF	United Nations "Childrens Fund"
USAID	United States Agency for International Development
Village	Unless otherwise, noted, the term "village" used alone generally refers to the mother village and all its component settlements
VEC	Village Executive Council

VPC	Village Popular Council
wastewater	Combination of toilet wastes (septage) and washwater (sullage)
WASH	Water and Sanitation for Health Project
zir	Clay pot for holding water in village homes

42

PREAMBLE

QUOTATIONS FROM THE VILLAGERS

The findings and recommendations in this report are the result of a team of specialists, local and expatriate, who spent two months in the villages to conduct the assessment. Reports such as this are meant to bring about improvements in the life of those who live in the villages. This opening section gives voice to the 320 villagers interviewed and the many officials with village water responsibilities who accompanied the assessment teams to the various villages. This is how some of these people see the village water situation.

Role of Popular Council

The Chairman of the Village Executive Council in a village :

> "The more benefits we get from the BVS Project, the more headaches we suffer from the Popular Council members."

A Popular Council member from the same village:

> "The most important benefit from the BVS Project is that we now have a real role to play, and we do it."

The Chairman of a Village Executive Council:

> "The members of our Popular Council, especially the Chairman, are trouble makers. They don't know their role. They always send a telegram to the governorate or go directly and meet the governor himself for even the smallest issues. So I just step aside and let them do what they want even if I don't agree with them."

A Popular Council Member in another village:

"We thank God because we don't have any problems in our village and we cooperate with the Executive Council. In other villages there are a lot of troubles and conflicts between the village Executive Council Chairman and the Popular Council members. So everything becomes complicated and none of the projects get implemented in the right way."

Wastewater Disposal Problems

A village woman:

"I prefer to wash clothes and dishes in the canal because it is easy to dispose of the wastewater directly there. I think that there is no problem as long as the water is running. Only the stagnant water is dangerous."

A village woman:

"It is easier to carry the dirty dishes to the canal and back than it is to wash them in the house and carry all the wastewater to the canal."

A village woman in the delta:

"Every time I consider turning on the faucet, I remember that every drop of water used will have to be carried on my head out to the canal."

A village woman in the delta:

"The agricultural drain is so far it is impossible to carry all the water there. We have no choice but to dump it in the street and pay the fine when there are complaints."

-44

A Chairman of the Village Executive Council:

"The most urgent problem we have now is wastewater disposal and we can't find any solution. Although we have a tractor and tank, it can't pick up the sullage in many parts of the village because the streets are too narrow."

A Chairman of the Village Popular Council:

"We are willing to raise funds for a wastewater project. Just start one with as little as 10% of the money, we'll find the rest."

Water Service

A village woman:

"Why should I get connected to the water system? I often see my neighbors with water connections out fetching water because their service is interrupted so often."

A village woman:

"In summer, water is very scarce. We fight over the little supply that is available."

A man in a village with many new handpumps:

"People would not be installing those handpumps if the water system was working properly."

Quality of Piped Water

A village man in the delta:

"I have a handpump at my house and I am not connected to the piped water system because I do not want to be. My neighbors who are connected use the water from my

45

handpump for drinking and making tea. I believe that the water from my handpump is cleaner and healthier than the piped water."

A village woman:

"The piped water sometimes is very rusty and cloudy, so I store the water in the container until it becomes clear; then I can use it for making tea or for drinking."

A village woman:

"We can't drink tea without putting cinnamon in the boiling water because the piped water has such a bad taste."

A woman in a village where untreated Nile water was being pumped into the system several hours a day because the regular supply was inadequate:

"They think we are stupid, we know that the piped water comes directly from the Nile. Look, little worms are floating in water in the zir. This is criminal."

A village woman :

"We have been forced to buy our drinking water (from a water tanker) because the piped water is so salty."

Public Standpipes

A poor woman in a village where the governorate policy is to shutdown the public standpipes :

"I can't afford to have piped water. It is not fair to close the public standpipes because they are important to those of us without house connections. The government owes me this most important service."

46

A rich woman :

"Because the water pressure at my house is so low, often I am forced to get water from the public standpipe. I suffer a lot because of all the poorer people there quarreling, bathing their children, and doing their laundry and dishes. They resent competition from rich people like me for the water."

A Chairman of the Village Executive Council:

"I closed the public standpipes except for two of them near the canal. Because of the expansion of the village the location of the standpipes quickly came to be in the middle of a residential area. Also the village has many adobe houses which are affected by the leakage of the water and may fall down. So it is better to close all the public standpipes and not be blamed if a house falls down.

A village woman:

"We would like to have public standpipes in our villages if they had proper drains for the wastewater."

The Invisible Poor (Official View vs. Reality)

A Chairman of the Village Popular Council :

Reality : A village in which 30% of the houses have water connections and the public standpipes have been closed.

Chairman's View:

"The BVS Project has had a significant impact upon the water system in our village. Ninety percent of the houses have water connections, and the ten percent who don't can get water from their neighbors."

47

A water station operator:

Reality : A village with 50% of the houses connected to the water system and no standpipes.

Operator's View :
"We don't have any standpipes in this village. Everyone has house connections."

A governorate Housing Directorate engineer :

Reality : A village of 2,000 people with only 22 house connections and no public standpipes .

Engineer's View :
"We don't need standpipes because most of the people have connections and the others can get water from their neighbors with connections."

Appreciation of New Water Service

A village woman:

"Look at where we were and where we are now! Such a huge difference!"

I. INTRODUCTION

1. Purpose of Assessment

As part of a major effort to promote the concept of decentralization, USAID and the GOE embarked on the Basic Village Services (BVS) Program in 1979. The major thrust of this program was that US grant funds would be made available at the village level for approved types of infrastructure projects or project components. The GOE contribution was to provide funding in the amount of 10 percent of the USAID contribution to be used for maintenance of the new works.

From 1980 through 1986, a total of LE 228 million (about US $104 million) was disbursed through 22 governorates to about 920 villages for expenditure on local infrastructure projects. Water projects (46%) and sewerage projects (9%) accounted for 55% of all such expenditures. Roads, at 35%, was the next largest area of investment. All other areas combined only amounted to 10% of expenditures.

The second phase of the decentralization effort, in the form of the Local Development II (LD II) program, was recently begun. A major portion of capital funds from this program is expected to be directed to water and wastewater projects.

The purpose of this assessment is two fold:

(1) Determine the status of the water projects funded under the BVS program, and

(2) Based on this assessment, make recommendations to guide the implementation of the LD II program so as to improve the performance, reliability and sustainability of village water systems in Egypt.

49

TABLE 1
Governorates, Markaz and Villages Included in Assessment

Governorate	Markaz	Village	1986 Census Buildings	1986 Census Population
Damietta	Fariskour	El Rahamna	2,452	14,717
		Sharbas	5,457	29,292
		Dahra	944	6,818•••
		El Ghonimiya	2,075	11,675
		Sub Total	10,928	62,502
Fayoum	Senouris	Fidimin	6,989	34,881
		Minshat Bani Etman	6,263	29,274
		Sanhour	8,166	40,579
	(Itsa)•	El Gharaq••	7855	35,177
		Sub Total	29,273	139,911
Gharbiya	Mahala	Bashbish••	6,219	33,892
	El Koubra	El Matamadiya	9,166	52,352
		Shoubra Babel	5,683	33,087
	Zifta	Nahtai	7,925	36,721
		Sandebast	4,639	26,783
		Shoubra Malas	5,548	31,521
		Tafahna El Azab	5,376	25,241
		Sub Total	44,556	239,597
Giza	Badrashin	Saqara	7,233	34,830
		Maraziq	6,783	41,641
		Om Khenan	3,372	18,954
	El Saf	El Qababat	12,540	66,688••••
		Atfih	5,604	28,201
		Sol	6,781	32,106
		El Borombol	6,360	31,869
		Sub Total	49,173	254,289

• Not included in the survey
•• Included a DSF-Funded compact water treatment plant
••• Smallest village in survey
•••• Largest village in survey

50

TABLE 1 (cont'd)

Governorate	Markaz	Village	1986 Census Buildings	1986 Census Population
Menoufia	Ashmoun	Grais	6,328	29,831
		Talia	9,238	55,682
		Samadoun	6,065	34,244
	Qouesna	Shoubra Bakhoum	3,901	17,451
		Ibnahs	9,422	45,820
		Om Khenan	6,654	36,745
	El Bagour	Istanha	5,719	27,920
		Bahnai	4,161	17,561
		Kafr El Khadra	6,960	26,064
		Mit Afif	2,877	11,623
		Sub Total	61,125	302,941
Qena	(Qift)•	El Barahma••	3,715	20,400
	Esna	Kiman El Mataana	6,190	30,742
		Asfoun	8,980	45,677
		El Shaghab	3,666	15,957
		Sub Total	22,551	112,776
6	10	36	217,606	1,112,016

Averages : 30,890 people per village
5.11 persons per building
5.05 persons per family

• Not included in the survey
•• Included a UNICEF water system

2. Field Test Sample

Of the 22 governorates in the BVS program, 6 can be roughly classified as desert governorates. USAID is evaluating their special needs in another program, so the remaining 16 governorates (and their approximately 800 villages) became the universe from which the field sample was to be chosen.

Six governorates were chosen for sampling in order to have coverage in each of the areas exhibiting unique characteristics : (1) the coastal Delta, with saline groundwater; (2) the southern Delta, with fresh groundwater; (3) Fayoum, because of its special case as a depressed oasis; (4) the central Nile Valley; and (5) the upper Nile Valley. Because the Delta contains about half the people of Egypt, the 6th governorate was selected from one of those in the Delta with a mixture of salt and fresh groundwater.

A total of 10 markaz* and 36 villages were then selected from the 6 sample governorates. (See Appendix A for details of the sample selection criteria and procedures). The governorates, markaz and villages chosen for sampling are presented in Table 1.

3. Assessment Methodology

Field data were collected by two teams which spent an average of three days each per week in the field from mid-November 1987 through mid-January 1988.

Teams consisted of an environmental engineer, a social scientist, and a financial / public administration specialist, supplemented by other professionals provided by ORDEV.** Details of the team composition and the project methodology are also described in Appendix A.

---

* Markaz is the county or district administrative unit below the governorate level. The plural of markaz is marakez. For the purposes of this report, only the word markaz will be used and should be understood in both the singular and plural forms.

**ORDEV is the Organization for Reconstruction and Development of the Egyptian Village.

II. FINDINGS

1. General

1.1 Positive Aspects of Village Water

Despite the many problems which are described in the following sections, the situation in village water supply in Egypt is far from grim.

The USAID Local Development Program, which has provided about two thirds of all village water project capital funding for the past 8 years, has been a significant positive factor in bringing about improvements in providing more and better quality water to the Egyptian villages:

* Increasingly, villages are making decisions on spending capital funds in accordance with their perceived needs.

* There was a functioning water system in all 36 villages visited, at least in the mother village, and in most satellite villages.

* There has been a considerable increase in the number of house connections over the past 8 years : about 31% in the 36 villages in the assessment vs an average of 5% in about 300 villages surveyed at the time of the 1980 provincial water study.[•] Since rural population increased by 31% in this period, this means about seven million more people are now connected to piped water systems compared to ten years ago. (On the other hand, the unconnected population has remained fairly constant at about 19 million because of the population increase).

* Most water system operators are performing fairly well, considering their lack of training, power outages, limitations of their systems, limited technical support, and inadequate funds to run their systems.

• " Provincial Water Supplies Project ", Binnie-Taylor and Dr. Abdel Warith, Feb. 1980

* Some villages are very entrepreneurial in raising revenue, stretching limited funds and solving wastewater problems.

1.2 Regional Differences

There are significant differences among the governorates which must be taken into account in making recommendations:

* The unavailability of fresh groundwater makes Damietta and Fayoum villages dependent on regional pipe networks supplied by treated surface water, whereas most of the other villages have their own groundwater sources.

* The procedures for project selection, the allocation of resources and the concept of decentralization are quite different for regional water systems than they are for individual village water systems.

* Availability and levels of skill vary considerably among the governorates.

1.3 Village Size and Description

According to the 1986 census, the average population of all villages in the 6 governorates sampled was 29,450. Of the 36 villages sampled, the sizes ranged from 6,800 to 66,700, with an average of 30,900. The 36 villages have a total of 119 satellite villages, or an average of 3.3 satellites per mother village. In addition to satellite villages, many mother villages are also responsible for a significant number of ezbahs or nagas, settlements of a few dozen to several hundred houses.

Using 1986 census data for buildings, the average number of persons per building in the 36 villages was 5.11, with a range of 4.8 to 5.7 in the 6 governorates. The average number of persons per family was 5.05.

These numbers of persons per building or per family are generally considered lower than actual by many people. Numbers in the order of 7 to 8 persons per family or building are frequently quoted for rural Egypt. The lower figures in the census may reflect a count of the many new houses under construction but not yet occupied, or other factors. Frequently, however, the water connection is made at the earliest stage of construction so as to provide water for masonry or clean up.

For the assessment, the number of persons per building was only used as a transition factor to get from the number of house connections to the number of people served. Table 4 seems to indicate that this methodology is acceptable, since the end results show remarkable agreement with the census report of the percentage of buildings which are directly connected to a piped water system.

Satellites in the delta tend to be closer to the mother village, but they are generally more distant in Fayoum and in central and upper Egypt. Population densities are also higher in the delta.

Agriculture is by far the principal source of income in most villages. With few exceptions the greatest number of dwellings are only one (mostly) or two stories in height. Multi-storyed buildings are rare. Most buildings (78% according to the 1986 census) are made of adobe (sun-dried clay). Most of the others are built with fired brick.

1.4 Water Use Factors

1.4.1 Sources

In the study villages, people obtain their water essentially from two sources, groundwater and surface water :

* Groundwater is obtained from deep wells (village systems), shallow wells (usually private hand pumps) or, rarely, from shallow dug wells.

56

* Surface water is obtained either as treated water from the Nile or canals (usually village or city systems, sometimes by private tanker trucks), or untreated, directly from canals.

1.4.2 Methods of Obtaining Water

These sources are made available to the villagers by a variety of methods, including:

* Piped water distribution systems are used to transmit deep well water or treated canal or river water directly to the houses of some villagers through official connections. People sometimes receive piped water indirectly from their friends or neighbors who have connections. An earlier study• estimated that about 10% of the people receive some water this way. This assessment indicates as many as 22% of the people obtain some of their water from neighbors.

  Another means of receiving piped water is through the taps of public standpipes in the village. Piped water is also obtained from the taps at public buildings such as mosques and schools. A final means of using piped water is through illegal connections. No data are available on the possible extent of such practices.

* Hand pumps normally tap groundwater down to a depth of about 15 to 25 meters. They are almost always private, though some are communally owned. Most are located within housing compounds.

* Water from canals is utilized in two ways: some of it is carried back to the home in containers for later use. More commonly, clothing and cooking utensils are brought to the canal for washing. Bathing and drinking are also practiced to some extent at the canal.

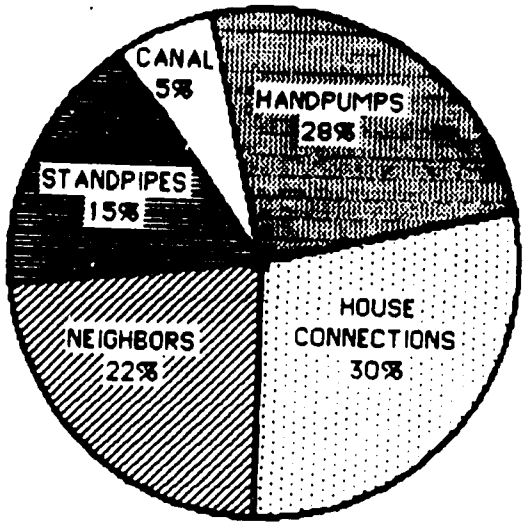
• " Water Supply and Sanitary Drainage for Qena and Aswan Governorates "' Upper Egypt Consultants, June 1986 (Phase 1)

* Tankers are employed in some water-short areas to carry treated water to villagers willing to pay for this service.

* Public dug wells are also utilized in some villages but their use is rare. Water is obtained by windlass, rope and bucket

* See Figure 1 for the various sources of water reported by persons interviewed in this assessment.

Fig.1 Drinking Water Sources Reported by Water Users in Thirty-six Villages



Note:
Results are indicative only of an overall pattern, and usage varies considerably among the six governorates in the water users survey. Also, many villagers use different sources under different circumstances.

1.4.3 Purpose of Water Usage

Which source of water people use depends partly on what's conveniently available to them, what they plan to use it for, and also on wastewater disposal considerations.

* Taste. Water is thought to be good or bad on the basis of the criteria: "Does it make good tea ?" Even people with house connections will turn from bacteriologically safe water if it's salty or tastes of chlorine, in favor of contaminated water from shallow wells or canals which is low in salts and chlorine-free. In one delta village people were paying a very high price (LE 5/m3, or 20 pt for the common 20 liter container) for tanker water which was much lower in "saltiness" (total dissolved solids) than the village water otherwise available to them.

* Hardness. Where piped waters are too hard to raise suds, many people turn instead to canal water for washing.

* Disposal considerations. Even when piped water was sufficiently soft, many women preferred to do their washing at the canals because washing in the house meant that substantial amounts of wash water had to be disposed of.

* Distance considerations. The scarcity of public standpipes in most villages frequently forces villagers to the use of handpumps and / or canals, even when the piped water is good.

* Cultural considerations. Less use of canals for washing was made by upper Egypt women than by those in the Delta.

* Bathing. Men are able to perform their ablutions at the Mosque . Relatively small amounts of water are used for bathing in the home (there are few bath tubs or showers).

* Other uses. Water is also used for construction, to water livestock, common in most village homes, and sometimes to irrigate small plots within compound walls. The aggregate of such usage is probably not great.

1.4.4 Amounts of Water Usage

The greatest number of house connections observed in the villages terminated just inside the wall of the house, with a single tap. Furthermore, none of these houses had piped sewers for wastewater disposal.[•] This situation ensures that total per capita use of water in such homes is almost certainly much lower than that normally ascribed to people with piped water connections. One study[••] of 11 households over a two month period indicated that water usage from such single tap connections without sewers is about 40 lpcd. Another study[•••] estimated such usage at 55 lpcd.

• Three villages visited in Damietta have sewer systems under construction, but they are not yet in operation.

•• "Water Supply and Sanitary Drainage for Qena and Aswan Governorates", Upper Egypt Consultants, June 1987 (Phase 2)

••• "Provincial Water Supplies Project", Binnie-Taylor and Dr. Abdel Warith, Feb. 1980.

2. Institutional Issues

2.1 Organization of Village Water Systems.

2.1.1 Background.

Local government in Egypt is evolving away from a highly centralized system of powerful national ministries, toward a decentralized system in which governorates (and to a lesser degree, markaz and villages) are given certain authority to coordinate activities and services within their territory. Under the Local Government Law of 1980, national ministries are represented at the governorate level by directorates (*moudiriya*, such as Directorate of Housing, Directorate of Health) which are thus partly responsible to the governor and partly responsible to their ministry in Cairo.

The dissolution of the General Organization for Potable Water (GOPW) in 1981 completed the transfer of principal responsibility for water services from the central government to individual provincial governorates, as part of the Government's policy of decentralization. Four different approaches have been adopted by the governorates in organizing water service :

(1) Each markaz operates its own water systems for larger towns;

(2) The Governorate Housing Directorate takes direct responsibility for water services, through the markaz, in smaller towns and villages not served by regional water schemes;

(3) Separate organizations were established for regional water supply schemes previously operated by the GOPW; and

(4) New water companies were established with governorate-wide responsibility for water services.

10

The Government's longer term strategy is that each provincial governorate should establish its own water company.

To date three such companies have been formed : in Beheira (1981), Kafr el Sheikh (1983) and, most recently, in Damietta (1984). A similar approach is being developed for eight other governorates, with bilateral donor support.

The second situation described above covers water supply systems in all villages except those served by a regional water system. In theory, the housing directorate personnel are under the administrative authority of the governor, but they are professionally and technically responsive to their ministry. It is a dual system under which the clear vertical lines of authority under the old centralized system have been compromised for the sake of more relevant coordination at the local level. This pattern of "dual authority" is replicated at the markaz level where there are departments *(edarat)* of education, health and so forth.

2.1.2 Organizational Findings.

Markaz. The key institution with responsibility for village water systems at the markaz is the " Department of Housing". The markaz engineer belongs to this department and he responds both to his superiors in the Directorate of Housing at the governorate capital, and to the chairman of the markaz. One markaz water engineer explained it this way, "I report up to my superiors through the Directorate of Housing at the governorate, but orders come down to me through the markaz chairman."

Village. At the village level the duality of the system results in confusion about the authority over water system personnel. Typically there are two sets of employees responsible for water system operation and maintenance: the station operators on the payroll of the Department of Housing, and plumbers, clerks, and workmen on the payroll of the Village Council.

61

Water Operation. Local water system employees do not always respond to directives from the village chairman, as they consider themselves under the authority of the markaz engineer of the Department of Housing. The village chairman, if unhappy with the performance of the local water system operators, can do nothing more than file a complaint with the markaz engineer. On the other hand, the markaz engineer is unable to provide close supervision of these employees because of their dispersed locations and his lack of transportation, and competing pressures on his time at the office.

Some villages have worked out a compromise whereby the village council staff takes responsibility for repair work on the pipe network in the village, and the water system operators take responsibility for operating the pumps and doing minor maintenance and repair work at the pump station. Some work reasonably well together but where there are conflicts between the village chairman and the water operator, the organizational system is not well suited to resolving them.

The establishment under LD II of village maintenance centers under the authority of the village chief may be a step towards enhancing the village's authority and control over its water system's effective operation. However, it is still not clear if this maintenance center has the authority to work on the networks and pumping stations that officially are the responsibility of the Department of Housing.

Inter-"Ministerial". The system becomes more bureaucratically complex when it involves not just the Department of Housing and the Village Council, but the Department of Housing and the local representatives of another ministry, such as the Ministry of Health. In this regard, important matters relating to the testing of the water and the disinfecting of the water tanks become mired in the pyramidal structure of the bureaucracy, allowing for very little horizontal coordination, even at the markaz level, let alone at the village. In such realms, the old centralized bureaucracy holds sway. The Ministry of Health "enforces" national standards; the governorate's Directorate of Health is responsible for the laboratory work; the markaz Department of Health operates

mainly as a conduit or is bypassed, the village health inspector collects the samples and sends them to the governorate laboratory, and the operators of village water stations and village chairmen receive reports of dangerous contamination months after the event. Even then, these reports rarely specify what could or should be done about the situation, and there is no effective follow-up to negative results. Neither is there any effective supervision of the process to ensure quality control.

2.2 Subproject Selection Process

2.2.1 General Guidelines

The BVS subproject selection process basically follows guidelines specified in the project agreement between Egypt and the United States, and regulations designed by ORDEV.

The core of these regulations is that the BVS funds are intended for villages. The governorate's BVS funds are to be assigned to particular villages, and the village Popular Council must approve the subprojects for which its funds are to be spent.

The six governorates in our sample vary in their implementation of these guidelines. The most important variations are in the following two parameters:

* The formula used for determining the amount of each village's allocation.

* The constraints placed on the villages' freedom of subproject selection.

62

2.2.2 Allocation of Funds to Villages.

In Menoufia, Giza, and Fayoum, the governorate allocates the funds to the villages according to the population size of the village, regardless of any village's claims to special needs or access to other resources.

In Gharbia, the governorate allocates an equal amount to each village council, regardless of village size or need.

In Damietta and Qena, the governorate makes a determination according to need and access to other resources, and then allocates funds accordingly.

2.2.3 Constraints on Villages' Subproject Selection.

Certain constraints come from ORDEV. In the first year of BVS, subproject selection was limited to the categories of water, roads, and wastewater. That list of three has since been expanded to 23, although the bulk of BVS funds continued to be put into the original three sectors. In all cases, the governorates place certain priorities on the use of the funds, usually stressing the importance of water, roads, or wastewater.

In Menoufia, Gharbia, and Giza the selection of subprojects is left to the Popular Council in consultation with the Chairman of the Executive Council and the engineer from the markaz Housing Department. The constraints placed on the Popular Council's selection are that a subproject should have the concurrence of technical feasibility from the markaz engineer, and it should follow the guidelines and priorities set by the governorate and markaz. Regarding water projects, the Markaz generally insists that priority areas for new water networks be densely populated areas along a wide street, perhaps containing a public facility such as a school, clinic, or mosque.

In Damietta and Fayoum, the governorate integrates the BVS village allocations into its broader sector development plans, since these governorates are mostly served by regional networks of surface water rather than local groundwater systems. For instance, in Damietta and Fayoum, the total costs of refurbishing a large water treatment plant might be charged proportionally against the BVS allocations of all the villages served by that plant. The new multi-village sewerage systems being constructed in Damietta are also treated in this manner.

Such an approach significantly limits the Village Popular Councils' freedom to select their subprojects in these governorates.

In Qena, the Governorate played a strong role in project selection. They set priorities among water and other uses. While the villages were asked to express their needs, the governorate Housing Department appeared to be making decisions on the specific use of funds for water projects at village levels.

2.3 Subproject Implementation Process

Regardless of how the selection is made, implementation is the weak link. Neither the village nor the markaz have sufficient skills or experience to ensure that the works are (1) a logical part of a comprehensive plan to serve the village water supply needs, (2) properly designed to fulfill their specific needs, or (3) adequately specified for competitive tendering.

The markaz engineers have responsibility to see that the works are properly installed or constructed. Much of the technical planning and design responsibility falls on the shoulders of the Housing Directorate's engineers at the governorate level. With few exceptions, all too frequently these engineers suffer from the double affliction of (1) having too much to do, with projects thorughout the entire governorate, and (2) usually inadequate practical training following receipt of their university degree.

The design, procurement and construction procedures are such that there are rarely any copies of plans, designs, construction drawings, specifications, or equipment operation and maintenance manuals, even within a year or so after the works have been completed. The teams saw hardly any such documents at the village or markaz level, and very little at the governorates. The water system operators, who need them most, rarely had anything.

2.4 Consequences of Program Focus

2.4.1 Slow Pace of Capacity-Building.

The BVS Program had the twin aims of encouraging decentralized decision-making and strengthening local units' capacity to implement infrastructure projects effectively. The BVS Program goal stressed that the project is to "*...expand the decision making capacity on the broadest possible basis...*" And the BVS Project purpose stressed the capacity-building aspect to "*...improve and expand a continuing capacity in local units to plan, organize, finance, implement, and maintain locally chosen infrastructure projects.*"

While somewhat uneven, the process of decentralization is moving forward, and the concept has taken hold very well in several governorates. In those two governorates in the assessment sample with regional surface systems for water supply, the decentralization theme has not reached the village level (see Section 2.2.3).

There is little evidence, however, at least in the realm of water projects, that the capacity-building purpose of the BVS Program has been achieved. Earlier evaluations (1984) and the follow-on LD II Project Paper recognized this fact, particularly in regard to the lack of systematic maintenance, and steps have been taken to correct this under LD II.

Equally as important as the lack of systematic maintenance, is the lack of systematic application of simple engineering planning and design skills at the early stages of implementation. There is little evidence that village water systems are designed and implemented any differently in 1987 than they were in 1980, or even in 1960. As a result, funds were not spent as effectively as they could have been.

2.4.2 Limited Project Resources Compared to Needs

The BVS Program was designed to provide relatively small amounts of funds on an annual basis to practically every village in Egypt to implement relatively small local infrastructure projects. The BVS Program was not intended as a rural water project and it lacked the resources (financial and technical assistance) to embark upon a full scale program for the rehabilitation and expansion of rural water systems to serve Egypt's 27 million rural residents.

The total amount of BVS funds spent on water and sewerage was LE 125 million, which is a very large sum of money. By spreading these funds among some 900 mother village units, however, the average total expenditure over the approximately five years of the program was about LE 135,000 per village. For the six governorates in the assessment, the total BVS capital investment for water and wastewater amounted to only LE 5.50 per person in the rural areas of these governorates.

Including other sources of capital, the average amount spent nation-wide on water and wastewater projects from the early 1980's was in the order of a total of LE 200,000 per village. With village populations averaging about 30,000 people, that amount of money does not buy very much in comparison with village needs. A single 150 m^3 elevated storage tank, for example, costs in the order of LE 120,000.

67

To bring about significant development in the water and wastewater sector for villages, either more funds must be made available or there should be a focussing of effort on a smaller number of villages.

Finally, there are concerns about the negative aspects of grant funding. Experience has shown that municipalities take better care of works that they helped pay for. The assessment turned up several examples of the philosophy of :
"That's the Government's (elevated tank, pump, public standpipe). It's up to them to come and fix it".

V6

3. Water Supply Systems

3.1 Planning, Design and Construction Procedures

These procedures are also discussed under Section 2.3, Subproject Implementation Process. In addition, much of what is called design is often the use of standard plans developed by NOPWASD for typical elevated tanks, pump station layouts, well construction or other components. This is not an incorrect practice, but too often the selection is not made logically. The same size and height of an elevated tank, for example, is proposed for a village of 5,000 or 20,000 people. Similarly, pump and motor "design" is too frequently a matter of installing what is currently available (from a bilateral grant, for example), without matching either head or capacity to the systems' particular needs.

There is rarely any prior testing before drilling the actual well.• There is no matching of gravel pack, screen length and slot design to aquifer characterisitics, no developing, and no long term yield testing of deep wells. In Qena, for example all deep wells drilled in three separate villages had identical lengths, diameters and screen lengths and slot sizes.

The failure to consider village components as part of a comprehensive system or to apply basic engineering practices has led to such problems as :

* Elevated tanks with grossly insufficient capacity and/or with elevations too low to provide adequate pressure

* Elevated tanks with connecting pipes much too small to permit their effective use.

• This statement has been disputed by some local engineers, but the teams never encounted any data about testing even when it was requested. Further, the performance of relatively new wells generally was not indicative of effective prior testing.

69

* Pumps and motors inadequate to lift water into available elevated tanks

* Construction of new wells within 10 to 15 meters of existing wells, with the probability of interference and lower yields

* Location of wells on the basis of the availability of village land rather than hydrogeological considerations.

* Improper matching of pump capacity to wells, frequently because of lack of knowledge of the safe yield of the well.

* Investments in well construction without prior testing, with the result that often water quality is substandard or quantities are inadequate.

* Construction of new, small self-contained water treatment plants in some villages or satellite villages when expansion and extension of adjacent systems would have been more logical and economical

* Installation of pump capacities which exceed any possible village needs

* Failure to provide standby power and adequate storage to meet the village's needs during frequent power outages

3.2 Types and Description of Systems in Use

Two basic types of systems were encountered : (1) regional systems in which extensive areas are served by a network of pipelines from one or more surface water treatment plants (Damietta, Fayoum), and (2) individual systems which use groundwater as a source from one or more wells and provide water to only one or a few villages. A few villages had combinations in which much of the village was served by a neighboring surface water treatment plant but some of its satellites had individual systems supplied by wells. A few other individual systems were served by "compact" water treatment plants.

70

Regional systems are common in areas of saline groundwater. Individual systems are found only in areas where there is an adequate supply of potable groundwater.

The results of the assessment of the water systems in the 36 villages are summarized in Table 2. Summaries of the village reports are presented in Appendix B. Other than the DSF and other compact water treatment plants and the UNICEF self contained well systems, the remaining villages were served by either regional water treatment plants located outside the village, which were not investigated, or by deep well systems. The older deep well systems have pump stations with centrifugal pumps in a dry pit 4-6 meters below ground level, with either electric motors or diesel engines to drive the pumps. The older wells (1950 - 1970) were usually 30 to 60 m deep, with 100mm dia screens and 200mm dia above the screen. Relatively few of these systems are now in operation.

Most recent well systems consist of drilled wells from 45 to 60 meters in depth, 250mm in diameter. Screen and well casing are the same diameter. A typical screen consists of the following: A 20m section of steel pipe with 5/8-inch holes drilled at a pattern of 144 holes per square foot. This drilled section is then wrapped with fine woven galvanized copper wire mesh screening which is tack welded to the steel pipe. A 2m tail piece in added at the bottom.

Typically, a small pump station building is constructed for each well, with a deep well turbine pump powered by either an electric motor or a diesel engine. It is very common to drill a second well within 15 to 20 m of the first one and build another pump station beside the first. Sometimes both pumps are powered by electric motors and sometimes one is fitted with a diesel engine.

When there is an elevated tank, it is usually nearby and both pump stations are connected to it. In the newer systems, the pumps are connected to both the distribution system and the tank, so that the storage "floats" on the distribution system.

TABLE 2 BASIC DATA OF THIRTY-SIX VILLAGES

GOV/VILLAGE	POPULATION	SYSTEM No.	TYPE (1)	WATER SOURCE	WELLS No.	PUMPS No.	CAPACITY (m /h) ELEC	CAPACITY (m /h) DIESEL	PIPE LINE/KM	STORAGE No.	STORAGE m	TANKS Ht	PUBLIC STANDPIPES No.	PUBLIC STANDPIPES PERSONS/UNIT
DAMIETTA														
EL RAHAMNA	14,717	1	R	NILE	0	0	N.A.	N.A.	---	0	-	-	0	---
SHARABAS	29,292	1	R	NILE	0	0	N.A.	N.A.	7	0	-	-	2	14,646
EL DAHRA	6,818	1	R	NILE	0	0	N.A.	N.A.	2	0	-	-	4	1,705
EL GHONIMIYA	11,675	1	R	NILE	0	0	N.A.	N.A.	6	0	-	-	8	1,459
SUB TOTALS	62,502	4			0	0	0	0	15	0	0		14	4,464
FAYOUM														
FIDIMIN	34,881	1	R	NILE	0	0	0	0	9	0	-	-	10	3,488
MINSHAT BENI ETMAN	29,274	1	R	NILE	0	0	0	0	10	0	-		40	732
SANHOOR	40,579	2	C	NILE	0	3	100	0	30	0	-	-	19	2,136
EL GHARAQ	35,177	3	C	NILE	0	5	105	0	27	0	-	-	8	4,397
SUB TOTALS	139,911	7			0	8	205	0	75	0	0		77	1,817
GHARBIYA														
EL MOUTAMADIYA	52,352	1	R	WELL	0	2	144	144	11	3	90	16	29	1,805
SHOUBRA BABEL	33,087	3	I	WELL	7	7	295	220	4	4	290	16-30	9	3,676
TAFAHNA EL AZAB	25,241	2	I	WELL	5	5	133	202	26	3	80	12-16	7	3,606
SHOUBRA MALAS	31,521	3	I	WELL	4	7	133	403	30	2	140	15-25	13	2,425
SANDABAST	26,783	2	I	WELL	4	4	133	306	17	3	100	15-25	12	2,232
NAHTAI	36,721	3	I	WELL	6	8	195	170	N.A.	4	200	16-25	16	2,295
BASHBISH	33,892	1	C	NILE	0	6	200	0	21	1	150	G.L.	25	1,356
SUB TOTALS	239,597	11			19	30	794	1,081	94	13	670		73	3,282
GIZA														
EL BOROMBOL	31,869	2	I	WELL	5	6	280	241	15	1	100	25	0	---
EL QABABAT	66,688	3	I	WELL	6	10	540	223	36	3	90	12-25	1	66,688
EL SOL	32,106	1	I	WELL	5	3	234	90	---	1	100	45	0	---
ATFIF	28,201	1	I	WELL	8	5	658	90	---	1	30	12	0	---
EL MARAZIQ	41,641	3	I	WELL	7	12			22	2	100	25-30	14	2,974
SAQARA	34,830	2	I	WELL	6	12	1152	324	32	1	140	25	6	5,805
OM KHENAN	18,954	1	I	WELL	2	8	864	288	10	1	100	35	0	---
SUB TOTALS	254,289	12			37	48	2,864	968	104	9	560		21	12,109
MENOUFIYA														
SHOUBRA BAKHOUM	17,451	2	I	WELL	2	4	144	162	12	2	70	10	3	5,817
IBNAHS	45,820	4	I	WELL	8	16	560	1050	18	4	160	12	14	3,273
OM KHENAN	36,745	3	I	WELL	4	9	198	446	25	1	25	10	N.K.	---
BAHNAI	17,561	3	I	WELL	4	11	254	216	22	3	200	12-15	13	1,351
ISTANHA	27,920	2	I	WELL	4	8	173	148	15	2	100	20-30	12	2,327
KAFR EL KHADRA	26,064	4	I	WELL	5	12	360	367	21	3	200	16-25	19	1,372
MIT AFIF	11,623	2	I	WELL	2	6	158	108	6	2	80	15	10	1,162
SAMADOUN	34,244	3	I	WELL	3	6	126	34	19	2	210	17-40	1	34,244
GRAIS	29,831	2	I	WELL	3	7	180	54	12	1	100	15	2	14,916
TALIA	55,682	4	I	WELL	6	18	180	180	59	3	250	8-30	4	13,921
SUB TOTALS	302,941	7			8	19	464	196	37	5	390		13	23,303
QENA														
EL BARAHMA	20,400	6	I	BOTH	5		-	0		2	250	15	16	1,275
KIMAN EL MATAANA	30,742	2	I	WELL	2	2	108	0	17	2	125	10-25	14	2,196
ASFOUN	45,677	3	R/I	BOTH	1	1	54	0	71	1	20	10	20	2,284
EL SHAGHAB	15,959	1	I	WELL	2	2	108	90	45	1	100	25	15	1,064
SUB TOTALS	112,778	12			10	5	270	90	133	6	495		65	1,735
TOTAL	1,112,018	53			74	110	4,597	2,335	458	33	2,115		263	4,228

(1) R = REGIONAL SYSTEM. C = COMPACT TREATMENT SYSTEM. I = INDEPENDANT SYSTEM

72

3.3 Operation of the Systems

3.3.1 Independent Systems with Wells

Storage is so limited (an average of less than 4 liters per person) that when the pumps are not operating there is effectively no service within a short time after they turn off. Without storage, the systems can only operate during the periods of water demand, roughly from 6AM to 6PM.

Actual operating hours vary greatly, and depend upon such factors as :

* Power outages• (about 80% of the independent systems had diesel engines, but not always with adequate capacity)

* Equipment failure (there are not many systems with backup units)

* Pipeline breaks (these can put systems out of service for a day or more at times, and always for at least several hours)

* Low voltage (electric pumps in some areas cannot operate after 5 PM)

* Operator negligence (some villagers reported that operators would go off for a few days)

* Lack of operating funds (limited money for diesel fuel and electricity were cited in some villages as the cause for restricted hours of operation)

* Tank cleaning (in some villages, systems had to be shut down to clean the elevated storage tanks)

• 42% of the villages had power outages during the assessment visits.

3.3.2 Systems with Water Treatment Plants

Villages in Damietta and most of those in Fayoum are served by regional piped systems with large central water treatment plants. Those were not investigated because they are not village systems. Three of the villages studied were served by individual "compact" water treatment plants : 2 of them Graver (USA) units funded under DSF and one an Austrian unit.

The dosing rate of treatment chemicals used by the compact units was predetermined by the manufacturers' representative who commissioned the works. The doses are not varied by operating staff to suit changes in raw water quality. None of the operators met had been trained to use jar stirrers to determine optimum doses of alum, nor did they have the equipment to perform the test. Comparators to test the presence (but not always the amount) of residual chlorine in the water were available at the three compact units seen. At one station the test chemicals supplied with the plant had been used up and had not been replaced.

Frequent power failures significantly affect the continuity of water supply. The 3 villages served by compact units are totally dependent on electric motors. They have no elevated storage and no stand-by power generators. All 3 systems were down at the time of the field visits because of power outages.

The compact units also depend on a regular and reliable supply of water treatment chemicals including chlorine gas for disinfection, and aluminum sulphate for removing turbidity. If stocks of either run out, the works are closed until replenishments are received. In the meantime, consumers have to find alternative sources of water.

Because of lack of storage, these systems can only operate during the hours of demand. In one village, the VEC chairman said he sometimes has to jump in his car and drive to the plant to instruct them to shut it down because " the pressure will burst the pipes if not enough taps are open "

Operating hours are also affected by many of the factors listed in Section 3.3.1.

3.3.3 General Operation Problems

None of the well pump systems had operating manuals. One of the compact unit systems had a large manual written in English that was totally inappropriate for use in Egypt.

Elevated water tanks are rarely fitted with level indicators. The operators run the pumps until water is seen or heard to overflow from the tank. Often the storage tank capacity is so small that some tanks are refilled 10 to 20 times daily.

Some of the diesel engines are fitted with external water cooling systems supplied from the pump delivery. The coolant runs to waste.

Both these losses represent a waste of energy that could be saved to reduce operating costs. Furthermore the water wasted tends to pond around the pump station creating a general nuisance and a breeding ground for mosquitoes.

Records are supposed to be kept by the pump station operators of the running hours of the pumps used and consumption of diesel fuel. There are no working flow meters to measure the total daily output, and no estimate is made of the daily production based on pump capacities and running hours. Examination of operators records during the field trips indicate that significant improvement is needed in this area.

Housekeeping of most of the pump stations is very poor. Pump rooms are often poorly lit, dirty, unpainted and cramped. Oil and diesel fuel covers the floor, and operators rarely have clean rags to clean plant and machinery. Toilet and washing facilities are non-existent for operators. The water compounds are often a graveyard of scrapped machinery.

25

The logistics of supplying essential consumables to pump stations and compact units is a recurring problem. Few of the village units have transport for carrying fuel or chemicals, and sometimes the markaz has only one vehicle to deliver supplies to ten villages. Lack of transport also causes problems for operator supervisors to visit stations, and check on problems and collect routine data. No stations visited had telephones.

3.4 Maintenance and Repair of Systems

Villages operating pump stations and compact treatment units generally tend to operate their equipment until it fails. Preventative maintenance is minimal, confined to changing oil, and topping up coolant water and starter batteries. Filters for oil and air receive little or no attention and are rarely replaced. Lubrication of moving parts is generally done, if at all, by markaz personnel.

The operators at one compact unit in Gharbiya Governorate grease bearings and perform routine maintenance as instructed by the manufacturers' representative. Another two units in Fayoum Governorate are dependent on staff from the regional water company to perform maintenance and make repairs.

Generally the village units lack the skills, tools, workshop facilities and spares to perform anything beyond very minor maintenance and repairs. No maintenance manuals or schedules were seen for any equipment other than one of the compact units. This manual was in English, contained excessive detail, and used units of measurement non-standard in Egypt. In most instances, the operators reported the oil of diesel engines is "changed every 200 hours and bearings are greased at regular intervals". In field visits to 36 villages no one was ever seen to be performing maintenance tasks and not a single lubricating gun was seen at any village.

76

A policy of universal metering has been adopted to supply individual private consumers, but neither villages nor markaz have meter testing or repair facilities. Consumer's themselves, said officials, are responsible for repairing faulty meters. At the Fayoum water company there are said to be facilities where meters are calibrated against both a new unit and a tank of known capacity. No attention is paid to the fact that in practice the meters operate at every low flow rates.

Typical of village communities in most developing countries, the villages in Egypt lack the resources to perform maintenance programs. Five resources required to maintain plant and equipment include (1) the manpower skills to strip, test, and reassemble the machines in service; (2) tools; (3) spare parts; (4) workshops; and (5) transport and telephones. In addition, there must be an agreed program, plan or schedule for maintenance. Such plans are being required under the LD II program but were not evident during the assessment.

The following evaluation represents the field visit findings relative to these five maintenance resources:

(1) The level of skills of personnel at village level are not adequate for more than simple routine maintenance. Major overhauls require the skills usually found in the private sector or, rarely, some of the markaz centers. There is also a lack of supervision of maintenance staff and operators.

(2) Most of the pump stations have virtually no basic tools (screw drivers, hammers, pliers and adjustable wrenches). None had lubricating guns for greasing bearings.

(3) Spares are in short supply. For the most part, the only spares found are those issued as part of the supply contract when the machine or plant was purchased. Once these spares are used there appears to be no procedure for replacing them. Some operators complained that certain spares for imported equipment are unavailable in Egypt.

Because of shortages of spares, machines are often repaired either using spares cannabalised from scrapped machines or with parts fabricated by private sector craftsmen. At the village, the only spare parts seen were pipe and mechanical joints.

(4) The LD II program is providing funds to construct a workshop at each village. For these to provide a useful service to the villages, skilled tradesmen and workshop tools must be provided. At present workshops at some markaz are unsuitable and ill equipped for major repairs of pumps and motors.

(5) There is an acute shortage of transport for maintenance staff to regularly visit each station. None of the stations had telephones.

Overall, although some operators and village staff have attended training programs, tools have been purchased, and workshops are being constructed, as yet there has been little impact on the maintenance of pumps, motors and compact treatment plants in the villages visited.

3.5 Overall Evaluation of System Performance

3.5.1 Levels of Service

* All 36 villages had a functioning water system
* Very few systems were in operation 24 hours per day; most operated for about 6 to 8 hours per day.
* Approximately 31% of the population was directly connected to piped systems.• (See Tables 3 and 4)
* The number and quality of public standpipes was totally inadequate to serve those not connected to the system

• The percentages connected vary from 23% in Qena to 77% in Damietta. Table 4 indicates remarkable similarity in the results of the assessment and the data reported in the 1986 census.

* Interruptions in service were frequent and often extended
* Elevated storage was totally inadequate in terms of allowing proper operational flexibility and as emergency storage

3.5.2 Quantities and Pressure

* There was no means of determining either the quantities of water produced or those consumed because of the lack of metering at the source, meter inadequacies at the consumers connections, and lack of metering at public buildings and standpipes. Field measurement was beyond the scope of the assessment.

* Past studies have shown the following:

  - Water use at connections without sewers in the order of 40 lpcd (Upper Egypt Consultants) to 55 lpcd (Binnie Taylor/Warith)
  - Water use at connections with piped sewers in the order of 130 lpcd (Chemonics, for one village in Damietta)
  - Waste and leakage in excess of 50% of the total water produced• (Binnie Taylor/Warith)

* Many water systems suffer from low pressure at the extremes of their pipe networks. Maximum pressure was about 30 meters.

• In three 24 hour tests, minimum night flow was 55% to 90% of average daily flow.

TABLE 3

PERCENTAGE OF POPULATION DIRECTLY CONNECTED TO WATER SYSTEMS IN 36 VILLAGES SURVEYED

Village	Population*	Persons Per Bldg*	Connect.s**	People Connected	Percent of People Connected
DAMIETTA					
El Rahamna***	14,717	6.00	1,860	11,180	76.0%
Dahra	6,818	7.22	685	4,946	72.5
Sharbas***	29,292	5.37	4,140	22,260	76.0
El Ghonimiya	11,675	5.63	1,692	9,526	81.6
	62,502	5.72	8,377	47,912	76.7%
FAYOUM					
Fidimin	34,881	4.99	3,271	16,322	46.8
Minshat Beni Etman	29,274	4.67	1,039	4,852	16.6
Sanhour	40,579	4.97	2,250	11,183	27.6
El Gharaq	35,177	4.47	1,307	5,855	16.6
	139,911	4.78	7,867	38,212	27.3%
GHARBIYA					
El Matamadiya	52,352	5.71	1,212	6,921	13.2
Shoubra Babil	33,087	5.82	2,270	13,211	39.9
Tafahna El Azab	25,241	4.70	1,269	5,964	23.6
Shoubra Malas	31,521	5.68	1,376	7,816	24.8
Sandebast	26,783	5.77	2,024	11,679	43.6
Nahtai	36,721	4.63	1,342	6,213	16.9
Bashbish	33,892	5.45	2,219	12,094	35.7
	239,597	5.38	11,712	63,898	26.7%

* From 1986 census.

** Official connections to piped water system, from most recent village records, except as noted below.

*** These villages had no record of connections and the Water Company records were not considered reliable (too low). Village statements and observations support estimates in the order of 76%, the 1986 census figure for Fariskour Markaz, for percentage of buildings with piped water.

TABLE 3

PERCENTAGE OF POPULATION DIRECTLY CONNECTED TO WATER SYSTEMS IN 36 VILLAGES SURVEYED

(Continued)

Village	Population*	Persons per Bldg*	Connect.s**	People Connected	Percent of People Connected
GIZA					
El Borombol	31,869	4.65	1,340	6,231	19.6
Qababat	66,688	5.32	4,300	22,876	34.3
Sol	32,106	4.73	2,758	13,045	40.6
Atfif	28,201	5.03	1,639	8,244	29.2
Maraziq	41,641	6.14	2,105	12,925	31.0
Saqara	34,830	4.82	1,839	8,864	25.4
Om Khenan	18,954	5.62	2,032	11,420	60.2
	254,289	5.17	16,013	83,605	32.9%
MENOUFIA					
Shoubra Bakhoum	17,451	4.72	896	4,229	24.2
Ibnahs	45,820	4.86	2,700	13,120	28.6
Om Khenan	36,745	5.52	3,000	16,560	45.1
Bahnai	17,561	4.22	1,209	5,102	29.0
Istanha	27,920	4.88	1,035	5,051	18.1
Kafr El Khadra	26,064	3.74	1,909	7,140	27.4
Mit Afif	11,623	4.04	606	2,448	21.1
Samadoun	34,244	5.65	1,177	6,650	19.4
Grais	29,831	4.71	981	4,620	15.5
Talia	55,682	6.03	2,357	14,213	25.5
	302,941	4.96	15,870	79,193	26.1%
QENA					
El Barahma	20,400	5.49	826	4,535	22.2%
Kiman El Mataana	30,742	4.97	404	2,008	6.5
Asfoun	45,677	5.09	3,007	15,305	33.5
El Shagab	15,957	4.35	1,058	4,602	28.8
	112,776	5.00	5,295	26,450	23.4%
Total	1,112,016	5.11	65,134	339,270	30.5%

* From 1986 census.

81

•• Official connections to piped water system, from most recent village records

TABLE 4

COMPARISON OF DATA SOURCES ON PERCENTAGE OF POPULATION DIRECTLY CONNECTED

Governorate	1980 Provincial Report	1986 Census, Rural Governorates	1986 Census, Markaz Surveyed	Results of WASH Assessment
Damietta	37%	75%	76%	77%
Gharbiya	4	37	30	27
Menoufia	4	29	25	26
Giza	11	31	31	33
Fayoum	2	24	•	27
Qena	4	13	25	23
Average	7%	31%	-	31%
Country	5%	28%	28%	

Year	Rural Population	% Connected	Persons Connected	Persons Not Connected
1976	20.6 million	5%	1.0 million	19.6 million
1986	27.0	31%	8.4	18.6

• Fayoum census data not available as of 1 March 1988.

92

3.5.3 Water Quality

* None of the deep well water systems provided any disinfection (chlorination) at the source. All of the surface water systems have the capability of adding chlorine to their treated water, and most appeared to be doing so.

* Surface waters generally were relatively low in hardness, total dissolved solids and iron and manganese. Some well waters were relatively high in hardness and total dissolved solids. Others had excessive levels of iron and manganese.

* Most surface waters tend to be acceptable to consumers in terms of taste and suitability for washing clothes

* Bacteriological contamination in water distribution systems was fairly extensive (over half of the samples taken), even when source works tested negative. The two principal causes for this are probably:

  - Intermittent supplies which create vacuum conditions when the system is not under pressure, and
  - Direct contamination of piped water during repairs of pipeline breaks

* Some well waters were sufficiently hard that piped customers preferred to use canal water for clothes washing

* Some well waters were sufficiently salty, or high in iron or manganese, that piped customers preferred to use shallow well water (or sometimes canal water) for drinking and cooking

* A previous study (Binnie Taylor/Warith) found bacterial contamination in 84% of the shallow-well hand pump waters tested in two delta governorates. The limited testing done by the assessment teams found that water from 53% of the handpumps had bacterial contamination.

93

* Analyses of canal water from about seven locations indicated a heavy degree of bacteriological contamination in all canals tested.

* The system of sampling and analysis of village water for bacteriological contamination that is currently being used is sufficiently flawed that the results cannot be used with confidence.

* See Figure 2 for a summary of the bacteriological analyses of water samples taken in selected villages.

* See Appendix C for details on water quality and a summary of analyses results conducted during the assessment.

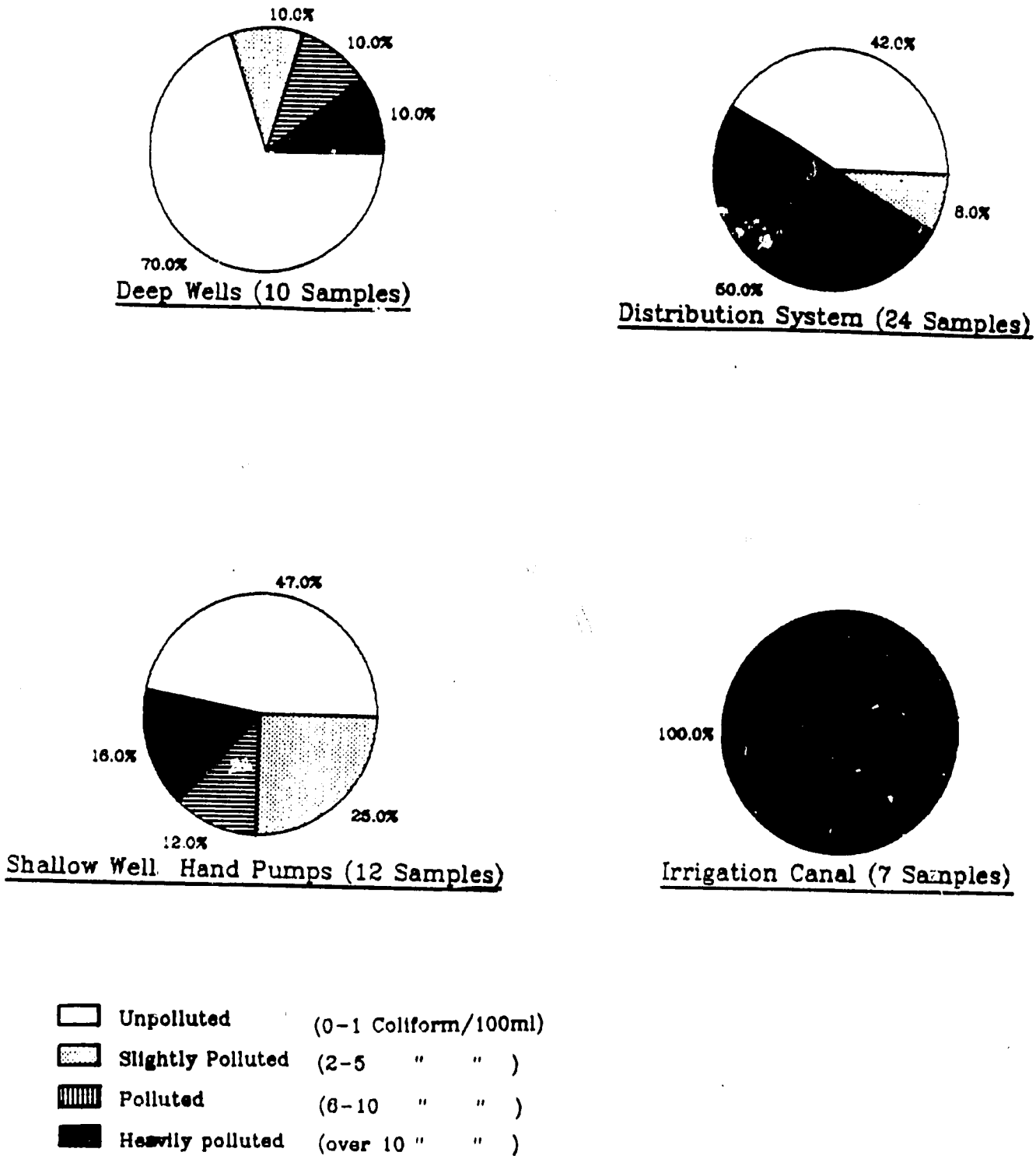


Fig. 2 Bacteriological Analyses of Water Samples

4. Wastewater Disposal

4.1 Existing Situation

4.1.1 Excreta Disposal

Excreta disposal practices in Egyptian villages contribute to the high rates of bilharzia and generally low levels of sanitation. Most homes have some form of toilets, but very few meet acceptable standards.

For those houses with toilets, excreta is disposed in pit latrines, pour flush vaults (relatively few), and cess pits. Mosques, schools, and other public buildings usually have septic tanks and soakaways or storage vaults. The contents of tanks and vaults are removed by either mechanical pumper-tankers or manually into donkey drawn carts. The latter are used to empty those facilities' inaccessible to the mechanical tankers, or when the pumper-tankers are not available. Septage collected from the houses is supposed to be discharged into irrigation drains. In practice, tanker operators tend to discharge wherever it is convenient.* At the present time, septage disposal practices are far from satisfactory.

4.1.2 Sullage Disposal

Houses in the great majority of villages visited have no piped drainage system for sullage disposal. It is fairly common for those houses with individual water connections to collect sullage in small watertight troughs, usually located right below the watertap. These are periodically emptied by bailing water outside the house onto unpaved streets, or carrying it to the nearest canal or drain. Some houses have larger underground vaults, often with an access port outside the house to permit pumping them out.

---

* See Section 5.3 of Appendix F for additional information on excreta disposal and costs.

Because of the effort needed to empty sullage collected in troughs or vaults, water use tends to be limited. Clothes are frequently laundered away from the houses in canals, at public standpipes or at handpump wells. This type of disposal system is a major constraint on the volume of water consumed. There are not many feasible alternatives to the current common practice of disposing of much of the sullage in village roads.

4.1.3 Piped Sewerage Systems

Three of the four villages visited in Damietta have major piped sewerage systems under construction as part of the BVS program. Two of them (Ghonamiya and Sharbas) will be part of a mini-regional (8 villages) wastewater system, with treatment to be provided by an extended aeration treatment plant. The other (Rahamna) is part of a 6 village system with an oxidation ditch for treatment. These systems are not yet in operation.

These systems are estimated to serve from 25% to 75% of the people in these villages. The BVS per capita sewerage costs average LE 36 for these three villages (based on total population). Total costs for main piped sewers and treatment amounts to about LE 70 per capita. This figure does not include house connections, so the total cost of providing piped sewerage and treatment in Damietta is probably well over LE 100 per capita. At that rate, it would cost in the order of LE 3 billion to provide the people of rural Egypt with piped sewerage.

Piped sewerage systems and wastewater treatment plants will also impose a heavy burden in terms of operating costs and manpower skills to operate and maintain the systems.

The companion problem to the very high cost of piped sewerage is its effect on water consumption. A recent study by Chemonics showed that water use by people connected to a piped water system in a village * for which a piped sewerage system had just been completed was 130 lpcd. That level is about two to three times the estimated consumption for piped customers without sewerage systems.

Even if funds could be found to construct piped sewerage systems in Egypt's villages, it probably would be necessary to practically double the water investments to meet the certain major increase in water consumption. The conclusion is that piped sewerage should not be encouraged as a general solution to the wastewater problems of rural Egypt.

Nevertheless, there are some areas of Egypt where piped sewers, despite the drawbacks, may be the only feasible means of addressing the wastewater problems. Damietta, with a combination of high groundwater levels, relatively high population density, relative affluence and city-like villages, represents the type of area which probably falls in this category.

4.1.4 Community Sullage Systems

Several villages have constructed community sullage collection and disposal facilities, with varying degrees of success. Some were built with BVS funds and some with local, private voluntary contributions.

* One system consisted of piped sewers to collect the overflow from household vaults. The sewers led to a pit whose contents were pumped to a nearby drain. The system is largely unsuccessful because of widespread blocking of the sewers with solid wastes. It was locally designed and funded.

---

* Village of Mit El Kholy (Damietta), 1986 population of 11,895.

* The other systems consisted of the construction of below-ground masonry tanks covered with gratings, located throughout the village

* The community vaults had the greatest success in Om Khenan (Giza), with systems in two of its villages (one BVS, one privately funded). The reasons for success :

  (1) There were enough of them so that many people were willing to use them
  (2) The vaults were pumped out every day, without fail
  (3) The gratings were sufficiently widely spaced so that they didn't become choked with solids

* Failures seem to be tied to one case in which the gratings were too narrow, and others where pumping out the tanks was infrequent, and it made no sense to the villagers to carry sullage to an overflowing vault when they could more easily throw it out their front door.

* An improved system of septage and sullage collection, conveyance and disposal may be a lower cost and more appropriate technology for much of rural Egypt.

4.2 Factors Affecting Disposal

4.2.1 Legal Aspects

Law 48 currently sets rigid standards for the quality of water to be discharged into the waters of Egypt. The standards are such that, in effect, wastewater treatment systems suitable for village conditions generally would be unable to meet those standards. Discussions are now underway to attempt to relax those standards for villages. Unless such relaxation is obtained, it will be impossible to deal with the problem of disposal of village wastewater in a rational manner.

81

4.2.2 Land Constraints

Wastewater problems are currently most severe in the Delta. Unfortunately, the Delta is the most densely concentrated part of Egypt and, as a consequence, land is less available and more expensive there than in any other part of rural Egypt. Equally unfortunate is the fact that, for various wastewater treatment options, costs are inversely proportional to the amount of land required. Stabilization ponds, for example, are one of the least expensive and least difficult to operate of all the alternatives, but they require extensive land areas.

4.2.3 Financial Constraints

Even relatively simple wastewater collection and treatment systems probably will be beyond the financial resources likely to be available in the forseeable future, when compared to the needs of some 900 mother villages (about 4,000 mother and satellite villages) in rural Egypt.

4.2.4 Technical and Social Considerations

The major wastewater problems in the villages today are:

Removal. The only means of removing wastewater (septage and sullage) from homes without sewers are :

* Store it in vaults or pits for later removal by mobile works
* Carry it away from the house

In most villages the vault emptying services are inadequate and unreliable. When carrying sullage from the house, the options are (1) the legal requirement that the wastes be carried to an agricultural drain, which often is unreasonably distant, or (2) the illegal practice of throwing it in a nearer irrigation canal or the street, which, cumulatively, results in nuisance conditions in many villages.

90

Disposal. Law 48, requires a high degree of treatment for wastewater prior to discharge into irrigation drains. The tankers, public and private are supposed to discharge their wastes to the agricultural drains. There is no apparent supervision of this activity and septage wastes have been observed to be discharged in sugar cane fields, on the land in desert fringes of communities and even in irrrigation canals, when these are more convenient than a drain.

4.2.5 Conclusion

The villages have a major dilemna in regard to wastewater. The law requires them to do what is financially impossible, and no feasible alternatives are available to them. Some intermediate system should be made available which will give them improvement at an affordable cost.

.91

5. Financial Matters

5.1 Capital Funding

Information on capital expenditures for water and wastewater in the 36 villages came from a combination of data as reported in each village and official ORDEV records. The two sources were not always in agreement. Contributions from the GOE (Bab 3) are probably understated. In general, better data on USAID capital expenditures were available than from other sources.

Expenditures on wastewater projects were unusually large in Damietta, and somewhat distort the picture, even though their water expenditures were very small.

Most BVS funds were spent from 1981 onward. Since that time, capital expenditures in the 36 villages came from the following sources :

USAID Funds			Non-USAID	
BVS Water	LE 5.17 M		GOE	LE 3.40 M
BVS Sewerage •	2.87		Other	0.78
Total BVS		8.04		LE 4.18 M
LD II		1.84		
DSF		0.44		
Total USAID	LE 10.32 M			10.32
Total Capital Funding, All Sources				LE 14.50 Million

Analysis of these findings shows :

Source of Funds	Percent of Total	Avg. Amount Per Village	Avg. Amount Per Person
BVS Water	36%	LE 144,000	LE 4.65
Total USAID	71%	LE 287,000	LE 9.28
All Sources	100%	LE 403,000	LE 13.04

• Almost all of this was spent in Damietta (2.0M) and Fayoum (0.8M)

92

For BVS funding only, for all 279 villages in the six Governorates sampled, the expenditures were as follows :

	Avg./Village	Avg./Person
BVS Water	LE 121,000	LE 4.17
BVS Water & Wastewater	LE 159,000	LE 5.51

USAID has contributed over two thirds of all capital water and wastewater funding in these 36 villages the past seven years. GOE funding has been low and probably will not increase significantly.

If village water and wastewater systems are to be upgraded, considerable additional capital funding will have to be obtained. Investments in the order of LE 50 per person will probably be needed for water and minor improvements in septage and sullage disposal. Piped sewerage systems will probably cost over LE 100 per capita.

5.2 Operation, Maintenance and Repair Expenditures

Very little data were available in the villages on expenditures for O&M and repair. O&M and repair responsibilities are also shared between the markaz and the village. Data available at the markaz were related to budgets rather than expenditures.

When apprently useful data were collected (operating expenses going back 8 years, with such categories as electricity, fuel oil, lubricants and chemicals) for 3 villages in one governorate, analysis showed the data to be suspect:

* The totals were very similar and many of the categories were identical for all three
* The populations of the villages ranged from 15,000 to 45,000
* The number of connections ranged from 400 to 3,000
* All 3 showed similar expenditures for fuel oil but one village had no diesel engine

These amounts may be generalized and could be intended for use for budgeting only. The operating costs can be estimated from current manpower and salaries, and from power costs of electricity and fuel. These components probably equal 90% of total operating costs.

The reason there are no data available for maintainance and repair costs probably is that very little such work is being done. The conclusion is that there are no useful data currently available on existing O&M repair costs in the villages.

A rough estimate of water O&M costs was obtained by studying the Damietta situation. Damietta is currently generating about LE 2.18 per person in annual revenues, for those connected to the system (based on 76% connected). This amount is said to cover 80% of operating costs, so full annual operating costs would be about LE 2.75 per person. Recognizing that Damietta is currently underspending on maintenance and repair costs, an amount in the order of LE 4 per person per year (about LE 24/ connection/year) may represent a rough guide for estimating O&M and repair costs in Egypt.

The limited resources available to the village for the operation and maintenance of village water systems are primarily drawn from the governorate's Bab 1 (manpower) and Bab 2 (commodities and services) budgets. Resources used at the village level, however, are usually under the direct control of the markaz which is responsible for the authorization of expenditures and their subsequent disbursement.

In recognition of the limitations of this approach, BVS maintenance funds were established at the village level to ensure the availability of adequate resources to cover the preventative maintenance and repair of equipment purchased under the BVS program. The funds amount to 10% of the total capital funding made available to each village under the BVS program. These maintenance funds are to be used for all BVS infrastructure components - water, roads, sewerage and so forth.

A study in 1986 by Chemonics showed that 62% of the funds had not been utilized. This assessment showed that, 18 months later, 53% of the funds have still not been used. There are several reasons for this :

* Some villages are loathe to spend the money because they would then no longer be able to use the interest it now earns
* It is seen as a non-replenishable resource that should be saved for a future emergency
* Some villages never saw the money (or even knew about it), and the funds stayed at the governorate

Experience with this fund has also resulted in the following findings :

* Some of it was used to buy new capital goods rather than the performance of maintenance
* The lack of understanding of what maintenance is and why its important, the limited technical skills at the village, and the generally weak support available under existing institutional arrangements, are severe constraints to the effective use of this fund.

The conclusion is that inadequate finance is not the primary cause of operational, maintenance and repair problems, since more than half the allocated BVS funds are still available for that purpose, while deficiencies continue.

The BVS maintenance fund was a useful first step to get the villages to start focussing on maintenance as an important element of providing water supply on a sustained basis. On the other hand, for the 36 villages studied, this BVS fund amounted to only LE 0.55 per person for the entire period of the program.

95

5.3 Water System Tariffs and Revenue

5.3.1 Tariffs

Water tariffs nationwide were set in 1961 at a level of 2 piastres (LE 0.20) per cubic meter. They remained unchanged until 1984. The new policy provides for the following:

* Initially tariffs should cover 35% of O&M costs, with the possibility of raising them to cover all such costs by 1991
* Domestic rates of 3 piastres/m3 for the first 30 m3 and 5 piastres/m3 for usage above 30 m3
* The addition of a 10% surcharge to cover O&M costs of sanitation systems, if they exist.

Rates actually charged varied considerably among the 6 governorates studied :

Damietta : Now a regional water company as of July 1986, they charge the highest rates of the six. Current charges are 5 pt/m3 for up to 30 m3 and 7.5 pt thereafter. They reportedly now recover 80% of their operating costs, including manpower, but are letting maintenance and repair work slide. They expect to recover 100% of costs by the end of 1988.

Fayoum : They subscribe to the national schedule

Gharbiya : They also follow the national schedule, but apply a charge per room for non-metered customers :

1 room	30 pt	3 rooms	60 pt
2 rooms	45 pt	4 rooms (or more)	100 pt

They also apply a monthly meter rental charge, stamp and local fund charges, and they set a minimum charge for metered customers.

Giza: They don't follow the national system. Most villages charge a flat rate of 25 pt per connection per month, while most of those with meters charge 2 pt/m3. Two Giza villages generated additional funds as follows :

* One levied an annual charge of LE 10 to LE 20 per connection to assist in paying O&M and repair costs
* Another doubled the 25 pt/month charge and retained half of it for its village services and local development fund

Menoufia : They use the national schedule. They also levy a fixed charge of LE 1.50/month for non-metered customers

Qena : They use the national system, but with variations. Their higher rate is effective only after 50 m^3 instead of $30m^3$. They also use the "Momarsa" system for non-metered customers, with a flat rate of LE 0.50/month. To the regular water bill they also add a monthly meter rental charge and a series of small supplementary charges, almost like a tax. These provide funds for the village fund, Qena Uniiversity and miscellaneous other causes.

5.3.2. Connections and Charges

The average charge for making a house connection was LE 128, including a meter (LE 60). House connection costs ranged as follows :

28%	LE 50 - 100
37%	LE 100 - 150
35%	Over LE 150

In the villages for which complete data were available, there has been a dramatic 70% increase in total house connections since 1981, about the start of the BVS program.

The assessment results show that 31% • of the people in these 36 villages are now served directly vs. only 5% nationwide in some 300 rural systems studied in 1979. This is all the more remarkable when the 31% increase in rural population from 1976 to 1986 is taken into account. This translates to an increase of about eight times the number of people receiving piped water in the past 10 years, or about 7 million more people.

• See Tables 3 and 4.

5.3.3. Revenues

(1) Existing Situation

Relatively complete data on revenue generation for the five-year period 1982-1987 was obtained for 18 villages. Revenues increased six-fold during that period, from an average of about LE 1,000 per village in 81/82 to about LE 6,000 in 86/87. This increase came about partly because of the increase in tariff rates that came into effect in 1985, but mostly because of the increase in piped connections to the water systems, as noted in the previous section

While the relative increase in revenues has been rapid, the current levels are still very low. In the 5 governorates excluding Damietta, current annual revenues range from LE 2.26 to LE 3.99 per connection, as noted in Table 5.

Damietta, with higher tariffs and a higher percentage connected, has total annual water revenues of about LE 2.18 per capita served, or about LE 12.50 per connection per year.

These levels of annual revenues per water connection appear to be much lower than what should be generated on the basis of stated user charges, or even comments from the water users on how much they are paying.

Table 5

Annual Revenue from Sale of Water, 1986/87

Village	Total Annual Revenue from Sale of Water	No. of Vil.	No. of Conn.	Annual Revenue Per Conn.	Connected Pop'n	Revenue Per Capita Connected
Fayoum	LE 27,729	4	7,867	LE 3.52	38,200	LE 0.73
Gharbiya	LE 46,675	7	11,712	LE 3.99	63,900	LE 0.78
Giza	LE 44,520	7	16,013	LE 2.78	83,600	LE 0.53
Menoufia	LE 35,869	10	15,870	LE 2.26	79,200	LE 0.45
Qena	LE 16,557	4	5,295	LE 3.13	26,500	LE 0.62
Total/Avg.	LE 171,350	32	56,757	LE 3.02	291,400	LE 0.59

Damietta Water Company

Total Annual Revenue from Sale of Water	Total Gov. Population	Estimated Connected Population•	Annual Revenue Per Capita	Approximate Annual Revenue Per Connection ••
LE 1,226,916	741,260	563,400	LE 2.18	LE 12.50

(2) Ability to Pay

A frequently cited indicator of ability (but not necessarily willingness) to pay is that the combined charges for water and wastewater services should not exceed 5% of household income. Reduced levels of service in the form of a subsidized minimum amount of water for those connected to the system, or the provision of public standpipes; are two means of assuring that even the poorest people in the village can share in the benefits of the water system.

A study of income distribution in rural areas of Egypt ••• showed the following :

Table 6

Income Distribution in Rural Egypt

Percent Earning More Than Income Shown	Annual Household Income••••	5% of Household Income	
		Annual	Monthly
90%	LE 700	LE 35	LE 2.90
75%	1,100	55	4.60
45%	1,800	90	7.50
10%	3,400	170	14.15

• Based on 76% connected (1986 census data for Damietta)

•• Based on 5.72 persons per building (1986 census data for Damietta)

••• " Income Distribution in Egypt ", PhD thesis by Ahmed Hamdallah Samman, Cairo University, 1985

•••• Income is in 1986 currency, rounded to nearest LE 100.

If People in rural Egypt were willing to pay up to 5% of their family income for water and sewerage, this means that 75% of the people in the village could pay LE 4.60 per month for such services.

5.4 Financial Record Keeping

The Government Cash Accounting System (GAS) is in use by governorates, markaz and also at the village level. This system has now been in use for over twenty five years, is well understood and is generally operating in a satisfactory manner. The system is based on cash accounting receipts and payments principles, utilizing a double entry approach to control expenditure against annual budget allocations.

In Damietta, the transfer of responsibility to the newly formed water company has necessitated a change in accounting systems. The Damietta Water Company uses the Standard Accounting (SAS) which is used by all public sector companies. This system is comparable with the normal commercial accounting approach based on accrual accounting principles.

While two accounting systems are used in the governorates, depending upon institutional arrangements, the prime accounting documents in use for basic tasks such as billing and collection are comparable. In villages surveyed, where the governorate is still responsible for water services, accounting responsibilities are split between the village accounting unit and markaz officials. In essence, the village officials prepare prime accounting documents such as requests for supplies and requests to make payments which are subject to the approval of the markaz. The main accounting function undertaken at the village level is the billing and collection function for connections and water sales. A brief description of these procedures is set out below.

160

New Connection Procedures

* Consumer completes request for connection to village executive council (VEC) chairman
* VEC technical personnel prepare estimate of connection costs
* Consumer pays for connection, with VEC retaining a proportion of charges, the balance being remitted to the markaz
* VEC technical personnel complete connection
* VEC accounting personnel complete ledger, recording financial aspects of each connection

Monthly/Quarterly Billing and Collection Procedures

* Meter reader visits each property, usually on a monthly basis and completes meter reading book (form 27)•
* Accounting personnel completes customer's ledger (form 6) which includes calculation of monthly charge
* Collection sheet (form 28) or handwritten list prepared for collector to inform consumer of amount due (usually quarterly)
* Water bill, which also serves as a receipt (form 33), is issued by collector once consumer pays.
* Date of receipt is noted in customer's ledger (form 6)
* Warning letters issued for non-payment followed by disconnection if charges and fines not paid
* Cash receipts (form 33) summarised and forwarded to markaz for their accounting records. Cash collected is banked in village post office for markaz, which in turn accounts to Ministry of Finance for water revenue.
* Village, through the markaz, is subsequently refunded any miscellaneous charges included with the water bill such as contributions to the village services and local development fund.

• These are standard GOE forms

101

In general, villages have simplified the GAS procedures by not completing certain intermediate accounting forms. In Damietta, the newly established water company has centralized its accounting function at plant or markaz level and village officials are no longer involved in financial management procedures.

5.5 Metering

The present cost to the consumer to purchase a meter, which is usually required, is about LE 60. This represents about half the total connection charge (See Section 5.3.2). At present water tariff rates and usage in the majority of houses without sewers, it would take over ten years just to generate revenue equal to the cost of the meter.

The principal purpose of metering is to ensure fairness in paying for water actully used. A secondary reason is to discourage waste. For the majority of Egyptian homes with only one or two taps and no sewers, the constraint on use is the need to hand carry most of the wastewater out of the house.

The secondary costs of metering include:

* Need to periodically read the meter
* Need to calculate bills based on water usage
* Need to calibrate and repair water meters.

Giver the above factors, including the absence of meter repair capacities, for the great majority of Egyptian village homes metering is a significant expense which provides little or no correspending value. To provide meters in a typical village of 30,000 with 75% connections would cost over LE 250,000. There are much better uses for such money.

6. Impact of BVS Funding

6.1 Introduction

This evaluation of the relative impact of the BVS contributions is limited to its physical contributions to village water and wastewater systems, and not to institution building. The evaluation is necessarily limited, relative and somewhat subjective because of data limitations and the difficulty of defining the measures of impact. The BVS contribution to a village was considered " Significant ", for example, if these funds purchased components which constituted, say, about half of the pipe network and half of the source works. The resulting system might still be far from adequate, but the rating of significant would be appropriate because the system would have been very badly off without BVS assistance.

Impact was considered " Minor " if the works were judged to be sufficiently limited that their absence would have made little difference to the systems' ability to serve the needs of the village.

Cases which didn't seem to fit in those two categories were labled as " Helpful ".

The rating might be "Significant" for a village with extensive and useful BVS wastewater expenditures, but with no BVS water expenditures, and vice versa.

103

6.2 Ratings of Relative Impact

Overall, 20 villages or 56% of the sample were rated as being significantly impacted by BVS funds. The BVS support was somewhat helpful for 11 villages, or 30%, and of minor consequence for another 5 (14%).

The evaluation results are summarized in Table 7 below. The details on which this summary was based are presented in Table 8.

Table 7

Summary Evaluation of Impact of BVS Funding

Governorate	Number of Villages	Level of Impact: Significant	Helpful	Minor
Damietta	4	2	1	1
Fayoum	4	0	3	1
Gharbiya	7	4	2	1
Giza	7	5	2	0
Menoufiya	10	7	2	1
Qena	4	2	1	1
Total	36	20 (56%)	11 (30%)	5 (14%)

104

Table 8

Factors Relevant to Evaluation of BVS Impact (1)

Village	1,000 Pop'n	BVS W/WW Funds (000)	% Total BVS	BVS W/WW Per capita	Comments	Rating
Damietta						
Rahamna	14.7	695	97%	LE 47	Sewers, treatment : 25% of village	H
Sharbas	29.3	1,172	77	40	Sewers, pump sta, treatment	S
Dahra	6.8	0	—	—	—	M
Ghonamiya	11.7	402	89	34	Sewers, pump sta	S
Total/Avg.	62.5	2,269	82%••	LE 36		
Fayoum						
Fidemin	34.9	151	58%	LE 4.30	No water, some sewers	M
Minshat	29.3	465	84	16	18 Km water pipeline	H
Sinhoor	14.6	569	10	39	Misc. water, sewers	H
Gharaq	35.2	275	57	8	7Km water pipeline	H
Total/Avg.	139.9	1,460	78%•••	LE 10.40		

• S = Significant, H = Helpful, M = Minor

•• Water = 8% (238,000), Wastewater = 74% (2,031,000)

••• Water = 33% (620,000), Wastewater = 45% (840,000)

105

Table 8

Factors Relevant to Evaluation of BVS Impact (2)

Village	1,000 Pop'n	BVS W/WW Funds (000)	% Total BVS	BVS W/WW Per capita	Comments	Rating
Gharbiya						
Bashbish	33.9	100	43%	LE 2.96	9Km pipe, intake for WTP	H
Motamadeia	52.4	195	100	3.72	11Km pipe, 2 pump sets	S
Shoubra B.	33.1	184	90	5.57	2Km pipe, elev. tanks	H
Nahtai	36.7	218	86	5.95	2 elev. tanks	S
Sandabast	26.8	138	68	5.13	elev. tank	S
Shoubra M.	31.5	212	98	6.73	elev. tank	S
Tafhna	25.2	19	9	0.75		M
Total/Avg.	239.6	1,066	70%	LE 4.45		
Giza						
Saqara	34.8	187	71%	LE 5,37	10Km pipe, well, diesel pump	S
Maraziq	41.6	263	78	6.32	16Km pipe, well, 10 pub. standpipes	S
Om Khenan	19.0	103	59	5.42	7Km pipe, well, pump	H
Qabbabat	66.7	371	77	5.56	10Km pipe, well, 14 pub. standpipes	S
Atfieh	28.2	179	74	6.34	15Km pipe	S
Sol	32.1	255	95	7.94	18Km pipe	S
Borombol	31.9	141	44	4.42	9Km pipe, 8 pub. standpipes	H
Total/Avg.	254.3	1,499	72%	LE 5.90		

106

Table 8

Factors Relevant to Evaluation of BVS Impact (3)

Village	1,000 Pop'n	BVS Water Funds (000)	% Total BVS	BVS Water Per capita	Comments	Rating
Menoufiya						
Grais	29.8	125	80%	LE 4.19	70% pipe, 70% pump sets	S
Talia	55.7	267	87	4.79	50% pipe, 30% pump sets	S
Samadoun	34.2	107	56	3.13	50% pipe, 50% pump sets	S
Shoubra B.	17.5	40	24	2.31	60% of connections, 1 diesel	H
Ibnahs	45.8	173	61	3.78	well, pipe, pump	H
Om Khenan	36.7	60	28	1.64	15% of pipe, pump	M
Istanha	27.9	132	86	4.72	most pipe, 35% wells, 50% pumps	S
Bahnai	17.6	110	96	6.24	35% pipe, 60% of source, pumps	S
Khadra	26.1	170	98	6.50	50% pipe, 35% wells, 50% pumps	S
Mit Afif	11.6	50	60	4.30	50% pipe, all pumps/ motors	S
Total/Avg.	302.9	1,234	67%	LE 4.07		

107

Table 8

Factors Relevant to Evaluation of BVS Impact (4)

Village	1,000 Pop'n	BVS Water Funds (000)	% Total BVS	BVS Water Per capita	Comments	Rating
Qena•						
Barahma	20.4	157	100%	LE 7.70	7Km pipe, pump/motor	H
Kiman	30.7	171	100	5.60	40% pipe, 2 pump/ motors, elev. tank	S
Asfoun	45.7	84	62	1.80	pump/motor for small naga	M
Shaghab	16.0	102	100	6.40	30% pipe, all source works	S
Total/Avg.	112.8	514	91%	LE 4.55		
TOTAL	1,112.0	8,042••	(5,169 for water only)			
Average	30.9	223	76%	LE 7.23	(Water & Wastewater)	
Average	30.9	167	49%	LE 4.65	(Water Only)	

• BVS water expenditures in Qena villages and some others are approximations. There were often significant discrepancies between ORDEV and village records.

•• Total includes water and wastewater.

108

III. RECOMMENDATIONS

Introduction

It is impossible to make recommendations that will be uniformly applicable to all villages. Furthermore, many recommendations will be dependent upon what actions are taken or decisions made about broader issues that presently require resolution. Recommendations will vary considerably from those villages which have water systems which lie within their borders and villages served by regional water systems, most of whose problems can only be resolved regionally.

Recommendations are directed to various governmental agencies with responsibilities for the water and wastewater sector and to the LD II Technical Assistance Consultant.

The extent to which the recommendations can be implemented will be greatly affected by the constraints of limited funding and scarcity of effective personnel. Finally, the opinions of key officials about the relative merits of the recommendations will be the ultimate factor in their implementation.

The recommendations have been sub-divided into the following categories:

* Broad Recommendation
* Specific Recommendations
* Implementing Entities
* Time Schedule and Output

Where appropriate, mention is made of "Guidelines". This refers to the separate document on "Guidelines for Implementation of Villlage Water and Wastewater Systems".

The recommendations which follow are based on the findings and conclusions drawn from the assessment. It is recognized that the LD II Program and Chemonics (the BVS and now LD II Technical Assistance Consultant) are moving toward some of these

104

recommendations, and will be building on a base of several years of efforts. It is no denigration of these efforts to say that while much has been done, even more work remains to be done.

In fact, reviewing the recommendations and the work suggested to be undertaken by the LD II TA Consultant, the first recommendation is to expand significantly the level of effort of technical assistance over what is now being provided.

It is also recommended that the full assessment report be translated into Arabic to assist Egyptian officials in addressing the problems related to village water and wastewater.

Recommendations in this section are listed under the following headings:

1. Focus of Local Development Funds
2. Consideration of Regional systems
3. Organizational Issues
4. Planning, Design and Construction
5. Water Supply Systems
6. Wastewater Disposal
7. Maintenance and Repairs
8. Tariffs and Revenues
9. Health Education
10. Suggested Priority of Recommendations

1. Focus of Local Development Funds

1.1 Broad Recommendation

Allocate available water and wastewater funds to a smaller number of villages so as to complete systems which could serve as successful examples for others to follow as additional funds become available, and convert some of these funds from grants to loans.

1.2 Specific Recommendations

1.2.1 Focus of Effort

(1) Allocate a fixed percentage of total LD II funds for water and wastewater projects (say at least 50%, based on BVS experience)

(2) Concentrate these funds on a limited number of mother villages (say 100 to 200) for the next 3 years

(3) Choose the first group of villages on the basis of criteria to be determined by the LD II TA Consultant, including:

* Extent to which villages expend efforts in collecting data to support prefeasibility studies.
* Determination of needs as evidenced by Prefeasibility studies
* Extent to which villages are willing to borrow some funds to achieve desired service goals

* Need for pilot programs to demonstrate feasibility of achieving target goals for water and wastewater systems

1.2.2 Loans vs. Grants

(1) Consider setting aside some of the development funds (say 50%) to be provided in the form of loans instead of grants to reward those villages which are willing to repay a portion of their funds, with a larger than average share of funds in order to achieve their objectives.

(2) Encourage other development agencies to lend additional funds to expand the pool of development funds available for water and wastewater projects

(3) Establish or identify a national development bank to administer the loan portion of the fund, and prepare criteria for gaining access to such funds.
(Note : A successful program of this type has been in operation in Brazil for 20 years)

1.3 Implementing Entity

This recommendation is directed to the Amana (with ORDEV) and will require discussion with the participating Governorates.

1.4 Time Schedule and Output

1.4.1 Time Schedule. If this recommendation is to be followed, it should be considered as soon as possible. The necessary changes should be made in the LD II General Planning Guidelines. The "focus of funding" decision can be made independently from the decision on "loans vs. grants".

1.4.2 Output. Focussing funding will allow more effective use of limited skills in the design, construction and implementation of systems, and result in more complete and logical systems. The use of loans will expand the limited resource base and give villages a greater stake in their systems.

1.5 Guidelines Reference

See Guidelines Section III-3, Criteria for Project Selection.

112

2. Consideration of Regional Systems

2.1 Broad Recommendation

In accordance with national policy, investigate the possibility of providing water and wastewater services on a regional basis to as many villages as is feasible.

2.2 Specific Recommendations

(1) Establish criteria for regionalization feasibility

(2) Assess the potential for regionalization

(3) Require each Governorate to prepare a preliminary plan for regional development of water and wastewater services

(4) Encourage bi-national and international development agencies to provide the funding needed to upgrade regional or Governorate water supply and wastewater companies

(5) In reviewing Governorate requests for LD II funds for water and wastewater projects, limit funds for regional systems (and villages suggested to be part of large regional systems) to:
   * Planning
   * Leakage investigations and control
   * Revolving funds to finance house connections

(6) Require all regional water companies to accept responsibility for wastewater collection and disposal

(7) Encourage the establishment and growth of Governorate - wide private water and wastewater companies

2.3 Implementing Entities

2.3.1 **Policy.** The Amana, ORDEV, and NOPWASD should agree on whether this recommendation should be adopted as a matter of policy.

2.3.2 **Details.** The Governorates should play the lead role in determining the potential for regionalization within their boundaries. NOPWASD should review the process for potential cross-governorate regional systems.

2.4 Time Schedule and Output

2.4.1 **Time Schedule.** This recommendation relates to a matter of policy which will affect the allocation of LD II funds. Accordingly, a decision should be made as soon as possible. The necessary changes should be made in the LD II Planning Guidelines.

Once policy is agreed upon, the Governorates should move in early 1988 to prepare the regional plan described in Sect. 2.2(3), following the guidelines referred to in Sect. 2.5.

2.4.2 **Output.** Regionalization of water and wastewater services is an expressed national policy. Regional systems can provide economies of scale and focus trained and experienced personnel, leading to improved operation and maintenance.

2.5 Guidelines Reference

See Guidelines Section III-1, Determination of Potential for Regionalization.

114

3. Organizational Issues

3.1 Broad Recommendation

Confirm that the Governorate is the primary unit which has responsibility for water and wastewater in the villages, move to clarify and strengthen this responsibility, and expand the role of the private sector.

3.2 Background

Section 2.1 of the Findings section of this report describes the present situation of the "Organization of Village Water Systems". As that section points out, while the Governorates have been given this responsibility, there is still confusion and lack of clarity. The broad issues of responsibilities in the water and wastewater sector are about to be addressed in the "Water and Wastewater Sector Institutional Support Project, Technical Advisory Services" program being funded by USAID. Recommendations made here should be coordinated with the work of that program.

3.3 Specific Recommendations

(1) Select the Governorate Local Development Committee (GLDC), to be formed under LD II "to oversee LD II program formulation and implementation", as the primary body in the Governorate for ensuring that the Governorate's water and wastewater responsibilities are met.

(2) Strenghten the Governorate's Directorate of Housing's capabilities in broad planning and managment of the water and wastewater sector.

(3) Clarify the specific responsibilities of other parties in regard to water supply and wastewater. The following is suggested:

(a) Village Responsibilities

* Operation, routine maintenance and basic repairs for water and wastewater systems
* Collection of revenues

(b) Markaz Responsibilities

* Periodically monitor the village's performance in operation and maintenance of their systems
* Contract for private sector services for non-routine maintenance and complex repairs
* Provide general support to villages in emergencies
* Provide routine supervision of construction services.

(c) Governorate Responsibilities

* Provide technical support in the form of training and advice
* Contract for private sector services for specific planning, design and, for complex works, supervision of construction; and for the preparation of O&M manuals.
* Approve private sector planning reports, engineering designs and O&M manuals
* Coordinate the allocation of capital funding to the villages
* Monitor the services provided by the markaz

(d) National Government Responsibilities

* Establish water and wastewater standards
* Coordinate education programs related to water, sanitation and health
* Monitor and enforce the performance of village water and wastewater systems (spot checking)
* Provide guidance and assistance to the Governorate training centers
* Collect and share water and wastewater sector information
* Obtain international funding and guarantee loans from international agencies
* Licence operators of water and wastewater systems

116

(e) Contract with the Private Sector for the Following:

* Conduct basic village feasibility studies
* Prepare engineering designs, specifications and construction tender documents
* Supervise complex construction projects
* Prepare O&M manuals
* Construct projects, including civil works and mechanical/ electrical works
* Perform major repairs, including repairs to mechanical equipment and breaks in large diameter pipelines
* Develop training manuals and audio-visual materials for specific training objectives

(f) Consider Utilizing the Private Sector for the Following:

* Establish and operate water and wastewater training centers to meet the needs of the governorates
* Provide operation and maintenance services under contract
* Develop health education programs as described in Recommendation 10.

3.4 Implementing Entities

3.4.1 Policy. Presumably institutional matters of this nature would have to be decided upon at a very high level of the GOE, with recommendations from the Amana.

3.4.2 Details. The LD II TA Consultant should review these recommendations and propose such changes or alternatives as seem appropriate. The Amana and ORDEV, with input from the Governorates, should agreee on policies in regard to:

(1) The Governorate's primary role

(2) The allocation of responsibilities

(3) The extent of involvement of the private sector.

3.5 Time Schedule and Output

3.5.1 **Time Schedule.** These recommendations invlove policy consderations of the highest level, many of which presumably will be dealt with in the Institutional Support Project referred to in Sect. 3.2. Assignment of primary responsibility to the Governorates is in accordance with both current law and the LD II program. The details of the clarification of responsibilities and the extent of involvement with the private sector will take time to resolve, but dialogue between the appropriate parties should start now. LD II training programs are particularly dependent upon early resolution of some of those issues.

3.5.2 **Output**. If implemented, the clarification of responsibilities should result in greater efficiency, improved focus of training, and more responsiveness to the consumer. Utilization of private sector skills and experience should result in better quality end results.

3.6 Guidelines Reference

The Implementation Guidelines are directed principally to the Governorate.

4. Planning, Design and Construction

4.1 Broad Recommendation

Improve the quality of planning, design and construction related to new village water and wastewater system components, or the upgrading or expansion of existing works.

4.2 Specific Recommendations

4.2.1 Planning

(1) Prepare a handbook or guidelines for conducting a Prefeasibility study of village water and wastewater existing facilities and needs, by stages, including capital and recurring costs :

* Include procedures for the selection of consultants to perform such studies
* Ensure that the planning process involves community participation
* Consider two levels of study : one for a very brief scanning survey to identify the most immediate needs; another for a Prefeasibility study to recommend specific improvements and costs, by stages

(2) Pre-qualify local private sector consultants to conduct such studies

(3) Set aside funds from capital development programs for the payment of such studies

(4) Require the execution of such studies (preferably by private sector consultants) and their subsequent approval, prior to disbursement of funds for water and wastewater projects

(5) Require village commitment to providing adequate O&M services as a prior requirement to receiving funds

(6) Establish criteria for eventual desired level of service in villages for water supply. See Sect. 5.2.1 for suggested target levels of service.

(7) Establish criteria for minimum levels of service in villages for wastewater. See Sect. 6.2. for suggested levels of service.

(8) Ensure the widespread availability of :

* Basic maps, in the form of the latest aerial topographic survey maps,
* 1986 census data, and
* Hydrogeological and water quality data,

to all parties involved in the planning and design efforts.

4.2.2 Design

(1) Review existing standard designs now currently in use in Egypt

(2) Develop improved, appropriate designs, or families of designs, for varying sizes and capacities, for widespread use throughout the hundreds of villages where they could be used, for :

* Wells
* Storage tanks
* Pump Stations
* Diesel engines
* Pipelines
* House connections
* Household toilets
* Septage/sullage vaults
* Vault pumpage facilites
* Slow sand water treatment plants
* Infiltration galleries and/or roughing filters
* Disinfection facilities
* Public standpipes
* Canal-side laundry facilities
* Sewage disposal ponds

(3) Ensure that designs incorporate the concepts of :

* Simplicity (to construct and operate)
* Reliability (to operate)
* Economy (to construct and operate)

* Interchangeability (for quick replacement)
* Maximum use of local products
* Standardization

(4) Prepare standard documents for the tendering of civil works and for the purchase of commodities and equipment

(5) Require that funds available for capital development programs only be expended on works based on approved design standards, and that approved tender documents be utilized.

(6) Utilize local private sector consultants for the design of approved capital works (first preference); or ensure that works designed by governmental agencies are reviewed by private sector consultants under sub-contract••

4.2.3 Construction

(1) Prepare a handbook for the procedures to be followed in regard to the supervision of construction of civil works, and the installation, start-up, testing and acceptance of mechancial and electrical works

(2) Upgrade the capability of markaz engineers to carry out the supervision of construction of village water and wastewater projects by :

* Conducting specific training programs
* Utilizing the newly developed construction supervision handbook referred to in paragraph (1), above.

• Selected from a list of pre-qualified consultants, possibly on the basis of " Indefinite Quantity Contracts " (IQC's)

•• Possibly under sub-contract to the Amana. Could be a local consultant, possibly with expatriate support

(3) Engage the local private sector consultant who conducted (or reviewed) the design to make periodic field inspection visits to monitor the performance of the markaz construction supervisors, and report on this performance to the Governorate.

4.3 Implementing Entities

4.3.1 Policy. The requirement of conducting studies prior to disbursement of capital development funds, the extensive use of private sector consultants, and the establishment of criteria for levels of service are policy issues to be decided by the Amana (with ORDEV).

4.3.2 Details. The development of handbooks, guidelines, training programs, standards, criteria for levels of service, and procedures for the selection of local private sector consultants should be prepared by the LD II TA Consultant.

4.4 Time Schedule and Output

4.4.1 Time Schedule. Most of the recommendations should be followed even if private sector involvement is not as extensive as proposed. Someone will have to have standards and guidelines to follow. It is suggested that the LD II TA Consultant make an early start on these recommendations.

4.4.2 Output. Improved planning, design and construction would result if these recommendations are followed, with the greatly increased liklihood that LD II water and wastewater funds would be more effictively utilized than in previous programs.

4.5 Guidelines Reference

See Guidelines Section III -2, Preparation of Prefeasibility studies.

112

5. Water Supply Systems

5.1 Broad Recommendation

Improve the capability, operation and reliability of water systems so as to extend the benefits of piped water to the majority of the people.

5.2 Specific Recommendations

5.2.1 Target Levels of Service

(1) Increase the number of people served directly by piped water systems (those who live in buildings with water connections) to about 75% of the total village population.

(2) Increase the number and quality of public standpipes such that there is about one unit for every 200 people not served directly, at a maximum distance of about 300 meters.

(3) Compare the relative costs of serving people through good quality (adequate drainage, sturdy taps) public standpipes and through piped connections to houses, to guide the adoption of a rational policy on the future role of public standpipes.

(4) Allow for water delivery to the houses at 50 lpcd and to the public standpipes at 25 lpcd.

(5) Reduce leakage and waste to 30% of the total value of water produced.

(6) Increase the capability of water systems to provide water during periods of electrical power failure and/or periods of low voltage when electric-motor driven pumps cannot operate :

* Provide enough capacity from diesel-engine driven pumps to meet 75% of the average daily design production rate, and

* Construct elevated storage tanks to provide storage equal to 25% of the normal average daily water usage.

(7) Adopt as a policy the provision of water under pressure 24 hours per day, with a minimum head of 25 meters to the bottom of the elevated storage tank.

(8) Provide water that is palatable as well as potable.

5.2.2 Technology Choices

(1) Source

* Where groundwater quality and quantity permit, wells should be the priority source of choice. Require effective testing before developing new wells.

* Where surface water treatment must be used:

  - Make every effort to connect groups of villages to regional system, with large conventional water treatment plants

  - For smaller groups, consider the use of slow sand filter plants. (pilot plants suggested as demonstration)

  - As an alternative, for groups of villages near the Nile, consider the use of infiltration galleries.

  - Make every effort to avoid the use of small compact water treatment units for individual vilages. They should be considered as interim (5 years) solutions only, because of the cost and difficulties of operation and maintenance at the village level.

(2) **Storage**

* Construct fewer but larger (most now are 150 m^3 or less) elevated storage tanks.

* Prepare standard designs for larger tanks (possibily 400 m^3) which would make use of local pre-fabrication and allow ease of erection.

* Consider constructing tanks in those villages indentified as being most deficient in storage by means of tendering several at a time. This would attract lower prices and larger, more qualified contractors.

(3) **Disinfection**

* Evaluate alternatives to the use of chlorine gas as a means of disinfection

* Conduct pilot testing of promising alternatives.

5.2.3 Operation of Water Systems•

(1) Prepare illustrated, Arabic language operation manuals for typical village water systems (wells, diesel and electric driven pumps, elevated tanks, distribution piping) and distribute them to water system operators

(2) As a future step, build on these typical manuals by preparing specific operation manuals to guide the operation of each individual water system

(3) Develop training programs to train operators in the specific operation of their systems

---

• Note: Maintenance and Repair recommendations are presented in Section 7.

(4) Develop a uniform, meaningful system of maintaining records of operation of the system

(5) Develop guidelines for operators to use to identify and reduce the quantities of water lost to leakage and waste

(6) Identify the vehicles, equipment and supplies needed to operate the system properly, and provide them

(7) Identify or develop a technical support group available to assist the operator when operational problems arise

(8) Use video tapes, mobile units and other methods for original and follow-up training of operators.

5.2.4 Performance Monitoring

(1) Establish a program for monitoring the operation of the water system which would include :

* Guidelines of what to do and what to look for at the time of field inspection visits
* Frequency of inspections and need for spot checking to be carried out without prior notice
* Talks to selected water system customers
* Programs for the collection and analysis of water samples
* Type of skills needed for conducting required tests
* Governmental agencies which should be informed of the results of such inspections
* Proposed course of action in event that inspection results are unsatisfactory

(2) Select the entity (Governorate level) which should conduct the inspection visits.

5.3 Implementing Entities

5.3.1 **Policy**. The Amana and ORDEV should consider and establish a policy on target levels of service for water systems, with the advice of the LD II TA Consultant. The Amana should also select the Governorate entity to have responsibility for performance monitoring.

5.3.2 **Details**. The LD II TA Consultant should take the lead in developing the various manuals, guidelines and training programs suggested.

5.4 Time Schedule and Output

5.4.1 **Time Schedule**. Target levels of water service should be established as soon as possible, since they are an important factor in conducting village studies.

The development and distribution of manuals and guidelines should be incorporated into the work plan of the LD II TA Consultant at a schedule which is consonant with its other priorities. The same is true for the development and application of training programs.

The implementation of performance monitoring should follow the steps suggested for upgrading the operation of water systems.

5.4.2 **Output**. The establishment of target levels of water service will allow improved planning and the implementation of works in accordance with achieving those target levels. The development of operating manuals, leakage detection and reduction guidelines; the establishment of operational support groups and the monitoring of performance; the provision of tools, vehicles and equipment to carry out their responsibilities; and the provision of training to make effective use of all of this assistance, should result in greatly improved performance of village water systems.

6. Wastewater Disposal

6.1 Broad Recommendation

Concentrate available wastewater funds on those areas where the problems are most severe, provide guidelines based on demonstration programs for other areas and technologies, and emphasize systems which minimize costs and operational problems.

6.2 Specific Recommendations

6.2.1 Domestic Toilet Facilities

(1) Prepare (adapt from the many designs now in existence) simple, low-cost designs for improved toilet facilities which can be constructed by home owners or village labor

(2) Consider the possibility of providing loans to pay for the cost of home toilets. Loans to be repaid over a period of years as part of the monthly water-wastewater tariff

(3) Prepare a pilot program for several villages which would :
* Upgrade/construct home toilets in most homes
* Upgrade/construct improved communal toilets in schools, mosques or other public buildings
* Provide basic education in sanitation practices.

(4) Provide toilet and sink facilities in conjunction with water pump stations or water department compounds for use by water system personnel.

6.2.2 Identify Priority Needs

(1) Develop criteria for determination of the extent of problems resulting from inadequate means of wastewater (septage and sullage) collection and disposal

(2) Apply this criteria in all governorates and prepare a list which identifies the relative extent of wastewater problems in order of those considered most serious.

6.2.3 Piped Sewerage Systems

(1) Recognize that piped sewerage may be the only technically viable solution for some villages in Egypt.

(2) Continue to monitor the progress of performance and costs of the five pilot sewerage schemes now underway as part of the LD II program

(3) Limit the use of piped sewerage systems to those villages which are prepared to pay a significant portion of these costs. (This solution is too expensive to be widely used in Egyptian villages in the forseeable future. The use of this technology should be discouraged as a general solution to village wastewater problems.)

(4) Do not permit the construction of piped sewerage systems without concurrent programs for the construction of treatment works for the collected wastewater.

(5) Make maximum use of "stabilization pond" - related treatment and avoid "extended aeration" - types of sophisticated treatment, with their high operating costs and complex operational problems.

6.2.4 Vault, Cartage and Disposal Systems

A. Storage Vault Systems

(1) Prepare improved designs for sullage storage vaults for new houses or for addition during house remodeling which would :
- * Accept overflows from or be combined with toilet pits/tanks/vaults
- * Provide external access for emptying the vaults
- * Provide about 2 to 4 week's storage of wastewater

(2) Encourage villages to construct such vaults with their own resources

(3) If agreed to by enough families (say 25 families per vault) in neighborhoods of houses without sullage vaults, consider the construction of neighborhood sullage vaults to which sullage could be carried for disposal.
This system exists and works in some villages now.••

(4) Consider a pilot program for several villages which would:
- * Explore this possibility through discussions with the village popular council and the villagers
- * Construct communal sullage vaults
- * Monitor the use of these vaults
- * Require payment from those families which use them, as part of their water/wastewater tariff

---

• The report on "Unsewered Areas Demonstration Project" for Greater Cairo, AMBRIC, October 1987, should be reviewed for possible adaptable concepts.

•• Om Khenan, Giza, is an example worth examining.

B0

B. Vault Pumper Systems

(1) Use simple 4-wheel tank trailers that can be pulled by a small farm tractor. For pumping, consider either a gasoline engine-driven sludge pump or one which might operate off the farm tractor's power take-off unit.

(2) Consider having some units of smaller size for less accessible areas

(3) Consider a pilot program for several villages which would :
- Determine the number and type of vault pumper units required, based on the quantities and proposed frequency of emptying required
- Construct and/or purchase the necessary units
- Train the operators in the use of the equipment
- Monitor the cost of operation and performance of the system

C. Wastewater Disposal

(1) Provide an earth basin sewage stabilization pond adjacent to an irrigation drainage canal or, if possible, on the desert fringe of the village, as the designated location for disposal of the village's septage and sullage wastes

(2) Prepare designs for such sewage ponds which will :
- Require a minimum of land
- Provide some degree of treatment
- Not constitute an aesthetic nuisance to the villagers

(3) Obtain a waiver from the Ministry of Irrigation to permit pumping the effluent from these sewage ponds to the drainage canals without meeting current treatment standards

(4) Utilize a standard diesel-driven irrigation pump to pump the effluent from these ponds to the drain at a rate necessary to maintain pond levels within an acceptable range of depths

D. Pilot Testing and Comparison

(1) Design, implement and monitor vault/pumpage/sewage pond systems in several villages in order to :

* Determine the capital and operating costs of such systems
* Determine their performance
* Assess village use and acceptance of such systems

(2) Make comparisons of such systems with the pilot piped sewerage systems

(3) Prepare illustrated, Arabic language operation and maintenance manuals for the pilot wastewater systems of vaults, tanker pumpage and sewage disposal ponds.

(4) Provide training for the operators of such wastewater systems

(5) Provide the tools, spare parts, supplies and equipment needed for operation and maintenance

(6) Prepare a simple system of record keeping for wastewater systems

(7) Recommend a program for the supervision of the operation and maintenance of wastewater systems.

E. **Staging and Future Upgrading**

(1) Accept as a principle, that (a) any system which removes sullage and septage wastes from underfoot is a major improvement, and (b) it will be too costly to provide piped sewerage and a high degree of treatment for most villages for many years to come

(2) The vault/pumper/pond system can be upgraded in stages over the years

(3) Consider alternative systems, such as small-diameter, plastic pipe pressure sewers to carry settled effluent from vaults to the disposal location, possibly as a future upgrade of the vault system

(4) Vault, cartage and disposal systems should be considered initially in those villages where the problems are most obvious and severe, and where they are a viable and less expensive alternative to piped sewers. These systems could be implemented initially in those portions of the village where the problems are most serious.

6.3 Implementing Entities

6.3.1 Policy. Policy issues of these recommendations should be addressed by the Amana and ORDEV. Approval must be obtained from the Ministry of Irrigation to permit lower levels of treatment than those now required.

6.3.2 Details. The Governorates, with the assistance of the LD II TA Consultant, should identify the location of the most pressing wastewater problems. The recommendations for consideration of various alternative technologies and their pilot testing should be addressed by the LD II TA Consultant.

6.4 Time Schedule and Output

6.4.1 Time Schedule. For the most part, only the most critical wastewater problems in the northern-most parts of the delta require early attention. On the other hand, to avoid committing large sums of LD II funds to expensive sewerage projects, caution is advised. Overall policy implicatons of where and under what conditions piped sewerage systems are to be funded should be resolved before undertaking any new programs.

Other recommendations should be incorporated into the workplan of the LD II TA Consultant in the context of other tasks and their relative priorities.

6.4.2 Output. Identification of priority needs and a requirement that villages pay most of the costs should limit the construction of piped sewerage systems to those villages for which no other feasible alternative is available. Development of a system based on vaults, cartage and disposal would allow a lower cost, staged approach to wastewater collection that could be suitable for most Egyptian villages.

7. Maintenance and Repairs

7.1 Broad Recommendation

Develop and implement practical programs for preventive maintenance, clarify responsibilities, improve capability for making repairs, and ensure that maintenance and repair work is performed as required.

7.2 Specific Recommendations

7.2.1 Maintenance

(1) Treat the development and implementation of routine maintenance programs as having very high priority

(2) Review all work done to date by Chemonics related to maintenance needs and programs, and build on that work in addressing the recommendations in this section.

(3) Prepare illustrated, Arabic language maintenance manuals for typical water system components (pumps, electric motors, switchgear, diesel engines, valves, elevated tanks, pipelines) and distribute them to water system operators

(4) As a future step, build on these typical component manuals by preparing specific maintenance manuals for each system

(5) Identify specific vehicles, tools, equipment, parts and supplies needed for operators to conduct routine maintenance, and make them available to the operators

(6) Develop training programs to train operators in needed maintenance practices

(7) Identify specialized maintenance tasks beyond the capabilities of village operators, and recommend programs for ensuring that these tasks are performed (by the private sector or specially trained higher level governmental units)

(8) Identify specific maintenance tasks which should be the responsibility of the village water system operator.

(9) Develop follow-up programs to ensure operator understanding of the training programs and the content of the maintenance manuals

(10) Identify or recommend a support group available to assist the operator when maintenance problems arise

(11) Develop a record-keeping system for (a) scheduling of periodic preventive maintenance tasks, and (b) notation of time and work performed for all maintenance

7.2.2 Repairs

(1) Identify those repair tasks which should be the responsibility of the village operator (pipeline breaks, up to 150mm diameter, for example)

(2) Identify those repair tasks beyond the capabilities of village operators, and recommend programs for ensuring that these repairs are performed promptly and well (Examples : Private sector for rewiring electric motors or rebuilding diesel engines. Markaz teams or private sector for large diameter pipeline breaks)

(3) Prepare guidelines (illustrated, Arabic language) for village operators to use for common repairs (small pipeline breaks, for example, which would include procedures to minimize contamination of the distribution system as well as making the physical repair)

136

(4) Identify or recommend a support group available to assist the operator when repair problems arise

(5) Identify specific vehicles, tools, spare parts, supplies and equipment needed to conduct repairs, at village and markaz levels, and make them available (sump pumps for dewatering trenches to carry out repairs of pipeline breaks, for example)

(6) Develop procedures for the timely use of private sector companies for the repair of major items of equipment or major pipeline breaks so these services can be utilized by villages when emergencies arise (standby contracts)

(7) Recommend procedures for the temporary replacement (from governorate stores) of critical items of equipment (pumps, motors, engines) during the period such equipment is being repaired

(8) Develop a record-keeping system for notation of time, cost and work done for all repairs.

7.2.3 Performance Monitoring

(1) Recommend a program for monitoring maintenance and repair work, which would include:

* Guidelines of what to do and what to look for at the time of field inspection visits

* Frequency of inspections and need for spot checking to be carried out without prior notice

* Type of skills needed for conducting such tests

* Agencies or Departments which should be informed of the results of such inspections

* Proposed course of acton in event that inspection results are unsatisfactory

(2) Recommend the entity (Governorate level) which should conduct the inspection visits.

7.3 Implementing Entities

7.3.1 **Policy**. The Amana and ORDEV should adopt the concept of making significant improvement in village water system maintenance as one of its highest priorities. To ensure compliance with this policy, the Amana should require progress reports on this subject at its periodic meetings.

7.3.2 **Details**. The LD II TA Consultant should implement the recommendations listed under Maintenance, Repairs and Performance Monitoring, to the extent these recommendations are adopted by the Amana.

7.4 Time Schedule and Output

7.4.1 **Time Schedule**. Maintenance has often and justifiably been identified as one of the weakest links in the village water system program. Accordingly, the Amana and ORDEV should declare this subject as being of highest priority at the earliest possible opportunity. Work on improvements, along the lines recommended above, should also be started as soon as possible.

7.4.2 **Output**. Improved maintenance and repair work will contribute significantly to improved operational performance, system reliability, and the extended life of physical facilities.

138

8. Tariffs and Revenues

8.1 Broad Recommendation

Simplify the village tariff system, combine water and wastewater tariffs, and increase the rates to recover operation and maintenance costs.

8.2 Specific Recommendations

8.2.1 Tariff Policy

(1) Adopt as an immediate goal an increase in tariffs to cover the non-salary costs of operation, maintenance and repair of water and wastewater systems (Achieve by 1990).

(2) Adopt as a target goal that tariff rates should cover the total cost of operation, maintenance and repair of water and wastewater systems, including personnel costs (Achieve by year 2000).

(3) Retain the basic national tariff formula for metered customers, but with higher rates per cubic meter as needed to recover costs

(4) Charge non-metered households not connected to sewers on the basis of an assumed usage of 6 m^3/month (40 lpcd x 5 persons/ connection x 30 days/month), and use this as a minimum charge for metered customers. For those connected to sewers, increase the assumed usage to 18 m^3/month.

(5) Charge non-connected households with access to public standpipes on the basic of an assumed usage of 2.5 m^3/month (17 lpcd x 5 persons per household x 30 days/months) Note: This can only be done in villages where there are adequate numbers of standpipes.

(6) Charge for wastewater service on the basis of a percentage of water charges. 10% is now permitted but this may be too low.

(7) List, as a separate item on the water and wastewater bill, any charges for repayment of loans for water connections or toilet facilities.

(8) Consider a total water and wastewater charge of LE 4.50/month/connection• as being a realistic maximum for good quality service in the villages. (This represents 5% or less of 1987 rural family income for 75% of the rural families).••

(9) Major increases in water and wastewater tariffs should only be put into effect after there is significant improvement in the quality of water (or wastewater) service.

(10) To ensure fairness, adopt as a national policy that water and wastewater tariffs in Egypt's cities (from markaz capital to Cairo) should conform to practices at least as rigorous as those proposed above.

8.2.2 Metering

(1) Eliminate the use of meters for all buildings except for those with more than two taps, or those with access to piped sewerage systems.

(2) Install meters on public and community buildings to determine (monitor) water usage, even if no direct charges for such use are made.

• Not including possible repayment of loans for water connections
•• See Table 6

140

8.2.3 Expansion of the Revenue Base

(1) As an encouragment to making new single-tap connections to the piped water system, allow home owners to borrow funds for new connections and repay the loan in monthly payments over several years (5, for example).

(2) In conjunction with an expanded program of constructing new and improved public standpipes to serve those not connected, levy a fixed monthly charge on all families not connected to the piped system as their share of the cost of the standpipes and community water facilities and wastewater disposal works, if any). See Section 8.2.1 (5).

8.2.4 Collection, Retention and Use of Revenues

(1) Develop criteria for conditions under which villages might be permitted to retain and use the water and wastewater revenues they now collect and forward to the Ministry of Finance. Such criteria might include:

* Establishment of records for the collecton and reuse of funds which meet acceptable standards to permit auditing.

* Agreement to meet all of its annual recurring costs, including salaries, electricity, fuel, materials and equipment, with no additional funds from the government

* Willingness to accept this procedure for a limited period (say 3 years), as part of a study

* Existence of a reasonably good water system, with a relatively high percentage of people connected.

(2) Select several villages which are prepared to meet these criteria and use them as a pilot study to assess the possible feasibility of extending this practice.

141

8.3 Implementing Entities

8.3.1 **Policy**. Matters related to possible changes in national water and wastewater tariffs are policy issues to be decided at very high levels of the government. The Amana should take the lead in discussing these recommendations, to the extent they accept them, with the appropriate levels of the GOE.

8.3.2 **Details**. Tariff policy and details are matters or great important to the Governorates and the villages. The LD II TA Consultant should propose to the Amana and ORDEV means of obtaining acceptance from the Governorates and villages of those recommendations which the Amana finds appropriate.

8.4 Time Schedule and Output

8.4.1 **Time Schedule**. It will take time to determine policies which are beyond the scope of the Amana. Nevertheless, many of these recommendations can be implemented within the frame work of existing national water tariff policy. There is no reason not to make an early start in pursuing these issues with the Governorates and villages as suggested in Section 8.3.2.

8.4.2 **Output**. Increased revenues are the key to better water and wastewater service. Continued dependence on national subsidies will mean continued inadequacies in the services provided, since present subsidies are inadequate and increases highly unlikely. An increased revenue base will permit spreading of the costs so as to maintain them at manageable levels.

142

9. Health Education

9.1 Broad Recommendation

Increase the knowledge and understanding of the people of Egypt in matters related to water, sanitation and health.

9.2 Specific Recommendations

(1) Develop a national program for increasing the awareness of the relationships among water usage, good sanitation practices and health :

* Series of programs to be incorporated into the school curricula at various levels
* General programs for the media : television, magazines and newspapers

(2) As part of the training program for water system operators, develop a specific program to ensure that operators have a basic understanding of public health as it relates to their responsibilities.

9.3 Implementating Entities

9.3.1 **Policy**. The Amana should discus this recommendation with the Ministry of Health (MOH) and requc t that the MOH undertake such a program nationally.

9.3.2 **Details**. The LD II TA Consultant should develop the program referred to in Section 9.2 (2) and review it with the MOH.

142

9.4 Time Schedule and Output

9.4.1 Time Schedule. There is no particular time by which this work should be completed but the health of the people is sufficiently important that a start on such a project should not be delayed.

9.4.2 Output. Improved water sanitation and wastewater facilities alone are not sufficient to bring about the needed improvements in public health in Egypt. An increased awareness of water, sanitation and health will make the LD II investments in water and wastewater much more valuable to the health of the people.

144

10. Suggested Priority of Recommendations

No.	Category	Recommendation
1	General	Expand level of LD II technical assistance significantly to assist in carrying out these recommendations.
2	Maintenance	a. Establish the improvement of maintenance as being of very high priority. b. Develop and distribute appropriate maintenance manuals, and accelerate maintenance training. c. Clarify responsibilities for conducting maintenance. d. Identify and make available the vehicles, tools, equipment and parts needed for maintenance.
3	Focus LD II Funds	Limit funding of water and wastewater projects to fewer villages to permit more effective use of funds.
4	Institutional	Confirm the Governorates as the primary unit with responsibility for water and wastewater, and clarify the relative responsibilities of other parties.
5	Regionalization	Identify those areas where regionalization of water and wastewater services appears to be feasible and desirable.
6	Planning	Require the conduct of Prefeasibility studies as a pre-condition for receiving LD II funds for water and wastewater facilities.

145

7	Water Systems	a. Reduce leakage and waste to less than 30% b. Provide water under pressure 24 hours per day. c. Increase system reliability by increasing storage and adding diesel engine standby. d. Improve water quality through improved source selection and better disinfection. e. Extend pipe water connections to more people. Set a goal of 75%.
8	Wastewater	a. Identify areas of priority needs for improvements in wastewater systems. b. Develop and pilot test alternatives to piped sewerage systems.
9	Tariffs	a. Expand the revenue base by increasing piped connections and charging for access to public standpipes. b. Discontinue the use of meters for most village houses without sewers.
10	Health Education	Develop and implement a national program about the relationships among water usage, good sanitation and health.

146

APPENDIX A

ASSESSMENT SAMPLING AND METHODOLOGY

Appendix A

SAMPLING AND METHODOLOGY FOR ASSESSMENT OF VILLAGE WATER SYSTEMS

TABLE OF CONTENTS

Page

I. SCOPE OF WORK
1. Project Purpose A-2
2. Specific Objectives A-2
3. Project Outputs A-2

II. PROJECT TEAM
1. Number and Disciplines A-3
2. Specific Members A-4
3. Field Teams A-4

III. SAMPLE SELECTION
1. Sample Universe A-5
2. Criteria for Selection A-6
3. Size and Distribution of Sample A-7
4. Analysis of Sample A-7

IV. PROJECT METHODOLOGY
1. Data Collection A-8
2. Areas of Inquiry A-8
3. Study Findings A-8
4. Analysis, Conclusions and Recommendations A-9
5. Review of Recommendations and Final Presentation A-10

V. PROJECT SCHEDULE A-11

148

SAMPLING AND METHODOLOGY

I. SCOPE OF WORK

The details of the scope of work were established by USAID and made a part of the contract between USAID and WASH. The following sections are based on this scope of work.

1. Project Purpose

The overall purpose of the project is to contribute to the improvement of the performance, reliability and sustainability of village water systems in Egypt.

2. Specific Objectives

a. To determine the type and condition of a representative sample of village water systems by means of field surveys, with emphasis on those funded by USAID programs.

b. To utilize the results of the field surveys to prepare draft institutional, financial and technical recommendations and guidelines for developing and improving village water systems

c. To review the draft recommendations and guidelines with appropriate GOE and USAID officials and incorporate their reactions into final recommendations and guidelines.

d. To prepare the final recommendations and guidelines so that they :

(1) can be utilized by GOE officials as a clear and useful guide to assist them in implementing improvements to village water systems

(2) can be utilized by USAID to ensure the optimum use of LDII funds for village water systems

149

3. Project Outputs

The principal project outputs or " deliverables " from the project include :

(a) A draft assessment report which will include the findings, conclusions and recommendations resulting from the collection and analysis of the data from the field surveys.

(b) The conduct of workshops with GOE officials designed to advise them of the results of the assessment and obtain their comments and suggestions on the draft recommendations.

(c) A final report on assessment of village water systems with a summary in Arabic

(d) Guidelines (in English and in Arabic) for implementation of village water projects to assist GOE officials in planning, designing and implementing village water systems.

II. PROJECT TEAM

1. Number and Disciplines

The WASH Team consisted of the following members

a. Full Time

Pos.	Professional Staff	Number
A.	Project Manager/Environmental Engineer	1
B.	Field Team Leader/Social Scientist	1
C.	Field Team Leader/Environmental Engineer	1
E, F	Social Scientist	2
G, H	Finance/Management Specialists	2
		8

150

	Support Staff	
I	Office Manager	1
	Translator	1
	Secretaries	2
	Drivers	3
		7

b. Part Time

	Professional Staff	
J	Environmentalist	1
K	Social Scientist	1
L	Municipal Utility Finance Specialist	1
M	Institutional Development Specialist	1

2. Specific Members

Position	Name	Discipline	Local/Expatriate
A	Donald Cullivan	Env. En	USA
B	Richard Huntington	Soc. Scientist	USA
C	Nigel Nicholson	Env. Engr.	UK
D	Reda Haggag	Env. Engr.	Egyptian
E	Syada Greiss	Soc. Scientist	Egyptian
F	Zeinab Hassan	Soc. Scientist	Egyptian
G	Karl Baldwin	Fin./Mgt.	USA
H	Antoun Dahdouh	Fin./Mgt.	Egyptian
I	Irene Sourial	Off. Manager	Egyptian
J	Mounir Neamatalla	Env. Spec.	Egyptian
K	Samiha El-Katsha	Soc. Scientist	Egyptian
L	Michel Croston	Utility Finance	UK
M	Leo St. Michel	Int'l Dev't	USA

3. Field Teams

* Huntington Team

Team Leader/Social Scientist	R. Huntington
Engineer	R. Haggag
Fin./Mgt. Specialist	K. Baldwin
Soc. Scientist	Z. Hassan

151

* Nicholson Team

Team Leader/Engineer	N. Nicholson
Fin/Mgt/Specialist	A. Dahdouh
Soc. Scientist	S. Greiss

Note : These field teams were supplemented by a total of 5 engineers and social scientists from ORDEV.

III. SAMPLE SELECTION

1. Sample Universe

As defined in the USAID scope of work given to WASH, the sample universe included the following 16 Governorates :

Region	(Number)	Governorate	Descriptive Factors				
			Ecological(1)	Size(2)			
			Zone	LE	Vil	DSF(3)	UNICEF(4)
Delta	(8)						
		Behira	Coastal	S	L		
		Damietta	Coastal	S	S		
		Daqahliya	Mixed	M	L	+	
		Gharbiya	Mixed	M	L	+	
		Kafr el Sheikh	Coastal	S	M	+	
		Menufiya	Basic	L	L		
		Qalyubia	Basic	L	M		
		Sharqiya	Basic	L	L	+	
Central Egypt	(4)	Beni Suef	Central Valley	S	M	+	
		Fayoum	Special Case	S	M	+	
		Giza	Central Valley	L	M		
		Minya	Central Valley	M	L	+	
Upper Egypt	(4)	Aswan	Upper Valley	S	S	+	+
		Asyut	Upper Valley	M	M		+
		Qena	Upper Valley	L	L		+
		Sohag	Upper Valley	M	L	+	+

(1) Coastal = Saline groundwater, Basic = Fresh groundwater
(2) Size : For "LE" : L = Large (over LE 7 million in BVS Funds) S = Small (under LE 4 million); for "Vil" : L = over 50 villages, S = less than 30
(3) Includes 1 or more Decentralized Support Fund Projects (USAID)
(4) Includes 1 or more UNICEF Projects

152

2. Criteria for Selection

As agreed with USAID, the sample included 6 Governorates, 10 Markaz, and 36 Villages. The principal criteria for selection as agreed with USAID and ORDEV was as follows .

a. Governorates (Total = 6)

* One from each of the five ecological zones plus one from the " mixed " zone of the Delta
* At least one Governorate to include projects financed by DSF or UNICEF
* Representation from small, medium and large Governorates (by number of villages and/or amount of BVS contributions for water systems)

b. Markaz (Total = 10)

* Must lie within one of the sample Governorates
* Representation from small, medium and large Markaz
* At least one from each Governorate, 2 from larger Governorates
* Must include villages which meet sample criteria

c. Villages (Total = 36)

* Should lie within one of the sample Markaz
* Representation from small, medium and large villages
* The majority (say about 75%) to have significant BVS funds invested in their water systems
* One village from each Governorate to have significant non-BVS funds (other bi-lateral, GOE) invested in water systems
* Two villages to have DSF funded units
* One village to have a UNICEF funded unit

3. Proposed Size and Distribution of the Sample (1)

Governorate	(zone)	(size)	Number of Markaz	Number of Villages (2)	Special Criteria
Damietta	(coastal)	(S)	1	4	DSF
Fayoum	(special)	(M)	1	4	DSF
Gharbiya	(mixed)	(L)	2	7	DSF
Giza	(central)	(M)	2	7	
Menufiya	(basic)	(L)	3	10	
Qena	(upper)	(L)	1	4	UNICEF
TOTAL	6		10	36	

4. Analysis of Sample

a. Sample Universe

		Total	Delta	Delta as Percent
Governorates	=	16	8	50%
Markaz	=	135	72	53%
Vilages	=	798	444	56%

b. Proposed Sample

Governorates	=	6	3	50%
Markaz	=	10	6	60%
Villages	=	36	18	50%

c. Sample as Percent of Universe

Governorates	6/16	=	38%
Markaz	10/135	=	7.4%
Villages	36/798	=	4.5%

d. Other

* In the 6 Sample Governorates, there are : 42 Markaz and 279 villages
* The Markaz sample of 10 = 10/42 = 24%
* The village sample of 36 = 35/279 = 13%

(1) The Markaz and Villages to be sampled are to be jointly selected by the WASH Team and ORDEV, aproximately two weeks before the scheduled field trips.

(2) One village per Governorate to be selectedfor more detailed study.

154

IV. PROJECT METHODOLOGY

1. Data Collection

Two field teams conducted surveys of six governorates, ten markaz's, and thirty-six villages. The field teams collected information from the governorate and markaz officials during one for more visits to each of these offices. For the village surveys, the team spent at least one day (4 to 6 hours) in each village obtaining information on the basic water supply system and its operation, financial resources, and consumer satisfaction. The team collected information from village officials (Chief of Executive Council, Chief of Popular Council, Head of Finance, Engineers, Medical Officer, Health Inspector). The team also met with selected beneficiaries to ascertain their experiences with water service. Six additional villages were selected for more detailed study, usually over a period of two days, in order to obtain more detail on the decision-making process and the operation of the water supply system. Each field assessment team consisted of at least one of the following disciplines : Water supply engineer, social scientist and financial / management specialist.

2. Areas of Inquiry

The teams collected information on the physical components of the water system, its operation and maintenance, water quality (most villages) data on wastewater disposal, the BVS selection process, the financing of water investments and maintenance, the water users' perceptions of the service provided by the water system, and basic information such as population and geographic location. Time and resources did not permit independent collection of data on water production and consumption.

3. Study Findings

The teams produced a summary reports on the findings from the village surveys which include the following information :

Basic Data regarding :
The village population and other descriptive information
The village water system, its components and its operation
Information on wastewater collection and disposal practices
Financial information on water investments, revenue and maintenance funds
Beneficiary viewpoints on water service

Findings regarding :
Adequacy of the water system,
Substainability of the water system,
Process of selecting water system components for construction
Impact of USAID funded water components on the village systems

4. Analysis, Conclusions & Recommendations

a. Study Questions
The data and findings were collated and analyzed to provide overall answers to the following five questions which were specified in the AID Scope of Work :

1. To what extent are village water systems satisfying local needs for water? Is the quality of water supplied adequate? Is service reliable? Is water available in all parts of the village? Is water quality acceptable to consumers?

2. What has been the impact of the Local Development Program on rural water supply? How can this impact be improved and enhanced in the future? How significant are inputs provided by the Local Development Program to the overall village water system? Are the components of the water supply systems financed by the Local Development Program currently functioning?

3. What are the most frequent causes of inadequate or unreliable water service in the vilages? How can system performance and reliability be further improved? Are system components appropriately designed? Is construction quality for program inputs acceptable? Is equipment suitable and functioning? Is the system correctly operated? Does routine maintenance meet minimum acceptable levels?

4. Do village level officials have adequate technical back-up in the development, execution and operation of village water supply systems? What can be done to strengthen the institutional framework within village water supply systems operate? What assistance do the villages receive from the governorate in planning and budgeting for development of its water supply system? How and by whom were technical designs and specifications for water projects funded by the local development program reviewed? How and by whom was construction financed by the program supervised?

5. How are needs for financing capital and operations and maintenance costs of village water systems currently met? How can the financial vitality of these systems be improved? From what sources have system capital costs been met? What user fees are charged? What additional contributions are provided by local consumers? How are locally-collected revenues used?

b. <u>Conclusions and Recommendations</u>

On the basis of the answers to the above questions, general conclusions were arrived at regarding the current status of village water and wastewater systems, and the extent to which the local development program approach is addressing important problems.

151

5. Review of Recommendations and Final Presentation
The findings and proposed recommendations were presented in a two day workshop to appropriate officials and technicians from the six governments sampled (at governorate, markaz and village level)and from key officials from ORDEV, NOPWASD, Ministry of Health, Ministry of Finance, Ministry of Social Affairs, as well as USAID and Chemonics, in order to ascertain local reaction as to their practicality and relevance. The results of these workshops were incorporated into the final report on " Assessment of Village Water Systems " and the " Guidelines for Implementation of Village Water Projects ".

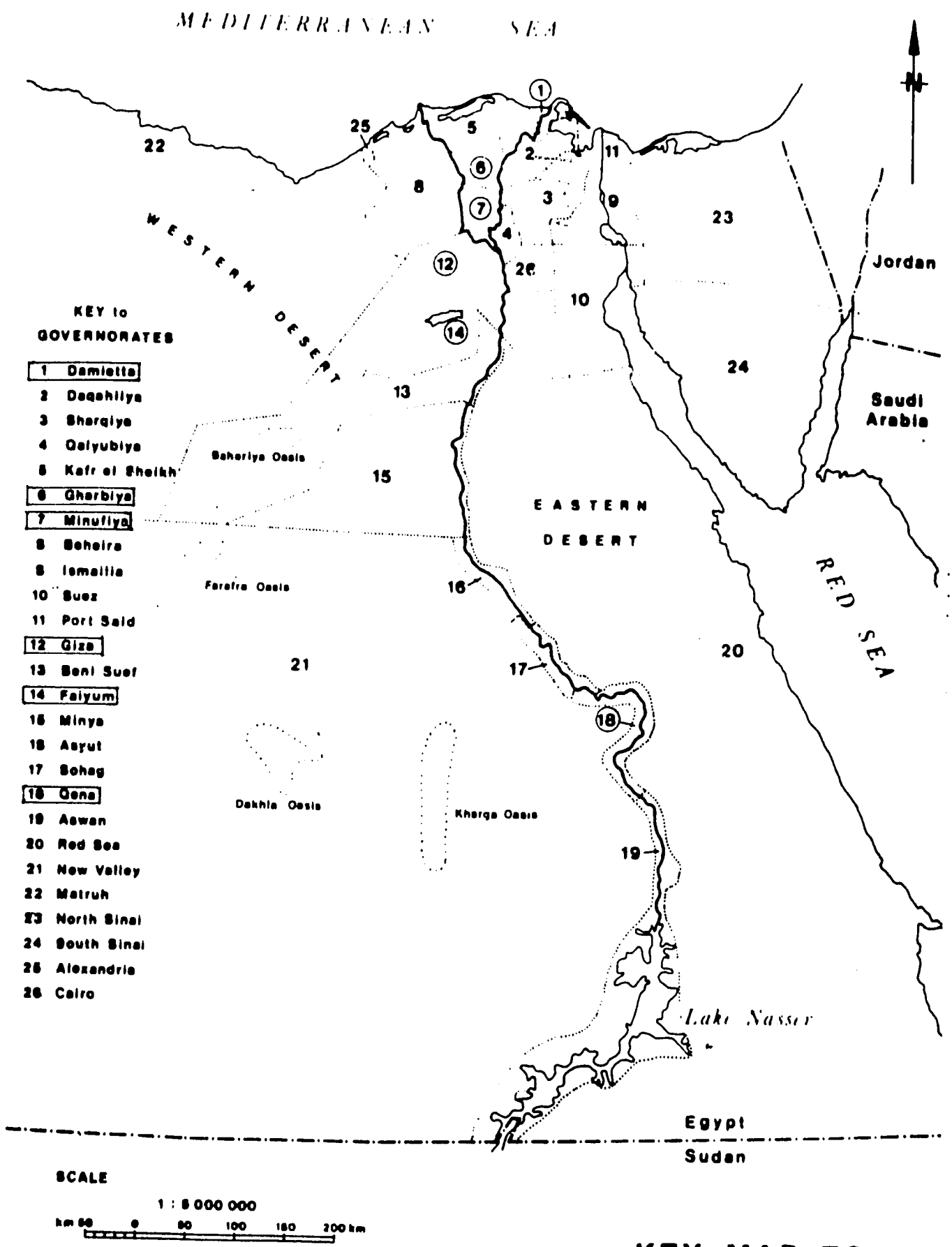
V. PROJECT SCHEDULE

The project took place over a period of about four months. The starting date for the project was 1 November 1987 and the final reports were submitted on 10 March 1988.

156

APPENDIX B

SUMMARIES OF VILLAGE WATER ASSESSMENT REPORTS



KEY MAP TO GOVERNORATES

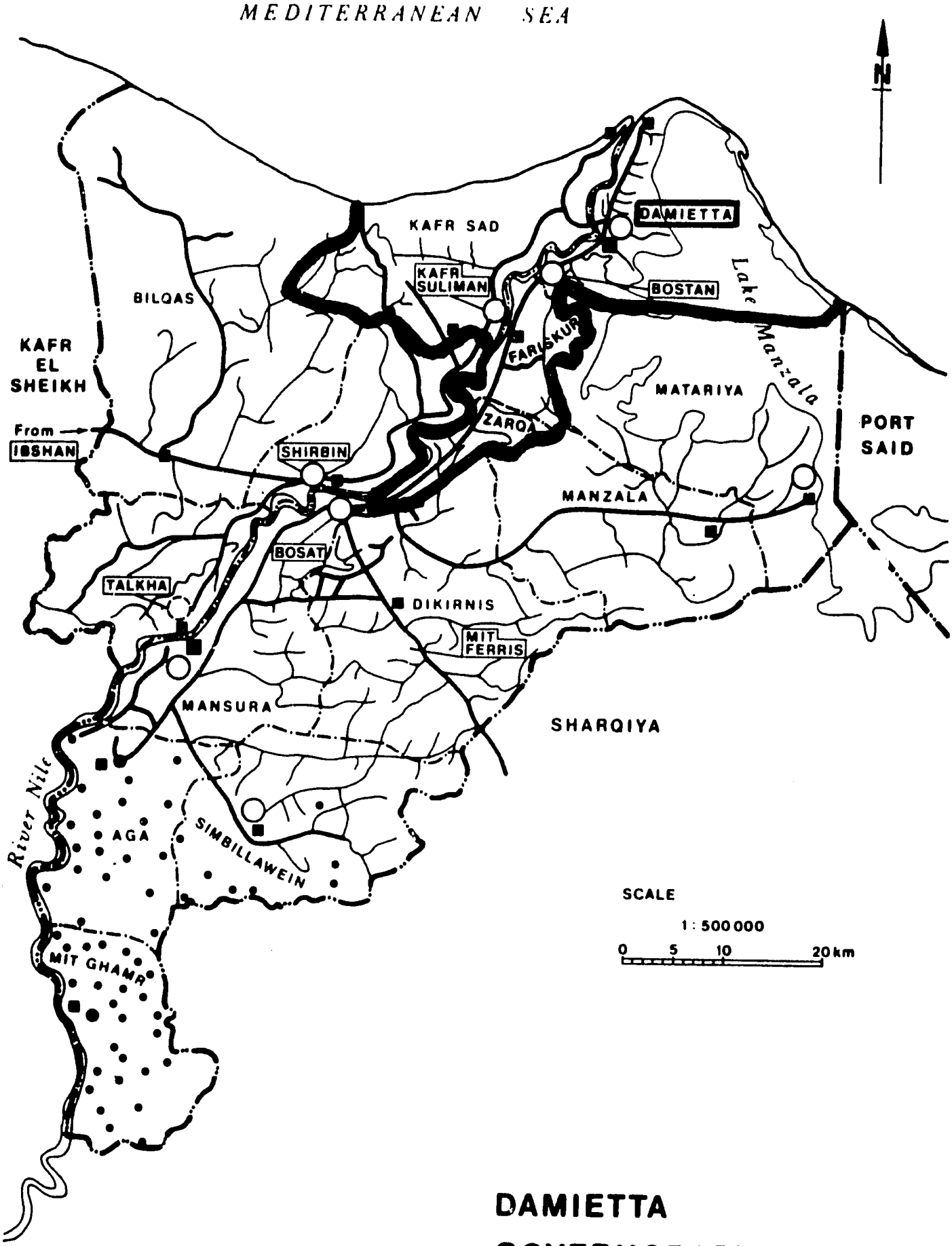
Maps Adapted from "Provincial Water Supplies Project", Binnie-Taylor/Warith, Feb. 1980

160

Governorates, Markaz and Villages Included in Assessment

Governorate	Markaz	Village
Damietta	Fariskour	El Rahamna
		Sharbas
		Dahra
		El Ghonimiya
Fayoum	Senouris	Fidimin
		Minshat Bani Etman
		Sanhour
	(Itsa)(1)	El Gharaq(2)
Gharbiya	Mahala	Bashbish(2)
	El Koubra	El Matamadiya
		Shoubra Babel
	Zifta	Nahtai
		Sandebast
		Shoubra Malas
		Tafahna El Azab
Giza	Badrashin	Saqara
		Maraziq
		Om Khenan
	El Saf	El Qababat
		Atfih
		Sol
		El Borombol
Menoufia	Ashmoun	Grais
		Talia
		Samadoun
	Qouesna	Shoubra Bakhoum
		Ibnahs
		Om Khenan
	El Bagour	Istanha
		Bahnai
		Kafr El Khadra
		Mit Afif
Qena	(Qift)(1)	El Barahma(3)
	Esna	Kiman El Mataana
		Asfoun
		El Shaghab

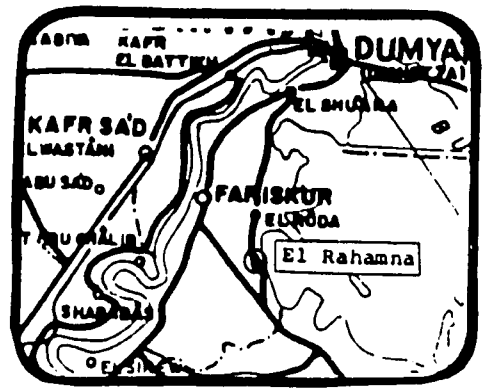
(1) Not included in the survey
(2) Included a DSF-Funded compact water treatment plant
(3) Included a UNICEF water system



DAMIETTA GOVERNORATE

Maps Adapted from "Provincial Water Supplies Project", Binnie-Taylor/Warith, Feb. 1980

VILLAGE	**Rahamna**
MARKAZ	**Fariskour**
GOVERNORATE	**Damietta**
DATE	**1 Dec 1987**



Scale: 1:1,000,000

SUMMARY

- Rahamna and its single satellite of Abu Graida have a total population of 14,700. The villagers are engaged in agriculture, fishing, and in the processing of cheese.

- There is no ground water, and all drinking water in Damietta comes from the governorate surface water network.

- The water system of Damietta is now the responsibility of a newly formed water company. So far, this has resulted in higher tariffs and delayed repairs.

- Villagers and local officials are very angry about the water and wastewater situation in general, and the performance of the company in particular.

- Rahamna is the seventh of nine villages served by the main line, and hence receives very little water three times a week at most. An estimated 76% of the villagers are served directly through house connections. Most householders have installed electric pumps directly on the lines to pump water into rooftop storage tanks. In the satellite village, people purchase their water from water vendors.

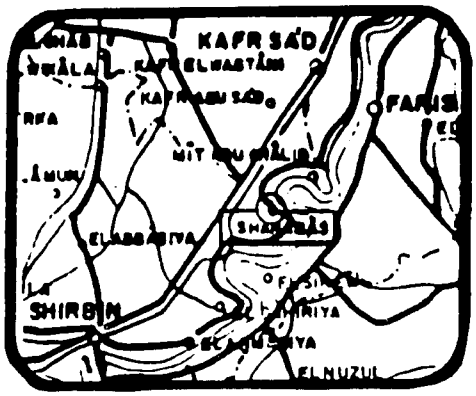
- The combination of a very old network with the vacuum caused by the lack of water delivery and the illegal private pumps creates a serious potential for polluted drinking water.

- Wastewater and excreta disposal are a major problem, with many village streets mired in raw sewage from overflowing septic vaults.

- BVS funds have been used toward installing a modern system of piped sewage. Two sewer lines have been installed and a pump station constructed. Future phases will install the pumps and construct a sewage treatment facility.

- To date the BVS funds have contributed little to improving the water or wastewater situation in Rahamna. The proposed sewerage system, when completed at a cost of over LE 700,000, should improve the wastewater situation for 25% of the village.

Village	**SHARABAS**
Markaz	**FARISKOUR**
Governorate	**DAMIETTA**
Date	**2 Dec 1987**



Scale: 1:1,000,000

SUMMARY

- Sharabas is a prosperous and attractive village on the banks of the Damietta branch of the Nile. Sharabas and its two main satellites have a total population of 29,300. There are in addition two smaller satellites and 15 settlements. The villagers are engaged in agriculture, cattle raising, cheese-making, and furniture production. One third of the men are reported to be working abroad.

- There is no ground water, and all drinking water in Damietta comes from the governorate surface water network. The village of Sharabas, until now served from the network, is switching to a system served by a water purification plant drawing from the Nile.

- The water system of Damietta is now the responsibility of a newly formed water company which is responsible for erecting the new water purification plant at Sharabas. An estimated 76% of the population is served by house connections. However, Water company records indicate a lesser percentage.

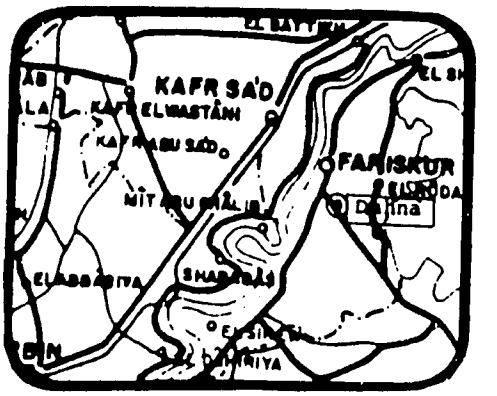
- Wastewater and excreta disposal are a major problem which is being dealt with through the construction of a large system of piped sewage serving Sharabas and seven other villages.

- In Sharabas main village and one satellite, piped sewage networks and pumping stations serving over 50% of the residents have been installed with BVS funding. The wastewater treatment facility serving Sharabas and seven other villages is scheduled for construction with major funding from BVS and a loan from the French government.

- The BVS contributions are major components of the water and wastewater system of this village. BVS funds have enabled Sharabas largely to complete its network of piped water in the main village and two larger satellites. BVS funding is also providing a system of piped sewage disposal and treatment to serve Sharabas and one satellite.

- The BVS contribution of LE 1,172,186 (ORDEV Records) is equal to 58% of the total investment of LE 2.02 million in water and wastewater. The BVS contribution to water and wastewater amounts to LE 40 per capita.

VILLAGE	**Dahrah**
MARKAZ	**Fariskour**
GOVERNORATE	**Damietta**
DATE	**2 Dec 1987**



Scale: 1:1,000,000

SUMMARY

- Dahrah and its two satellites have a total population of 6,800. The villagers are engaged in agriculture, cattle raising, and the processing of cheese.

- There is no ground water, and all drinking water in Damietta comes from the governorate surface water network.

- The water system of Damietta is now the responsibility of a newly formed water company. So far, this has resulted in higher tariffs, and delayed repairs.

- Villagers and local officials are angry about the water and wastewater situation in general, and the performance of the company in particular.

- Dahrah is the fifth of ten villages served by the main line, and hence receives very little water three times a week. Many householders have installed electric pumps directly on the lines to pump water into rooftop storage tanks. About 72% of the villagers are directly served by house connections according to the water company records.

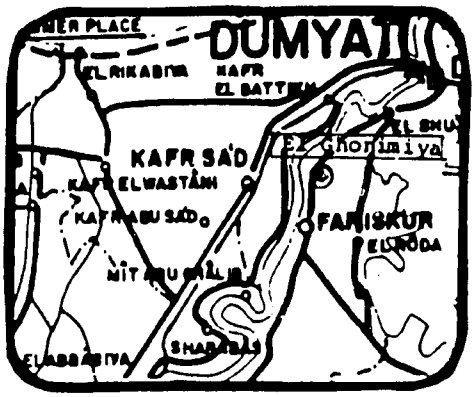
- The combination of a very old network with the vacuum caused by the lack of water delivery and the illegal private pumps creates a serious potential for polluted drinking water.

- Wastewater and excreta disposal are a major problem.

- Dahrah received LE 90,000 from BVS funds which it used to cover an agricultural canal that ran through the village. It is planned for Dahrah to contribute LE 200,000 toward replacing 3,000 meters of the main line serving the ten villages. This latter investment will amount to LE 29 per capita.

- To date the USAID funds have contributed nothing to improving the water or wastewater situation in Dahrah, although the covering of the canal probably has improved the sanitary conditions in that part of the village.

Village	**GHONAMIYA**
Markaz	**FARISKOUR**
Governorate	**DAMIETTA**
Date	**6 Dec 1987**



Scale: 1:1,000,000

SUMMARY

- Ghonamiya, its one satellite, and many small settlements have a total population of 11,700. The villagers are engaged in agriculture, cattle raising, the processing of cheese and other "cottage industries."

- All drinking water in Damietta comes from the governorate surface water network. Ghonamiya is served by the main line from Bosat station, and receives very little water three times a week under very low pressure. 82% of the population have house connections. Many houses virtually never receive water and villagers make extensive use of the public faucets.

- The combination of a very old network with the vacuum caused by the lack of water delivery and the illegal private pumps creates a serious potential for polluted drinking water.

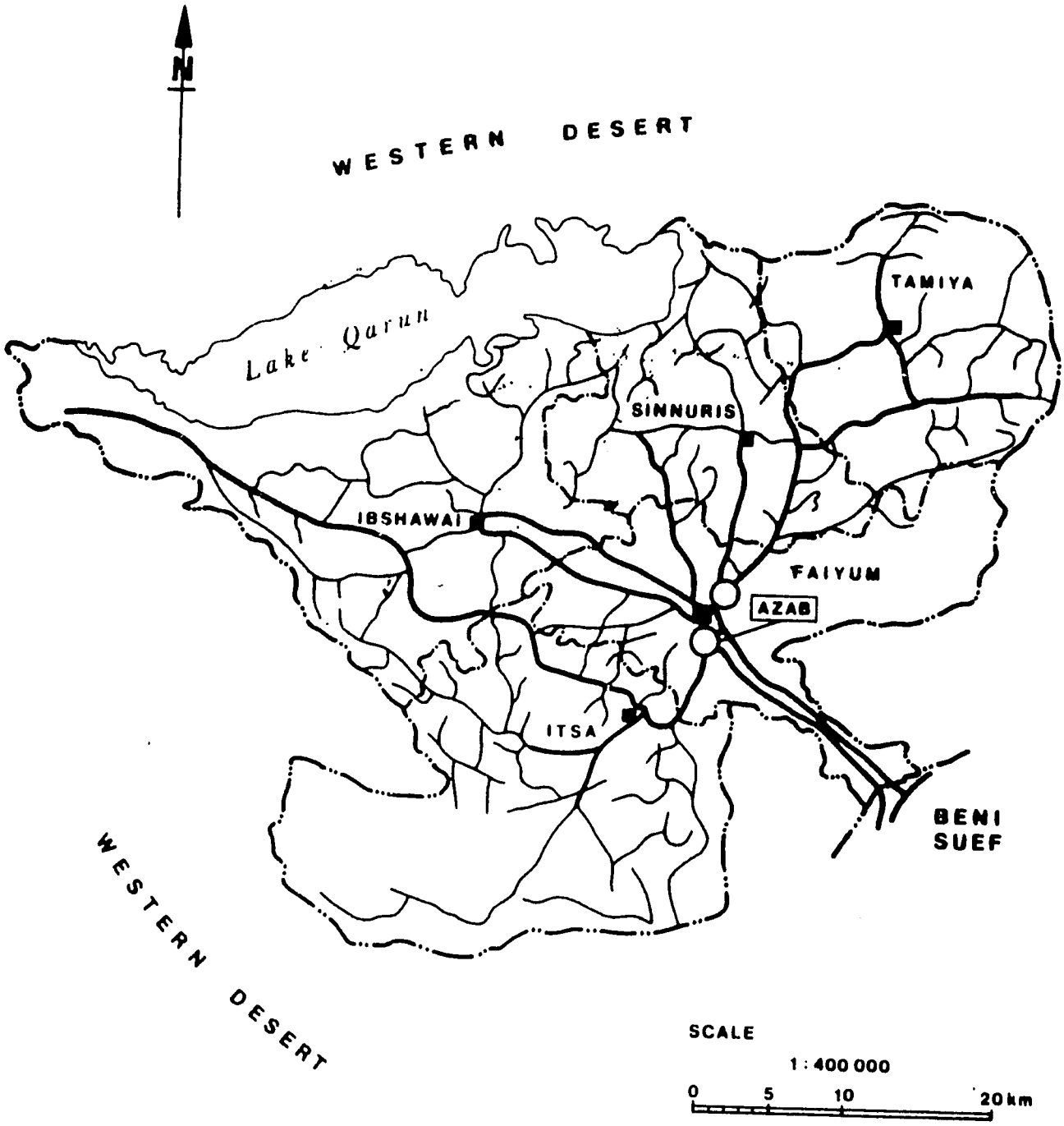
- The water system of Damietta is now the responsibility of a newly formed water company. So far, this has resulted in higher tariffs and delayed repairs. Villagers and local officials are angry about the water situation in general, and the performance of the company.

- The village is mired in mud and sewage. In some parts of the villages, raw sewage runs from the houses to the canal in open cement drains in the streets.

- Under BVS, a piped sewage network and pumping station have been installed but not yet functioning. The wastewater treatment facility serving Ghonamiya and seven other villages is scheduled for construction with major funding from BVS and a loan from the French government. The piped sewage system when completed should provide a major and desperately needed improvement in the sanitary conditions of Ghonamiya.

- BVS funds have paid for the replacement of almost half of the village water network.

- The BVS water and wastewater components costing LE 401,900 (ORDEV records) comprise an estimated 90% of the total investment in this sector, and amount to a per capita investment of LE 34.



NOTE

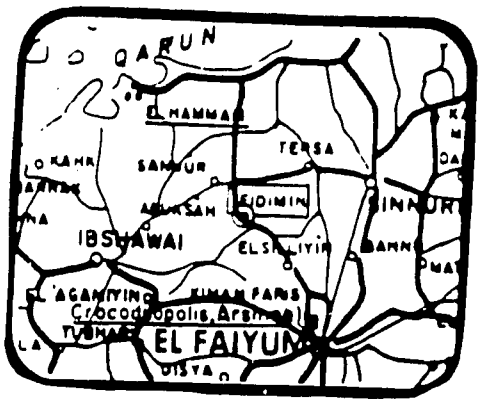
Boundaries shown represent the approximate limits of the populated areas. They are not necessarily the administrative boundaries.

Maps Adapted from "Provincial Water Supplies Project", Binnie-Taylor/Warith, Feb. 1980

FAIYUM GOVERNORATE

161

Village	**FIDIMIN**
Markez	**SENOURIS**
Governorate	**FAYOUM**
Date	**1 DEC 1987**



Scale 1:500,000

SUMMARY

* Fidimin and the two satellites have a population of 34,900 whose livelihood depends on agriculture and tourism. Fidimin is regarded as one of the wealthiest villages in Egypt.

* Piped water is supplied to Fidimin from a central water treatment works at El Azab, which is delivering an average of 63 Lcd.

* There are critical shortages of water but consumers with roof storage appear to receive an adequate supply. It is estimated 47% of the population are connected and the number of connections has increased by 335% in seven years.

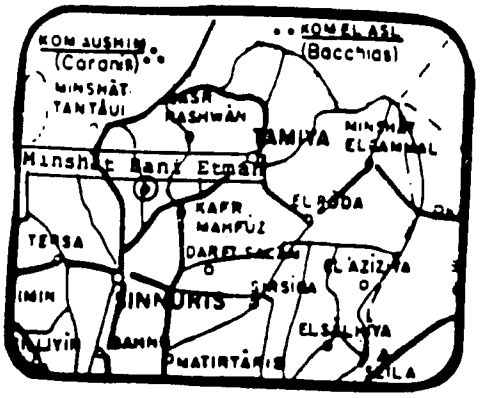
* The village has virtually no capability to repair bursts. All administration, operations and repairs are performed by the Water Utility of the Governorate.

* Sullage is disposed by a piped system installed using BVS funds. Excreta is disposed into vaults is emptied by buckets or a limited vacuum tanker service.

* The amount of revenue collected is LE 15,888 p.a.

* No BVS funds were spent on water projects by this village.

Village	**MINSHAT BANI ETMAN**
Markaz	**SENOURIS**
Governorate	**FAYOUM**
Date	**2, 6 & 7 Dec 1987**



Scale 1:500,000

SUMMARY

* Minshat Bani Etman has two satellites and includes 56 ezbahs. The total population is 29,300. The principal economy is agriculture.

* Minshat Bani Etman is supplied from a central water treatment works at Azab, which produces water for most of Fayoum.

* There is a critical shortage of water in the village and only 17% of the people are connected to the system. The number of connections has increased ten-fold over the past seven years. Some ezbahs are not connected to the piped system.

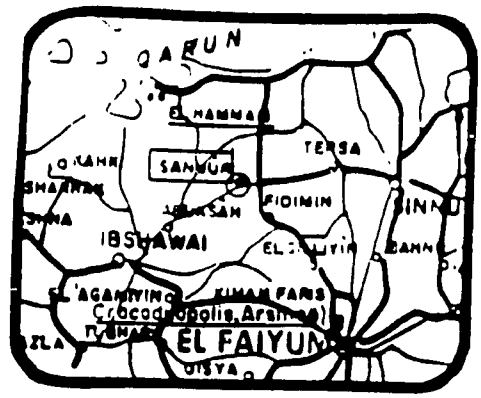
* The village has virtually no capability to repair pipeline breaks. All administration, operations and repairs are performed by the Governorate's water utility.

* Disposal of human excreta and sullage is sub-standard and unsanitary. Many houses have no toilets.

* The annual revenue collected is about LE 4,500 p.a. Some meters in the village recorded between 25 to 100 m^3 per year, equivalent to 15 to 55 lpcd.

* BVS and BAB III funds were spent on an approach main serving both Senouris and Minshat Bani Etman. Disregarding Senouris, the BVS contribution to water projects is equivalent to nearly LE 13 per person for the total village population.

Village	**SANHOUR**
Markaz	**SENOURIS**
Governorate	**FAYOUM**
Date	**6 DEC 1987**



Scale 1 : 500,000

SUMMARY

* Sanhour and two satellites have a total population of 40,600 whose livelihood depends on agriculture, tourism, fishing and carpet weaving.

* Piped water is supplied from a central water treatment works at El Azab, supplemented by a compact unit (100 m^3/h) at Weleda.

* There are critical water shortages and low water pressures, particularly in the mother village. 28% of the population are served and there has been a threefold increase in seven years of the number of connections installed.

* The village has no capability to maintain the compact unit and capability only to repair minor plumbing faults. All administration, operations and repairs are performed by the Governorates Water Department.

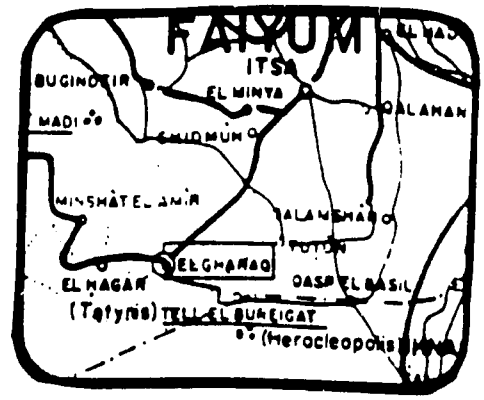
* Disposal of human excreta and sullage depends on the housing standard. Some expensive houses have a water borne waste system to cess pits, others have no toilets.

* The water sales revenue collected 1986-7 is LE 5,445.

* Most of the 7% of BVS funds allocated to water projects were spent on a mobile compact unit (5m^3/h) which is now out of service and awaiting transfer to another site. The BVS contribution towards water supply is about 1 LE per person.

170

Village	**EL GHARAQ**
Markaz	**ITSA**
Governorate	**FAYOUM**
Date	**7 DEC 1987**



Scale 1:500,000

SUMMARY

* El Gharaq and two satellites have a total population of 35,200 whose livelihood depends mainly on agriculture.

* Most of the piped water is supplied from a Graver ($100m^3/h$) compact treatment unit. A small quantity comes from the central water treatment plant at El Azab.

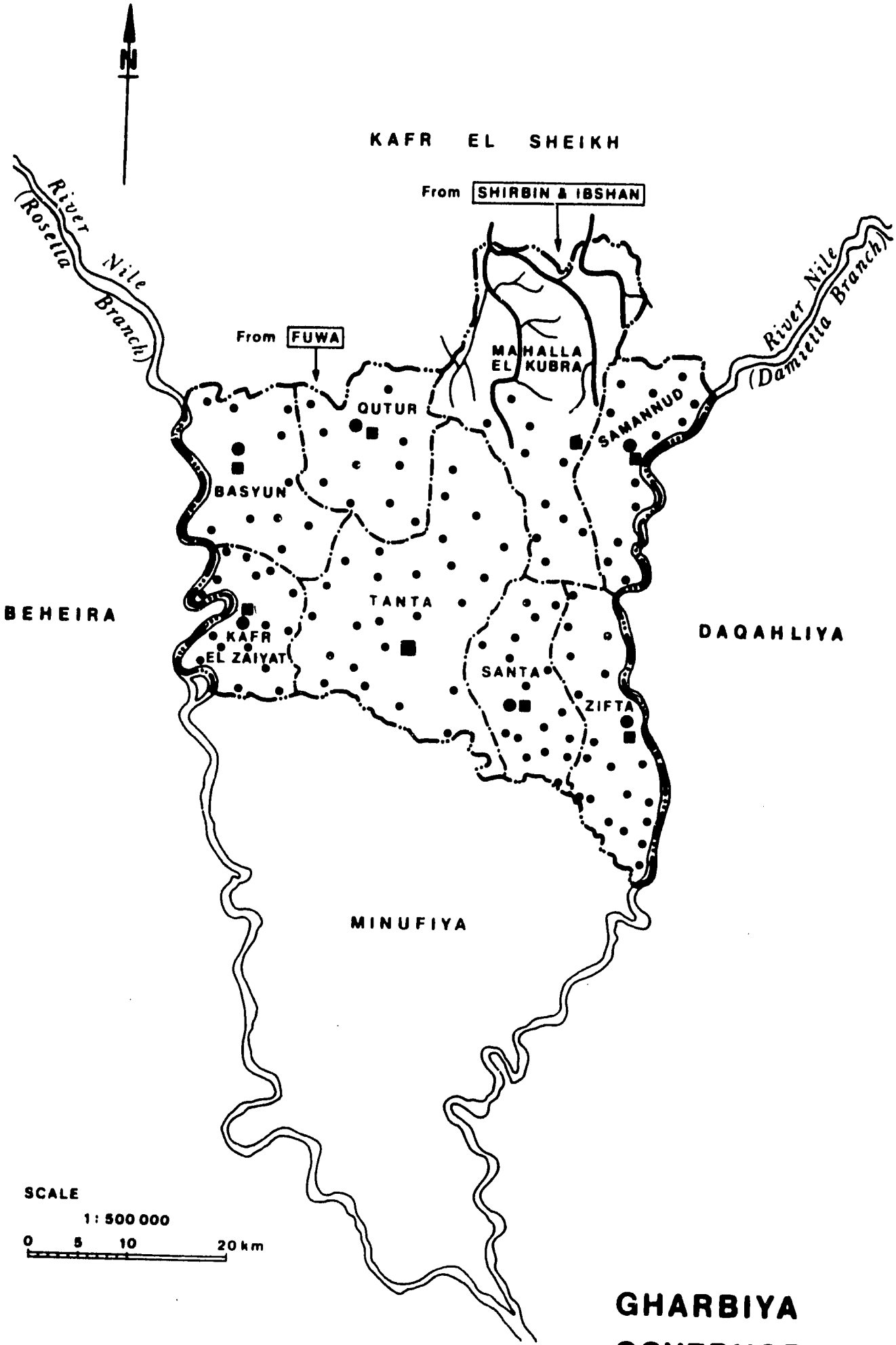
* The quantity of water supplied is inadequate for basic needs. Critical shortages are due to power failures and burst mains. Only 17% of the population are connected; yet the number of connections has increased threefold in seven years.

* The Governorate Water Utility is responsible for all administration, operations and repairs of the water supply system except minor plumbing repairs performed by the village unit.

* Human excreta is disposed in vaults emptied by either one vacuum tanker or manually by bucket. Sullage is usually disposed on unpaved streets or in canals.

* The water sales revenue collected in 1986-87 was LE 1,941 representing only 64 hours operation of the Graver unit.

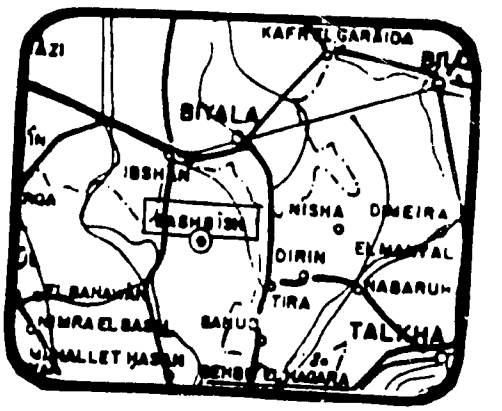
* The USAID funding to this village, is equivalent to LE 20 per person. 42% of the BVS funds are allocated to water pipelines which have not improved the supply to the village.



GHARBIYA GOVERNORATE

Maps Adapted from "Provincial Water Supplies Project", Binnie-Taylor/Warith, Feb. 1980

Village	**BASHBISH**
Markaz	**EL MAHALA EL KOUBRA**
Governorate	**EL GHARBIYA**
Date	**13 DEC 1987**



Scale 1:500,000

SUMMARY

* Bashbish and four satellites have a total population of 33,900 whose livelihood depends on agriculture.

* Most of the piped water is supplied from a Graver (200 m^3/h) compact treatment unit. A small additional quantity each day is received from Kafr El Sheik.

* The water quantity supplied is generally inadequate for needs and losses are high. Power failure and burst pipes are the causes of frequent interruptions, forcing villagers to use polluted canal water. The supply from the Graver unit is chlorinated. About 36% of the population are directly connected to the piped water system.

* The VEC operate the compact unit and repair burst pipes. They also collect water revenues.

* Human excreta is generally disposed in manually emptied vaults. One satellite has a pipe sullage system, but villagers at the others throw sullage onto unpaved streets or into canals.

* The water sales revenue collected in five months of 1987-88 is LE 5000, 30% more than 1986-87.

* The US funding contribution to this village, including the Graver unit, is equivalent to LE 27/head person. The impact of this expenditure is modest.

173

Village	**MOUTAMADIYA**
Markaz	**EL MAHALA EL KOUBRA**
Governorate	**EL GHARBIYA**
Date	**14 DEC 1987**

Scale 1:500,000

SUMMARY

* Moutamadiya and seven satellites have a total population of 52,400 whose livelihood depends on agriculture. Of interest, this village has a youth training centre.

* Ground water from deep wells in another village is the source of piped water supply. Moutamadiya has a local booster but no storage.

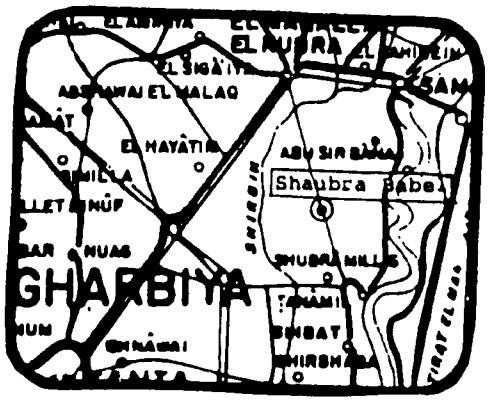
* The supply is generally inadequate and some consumers prefer to buy drinking water from a vendor supplying water from a source with lower mineral content than the piped supply. About 13% of the population are connected to the piped system. The village has capability to repair burst mains, but has very limited resources for pump or motor maintenance.

* There is no piped wastewater disposal system. Vaults are emptied by a single vacuum trailer, or manually. Sullage is disposed of on the unpaved streets or in canals.

* The water sales revenue collected was LE 12,364 in 1986-87 and LE 3873 for the first 5 months of 1987-88.

* The BVS contribution to this village is nearly LE 4 per person and represents 100% of the total allocation. The BVS investment has provided a supply where virtually none previously existed.

Village	**SHOUBRA BABEL**
Markaz	**El MAHALA EL KOUBRA**
Governorate	**El GHARBIYA**
Date	**16 DEC 1987**



Scale 1: 500,000

SUMMARY

* Shoubra Babel is a prosperous village with three satellites, and a total population of 33,100 whose livelihood depends on agriculture.

* Three independent deep well schemes supply the village.

* Power failures, breakdowns and burst mains lead to consumers suffering frequent interruptions, and water shortages. About 40% of the population are directly connected to the piped water system.

* The village staff maintain pumps but their capability is limited. Also burst mains are repaired by the village staff.

* There is no piped wastewater disposal system. Vaults are emptied by vacuum tankers or manually. Sullage is disposed on unpaved streets or into canals.

* The water sales revenue collection was LE 7479 in the 5 months of 1986-87.

* The BVS contribution to this village is nearly LE 6.00 per person and represents 90% of the total allocation. In addition BAB III investment accounts for a further LE 5 per head.

175

Village	**NAHTAI**
Markaz	**ZIFTA**
Governorate	**El GHARBIYA**
Date	**JAN 1988**

Scale 1:500,000

SUMMARY

* Nahtai and its ten satellites have a population of 36,700. The economy is mainly agriculture.

* There are three existing independent water systems serving the entire village, and the satellite of another village.

* About 17% of the total population are connected to the public system and there are sixteen public standpipes.

* The VEC have limited resources to operate the water system, and are supposed to be self-sufficient regarding repairs and maintenance.

* There is no sewerage system. Typically toilet waste is deposited in vaults which are emptied manually or by vacuum tanker.

* Revenues collected from water sales in 1986 - 87 is LE 5235.

* 86% of the total BVS funds have been allocated to water projects and USAID funded projects account for most of the recent water system extensions. The total USAID investment is equivalent to nearly LE 9 per person and the village officials estimate villagers contributed 33% towards pipe laying costs.

Village	**SANDEBAST**
Markaz	**ZIFTA**
Governorate	**EL GHARBIYA**
Date	**10 JAN 88**

Scale 1:500,000

SUMMARY

* Sandebast and its two satellites have a total population of 26,800. The economy is based mainly on industry and commerce.

* There are two independent deep well water systems supplying the mother village and the two satellites.

* About 44% of the population are connected to the public system and there are 12 public standpipes. One or two ezbah have no mains supply.

* The VEC unit have limited resources to maintain and operate the pumps and distribution system.

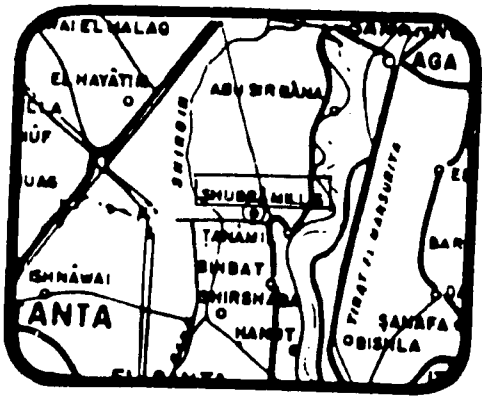
* Human excreta is typically disposed in vaults and sullage thrown on to the streets or in canals. The water table is high in this area, causing damage to some buildings.

* The revenue collected in 1986 - 87 was LE 11,200.

* USAID funded projects are the principal component of the recent extensions. These projects have lead to the number of connections increasing from 773 to 2047 between 1982-87.

* 68% of the BVS funds have been invested in water projects and the total USAID investment is equivalent to LE 5 per person.

Village	**SHOUBRA MALAS**
Markaz	**ZIFTA**
Governorate	**EL GHARBIYA**
Date	**11 JAN 88**



Scale 1:500,000

SUMMARY

* Shoubra Malas and its four satellites have a total population of 31,500. The economy is principally the manufacture of jute and the production of vegetable oil.

* There are three independent water systems supplying the whole village. One serving the mother village and the other two each serving two satellites

* About 25% of the population are connected to the public system and there are thirteen public standpipes.

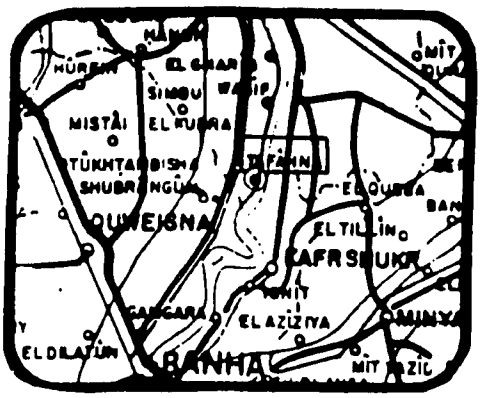
* The VEC unit are well organized and the supply system is well managed.

* There is a piped sullage water system in the mother village. Vaults for collecting toilet waste are emptied by vacuum tankers.

* Revenue collected from water sales in 1986-87 was LE 5426.

* 98% of the BVS funds were allocated to water projects and the funds have also been well utilized by enterprising village leaders. USAID funds amount to an equivalent of LE 8.4 per person.

Village	**TAFAHNA EL AZAB**
Markaz	**ZIFTA**
Governorate	**El GHARBIYA**
Date	**13 JAN 1987**



Scale 1:500,000

SUMMARY

* Tafahna El Azab and its four satellites have a total population of 25,200. The economy is mainly citrus fruit farming with carpet weaving and rope making providing some employment.

* There are three existing water supply systems, but one is semi-retired because the high mineral content of the well water is unacceptable to the consumers.

* About 24% of the population are connected to the public supply and there are seven public standpipes. The system has no spare capacity to supply new consumers.

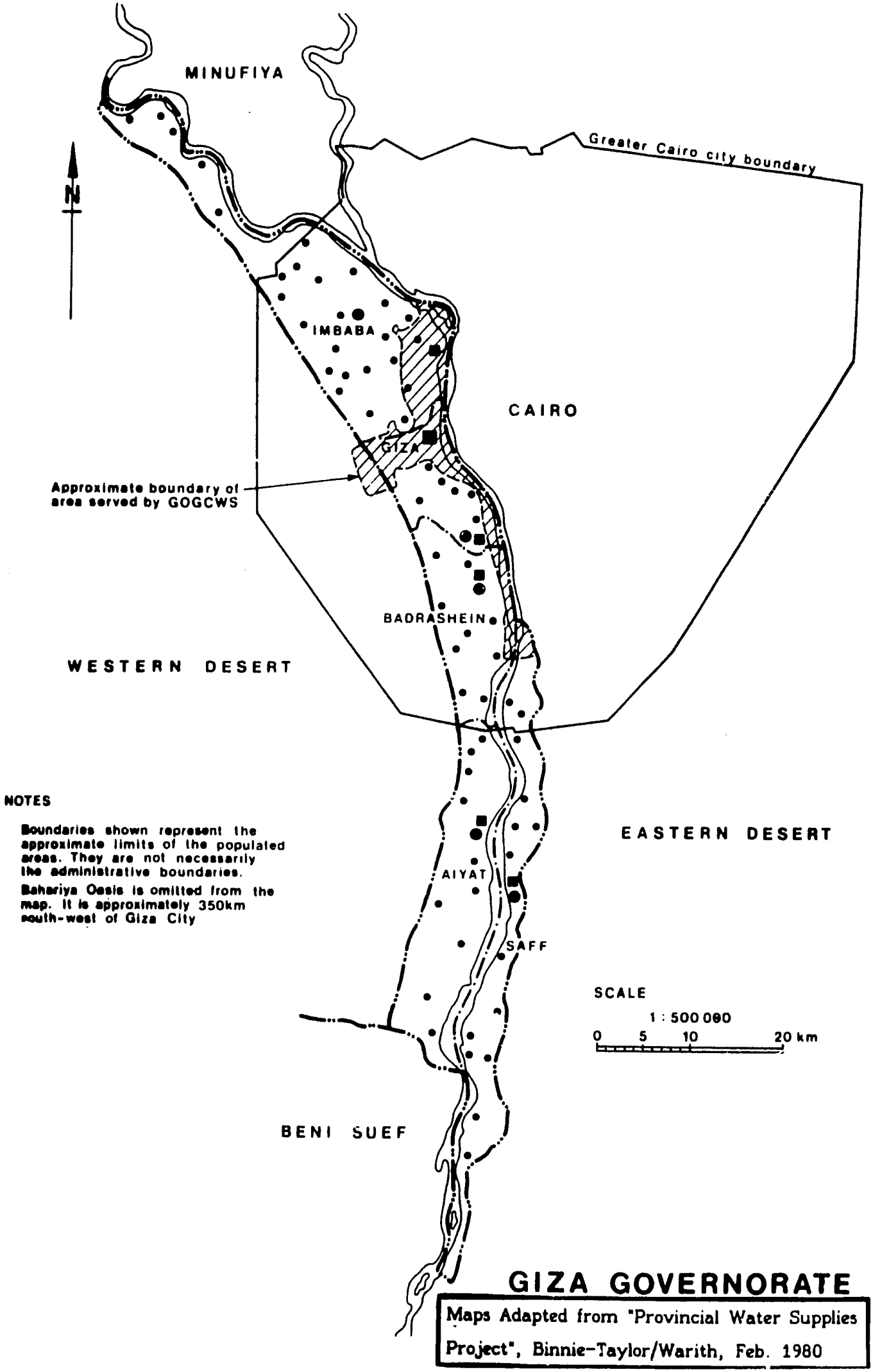
* The VEC unit operate the water pumps and repair pipe breaks.

* Human excreta is typically disposed in vaults and sullage thrown onto the streets. A high water table is said to cause structural failure of buildings.

* Revenue collected from water sales in 1986-87 was LE 7,112.

* Only 9% of the BVS funds were allocated to water projects and USAID funds amount to less than LE 1.00 per person.

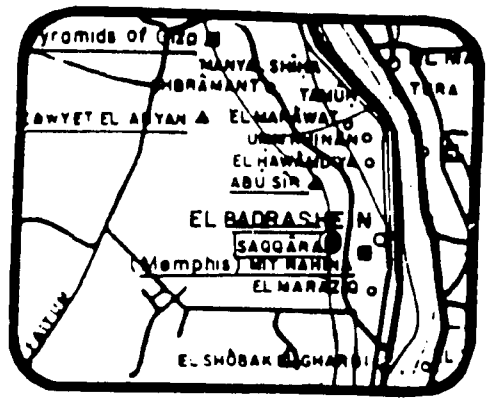
174



GIZA GOVERNORATE

Maps Adapted from "Provincial Water Supplies Project", Binnie-Taylor/Warith, Feb. 1980

Village	**SAQARA**
Markaz	**BADRASHIN**
Governorate	**GIZA**
Date	**13 DEC 1987**



Scale: 1: 1,000,000

SUMMARY

- Saqara and its single satellite of Abou Sir have a population of 34,800 who are mostly engaged in commercial agriculture, with a heavy supplemental emphasis on trade and tourism.

- The principal source of piped water supply is from deep wells, producing water of acceptable quality. The pumping capacity of the piped water system is excessive and the storage capacity is grossly insufficient. Water service is quite reliable with few interruptions reported by either operators or villagers. At least 25% of the villagers are served by direct house connections.

- There are less than 6 public standpipes in the villages to serve the portion of the population without house connections. Handpumps on shallow wells provide a ready alternate source of water. Most people still prefer to use the canal water for washing clothes and dishes.

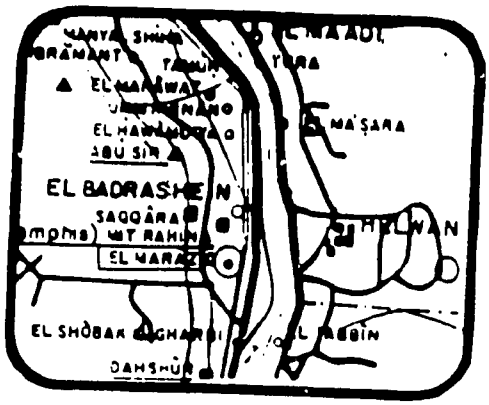
- There is no piped wastewater collection system, and septage from household vaults is discharged untreated to a reportedly distant agricultural drain. There is insufficient local capacity for the pumping out of private septic vaults.

- The service charge for water is only 25 pt per house per month which yields an annual revenue of LE 2,300 which is remitted to the central government. The village council collects LE 10-LE 20 from each house which is put in the Village Development Fund to cover village expenses in the upkeep of the water system.

- The USAID funds had a significant impact on the water system of Saqara. The BVS-funded components comprise about one-third of the total pipe network and two-thirds of the recently constructed network. However Saqara has received a considerable investment in water from the GOE budget (reportedly over LE 400,000).

- Saqara spent LE 187,000 of its BVS funds on water projects. This represents a capital investment of LE 5.37 per person.

Village	**MARAZIQ**
Markaz	**BADRASHIN**
Governorate	**GIZA**
Date	**14 DEC 1987**



Scale: 1: 1,000,000

SUMMARY

- Maraziq and its 4 satellites have a population of 41,600 who are mostly engaged in commercial agriculture, especially date palms.

- The principal source of piped water supply is from deep wells. The source serving most of the main village produces water of unacceptable quality, being high in salt content. The pumping capacity of the piped water system is excessive and the storage capacity is grossly insufficient. Water service is quite reliable with few interruptions reported by either operators or villagers. 30% of the villagers are directly served by house connections.

- Although there were 14 pubic standpipes in the villages, nearly all are now closed; the population without house connections uses water from neighbors and shallow wells.

- There is no piped wastewater collection system, and septage from household vaults is discharged untreated to a reportedly distant agricultural drain. There is insufficient local capacity for the pumping out of private septic vaults.

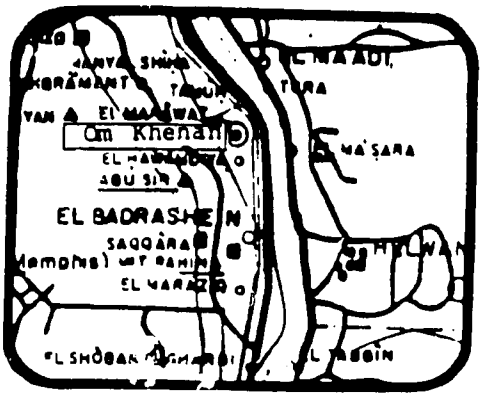
- Handpumps on shallow wells provide a ready alternate source of water. Most people still prefer to use the canal water for washing clothes and dishes.

- The service charge for water is only 25 pt per house per month which yields an annual revenue of LE 6,000 which is remitted to the central government. The village council collects a matching amount from each house which is put in the Village Development Fund to cover village expenses in the upkeep of the water system.

- The USAID funds had a significant impact on the water system of Maraziq. The BVS-funded components comprise over 80% of the total pipe network and house connections, plus one well and other items.

- Maraziq spent LE 193,600 of its BVS and LD II funds on water projects. This represents a capital investment of LE 4.65 per person.

Village	**OM KHENAN**
Markaz	**BADRASHIN**
Governorate	**GIZA**
Date	**13 DEC 1987**



Scale: 1: 1,000,000

SUMMARY

- Om Khenan and its single satellite of Shaikh Othman have a population of 18,954. The village is essentially a suburban village in the shadow of the town of Al Hawamdiya, on the outskirts of Cairo.

- The principal source of piped water supply is from deep wells, producing water of acceptable quality. The storage capacity is insufficient. Water service is quite reliable with few interruptions reported by either operators or villagers.

- House connections have doubled during the past seven years to the point that at least 78% of the houses are directly connected. There are no longer any public standpipes.

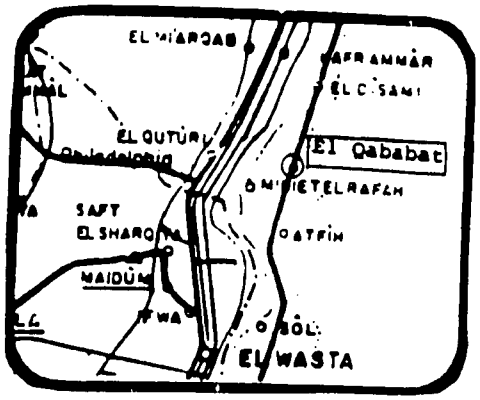
- There is no piped wastewater collection system. The village pumping truck pumps out the houses for a modest fee, and contributes an estimated "profit" from this operation to the Village Development Fund.

- Om Khenan has set up a successful solution to the problem of sullage disposal using 10 public sullage vaults which are pumped out daily.

- The USAID funds had a significant although not an overwhelming impact on the water system of Om Khenan since the village has been successful in mobilizing resources from other sources as well. The BVS-funded components comprise over one-third of the total pipe network, one of its four functioning wells and submersible pumps. The BVS funds also allowed the successful solution of the village's sullage disposal problem.

- Om Khenan spent LE 103,000 of its BVS funds on water projects. This represents a capital investment of LE 5.43 per person.

Village	**EL QABABAT**
Markaz	**EL SAF**
Governorate	**GIZA**
Date	**20 DEC 1987**



Scale: 1: 1,000,000

SUMMARY

- El Qababat and its 5 satellites of have a population of 66,700. El Qababat is a wealthy agricultural village on the edge of the desert. Its people are very actively involved in many private commercial activities involving land reclamation, egg production, and brick making.

- The principal source of piped water supply is from deep wells, producing water of acceptable quality. The storage capacity is insufficient. Water service is quite reliable with few interruptions reported by either operators or villagers. However the system functions only eight hours per day. 34% of the villagers are served by house connections.

- There is no piped wastewater collection system. However the Markaz pump trucks provide adequate service. The contents are disposed at the land reclamation project.

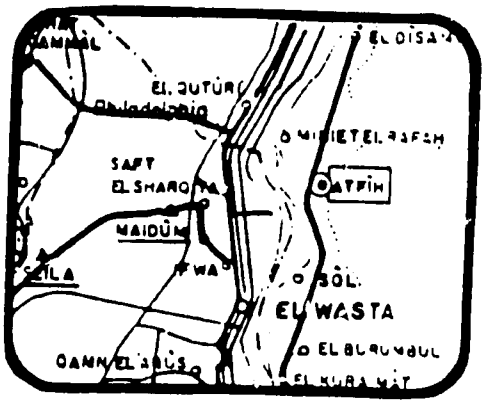
- The USAID funds had a significant impact on the water system of El Qababat despite the fact that the village mobilized substantial capital investments from the GOE budget and through local contributions. The AID funds of LE 413,000 represent slightly over 70% of the recent investment in the water system.

- The BVS-funded components comprise almost half of the total pipe network, plus one new well, submersible pumps, and other components.

- The USAID-funded investment in the water system represents a per capita investment of LE 6.19.

184

Village	**ATFIH**
Markaz	**EL SAF**
Governorate	**GIZA**
Date	**23 DEC 1987**



Scale: 1: 1,000,000

SUMMARY

- Atfih is a medium sized village (population 28,200) of middle Egypt consisting of the main village and 4 satellites. It is an agricultural village with a specialty in sugar cane (1,500 feddans) plus substantial fields of organges and grapes. Villagers are also involved in agricultural commerce regarding sugar cane; and there are a number of carpet weaving (kelim) operations. This village is scheduled to become a Markaz town.

- The principal source of piped water supply is from deep wells, producing water of acceptable quality. The pumping capacity at the Atfih station is excessive, and the storage capacity is insufficient. Water service is quite reliable with few interruptions reported by either operators or villagers. 29% of the villagers are directly served with piped water through house connections.

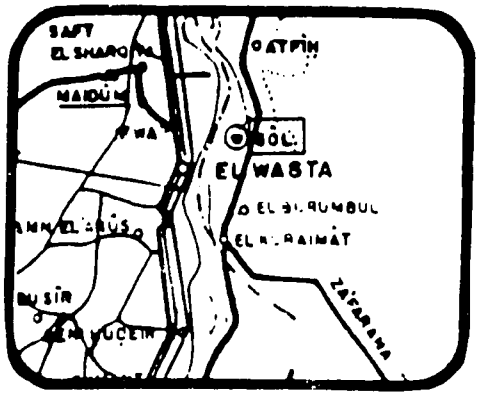
- There is no piped wastewater collection system. Residents dispose of sullage in the streets, canals, or agricultural land.

- Many residents have pit latrines rather than septic vaults. These are a problem in that they must be dug out by hand once or twice a year at a reported cost of LE 100 per operation.

- The USAID funds had a significant impact on the water system of Atfih, providing approximately 17 km of its piped network. This is estimated to be well over half of the total.

- The AID funds of LE 215,200 represent over 80% of the reported recent investment. The USAID-funded investment in the water system represents a per capita investment of LE 7.63.

Village	**SOL**
Markaz	**EL SAF**
Governorate	**GIZA**
Date	**21 DEC 1987**



Scale: 1: 1,000,000

SUMMARY

- Sol and its 3 satellites of have a population of 32,100. It is a fairly large agricultural village specializing in fruits and date palms. They also have a date processing industry—dried dates and containers made from palm fronds. There are many egg-producing, cattle raising, and chicken producing operations. The village also has a minor auto repair industry serving the surrounding area.

- The principal source of piped water supply is from deep wells, producing water of acceptable quality. The storage capacity is insufficient. Water service is quite reliable with few interruptions reported by either operators or villagers. The piped system directly serves 41% of the villagers through house connections.

- The pumping capacity at the Sol station is many times that needed for the village. The reason for this is that the station had once been planned to serve additional villages, but these plans were abandonned.

- There is no piped wastewater collection system. Residents dispose of sullage in the streets, canals, or agricultural land.

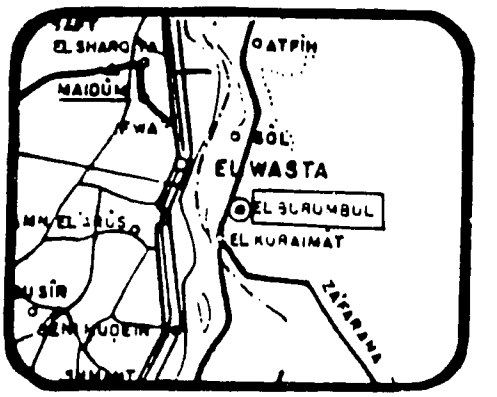
- Most residents have pit latrines rather than septic vaults. These are a problem in that they must be dug out by hand once or twice a year at a cost of LE 60 per operation.

- The USAID funds had a significant impact on the water system of Sol, providing 23 km of its piped network, which comprises about two-thirds of the total network.

- The AID funds of LE 294,481 represent 90% of the reported recent investment.

- The USAID funds represents a per capita investment of LE 9.17 in the water system.

Village	**BOROMBOL**
Markaz	**EL SAF**
Governorate	**GIZA**
Date	**29 DEC 1987**



Scale 1 : 1,500,000

SUMMARY

- Borombol and its three satellites have a population of 31,800. Most villagers work in agriculture, however many reportedly work in construction trades with frequent stays of over five days a week in other parts of the country.

- The principal source of piped water supply is from deep wells, producing water of unacceptable quality. The storage capacity is insufficient. Water service is relatively reliable with few interruptions reported by either operators or villagers. However the station operates for only six to eight hours per day. The piped system serves 20% of the population through house connections.

- There is no piped wastewater collection system. Residents dispose of sullage in the streets, canals, or agricultural land.

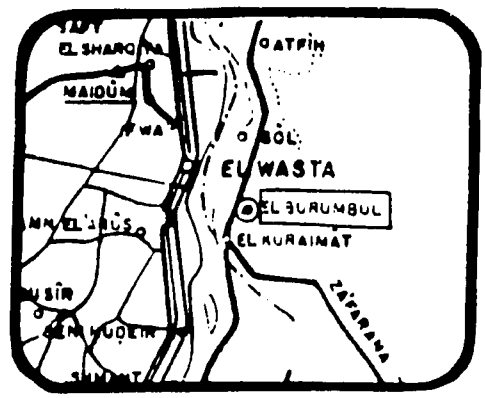
- Most residents have pit latrines or septic vaults. The contents of these are pumped out and disposed in the nearby desert.

- The USAID funds have provided an important but not major share of the currently operating water facilities of Borombol, pro- viding 9 km of its 21 km piped network, and one of its six operating pumps motors/engines.

- The USAID funds of LE 165,500 represent 65% of the reported recent investment.

- The USAID-funded investment in the water system represents a per capita investment of LE 5.18.

Village	**BOROMBOL**
Markaz	**EL SAF**
Governorate	**GIZA**
Date	**29 DEC 1987**



Scale 1 : 1,500,000

SUMMARY

- Borombol and its three satellites have a population of 31,800. Most villagers work in agriculture, however many reportedly work in construction trades with frequent stays of over five days a week in other parts of the country.

- The principal source of piped water supply is from deep wells, producing water of unacceptable quality. The storage capacity is insufficient. Water service is relatively reliable with few interruptions reported by either operators or villagers. however the station operates for only six to eight hours per day. The piped system serves 20% of the population through house connections.

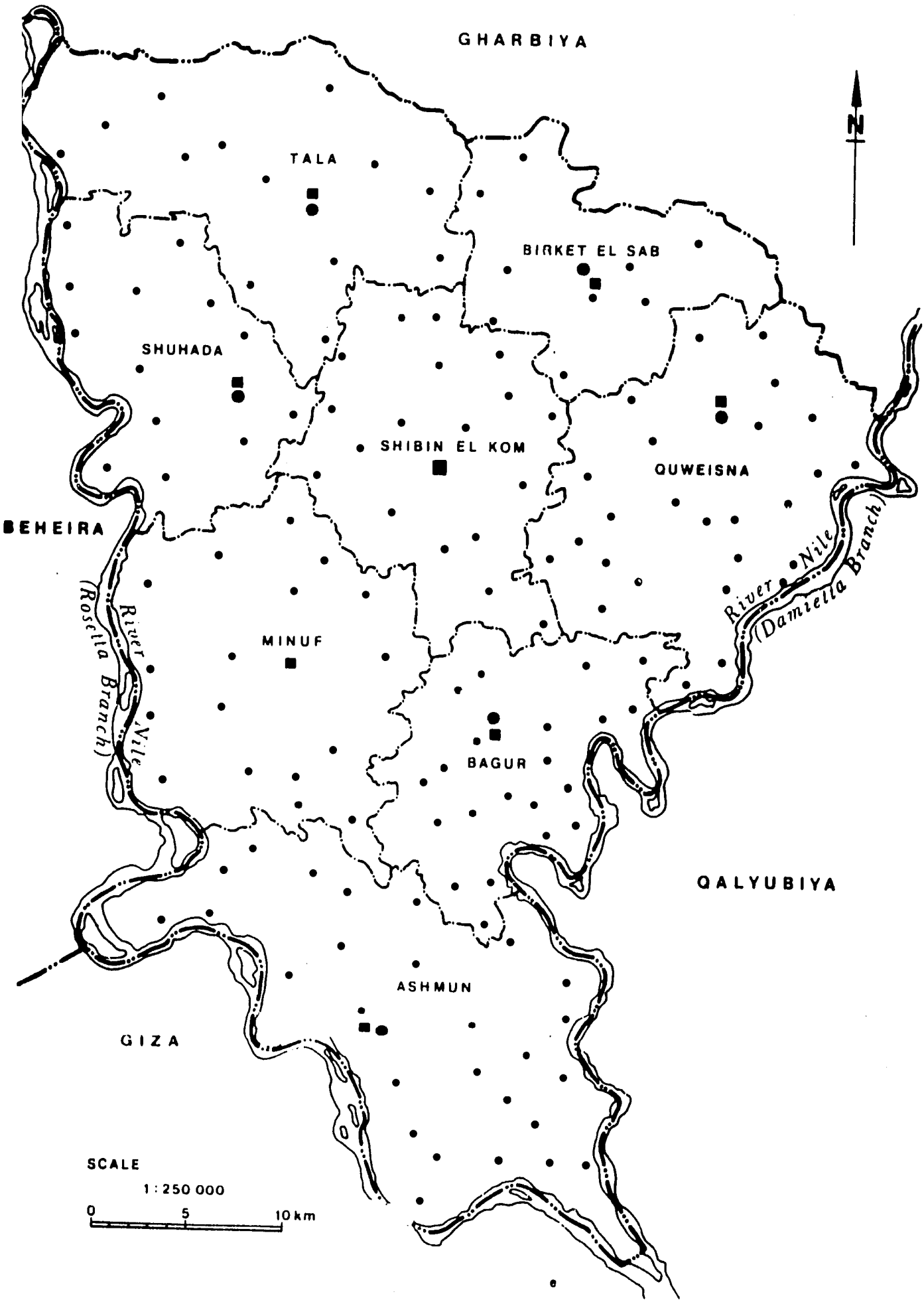
- There is no piped wastewater collection system. Residents dispose of sullage in the streets, canals, or agricultural land.

- Most residents have pit latrines or septic vaults. The contents of these are pumped out and disposed in the nearby desert.

- The USAID funds have provided an important but not major share of the currently operating water facilities of Borombol, pro- viding 9 km of its 21 km piped network, and one of its six operating pumps motors/engines.

- The USAID funds of LE 165,500 represent 65% of the reported recent investment.

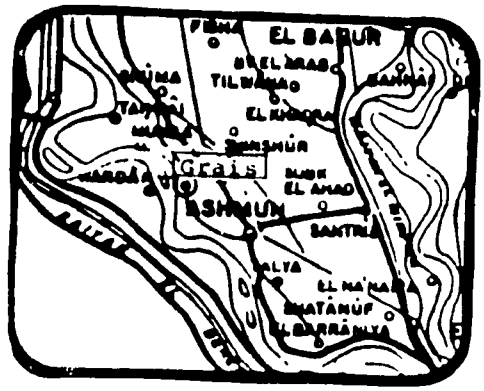
- The USAID-funded investment in the water system represents a per capita investment of LE 5.18.



MINUFIYA GOVERNORATE

Maps Adapted from "Provincial Water Supplies Project", Binnie-Taylor/Warith, Feb. 1980

Village	**GRAIS**
Markaz	**ASHMOUN**
Governorate	**MENOUFIA**
Date	**22 NOV 1987**



Scale 1: 1,000,000

SUMMARY

- Grais and its 3 satellites have a population of 29,800 (1986 census) who are mostly engaged in agriculture.

- The principal source of piped water supply is from deep wells which provide water of adequate quality except for relatively high levels of iron and manganese. The pumping capacity of the piped water system exceeds the village's needs. Storage is inadequate and there are not nearly enough public faucets to meet the needs of those not directly connected to the system. Only 15% are directly served by house connections.

- Power outages and equipment breakdowns, coupled with the extremely limited amount of storage, cause unacceptably frequent and long periods without water.

- There is no piped wastewater collection system and septage from household vaults is discharged untreated to local agricultural canals. Collection from vaults is unsatisfactory.

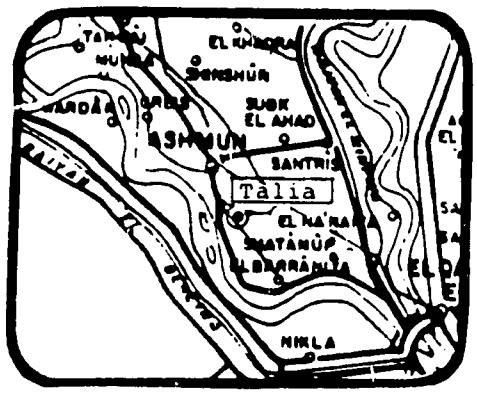
- The amount of revenue collected from water customers barely covers the cost of meter installation, reading, and revenue collection, and the entire amount is sent to the central government.

- The villagers' principal complaint is the length of periods without water supply. Handpumps on shallow wells provide an alternate source of water, but some of this water is bacterially contaminated.

- Grais spent 80% of its BVS funds on water projects, which account for about two-thirds of the current system facilities.

- Total BVS and LD II funds spent on water (LE 156,000) represents a capital investment of only LE 5.24 per person.

Village	**TALIA**
Markaz	**ASHMOUN**
Governorate	**MENOUFIA**
Date	**23 NOV 1987**



Scale: 1: 1,000,000

SUMMARY

- Talia and its 6 satellites have a population of 55,244 who are mostly engaged in agriculture.

- The principal source of water is from deep wells with water of adequate quality except for high levels of iron and manganese Storage is marginally adequate for the population served. 25% of the villagers are directly served with house connections. Consumers without house connections are not served by public faucets. These people rely on shallow handpumps, canals, or water from their neighbors who are connected.

- There is no piped wastewater system and collection of septage from house tanks is inadequate. Septage is discharged into local canals.

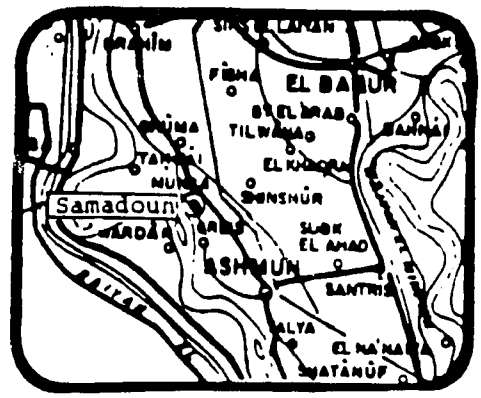
- Revenue generated by monthly user charges is a significant proportion of operating costs. It is sent to the central government.

- Beneficiaries are largely satisfied with water service and quality. Those without connections complain of the shutting down of the public faucets.

- Talia spent 90% of its BVS funds on water projects. This accounts for half of the current system facilities and 90% of recent capital investments in water.

- The total BVS and LD II funds spent on water to date amount to LE 361,304, which represents only LE 6.49 per person in Talia.

Village	**SAMADOUN**
Markaz	**ASHMOUN**
Governorate	**MENOUFIA**
Date	**25 NOV 1987**



Scale: 1: 1,000,000

SUMMARY

- Samadoun and its 2 satellites have a population of 34,200 who are mostly engaged in agriculture.

- The principal source of piped water supply is from deep wells which provide water of adequate quality except for relatively high levels of iron and manganese. The pumping capacity of the piped water system is excessive. There are not nearly enough public standpipes to meet the needs of the 81% of the population not directly connected to the system.

- Water service is quite reliable with few interruptions reported by either operators or villagers.

- There is no piped wastewater collection system and septage from household vaults is discharged untreated to local agricultural canals. Collection from vaults is unsatisfactory.

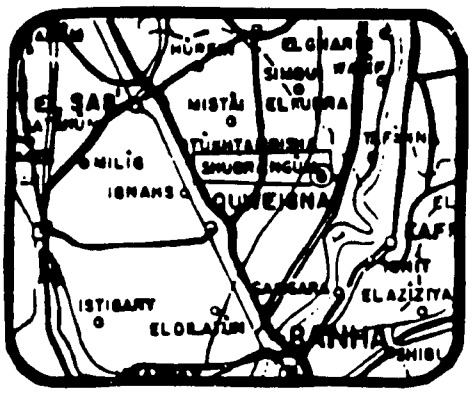
- The amount of revenue collected from water customers barely covers the cost of meter installation, reading, and revenue collection, and the entire amount is sent to the central government.

- Handpumps on shallow wells provide a ready alternate source of water. Most people still prefer to use the canal water for washing clothes and dishes.

- The BVS-funded components comprise about 50% of the total investment in the village water system during the past dacade. AID-funded components are central to the system, and comprise half of the current pumps and pipe network.

- The USAID portion of the water capital investment of LE 146,000 represents only LE 4.26 per person.

Village	**SHOUBRA BAKHOUM**
Markaz	**Qouesna**
Governorate	**MENOUFIA**
Date	**22 NOV 1987**



Scale 1:500,000

SUMMARY

* Shoubra Bakhoum and its satellities have a population of about 17,500 whose livelihood depends on agriculture.

* About 26 percent of the total population is connected to the piped water system Pump capacity appears to exceed needs by a considerable amount but storage is grossly inadequate, both in terms of low height and small capacity.

* There is no pump or motor maintenance or repair capability within the village. Water pipe breaks are repaired by village unit staff.

* There is no piped wastewater system. Sullage is thrown on to streets or into canals and excreta is disposed in vaults. Three private tankers are available for emptying the vaults.

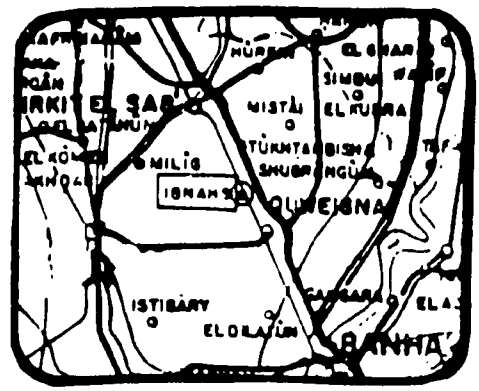
* The total annual revenue collected from 1986-87 water sales was only LE 5,017.

* Water users are generally satisfied with the service but think more valves would minimise the number of consumers affected by pipeline breaks.

* Shoubra Bakhoum spent 20% of its allocated BVS funds on water projects.

* The USAID expenditure on water projects represents slightly more than LE 2.00 per person in the village.

Village	**IBNAHS**
Markaz	**QOUESNA**
Governorate	**MENOUFIA**
Date	**23 NOV 1987**



Scale 1:500,000

SUMMARY

* Ibnahs and its six satellities have a total population of 45,800 whose livelihood is mainly agriculture.

* There are four independent water supply systems serving Ibnahs, and two satellites of a separate village. Pressures for all four systems are low and interruptions frequent, sometimes lasting 24 hours. Total storage for the four systems is 160 m^3.

* An estimated 57% of the total village population have piped water connections.

* The village has no workshop; a motorbike for transport and only a few basic handtools. With only one vehicle to serve ten villages, the Markaz has difficulty supplying fuel to the pump station.

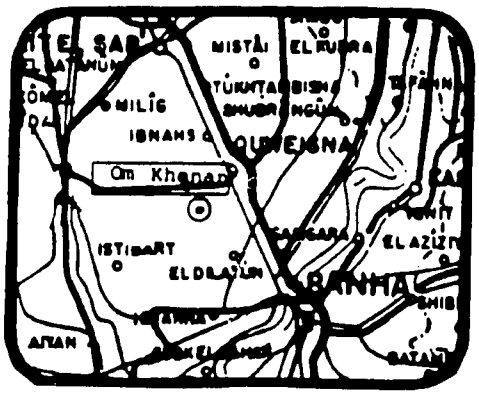
* There is no piped wastewater system; houses have individual vaults for excreta disposal. Sullage is thrown on unpaved streets or into canals.

* Revenues over a five year period average only LE 2,400 per year.

* 63% of the total BVS investment was spent on water projects in this village. The total USAID investment is equivalent to less than LE 4 per villager.

194

Village	**OM KHENAN**
Markaz	**QOUESNA**
Governorate	**MENOUFIA**
Date	**25 NOV 1987**



Scale 1:500,000

SUMMARY

* Om Khenan and its nine satellites have a population of 36,700 whose livelihood depends on agriculture

* Three interconnected pump stations serve about 45% of the total population who have connections. Pressures are very low and the supply is frequently interrupted. Storage capacity is only 25 m^3 for the entire village.

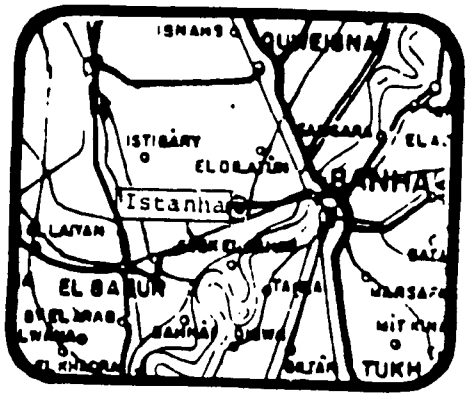
* The village has a small but very orderly workshop used for maintaining small motors and minor repairs to larger units. Only limited tools and spares are available to the mechanics. The village unit has no transport and it is difficulty for the Markaz to supply fuel to ten villages with only one vehicle.

* There is no piped wastewater system; houses have individual vaults for excreta disposal. Sullage is thrown on the unpaved streets or into canals.

* The average revenues over 7 years collected for water sales amount to LE 1,150 per year.

* 28% of the total BVS expenditure has been spent on water projects. The total USAID investment represents less than LE 2 per villager.

Village	**ISTANHA**
Markaz	**BAGOUR**
Governorate	**MENOUFIA**
Date	**3 JAN 1988**



Scale: 1:1,000,000

SUMMARY

- Istanha and its 4 satellites have a total population of 27,900, who are largely engaged in agriculture.

- The principal source of piped water supply is from deep wells which provide water of adequate quality from two of the three stations. The storage capacity is insufficient. 18% of the villagers have house connections.

- The water service is quite reliable in the main village, with interruptions in service occuring once every week or ten days, and these being repaired the same day. In certain other areas of the village, service interruption is as common as water delivery, due to frequent bursts in the mains.

- There is no piped wastewater collection system and septage from household vaults is discharged untreated to local agricultural canals. Collection from vaults is unsatisfactory.

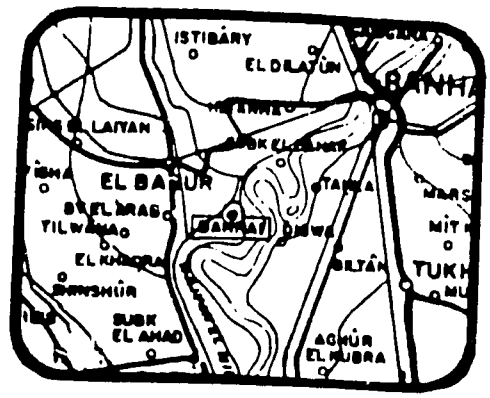
- Sullage disposal is a serious problem and causes pollution in the center of the village where it is disposed in a small canal. To address this the village sends around a tractor and tank to pick up sullage. Some houses have sullage storage on the roof which they empty into the village tractor/tank.

- Handpumps on shallow wells provide a ready alternate source of water. Most people still prefer to use the canal water for washing clothes and dishes.

- The BVS project has had a significant impact upon the water system of Istanha. The BVS project has provided almost half of the current pipe network and house connections, one out of the three wells, half the pump engines and motors, plus various other components.

- Istanha spent 86% of its BVS allocation on water projects. The USAID contribution amounts to LE 5.07 per capita.

Village	**Bahnay**
Markaz	**BAGOUR**
Governorate	**MENOUFIA**
Date	**6 & 10 JAN 1988**

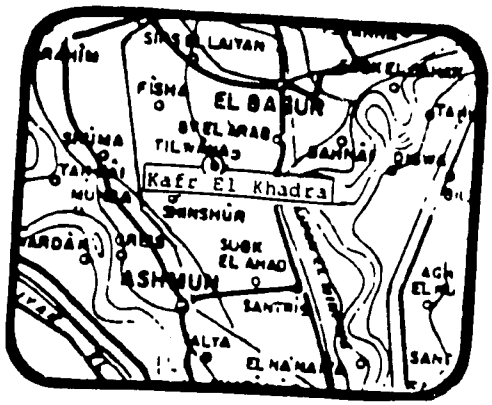


Scale: 1:1,000,000

SUMMARY

- Bahnay and its three satellites have a total population of 17,600, who are largely engaged in agriculture.
- The principal source of piped water supply is from deep wells which provide water of adequate quality. The water service is interrupted at least once every week due to burst pipes. Repairs take between 1 and 2 days. 29% of the villagers are directly served by house connections.
- There is no piped wastewater collection system. Most houses have vaults for excreta. The village is organized for regular pumping out of the vaults which, due to sandy subsoil, do not need frequent service.
- The village has invested in two public sullage vaults, but do not have adequate pumping capacity to keep them operational. The village also organizes daily pick up of sullage around the village with a tractor-pulled tank.
- Handpumps on shallow wells provide a ready alternate source of water. Most people still prefer to use the canal water for washing clothes and dishes.
- The BVS project has had a significant impact upon the water system of Bahnay. The BVS project has provided almost one-third of the current pipe network and house connections, three out of the five wells, half the pump engines and motors, plus various other components.
- Bahnay spent 96% of its BVS allocation on water projects. The USAID contribution amounts to LE 6.81 per capita.

Village	**KAFAR EL KADAR**
Markaz	**BAGOUR**
Governorate	**MENOUFIA**
Date	**11 JAN 1988**

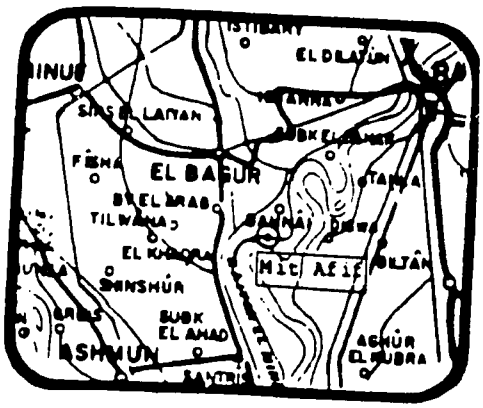


Scale: 1:1,000,000

SUMMARY

- Kafra El Kadra and its four satellites have a total population of 26,000, who are largely engaged in agriculture.
- The principal source of piped water supply is from deep wells which provide water of adequate quality. 27% of the villagers are directly served by house connections. Villagers also make use of shallow wells with handpumps.
- The water service is quite reliable, with service interruptions occuring only once every two weeks.
- There is no piped wastewater collection system and septage from household vaults is discharged untreated to a local agricultural drain. Collection from vaults is unsatisfactory.
- Handpumps on shallow wells provide a ready alternate source of water. Most people still prefer to use the canal water for washing clothes and dishes.
- The BVS project has had a significant impact upon the water system of Kafra El Kadra. The BVS project has provided almost half of the current pipe network and house connections, one out of the three wells, over half of the pump engines and motors, plus various other components and structures.
- Kafra El Kadra spent 100% of its BVS allocation on water projects. The combined total of BVS and LD II allocations is LE 217,544, which amounts to LE 8.35 per capita.

Village	**Mit Afif**
Markaz	**BAGOUR**
Governorate	**MENOUFIA**
Date	**10 JAN 1988**



Scale: 1:1,000,000

SUMMARY

- Mit Afif and its three satellites have a total population of 11,600, who are largely engaged in agriculture.

- The principal source of piped water supply is from deep wells. The storage capacity is grossly insufficient. Villagers are disatisfied with the quality of the piped water. People rely heavily on shallow wells and handpumps. 21% of the villagers are directly served by house connections.

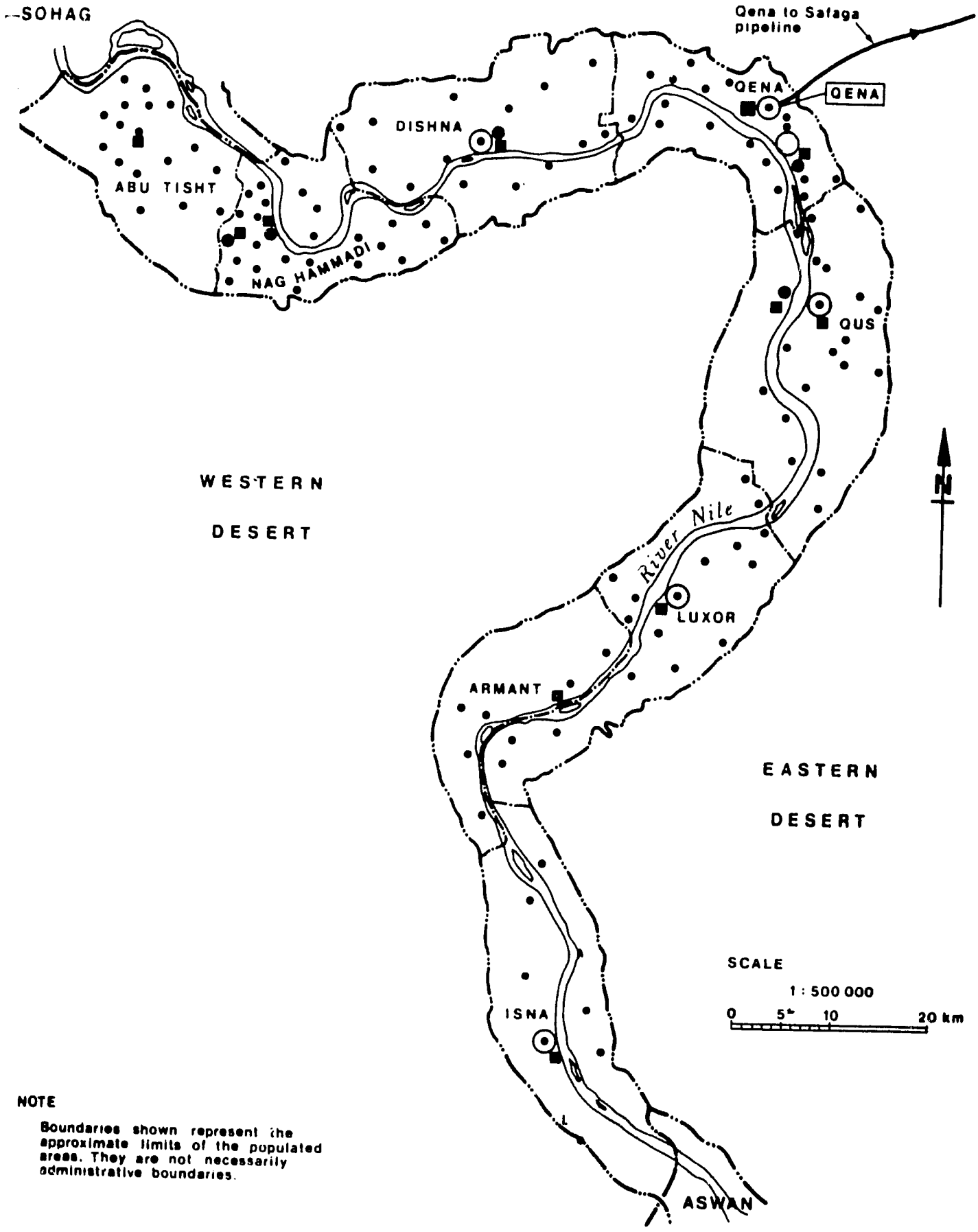
- The water service is very unreliable in the main village due to the lack of a diesel standby engine and almost nonexistant storage capacity.

- There is no piped wastewater collection system. Most houses have latrines rather than vaults. These latrines seep directly into the sandy subsoil and rarely need to be dug out.

- The main village does not have an agricultural drain nearby, and people use an agricultural feeder ditch, clogging it and paying frequent fines.

- The BVS project has had a significant impact upon the water system of Mit Afif. The BVS project has provided half of the current pipe network and house connections, and all of the presently operating pump engines and motors, plus various other components.

- Mit Afif spent LE 49,300, or 59% of its BVS allocation on water projects. This constitutes a per capita investment of LE 4.24.



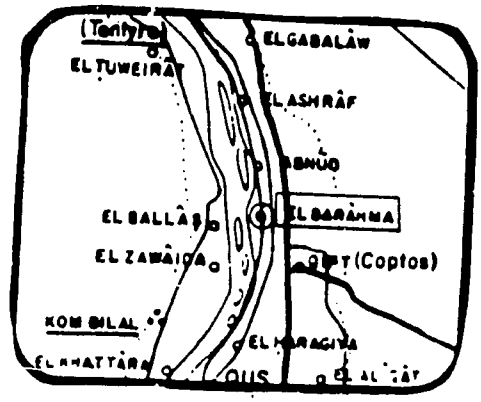
NOTE

Boundaries shown represent the approximate limits of the populated areas. They are not necessarily administrative boundaries.

QENA GOVERNORATE

Maps Adapted from "Provincial Water Supplies Project", Binnie-Taylor/Warith, Feb. 1980

Village	**BARAHMA**
Markaz	**QIFT**
Governorate	**QENA**
Date	**19 DEC 1987**



Scale 1 : 500,000

SUMMARY

* Barahma has no satellite villages but it includes 14 nagas or mini-villages. Total population is 20,400. The villagers are engaged principally in agriculture.

* The village proper and some of the nagas receive water from a treatment plant at Qift, some 3 km away. Five of the nagas receive water from separate deep well systems funded by UNICEF. One naga is served by a BVS funded system.

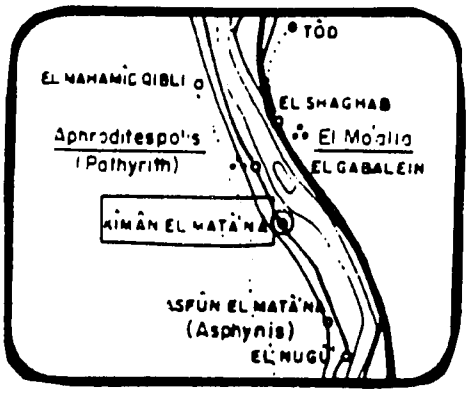
* Problems with power outages (no power on day of visit) and inadequate storage limit the value of the well sources. About 22% of the people are directly connected.

* There are insufficient public faucets for those not connected to the system. This leads to extensive use of polluted canals and shallow well hand pumps.

* The BVS-funded pump set constitutes a minor portion of water sources but BVS money paid for a significant portion of the distribution system. Total USAID water expenditures amount to about LE 7 per person.

* The lack of coordinated planning has resulted in the construction over the past five years of one over-sized system which has been abandoned because of insufficient power capacity, five small UNICEF systems and a BVS system, when it probably would have been more rational to extend the surface water system at Qift for the entire villages' needs.

Village	**KIMAN EL MATAANA**
Markaz	**ESNA**
Governorate	**QENA**
Date	**20 / 21 Dec 1987**



Scale 1 : 500,000

SUMMARY

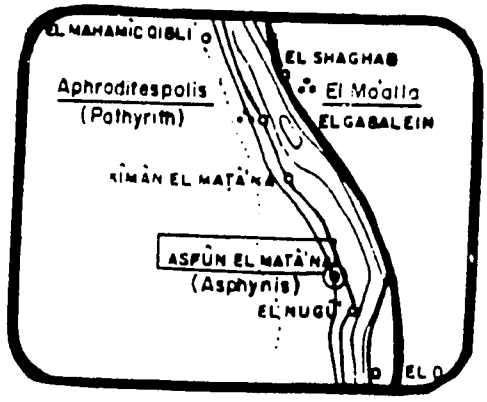
* Kiman El Mataana has two satellite villages and two nagas, or mini-villages. Total population from the 1986 census is 30,700. The principal economic base is agriculture.

* The mother village of Kiman and the satellite of Ghareira have independent water systems with deep wells as the source of supply. The satellite of Tafneis (9,600 people) has no piped water supply and its people use water from the canal, a public dug well and shallow-well hand pumps, all of which showed bacterial pollution when tested.

* People say water from the Kiman well is too salty so they use the canal or hand pumps for drinking. The Ghareira water was acceptable to its users. The two piped systems serve about less than 8 percent of the population and there are only 14 public faucets to serve the others. This fact, plus the salty water at Kiman and no public water system at Tafneis, means the great majority of the people in the village are drinking contaminated water.

* USAID-funded components account for the entire source of supply and one third of the distribution piping, but inefficient use has been made of these funds. Two particular examples are (1) the inability to use a new elevated tank because of the mis-match between tank height and pump/motor head capacity, and (2) the drilling of a second well within 15 meters of the Kiman well whose water is considered by the villagers to be too salty to drink. AID's funds amount to about LE 8 per person in the village.

Village	**ASFOUN**
Markaz	**ESNA**
Governorate	**QENA**
Date	**22 DEC 1987**



Scale 1:500,000

SUMMARY

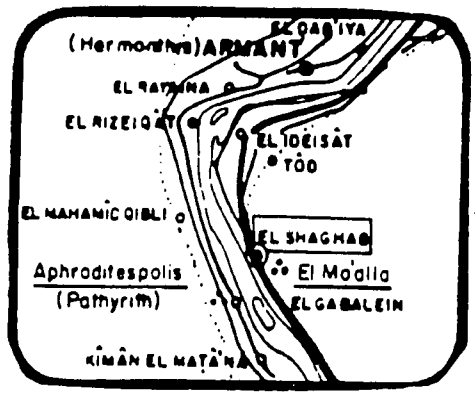
* Asfoun is a complicated collection of some 15 widely separated settlements, including three satellite villages, 4 resettled villages from Abu Simbel in Aswan, and a series of somewhat isolated nagas. Total population from the 1986 census is 45,700, mostly engaged in agriculture.

* The naga of Zenika has an independent water system using a deep well as its source. The supply is adequate but it has a totally inadequate number of house connections (only 12) and no public faucets. The rest of the village and its settlements are served from the Esna water treatment plant by two separate pipelines. About 34% of the population is directly connected to the piped system.

* The supply from Esna is inadequate and, to make up the deficiency, untreated and unchlorinated water from the Nile is now pumped directly into the distribution system for several hours per day. This is said to be an emergency solution until a new compact water treatment plant can be constructed along the Nile at Asfoun. No consideration appears to have been given to such preferable alternatives as (1) expanding the Esna system or (2) looking at potential ground water sources, particularly close to the Nile.

* Components purchased with USAID funds have had little positive impact in regard to providing potable water to the people of Asfoun. The LE 152,000 in USAID funds made available for water projects in Asfoun amounts to about LE 3.30 per capita

Village	**SHAGHAB**
Markaz	**ESNA**
Governorate	**QENA**
Date	**23 DEC 1987**



Scale 1 : 500,000

SUMMARY

* Shaghab has two satellite villages and about eleven nagas, or mini-villages, stretched along the east bank of the Nile for some 13 km. The total 1986 census population is 16,000. The principal economic base is agriculture.

* The only source of piped water for the entire village is two deep wells located beside each other in the satellite village of Maala, at about the mid-point of the line of the settlements. Five of the nagas are not connected to the village water system. The system provides direct house connections to about 34% of the population. The remaining people are dependent upon only 15 faucets (an average of two per settlement connected to the system) or must get their water from handpumps or the canal.

* Water quality and quantity appear adequate, if the pumps are operated long enough, and the system could probably support more house connections and extension to the unserved nagas. Diesel engine standby is available and seems capable of extended operation during power failures if needed.

* The existence at the Maala well site of two abandoned pump stations (built in 1954 and 1972) gives evidence of past failures in preventive maintenance and repair capability.

* The BVS funded electric motor/pump set serves as the backbone of the water supply for this village, and BVS funds provided 25-30% of the distribution piping. Total USAID funding amounts to about LE 9.50 per person.

APPENDIX C

WATER QUALITY

APPENDIX C

WATER QUALITY

1. Introduction

Drinking water containing pathogenic pollution is potentially harmful to health. It follows that the most important quality control is the need to meet bacteriological standards.

At most villages, there are several different water sources. Even villages with piped connections use water from shallow wells or canals during interruptions in piped supply. Also, if they dislike piped water for washing or even drinking, they will use the alternative sources. Villages without connections may collect water from public standpipes or neighbors' connections, otherwise they depend on shallow wells or canals.

Several samples from the six governorates were collected from canals and shallow well hand pumps and examined bacteriologically by the WASH team. The results shown in Table C-1 indicate heavy pollution of all the canal water samples. The figure on page C-6 shows that over half of the shallow well samples were contaminated.

2. Egyptian and WHO Standards

Table C-2 presents a comparison of Egyptian and World Health Organization drinking water standards. In general, the WHO standards are more restrictive.

206

3. Water Quality Control in Villages

Water quality monitoring is performed by Ministry of Health officials, and at some water treatment plants.

Each of the Governorates visited has laboratory facilities to analyze water samples. Two laboratories were inspected. The equipment and facilities at both were found to be in poor state, and the results they report must be regarded as suspect.

The health inspector at each village is required to collect monthly samples for chemical and bacterial examination, from the distribution system and the source works. The samples are sent to the governorate laboratory. Delays in delivery of a day or more are said to be common. The results are not returned to the village until at least a month after samples are collected, which is too late to take effective action if analyses show failure to meet standards.

The results are usually reported to the village only if there is a problem. Many of the reports make statements such as "unacceptable - high manganese" without giving suggestions on how the operators are to correct deficiencies.

4. Analyses Conducted During the Assessment

4.1. *Bacteriological Results.* About 55 water samples were analyzed for coliform bacteria by means of the Millipore Filtration technique. The results of these analyses are presented in the attached figure on page C-5. Exclusive of canal waters, the analysis showed that 52% of the results exceed WHO guideline maximums, but only 20% exceeded the Egyptian standards, which allow up to 5 coliforms/100 ml for well waters.

201

4.2. *Nitrates.* The only other health related constituent sampled was for nitrates. None of the 35 samples exceeded either the WHO or the Egyptian standards.

4.3. *Other Constituents.* While not directly health related, some constituents of water can be sufficiently high to drive people to use water which is not safe. Unacceptably high levels of iron, manganese, hardness, and total dissolved solids will adversely affect the taste of water or its suitability for washing. The proportion of the 35 samples analyzed which exceeded allowable limits for these constituents were as follows:

	Percentage Which Exceed	
Constituent	Egyptian Stds	WHO Guidelines
Iron	14 %	34 %
Manganese	43 %	49 %
Hardness	11 %	11 %
TDS	3 %	20 %

In some villages, consumers complained of the water's "saltiness" even when the TDS levels were within the WHO guidelines.

TABLE C-1

WATER QUALITY OF SELECTED CANALS

Governorate	Location	Coliform /100 ml	Conductivity[1]	pH
Damietta	New Bostan	TNTC[2]	710	7.1
	Ghonamya	—	1,140	7.2
	Rahamna	TNTC	1,500	7.1
	Sharabas	—	910	7.2
Fayoum	Minshat Bani Etman	TNTC	—	—
El-Gharbiya	Sandebast	TNTC	460	7.2
Giza	Borombol	TNTC	390	8.2
Menoufia	Kafr Khadra	TNTC	440	8.2
Qena	Asfoun Canal	TNTC	320	7.7
Cairo	Nile (Zamalek)	TNTC	420	7.3

Sampling Period Dec. 1987 - Jan. 1988

(1) Micromhos per cm (Total dissolved solids is about 70% of conductivity)

(2) Too numerous to count

TABLE C-2

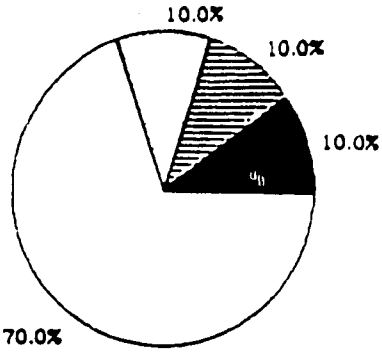
COMPARISON OF DRINKING WATER STANDARDS
EGYPT AND WHO GUIDELINES

Parameter	Egyptian Standards[1]	1984 WHO Guidelines
Biological (Health significance)		
Coliform organisms (Distribution system)	(2)	0
Inorganic (Health significance)		
Arsenic (mg/l)	0.05	0.05
Cadmium (mg/l)	0.01	0.005
Cyanide (mg/l)	0.05	0.10
Fluoride (mg/l)	0.8	1.5
Lead (mg/l)	0.10	0.05
Mercury (mg/l)	0.001	0.001
Nitrated (as N) (mg/l)	45	10
Aesthetic Quality (No Health significance)		
Chlorides (mg/l)	600	250
Chlorophenols (mg/l)	0.002	—
Color (TCU)	50	15
Copper (mg/l)	1.5	1.0
Hardness (mg/l $CaCO_3$)	500	500
Iron (mg/l)	1.0	0.3
Manganese (mg/l)	0.5	0.1
pH	6.2 - 9.2	6.5 - 8.5
Taste/odor	Acceptable	Inoffensive
Total dissolved solids (mg/l)	1,500	1,000
Turbidity (NTU)	25	5
Zinc (mg/l)	15.0	5.0

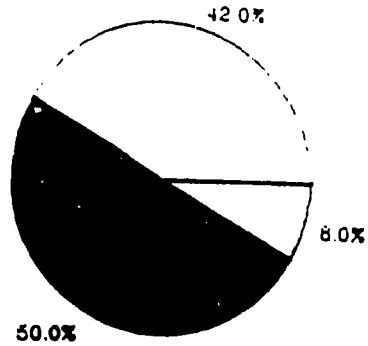
(1) "Water and Sanitation Sector Review, Egypt," WHO, July 1985.

(2) Chlorinated waters must be free from bacteria. Standards allow 5 coliform/100 ml for unchlorinated water (wells).

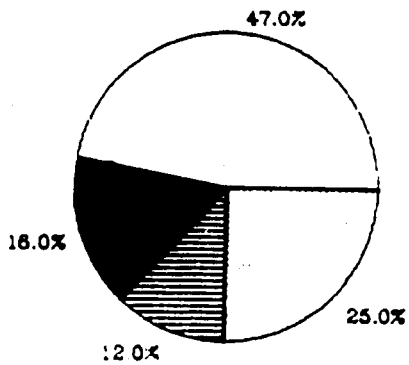
40



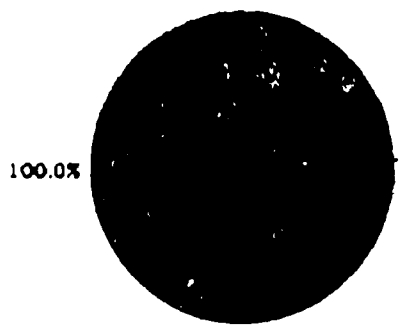
Deep Wells (10 Samples)



Distribution System (24 Samples)



Shallow Well Hand Pumps (12 Samples)



Irrigation Canal (7 Samples)

Unpolluted	(0-1 Coliform/100ml)
Slightly Polluted	(2-5 " ")
Polluted	(6-10 " ")
Heavily polluted	(over 10 " ")

BACTERIOLOGICAL ANALYSES OF WATER SAMPLES

C-6

211

RESULTS OF WATER QUALITY ANALYSIS

Village : **Sherbes, El Dahra, Ghonimiyc and El Rehemna**
Governorate : **Damietta**
Sample Date : **24 Jan 1988**

Constituent	Units	Egyptian Standards Value (A)		Value at Sample Point					
				Bostan In	Bostan Out	Dahra School	Sherabes School	Ghonimiyc Canal	Shagab Tank
Bacteriological Quality									
* Coliform Organism (C)	No/100mL	5	(0) (B)	–	–	–	–	–	–
Physical Quality									
pH (C)	—	6.2-9.2	(6.5 -8.5)	7.10	7.20	7.25	7.35	7.23	7.60
Color	T.C.U	50	(15)	≈ 20	< 10	< 10	< 10	≈ 50	< 10
Turbidity	JTU/NTU	5-25	(5)	65.0	19.0	20.0	28.0	150.0	14.0
Suspended Solid	mg/L		—	230.0	48.0	49.0	65.0	618.0	59.0
Total Dissolved Solids (D)	mg/L	1500	(1000)	325.0	325.0	325.0	380.0	600.0	390.0
Odor		Inoffensive		Oderless	Oderless	Oderless	Oderless	Oderless	Offensive
Chemical Quality									
Ammonia	mg/L		—	0.20	0.00	0.00	0.70	3.00	2.00
Chlorides	mg/L	600	(250)	68	66	66	62	1420	72
Iron	mg/L	1.0	(0.3)	0.02	0.02	0.10	0.20	0.80	0.20
Mangenese	mg/L	0.5	(0.1)	< 0.05	< 0.05	< 0.05	0.25	1.65	0.19
* Nitrates (as N)	mg/L	45	(10)	0.00	0.00	0.00	0.00	8.00	2.00
Sodium	mg/L	—	(200)	–	–	–	–	–	–
Sulphates	mg/L	400	(400)	37.0	43.0	45.0	55.0	45.0	50.0
Total Alkalinity (as CaCo3)	mg/L		—	180.00	160.00	150.00	190.00	210.00	180.00
Total Hardness (as CaCo3)	mg/L	500	(500)	186.00	176.00	176.00	198.00	240.00	200.00
(* Health Significant)									

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Villages : Minshat Bani Etman, Sanhour, Fidimin (Distribution outlet at three villages)
Governorate : Fayoum
Sample Date : 17 Jan 1988

Constituent	Units	Egyptian Standards Value (A)		Value at Sample Point		
				MBE	Sanhour	Fidimin
Bacteriological Quality						
* Coliform Organism (C)	No/100mL	5	(0) (B)	2	0	0
Physical Quality						
pH (C)	—	6.2-9 2	(6.5 -8.5)	6.7	—	—
Color	T.C.U	50	(15)	< 5	< 5	< 5
Turbidity	JTU/NTU	5-25	(5)	< 10	< 10	< 10
Suspended Solid	mg/L		—	32.0	36.0	32.0
Total Dissolved Solids (D)	mg/L	1500	(1000)	590.0	600.0	600.0
Odor		Inoffensive		Oderless	Oderless	Oderless
Chemical Quality						
Ammonia	mg/L		—	0	0	0
Chlorides	mg/L	600	(250)	102.0	110.0	114.0
Iron	mg/L	1.0	(0.3)	0	0	0
Manganese	mg/L	0.5	(0.1)	0.07	< 0.05	< 0.05
* Nitrates (as N)	mg/L	45	(10)	0	0	0
Sodium	mg/L	—	(200)	—	—	—
Sulphates	mg/L	400	(400)	39.00	40.00	39.00
Total Alkalinity (as CaCo3)	mg/L		—	180.0	180.0	175.0
Total Hardness (as CaCo3)	mg/L	500	(500)	280.0	288.0	292.0
(* Health Significant)						

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Village : Moutamadiya
Governorate : El Gherbiya
Sample Date : 31 Jan 1988

Constituent	Units	Egyptian Standards Value (A)	Value at Sample Point		
			Pump Station	Public Standpipe	Hand Pump
Bacteriological Quality					
* Coliform Organism (C)	No/100mL	5 (0) (B)	16	0	TNTC
Physical Quality					
pH (C)	—	6.2-9.2 (6.5 -8.5)	7.4	7.6	7.6
Color	T.C.U	50 (15)	< 5	< 5	< 5
Turbidity	JTU/NTU	5-25 (5)	< 10	< 10	< 10
Suspended Solid	mg/L	—	25.0	20.0	22.0
Total Dissolved Solids (D)	mg/L	1500 (1000)	1100	1100	4860
Odor		Inoffensive	Oderless	Oderless	Oderless
Chemical Quality					
Ammonia	mg/L	—	0	0.20	7.50
Chlorides	mg/L	600 (250)	442.0	438.0	1895.0
Iron	mg/L	1.0 (0.3)	0.00	0.00	0.05
Mangenese	mg/L	0.5 (0.1)	0.83	0.80	Nil
* Nitrates (as N)	mg/L	45 (10)	0.00	0.00	0.00
Sodium	mg/L	— (200)	—	—	—
Sulphates	mg/L	400 (400)	45.0	45.0	15.0
Total Alkalinity (as CaCo3)	mg/L	—	280.0	240.0	870.0
Total Hardness (as CaCo3)	mg/L	500 (500)	484.0	514.0	440.0
(* Health Significant)					

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Village : Nahtai
Governorate : El Gharbia
Sample Date : 6 Jan 1988

Constituent	Units	Egyptian Standards Value (A)	Value at Sample Point			
			Pump Station	House-200m from source	Café-800m from source	Shallow Well
Bacteriological Quality						
* Coliform Organism (C)	No/100mL	5 (0) (B)	0	1	0	2
Physical Quality						
pH (C)	—	6.2-9.2 (6.5 -8.5)	7.2	7.2	7.3	7.7
Color	T.C.U	50 (15)	< 5	< 5	< 5	< 5
Turbidity	JTU/NTU	5-25 (5)	< 10	< 10	< 10	< 10
Suspended Solid	mg/L	—	—	—	—	—
Total Dissolved Solids (D)	mg/L	1500 (1000)	290	300	280	300
Odor		Inoffensive	Oderless	Oderless	Oderless	Oderless
Chemical Quality						
Ammonia	mg/L	—	—	—	—	—
Chlorides	mg/L	600 (250)	10.00	42.00	34.00	46.00
Iron	mg/L	1.0 (0.3)	0.52	0.54	2.24	0.45
Manganese	mg/L	0.5 (0.1)	< 0.1	< 0.1	0.85	< 0.1
* Nitrates (as N)	mg/L	45 (10)	0.0	0.0	0.0	0.0
Sodium	mg/L	— (200)	—	—	—	—
Sulphates	mg/L	400 (400)	22.00	23.00	38.00	18.00
Total Alkalinity (as CaCo3)	mg/L	—	220.0	240.0	200.0	260.0
Total Hardness (as CaCo3)	mg/L	500 (500)	208.0	184.0	176.0	204.0
(* Health Significant)						

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Village : Tafahna El Azab
Governorate : El Gharbiya
Sample Date : 13 Jan 1988

Constituent	Units	Egyptian Standards Value (A)	Value at Sample Point: Pump Station	Private Hand Pump	Village Unit	School
Bacteriological Quality						
* Coliform Organism (C)	No/100mL	5 (0) (B)	9	TNTC	0	0
Physical Quality						
pH (C)	—	6.2-9.2 (6.5 -8.5)	7.6	7.1	7.3	7.3
Color	T.C.U	50 (15)	< 5	< 5	< 5	< 5
Turbidity	JTU/NTU	5-25 (5)	< 10	< 10	< 10	< 10
Suspended Solid	mg/L	—	42.0	38.0	40.0	36.0
Total Dissolved Solids (D)	mg/L	1500 (1000)	190	370	180	160
Odor		Inoffensive	Oderless	Oderless	Oderless	Oderless
Chemical Quality						
Ammonia	mg/L	—	0	0	0	0
Chlorides	mg/L	600 (250)	18	22	18	22
Iron	mg/L	1.0 (0.3)	0	0	0	0
Manganese	mg/L	0.5 (0.1)	0.08	1.15	0.08	0.08
* Nitrates (as N)	mg/L	45 (10)	0	0	0	0
Sodium	mg/L	— (200)	—	—	—	—
Sulphates	mg/L	400 (400)	19.0	20.0	18.0	21.0
Total Alkalinity (as CaCo3)	mg/L	—	160.0	230.0	150.0	140.0
Total Hardness (as CaCo3)	mg/L	500 (500)	144	230	136	140
(* Health Significant)						

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Village : El Mareziq
Governorate : Giza
Sample Date : 14 Dec. 1987

Constituent	Units	Egyptian Standards Value (A)		Value at Sample Point		
				School	Distribution System	Hand Pump
Bacteriological Quality						
* Coliform Organism (C)	No/100mL	5	(0) (B)	–	–	–
Physical Quality						
pH (C)	—	6.2-9.2	(6.5 -8.5)	7.8	7.8	8.0
Color	T.C.U	50	(15)	Colorless	Colorless	Colorless
Turbidity	JTU/NTU	5-25	(5)	21	58	36
Suspended Solid	mg/L		—	19	20	22
Total Dissolved Solids (D)	mg/L	1500	(1000)	1100	1180	320
Odor		Inoffensive		Oderless	Oderless	Oderless
Chemical Quality						
Ammonia	mg/L		—	0.22	0.20	0.20
Chlorides	mg/L	600	(250)	146	152	34
Iron	mg/L	1.0	(0.3)	0.90	4.50	2.80
Manganese	mg/L	0.5	(0.1)	0.95	1.26	0.59
* Nitrates (as N)	mg/L	45	(10)	2.00	0.20	0.40
Sodium	mg/L	—	(200)	104	109	22
Sulphates	mg/L	400	(400)	158	225	154
Total Alkalinity (as CaCo3)	mg/L		—	–	–	–
Total Hardness (as CaCo3)	mg/L	500	(500)	550	605	235
(* Health Significant)						

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Village : Kafr Khadra
Governorate : Menoufia
Sample Date : 1 Feb 1988

Constituent	Units	Egyptian Standards Value (A)		Value at Sample Point		
				Public Standpipe	Pump Station	Hand Pump
Bacteriological Quality						
* Coliform Organism (C)	No/100mL	5	(0) (B)	1	0	0
Physical Quality						
pH (C)	—	6.2-9.2	(6.5 -8.5)	7.4	5	7.6
Color	T.C.U	50	(15)	< 5	< 5	< 5
Turbidity	JTU/NTU	5-25	(5)	< 10	< 10	< 10
Suspended Solid	mg/L		—	20.0	25.0	21.0
Total Dissolved Solids (D)	mg/L	1500	(1000)	420	450	175
Odor		Inoffensive		Oderless	Oderless	Oderless
Chemical Quality						
Ammonia	mg/L		—	0.00	0.10	1.50
Chlorides	mg/L	600	(250)	52	49	16
Iron	mg/L	1.0	(0.3)	0.10	0.10	0.01
Mengenese	mg/L	0.5	(0.1)	0.83	0.70	Nil
* Nitrates (as N)	mg/L	45	(10)	0.30	0.01	0.00
Sodium	mg/L	—	(200)	—	—	—
Sulphates	mg/L	400	(400)	64.00	64.00	6.00
Total Alkalinity (as CaCo3)	mg/L		—	270.0	320.0	170.0
Total Hardness (as CaCo3)	mg/L	500	(500)	302.0	306.0	136.0
(* Health Significant)						

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Village : Ibnehs
Governorate : Menoufia
Sample Date : 31 Jan 1988

Constituent	Units	Egyptian Standards Value (A)		Value at Sample Point		
				Village Unit	Pump Station	Shallow Well
Bacteriological Quality						
* Coliform Organism (C)	No/100mL	5	(0) (B)	1	0	0
Physical Quality						
pH (C)	—	6.2-9.2	(6.5 -8.5)	7.5	7.5	7.3
Color	T.C.U	50	(15)	< 5	< 5	< 5
Turbidity	JTU/NTU	5-25	(5)	< 10	< 10	< 10
Suspended Solid	mg/L		—	21.0	22.0	20.0
Total Dissolved Solids (D)	mg/L	1500	(1000)	195	195	400
Odor		Inoffensive		Oderless	Oderless	Oderless
Chemical Quality						
Ammonia	mg/L		—	0	0	0
Chlorides	mg/L	600	(250)	16	14	76
Iron	mg/L	1.0	(0.3)	0	0	0.60
Mangenese	mg/L	0.5	(0.1)	—	—	1.10
* Nitrates (as N)	mg/L	45	(10)	0	0	0
Sodium	mg/L	—	(200)	—	—	—
Sulphates	mg/L	400	(400)	30.0	22.0	70.0
Total Alkalinity (as CaCo3)	mg/L		—	180.0	200.0	170.0
Total Hardness (as CaCo3)	mg/L	500	(500)	156.0	162.0	238.0
(* Health Significant)						

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Village : Talia
Governorate : Menoufia
Sample Date : 1 Feb. 1988

Constituent	Units	Egyptian Standards Value (A)		Value at Sample Point		
				Public Standpipe	Pump Station	Shallow Well
Bacteriological Quality						
* Coliform Organism (C)	No/100mL	5	(0) (B)	1	3	5
Physical Quality						
pH (C)	—	6.2-9.2	(6.5 -8.5)	7.3	7.3	7.4
Color	T.C.U	50	(15)	< 5	< 5	< 5
Turbidity	JTU/NTU	5-25	(5)	< 10	< 10	< 10
Suspended Solid	mg/L		—	22.00	22.00	22.00
Total Dissolved Solids (D)	mg/L	1500	(1000)	595	595	530
Odor		Inoffensive		Oderless	Oderless	Oderless
Chemical Quality						
Ammonia	mg/L		—	0.10	0.10	0.10
Chlorides	mg/L	600	(250)	88	86	54
Iron	mg/L	1.0	(0.3)	0.01	0.30	0.50
Manganese	mg/L	0.5	(0.1)	1.57	1.57	2.15
* Nitrates (as N)	mg/L	45	(10)	0.00	2.00	2.00
Sodium	mg/L	—	(200)	—	—	—
Sulphates	mg/L	400	(400)	63.00	63.00	43.00
Total Alkalinity (as CaCo3)	mg/L		—	400.00	390.00	410.00
Total Hardness (as CaCo3)	mg/L	500	(500)	421.00	390.00	340.00
(* Health Significant)						

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Village :El Berahma, Asfoun, and Shegeb
Governorate : Qena
Sample Date : 21 Dec. 1987

Constituent	Units	Egyptian Standards Value (A)	Value at Sample Point		
			El Berahma Med. Clinic	Asfoun Med. Clinic	Shegeb Distribution
Bacteriological Quality					
* Coliform Organism (C)	No/100mL	5 (0) (B)	0	26	5
Physical Quality					
pH (C)	—	6.2-9.2 (6.5 -8.5)	7.3	7.4	7.2
Color	T.C.U	50 (15)			
Turbidity	JTU/NTU	5-25 (5)			
Suspended Solid	mg/L	—			
Total Dissolved Solids (D)	mg/L	1500 (1000)	(230)	(220)	(330)
Odor		Inoffensive			
Chemical Quality					
Ammonia	mg/L	—			
Chlorides	mg/L	600 (250)			
Iron	mg/L	1.0 (0.3)			
Manganese	mg/L	0.5 (0.1)			
* Nitrates (as N)	mg/L	45 (10)			
Sodium	mg/L	— (200)			
Sulphates	mg/L	400 (400)			
Total Alkalinity (as CaCo3)	mg/L	—			
Total Hardness (as CaCo3)	mg/L	500 (500)			
(* Health Significant)					

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

RESULTS OF WATER QUALITY ANALYSIS

Village : Kimen El Mataana
Governorate : Qena
Sample Date : 21 Dec. 1987

Constituent	Units	Egyptian Standards Value (A)		Value at Sample Point			
				Kimen Deep Well	Ghareira Deep Well	Tefneis Dug Well	Kimen Distribution
Bacteriological Quality							
* Coliform Organism (C)	No/100mL	5	(0) (B)	0	0	65	2
Physical Quality							
pH (C)	—	6.2-9.2	(6.5 -8.5)	7.0	6.9	7.6	7.0
Color	T.C.U	50	(15)	None	None	None	
Turbidity	JTU/NTU	5-25	(5)	18	4	22	
Suspended Solid	mg/L		—	18	21	20	
Total Dissolved Solids (D)	mg/L	1500	(1000)	790	480	900	(900)
Odor		Inoffensive		Oderless	Oderless	Oderless	
Chemical Quality							
Ammonia	mg/L		—	0.3	0.5	0	
Chlorides	mg/L	600	(250)	98	12	86	
Iron	mg/L	1.0	(0.3)	1.80	1.65	0	
Manganese	mg/L	0.5	(0.1)	0.54	0.76	0	
* Nitrates (as N)	mg/L	45	(10)	0	0	0	
Sodium	mg/L	—	(200)	52	26	14	
Sulphates	mg/L	400	(400)	304	32	40	
Total Alkalinity (as CaCo3)	mg/L		—	300	310	595	
Total Hardness (as CaCo3)	mg/L	500	(500)	454	146	133	
(* Health Significant)							

Notes:

(A) "Adopted Standards for Drinking Water in Egypt" as amended 1975. Figures in parenthesis are values quoted in "Guidelines for Drinking Water Quality" WHO, 1984.

(B) For untreated water entering the distribution system, WHO require nil coliforms/100mL in 98% of samples tested throughout the year.

(C) Values of these constituents were determined by the WASH team taking field readings.

(D) TDS in brackets are 0.7 x field conductivity measurements. All other values are laboratory determinations.

222

Samples from Water Sources, Distribution Systems and Handpumps Which Exceed Allowable Drinking Water Standards

	WHO Guidelines			Egyptian Standards		
		Samples Exceeding Max			Samples Exceeding Max	
Constituents	Max.	Number	Percent	Max.	Number	Percent
Coliform/100 ml	0	13	52%	0/5●	5	20%
Nitrates, mg/l	10	0	0%	45	0	0%
TDS, mg/l	1000	7	20%	1500	1	3%
Iron, mg/l	0.3	12	34%	1	5	14%
Manganese, mg/l	0.1	17	49%	0.5	15	43%
Hardness, mg/l	500	4	11%	500	4	11%

● 0 For chlorinated waters (treatment plants)

5 For unchlorinated waters (wells)

APPENDIX D

UNIT COST DATA

APPENDIX D

UNIT COST DATA

Table of Contents

1. **Introduction** D-1

2. **Source Works** D-1
   - Treatment Plants
   - Wells

3. **Mechanical & Electrical Equipment** D-2
   - Pump Sets
   - Generators
   - Transformers

4. **Structures** D-3
   - Elevated Storage Tanks
   - Pump Station Buildings

5. **Distribution Systems** D-4
   - Pipelines
   - Support Facilities

6. **Operating Costs** D-5
   - Wages and Salaries
   - Consumables

APPENDIX D

UNIT COST DATA

1. Introduction

The prices presented in this appendix are based on recorded costs abstracted from village records at the time of the field assessment. No adjustment has been for inflation, nor has any attempt been made to justify their accuracy. These data were collected with the expectation they might be of some use for broad costing of possible future construction programs.

2. Source Works

2.1. Treatment Plants

Cost data were collected for three types of compact units. They include those manufactured by Graver (USA), Hydrotechnich (Austria), and a third small containerized unit of unknown make and origin. Some of this unit's components were of Italian origin.

Costs, including supply and construction are:

Capacity	Cost
100 m^3/hr	L.E. 500,000
200 m^3/hr	800,000
5 m^3/hr	32,000

2.2 Wells

All wells are drilled to a minimum depth of 30 m and a maximum of 75 m. An unperforated steel casing is used to within 25 m of the bottom. The screen consists of 25 m of perforated steel pipe wrapped with galvanized copper mesh. Costs, including

226

boring the hole and supply and installation of all materials, were as follows:

Size	Average Unit Costs/Meter (LE)	Range of Costs/Meter (LE)
10"	150	105 to 781
8"	150	100 to 221
4"	125	–

Note: The higher unit costs are for those wells bored to a shallow depth. Overheads will be fixed irrespective of depth.

3. Mechanical and Electrical Equipment

3.1 Pump Sets

Power	Median Rate (LE)	Range (LE)
Diesel Drive		
90 HP	25,000	
60 HP	9,800	6,700 to 13,000
40/45 HP	7,000	3,900 to 10,000
25/30 HP	6,000	3,700 to 8,200
12/17 HP	4,500	3,500 to 5,000
Electric Drive		
75 HP	16,000	
60 HP	6,000	6,000 to 10,000
40/45 HP	7,000	2,500 to 10,000
25/30 HP	4,000	1,500 to 6,000
12/17 HP	4,500	3,500 to 5,000

227

Note: The inconsistencies in prices may be due in part to the pumps having been bought at different times. Some were bought in 1981 and others in 1987.

3.2 Generators

The price of one stand-by generator was obtained. The unit is to serve a 200 m^3/hr compact unit.

Capacity	Cost
200 KVA	LE 60,000

3.3 Transformers

The prices are believed to include supply and installation costs.

Rating	Price (LE)	Range (LE)
100 KVA	19,000	13,000 to 25,000
50 KVA	10,000	8,000 to 11,000

4. Structures

4.1 Elevated Storage Tanks

17% of the BVS funds spent on water projects were invested in the construction of water towers. These are reinforced concrete.

Capacity/Height	Cost (LE)	Range (LE)
100 m^3, 25 m	135,000	100,000 to 150,000
50 m^3, 15 m	60,000	

4.2 Pump Stations, Buildings

	Cost (LE)	Range (LE)
Pump Houses	20,000	4,500 to 34,000
Workshops	20,000	
Operators Offices	4,000	4,000 to 4,500

Note: The pump houses differ in floor area which explains the large variation in costs.

5. Distribution System

5.1 Pipelines

Pipeline costs vary depending on whether they are for supply of pipes only or for supply and installation of the pipes. Some villages provide their own labor.

	Asbestos Cement		PVC	CI	GI
Size (inches)	Unit Cost (LE/m)	Range (LE/m)	Unit cost (LE/m)	Unit Cost (LE/m)	Unit cos (LE/m)
10	30	25 - 66			
8	15	12 - 17			
6	10	6 - 25			
4	9		10	23	
2			7		7
1					6

229

5.2 *Support Facilities*

	Cost (LE)	Range (LE)
House connections*	130	100 - 180
Meter (3/4")	60	
Valve (4")	350	
Valve and chamber**	920	
Standpipe***	2,000	180 - 2,600
Fire hydrant	350	38 - 525

Notes:

* These costs include the cost of a meter. Most house connections are 1" diameter G.I. pipes with three controlling valves, excluding the outlet faucet. (A saddle plug, an above ground external plug cock, and an internal gate valve.)

** Valve chambers are about 1 square meter, covered with concrete planks.

*** Complete public standpipe sites, including all concrete work and 6-8 outlets, cost LE 2,000 to 2,600. A single outlet with minimal supporting structure costs LE 180. None were provided with means of drainage.

6. Operating Costs

6.1. *Wages and Salaries*

The following rates of pay are for staff employed at the villages. The rates apply for 1987. The information source was NOPWASD.

Title	Monthly Salary (LE)
Supervisor	120
Operators	100
Skilled workman	80
Laborer	60

730

6.2 Consumables

Item	Cost (LE)
Electricity	0.05/KWH
Diesel fuel	0.05/Liter
Liquid chlorine	450/ton (75 kg cylinder)
Kibbled alum.	400/ton

231

APPENDIX E

ASSESSMENT QUESTIONNAIRES

BENEFICIARY QUESTIONNAIRE

BENEFICIARY QUESTIONNAIRE

GOVERNORATE _____
MARKAZ _____
VILLAGE _____
MOTHER VIL. OR SATELLITE _____
INTERVIEWER _____
DATE _____

I. Respondent

1. Male _____ Female _____.

2. Type of house: Adobe _____ Cement/Brick _____
Half adobe/half brick _____.

3. Do you have piped water in your house? Yes _____ No _____.
(If 'No', go to Question 22).

Sample selection

To be administered in every village to a minimum of 5 beneficiaries.

Some of those questioned should live in different parts of the village.

It is anticipated that most of those questioned will be women, but an effort should be made to have at least 20% of the respondants be male.

234

II. Water Service in House

Water Usage

4. When was water connected? _____.

5. How many faucets do you have ? _____ one, _____ more than one, Where ? _____
_____

6. What is piped water used for ? _____ drinking, _____ laundry, _____ washing kitchen utensils, _____ cleaning, _____ bathing, _____ others, specify _____

7. Why do you not use water for some purposes ? _____
_____

8. What do you do with wastewater (sullage) ? throw in canal _____ throw in street _____, throw down sullage vault _____, is the tank big or small ? _____. Do you throw it all down the vault _____ part of it _____ . What do you do with the rest ? specify _____
_____

9. Do you have a toilet facility ?
_____ Yes
What type ? Pit latrine _____
Latrine connected to vault _____
Flush toilet with septic tank _____
_____ No

Service and Water Quality

10. Is there water available all the time ? _____ .
Is the supply regular ? _____

11. Is the service sometimes interrupted ?
Yes _____ , How often? Specify _____
.
Is the service interrupted more often in summer than in winter ? ____
(specify specific periods or times of day when this occurs) _____
_____
No _____

12. When service is interrupted, who do you contact ? _____
_____

13. How quickly are repairs made ? _____
By whom ? _____

14. When was the last time service was interrupted ? _____
For how long ? _____
What did you do ? _____

15. Who repairs leaks that occur in the house ? _____

16. Are you satisfied with the quality of the water ?
Yes _____ ,
Satisfied with drinking water only _____
Why ? _____
No _____ , Why ? _____
It doesn't taste good _____ not clear _____ does not produce suds in laundry _____ other _____
_____

Cost of Water Service

17. Is the water metered ? _____ Unmetered _____

18. How much does it cost per month ? _____

236

19. How often are you billed ? _____
Where do you pay ? _____

20. What happens if someone does not pay ? _____
Is the village council lax about payments ? for how long _____
Warning ? _____ , After how long is this received ? _____
Disconnected ? _____ , After how long _____
Do you know of someone who was disconnected ? _____
What did he do ? _____

21. What was the initial cost of making a connection ? _____
_____

III. No Water Connection in House

Water Usage

22. Why are you not connected ? (specify reason)
_____

23. Where do you get water ?
Public standpipe _____
Private handwell _____, Public handwell _____
Neighbors faucet _____, Canal _____
Other (specify) _____

24. How far away from home is this source ? _____

25. Are there enough standpipes to serve the people in your area ?
_____ Yes _____ No.
Are public standpipes closed ? _____

26. What is this water used for ? _____ drinking, _____ laundry,
_____ washing kitchen utensils, _____ cleaning, _____ bathing,
_____ others, specify _____

231

27. Why do you not use water for some purposes ? _____
_____

28. What do you do with wastewater (sullage) ? throw in canal _____ throw in street _____, throw down sullage vault _____, is the tank big or small ? _____. Do you throw it all down the vault _____ part of it _____ . What do you do with the rest ? specify _____
_____

29. Do you have a toilet facility ?
_____ Yes
What type ? Pit latrine _____
Latrine connected to vault _____,
Flush toilet with septic tank _____
Other _____

_____ No

Service and Water Quality

30. Is there water available in the standpipe all the time ?
Yes _____ No _____

31. Is the service sometimes interrupted ?
Yes _____
How often? _____
Are there more interruptions in summer than in winter ? ____
During what times of the day ? _____

No _____

32. When service is interrupted, whom do you contact ? _____
Where do you get water ? _____
Where do you store water ? _____

258

33. When the standpipes break, what do you do ? _____

_____

34. How long does it take to repair ? _____
Who repairs the standpipe ? _____

35. When was the last time service was interrupeted ? _____
For how long ? _____ .

36. Who repairs leaks in the pipes in the streets or leaking faucets in standpipes ? _____

37. Are you satisfied with the quality of the water ?
Yes _____ Use it only for drinking? _____
Why ? _____
No _____, doesn't taste good
_____, doesn't make good tea
_____, doesn't make soup suds
_____, other _____

38. Do you have to pay anything to obtain water ?
_____ No
_____ Yes,

	WHO ?	HOW MUCH ?
Water Tankers	_____	_____
Neighbors	_____	_____
Other	_____	_____

239

IV. Knowledge of Water Program

39. Do you know about the water project in your village ?
_____ Yes _____ No

40. How was it decided where to put the new service ? _____
_____

41. What suggestions do you have to improve water service ?
_____
_____

240

VILLAGE QUESTIONNAIRE

VILLAGE DATA

I. GENERAL INFORMATION
(Executive Council Chief)

Date :

Governorate : _____
Markaz : _____
Village : _____

* No. of Satellites _____

1. Village Population _____

2. Head of Executive Council _____

3. Water System Operator _____

4. Persons Interviewed

Name	Title
_____	_____
_____	_____
_____	_____

5. Location of Village _____

6. Description of Village _____
_____
_____

a. No. or % brick (modern) vs. adobe houses in village :
brick _____ adobe _____
b. No. of village people working abroad _____
c. No. of feddans of agricultural land in village _____

II. LOCAL PRIORITIES, DECISION MAKING AND PROJECT IMPLEMENTATION
(Executive Council Chief)

A. Selection by the village of village water projects

(1) Describe the process followed _____
_____
_____

24V

(2) What are the roles of the participants?

a. Village Executive Council _____

b. Village popular Council _____

c. Popular council woman member _____

d. Village people _____

e. Executive council member in charge of water supply _____

_____

f. Executvie council member responsible for finance _____

_____

g. Markaz _____

h. Governorate _____

B. Annual BVS Allocation

1. When, in what form and to what office do you send your annual village requests for BVS funded water projects? _____

_____

_____

2. How is your request usually handled by the Markaz/Governorate?

a. Describe process _____

b. Time required _____

3. When and how do you learn each year of what projects and what project funds have been apporved? _____

_____

4. Do you know in time for good implementation planning and prompt start of implementation? _____

_____

5. Were your most needed projects for which you applied approved :

Last year? _____

Preceding 2 or 3 years? _____

6. Were adequate funds approved for each project :

Last year? _____

Preceding 2 or 3 years? _____

C. When your request has been aproved, what is the process for implementing your projects?

243

a. Role of Village _____

b. Role of Markaz _____

c. Role of Governorate _____
(cover project design, call for tenders, award of contract, supervision of construction, etc.)

D. Comments about the Project process

1. Do you have any specific problems with the ystem of BVS funding project selection or implementation? _____
_____
What suggestions would you make for improving the system?
a. Project selection _____
_____
b. Project financing _____
_____
c. Project implementation construction _____
_____

2. Do you feel that village officials ar able to exercise enough of their own inititative and decision making in the BVS process? Explain _____
_____

III. IMPACT OF DSS FUNDED WATER COMPONENTS
(Exec. Council Chief)

A. Approximately what percentage of the total capital funds available to your village since you began to participate with the project were provided by the DSS Program? _____

B. Additional people served _____

C. How did water system projects improve :

1. Public convenience _____
2. Public health _____
3. System reliability _____

D. What improvements were made in water system :
1. Planning _____

244

2. Public participation _____
3. Maintenance _____
4. Local contributions of labor/money to water sytem capital or maintenance _____

V. WATER PROJECT FINANCING
(Eexecutive Council Member for Finance)

A. (DSS) Funded Components (capital costs)

Year	Total Amount	Description of Funded Items
82-83	L.E. _____	_____
83-84	_____	_____
84-85	_____	_____
85-86	_____	_____
86-87	_____	_____
(87-88)	_____	_____

B. Other Funded Components (capital and O & M costs)

Year	Source**	Amount		Description (show cap. or O & M)
82-83	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
83-84	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
84-85	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
85-86	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
86-87	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____
(87-88)	_____	L.E._____	( )	_____
	_____	L.E._____	( )	_____

** BAB II, BAB III, GOE, Local, U.N., Other (describe)

245

C. Status of 10% O & M Fund (82-87)
(L.E.)

1. 10% O & M Fund Receipts/Expenditures

	82	83	84	85	86	87	Total
Received to Date							
Expended to Date							
Unexpended Balance Still on Bonds							

2. On what do you expend your village O & M funds? _____

3. Are there any capital or operating budgets? ( ) _____

4. Are you audited? ( ) _____
   How do you respond? _____

D. Locally Generated Revenues

1. Basic user fee/charge schedule.
   a. House connections _____
   b. User charges _____
   c. Other _____

2. Revenues from users :

	82-83	83-84	84-85	85-86	86-87	Total
House Connections						
User Charges						

246

Other (all else)*

_____

TOTAL

_____

* Describe major components _____

3. Collections and Delinquencies - For the most recent fiscal year (19)

   a. What was the total amount billed?
      - House connections L.E. _____ _____
      - User charges L.E. _____ _____

   b. What was the total amount actually collected?
      - House connections L.E. _____
      - User charges L.E. _____

   c. What penalties, enforcements measures do you apply for non payment? _____
      _____

   d. What are your major collection problems? _____
      _____

   e. How can your total collections be increased? _____
      _____

   f. What disposition/use is made of locally colected water fees and charges? _____
      _____

4. Degree and type of participation by users in donation of labor for capital projects _____
   _____

IV. Organization. Management & Administration (Exec. Council Chief)

A. Who is responsible for operation of the water system?(Name, title) _____
   _____

249

B. Water system employee

1. Number — Position Title

a. _____ _____

b. _____ _____

c. _____ _____

d. _____ _____

2. Skills & Education

a. _____

b. _____

c. _____

d. _____

3. Training received

a. _____

b. _____

c. _____

d. _____

4. What water system training is most urgently needed?

a. For : (Title) — Type or Training

_____ _____

_____ _____

_____ _____

b. Who (what agency) should provide this training? _____

_____

C. By whom are these water system functions performed?

1. Personnel functions:

a. Recruitment _____

_____

b. Setting of salaies _____

_____

c. Maintenance of personnel records _____

_____

d. Training _____

_____

2. Water system M & O functions :

a. Equipment maintenance & repair (mechanical/electric)

_____

248

b. Water system maintenance (plumbing) _____

_____

c. Building & grounds maintenance _____

_____

d. Spare parts procurement, storage _____

_____

e. Operating supplies procurement (fuel, chlorine, etc)

_____

f. Meter reading, billing, collection, enforcement of connection & use fees & charges _____

_____

_____

g. Maintenance of water records _____

_____

3. Capital Construction Functions

a. Identification of capital needs _____

_____

b. Supervisory of capital project construction _____

_____

4. Water system budget preparation & administration _____

_____

D. Points of Observation

1. Describe the organizations' office, furniture and equipment

_____

2. Are there any vehicles under their control and what is their condition? _____

_____

3. What files, plans and records are available? _____

_____

249

E. Management and Leadership

1. Have leaders clearly spelled out water system objectives to employees? (How?, in what form?) _____

_____

2. Do employees know what their responsibilites are? (How, where spelled out?) _____

_____

3. What are their priorities? Where spelled out?

   a. Today? _____

   _____

   b. This week? _____

   _____

   c. This month? _____

   _____

4. Do leaders regularly assign specific tasks? How? _____

_____

5. Do they follow them up? _____

_____

6. What do you hope to accomplish this year? Where spelled out? _____

_____

7. Who are the key leaders and what are their relationships relative to the water supply system

   a. At the upper levels of Markaz and/or Governorate

   _____

   _____

   b. At the Village Council level

   _____

   _____

c. The " Person-in-charge " of the water system

_____

_____

F. Adequacy of assistance from Markaz/Governorate

Does your village receive adequate water technical and administrative assistance in the following areas from higher levels? Describe additional asistance needed.

1. Water project needs identification and preparation of DSS fund applications. _____

_____

2. Water system technicla operations, including maintenance

_____

_____

3. Water system project construction _____

_____

4. Water system local revenue generation _____

_____

5. Water system fiscal and administrative processes _____

_____

6. Water system training _____

_____

GOVERNORATE QUESTIONNAIRE

GOVERNORATE DATA

I. GENERAL INFORMATION

Date _____

Capital City _____

Governorate _____

A. Population of Governorate

Rural _____

Urban _____

Total _____

B. Number of jurisdiction in the Governorate _____

Number of Markaz _____

Number of Villages _____

C. Person in Governorate responsible for allocation/approval of DSS funds to villages :

Name _____

Title _____

D. Persons Interviewed

Names _____

Titles _____

E. Location of Governorate

Area (D, U or O) _____

Kilometers from Cairo* _____ (*to Capital City)

Hours by car from Cairo* _____

F. Description of Governorate

Relative level of development _____

Principal types of business _____

Other _____

II. The Village Water System Processes

A. Describe the process for water project identification, approval, funding and implementation in your Governorate. For each, cover role of Central Government, Governorate, Markaz & Village.

_____

_____

_____

_____

253

B. How much latitudes does the Village have in choosing water projects? What decisions does Markaz make? Governorate? _____

_____

_____

C. What are the most important <u>problems</u> in the project identification, approval, funding & implementation processes that delay or stand in the way of completing good village water projects? What <u>solutions</u> do you suggest? _____

_____

_____

_____

_____

D. Are village water systems being adequately maintained in your Governorate? _____

_____

What suggestions would you make for improving the village water supply maintenance system? _____

_____

III. Provision of Governorate assistance for village water system development and operation.

A. What planning, budgeting, financial and technical (engineering) assistance for village water system development and operation does the Governorate provide to : _____

1. The Markaz _____

_____

_____

_____

2. The Village _____

_____

_____

_____

B. What are the <u>most important problems</u> in providing adequate assistance of this kind? _____

_____

_____

_____

254

C. What changes, improvements would you suggest? _____

_____

_____

_____

IV. Water Project Financing

A. DSS Funded Components (Capital Costs)

DSS Allocations Received from Central Government (Entire Governorate)

YEAR	TOT. AMT RECEIVED	AMT. RCD. FOR WATER	AMT. RCD. FOR ALL OTHER DSS	TOT. AMT ALLOCATED TO MARKAZ FOR WATER
82-83				
83-84				
84-85				
85-86				
86-87				
87-88				

B. Other Sources of Capital Funding for Village Water Projects

Funds Received From Other Sources

YEAR	SOURCE*	DESCRIPTION	TOT. AMT. RECEIVED	TOT. AMT ALLOCATED FOR VWS
82-83				
83-84				
84-85				
85-86				

255

Funds Received From Other Sources (continued)

YEAR	SOURCE*	DESCRIPTION	TOT. AMT. RECEIVED	TOT. AMT ALLOCATED FOR VWS
86-87				
87-88				

* BAB II, BAB III, GOE, Local, DSSI, U.N., Other (describe)

C. Do you review markaz expenditures from the 10% O & M Fund? _____

D. Financial Records and Budgets

1. Do you prepare capital or operating budgets? Obtain details on any budgeting related to water supply _____

2. What financial records are maintained :
   a. In general _____
   b. In regard to water supply _____

3. Are you audited?

4. Does any agency of the Governorate audit village water system records maintained at Markaz or Village level? _____

   If so, what is done with the results? _____

E. Improving village water system financing

1. What would you suggest as the most practical ways for villages to generate additional local revenues for water system construction/maintenance? _____

256

2. Do you think that village people are willing or able to pay a larger share of the cost? _____

_____

_____

3. What do you think about the present effectiveness of village collection of water system connection and use charges? _____

_____

_____

_____

4. What changes/improvements would you suggest for the collection system? _____

_____

_____

V. Training Needs for Personnel Involved in Village Water System Development/Operation

A. What training is most urgently needed at Governorate level?

	Position Title	Training Needed
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

B. What training is most urgently needed at Markaz level?

	Position Title	Training Needed
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

C. What training is most urgently needed at Village level?

	Position Title	Training Needed
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

VI TECHNICAL SUPPORT

A. Available Technical Skills

1. Broadly, what professional and technical skills exists at the Governorate level; (See Markaz questionnaire for guide)?

   _____

   _____

2. To what extent are these skills made available to:

   a. The Markaz ? _____

   b. The Village ? _____

B. Available Equipment and Materials

1. Braodly, what equipment and materials are available at the Governorate level (see Markaz Questionnaire for guide?)

   _____

   _____

2. To what extent are these items made availabe to

   a. The Markaz? _____

   b. the Village? _____

3. What stores/purchasing procedures exist for O&M?

   _____

4. What stores/purchasing procedures exist for capital works?

   _____

C. Technical Review of Village Projects

1. To what extent does the Governorate review projects proposed for construction at the village level? _____

2. Does the Governorate review the work of the Markaz officials responsible for operation of village water system? _____

   _____

258

3. Are you satisfied with the decentralized approach? What improvements would you suggest? _____

_____

D. Role of NIPWASD

What role does the National Organization for Potable Water and Sanitary Drainage in :

1. Providing technical assistance and support to those responsible for design, construction and operation of village water systems

_____

_____

2. Reviewing the adequacy of performance of village water systems? _____

_____

3. Can/will NOPWASD provide assistance if so requested?

_____

4. What water supply master plan exists for capital works programs _____

5. What laws and tariffs exist for water supply services _____

_____

6. What laboratory facilities exist for testing water quality?

_____

Who collects samples and tests _____

What tests are carried out _____

Are villages notified of sab-standard results _____

7. What do you consider the strengths and weaknesses of the water supply service in your governorate? _____

_____

APPENDIX F

CONSUMERS VIEWS OF VILLAGE WATER AND SANITATION

APPENDIX F

CONSUMERS VIEWS OF VILLAGE WATER AND SANITATION

TABLE OF CONTENTS

		Page
1.	Introduction	F-1
2.	Methodology of Survey	F-1
3.	Sample	F-2
4.	Multi-source Systems and Health	F-3
	Sullage Disposal Problems	F-4
	Poor Water Quality	F-5
	Service Interruptions	F-5
	Preference and Custom	F-6
5.	Cost of Water and Wastewater	F-7
	Water Service Charges	F-7
	Other Water Costs	F-7
	Wastewater Disposal Costs	F-9
6.	Changing Patterns of Water Use	F-10

APPENDIX F

CONSUMERS VIEWS OF VILLAGE WATER AND SANITATION

1. Introduction

An important part of the assessment included a survey of water users in each village. This survey was carried out to provide the following:

* A means of verifying and completing the statements of water system operators regarding patterns of service.

* Qualitative information on current water usage patterns regarding what water sources are used for what purposes.

* Information on villagers' attitudes and degrees of satisfaction regarding the piped water service they receive.

* Information on villagers' payments and expenses regarding water and wastewater.

The survey was intended to complement the observations and interviews of the technical field team, not as a stand-alone research instrument.

2. Methodology of Survey

The team sociologists and interviewers administered brief formal questionnaires in Arabic to 322 water users in 36 villages, and, in addition, held informal discussions with villagers, sometimes singly, sometimes in small groups, in every village.

262

As soon as the team arrived at each village council, the interviewer would enter the village, accompanied by a woman of the village to introduce her. She would then carry out the interview alone with each of the interviewees. The interview would last between fifteen minutes and half an hour.

3. Sample

The interviewers chose houses from different quarters of the village, and in most cases, from both the mother village and one of the satellites *(tawaba)* or small settlements *(ezba)*. The sample focused on those with water connections (68% of the total sample), however, some of those not connected to the piped system were also interviewed in each village. The interviewers chose houses that represented different levels of income and lifestyles in the village. Forty-seven (47%) percent of the sample live in modern masonry and fired brick housing, and the remaining 53% live in adobe or traditional houses of unfired brick and wood construction.

The survey focused on women (77% of the sample) since they are most immediately involved in the supply and use of water in the household, and because they are at home during the day and available for interview. However, the interviewers also conducted interviews with some men in almost every village of the sample. The table on the next page provides a profile of the villagers interviewed.

Profile of Water User Survey

Governorate	No. of Vil.	Total Inter-viewed	F	M	Conn-ected	% Conn.	Modern House*	Trad. House**
Menoufia	10	89	76	13	51	57%	25	64
Fayoum	4	28	18	10	18	64	10	18
Damietta	4	36	31	5	29	80	31	5
Gharbia	7	76	63	13	51	67	33	43
Giza	7	68	37	31	53	78	34	34
Qena	4	25	24	1	17	68	1	24
Total	36	322	249	73	219	68%	134	188

4. Multi-Source Systems and Health

A major purpose of providing piped water service is to improve public health. However, health benefits can accrue only to the extent that villagers use the cleaner water and are provided with adequate sanitation facilities in combination with an effective primary health care program. Almost every household in the survey reports using a combination of piped and non-piped water sources: canal water, handpump water, piped water at the house, and standpipe water (where standpipes function). See Figure 1 for the approximate percentage of the various sources of water supply.

---

* Fired brick.

** Adobe, or upgraded adobe.

264

Obviously, water is used for many purposes—drinking, tea, cooking, washing vegetables and crops, house cleaning, laundry, washing dishes and pots, bathing. Piped water is rarely used for all of these purposes, all the time, by any one family. Several factors contribute to the continued use of non-piped water by people with house connections:

* Wastewater disposal problems
* Poor water quality or palatability
* Service interruptions
* Preference and custom

Note : The cost of piped water was not mentioned as a consideration.

4.1 Wastewater (Sullage) Disposal Problems

The most important factor encouraging villagers to continue using non-piped sources of water is the problem of wastewater disposal. The quotations from the villagers on page ii of the Preamble make it clear why this is a problem.

In the past it was relatively easy to toss the wastewater in the street or into the septic tank and soakaway. However, with the rising water table in many areas, these options have almost disappeared, especially during winter. (These problems are less acute in middle and upper Egypt.) Villagers in nine of the villages report that fines are now actually levied against those who throw wastewater in the streets. In one very poor village, villagers complained of being fined LE 5.00 for dumping sullage in a small irrigation ditch *(mesqa)*.

The problem of wastewater disposal is the major factor leading women to continue to wash dishes and clothes in the canal. The problem of water palatability is the major factor leading people to continue to rely on the often-contaminated shallow wells, or even reluctantly from canals, in some cases, for drinking and tea water.

265

4.2 Poor Water Quality

Three factors regarding piped water quality contribute to encouraging women to make use of other less healthy sources of water. Hardness and saltiness are the major factors, while high iron and/or manganese are also a concern. In most areas served by groundwater systems, villagers judge the water to be too "hard" for effective laundering, and this factor contributes to the decision of many women with water connections to continue to do much of their laundry at the canal.

Other complaints about quality pertain to taste. In some areas, the water is salty, and although women will use it for cooking, they will not use it for tea or for drinking. The same is true where iron and manganese levels are high.

In many villages, people prefer the taste of the shallow well water to that of the piped water. Regarding water quality there is little realization that such wells are likely to be bacteriologically polluted, although most villagers now strongly state they don't drink the water of the canal or the Nile.

4.3 Service Interruptions

The piped water service is now a valued commodity, and users greatly miss it during the interruptions of service. The level of service varies greatly from village to village, and even between areas of a village. The following complaints are registered almost uniformly, even in the better of the systems observed:

* People complain of water shortages during peak times - Fridays, Ramadan, and summer.

* People complain that service is interrupted for repairs more often than necessary because there are not valves along the main lines that allow operators to isolate the problem area during repairs. One burst pipe and the whole village water system is shut down. They also complain about how long it takes to make the repairs.

-Use

* People complain that the operators of the water system are often lax and do not operate it according to schedule, i.e. they come to work late or go home early, leaving users without the expected water service. In two villages visited, villagers complained that sometimes the operators do not show up for several days in a row.

* People complain of interrupted water service due to the recurrent electricity outages compounded by small village storage tanks.

4.4 Preference and Custom

* Women interviewed stressed that they enjoy washing dishes and pots outdoors by the canal where they have room to spread them out and let them dry. At the house, the area is cramped for doing the pots and dishes with ease. Some also still make use of the abrasion of dirt to remove stubborn cooking residue from pots.

* Similarly with laundry, women in the crowded delta villages stressed the ease of being able to spread the work out in the open air and space along the canal where the water volume disperses the suds. In upper Egypt, women rarely do such work in a public place, and those without piped connections wash in their private courtyards.

5. Cost of Water and Wastewater

5.1 Water Service Charges

In most governorates, villagers report paying very low monthly fees, often as low as 25 pt per household. These fees are paid to the village council, usually on a quarterly or semi-annual basis.

The official rates for piped water are not regarded onerous, and in some villages, people report that they repeatedly forget to pay and are then subject to small fines.

In those villages that have added to the basic charge an additional charge for local maintenance, there is no reported resistence. Even in Damietta, where charges have increased considerably, villagers' anger is over the poor water service (only three days per week at very low pressure) as much as it is over the relatively high rates they have to pay.

5.2 Other Water Investments and Expenses

Although monthly government rates for piped water are low, other expenditures for water related services indicate a willingness to pay for good water service. Many people have made relatively expensive private investments in their piped water connection, ancillary equipment, or in alternative water systems.

In many villages, villagers contributed money and labor to install the pipelines for the water system.

Sixty-one percent of those in the sample with water connections have invested extra money (LE 15-25 per faucet) to have the convenience of more than one faucet at the house.

In the non-coastal delta and in much of middle Egypt, shallow wells equipped with handpumps are common. On average, hand pumps serve as a source for some of the needs of 28% of the people in the villages. (Fig.1) One villager advised a team member that the best way to judge the water system in the village is to count the number of new private handpumps. "People would not be installing those handpumps if the water system was working properly," he said.

Most of these shallow well handpumps are old and they periodically need to be repaired at a reported cost of between LE 150-250. New shallow wells and handpumps cost in the order of LE 1,000 to LE 1,500 to install today. Some villagers have replaced the old handpumps on these shallow (20-30 meters) wells with electric pumps that pump the water into a roof storage tank. Such electric pumps are reported to cost over LE 150, and the storage tanks cost an additional LE 100.

In the surface systems, householders compensate for the low pressure and intermittent service by installing illegal electric pumps to pump the water up to roof tanks. Again such devices cost and people pay. In Damietta for instance, well over half the houses in the four villages surveyed had invested in such pumps and tanks.

Finally, some villagers in a few areas report buying water from water vendors at a cost of 75 pt per day. One family reported spending 50 pt for a "cask" of water, which was less than 100 liters. That translates to a cost of LE 5/m^3

Along with television, the washing machine is fast becoming a very popular item. In some villages it seems that over 50% of the households have made this investment of between LE 80 - LE 120. Even in some adobe houses without water connections, one finds the electric washing machine being filled and emptied by bucket. One also finds women with washing machines at home, doing laundry by hand at the canal.

5.3 Wastewater and Excreta Disposal Costs

To deal with the wastewater (sullage) disposal problem, some householders in one village in Menoufia have constructed wastewater storage tanks on the roof of the house at an estimated cost of LE 100-150. These tanks hold enough sullage for about a week and are drained through a hose into the village's tractor-pulled sullage pick-up tank that makes regular rounds. They carry their dishes to the roof to wash them, and store other wash water there until the village sullage tanker comes round to collect the wastes.

The problem of having to pump out septic vaults is increasing in some areas due to the rising water table. The cost of pumping out septic vaults or digging out latrines varies considerably. In some areas people report paying as much as LE 60 to have their latrine dug out once a year.

In other areas, people report that their latrines almost never need to be emptied. Septic pumping trucks are reported to charge between LE 3.00 (government) and LE 5.00 (private) to pump out a household vault. But how often this needs to be done is not clear. In many villages people will delay the chore longer than they should in order to have the government truck do the job for LE 2.00 less than the private truck. It seems that the amount itself is not so important as is the principal of paying extra.

Conversely, many villagers stressed that they would contribute to the construction costs of a wastewater system, and in a number of the sampled villages they have already done so.

6. Changing Patterns of Water Use

It is important to remember how recent is the provision of piped water to village houses. The interview records show that among those with house connections, 75% have received this service during the past seven years, and 50% have received this service only during the past three years.

In most instances, villagers with house connections express their general satisfaction with the water service, despite any complaints or wish lists they may have. They stress that in the recent past they were without such service entirely, therefore they view the present system as an important improvement. There is an air of resignation about their system's deficiencies. It is difficult for villagers to assess fully the water system's deficiencies because they have never experienced a better system and they have fresh memories of worse.

As a relatively new service, villagers are still experimenting with how to work the piped water into their patterns of labor and living. In some villages in the delta, interviewees reported that after washing clothes and dishes in the canal, they bring them home and rinse them off with the cleaner piped water. In other places women in adobe houses without water connections are bringing buckets of well water to their electric washing machines. In other villages, the piped water contributes to the operation of profitable cottage industries such as egg production, chicken raising, and cheese making. Many villagers no longer allow their precious investment in livestock to drink from the polluted canal, but water them from the piped water system.

The availability of piped water is part of a wider pattern of changing village lifestyles. It goes along with the trend from adobe houses to cement houses, increased employment off-farm, overseas work experience, television-inspired styles of dress and cleanliness, and diversified economic endeavors.
Although usage of piped water at the house remains low, this usage is increasing despite the limitations of wastewater disposal.

231

APPENDIX G

BIBLIOGRAPHY

APPENDIX G

BIBLIOGRAPHY

"***A Consideration of Alternative Wastewater Treatment Systems for Six Damietta Villages,***" Chemonics/Cairo, January 1985.

"***A Study of the Problems of High Ground Water Levels in Nile Delta Villages,***" Joseph Haratani, WASH Field Report Nº 133, October 1984.

"***A Village Infrastructure Maintenance Program,***" .Chemonics/Cairo, 1985.

"***Arab Republic of Egypt Water Supply and Sewerage Sector Memorandum,***" The World Bank, 1984.

"***Assessment of the Operations and Maintenance Component of Water Supply Projects,***"James K. Jordan et al., WASH Technical Report Nº 35, June 1986.

"***Basic Village Services Annual Evaluation: Village Case Studies.***"Richard Huntington et al., USAID, February 1982.

"***Basic Village Services Fourth Mid-Project Evaluation,***" USAID, Chetwynd et al., March 1984.

"***Basic Village Services Projects — Quarterly Progress Report (Status of Expenditres),***" ORDEV, 30 September 1987.

"***Connection Financing for Water Supply and Sewerage in Developing Countries,***" Little et al., WASH Working Paper Nº 35, October 1984.

"***Demonstration Projects for Unsewered Areas in Greater Cairo,***" AMBRIC, October 1987.

"***Estimating Operation and Maintenance Costs for Water Supply Systems in Developing Countries,***" James K. Jordan et al., WASH Technical Report Nº 48, January 1988.

"***Feasibility, Design, and Management Studies for Water and Sewerage Development Projects in Daqahliya, Damietta, and Behera — Preliminary Report, A Project Development,***" Sogreah Consulting Engineers et al., September 1986.

273

"***Feasibility Study on Sharkiya Water Supply System in the Arab Republic of Egypt.***" Japan International Cooperation Agency, Nihon Suido et al., December 1984.

"***Guidelines for Assessing Village Water Projects Funded Under the DSS I Program.***" John Tomaro & Donald Cullivan, WASH, March 1987.

"***Guidelines for Drinking Water Quality,***" Vol. I Recommendations World Health Organization, 1984.

"***Guidelines for the Management of the BVS Maintenance Fund,***" Chemonics/Cairo, 1982.

"***Implementation Plan for Unsewered Areas — Demonstration Project for Greater Cairo,.***" Dennis B. Warner et al., WASH Field Report, February 1982.

"***Income Distribution in Egypt,***" Ph. D. Thesis, Ahmad Hamdallah Samnan, Cairo University, 1985.

"***LD II Projects - Qarterly Progress Report,***" (Status of Expenditures), ORDEV, 30 September 1987.

"***LD II Provincial Services Project, RFP,***" USAID, July 1987.

"***Local Development II: An Egyptian-American Cooperative Program***". Project Paper, USAID, August 1985.

"***Maintenance of Basic Village Services Project Water Supply Equipment,***" James K. Jordan, WASH Field Report Nº 152, August 1985.

"***Mid-Project Evaluation of Egypt Development Decentralization I (DSS I),***" USAID, December 1983.

"***National Water Quality Seminar,***" WHO/EMRO/Alexandria, UNDP, and UNICEF, November 1987.

"***Potable Water for All: The Egyptian Experience with Rural Water Supply,***" Gilbert and Anne White, *Water International*, (1986), p. 54-63.

"***Preliminary Design for Pilot Wastewater Drainage Projects in Six Delta Villages: Master Report.***" Chemonics/Cairo, September 1985.

"***Preliminary Design for Pilot Wastewater Drainage Project : Daqahla Village (Damietta).***" Chemonics/Cairo, December 1985.

"***Proposed Preventive Maintenance Plan for BVS Pumpset Projects,***" Chemonics/Cairo, 1981.

"***Provincial Water Supplies Project,***" Binnie-Taylor and Dr. Abdel-Warith, February 1980.

"***Rural Sanitation Projects: Some Issues and Strategies,***" Ahmed Gaber, Chemonics/Cairo, April 1986.

"***Sewage and Drainage Problems in Rural Egypt: The Magnitude of the Problem,***" M. Raslan et al., January 1985.

"***Standard Maintenance Costs for BVS Water and Road Projects.***" Chemonics/Cairo, 1984.

"***Village Water Supply Management Handbook,***" USAID, Maseru, Lesotho, January 1987.

"***Wastewater/Drainage Demonstration Project of Six Villages and Suggested Interventions,***" Chemonics/Cairo, April 1985.

"***Wastewater/Drainage Problems and Needs Assessment: for Kafr El-Sheikh Governorate,***" Chemonics/Cairo, July 1986.

"***Water and Sanitation Sector Review for Arab Republic of Egypt,***" WHO/UNDP/UNICEF, July 1985.

"***Water Supply and Sanitation — Project Preparation Handbook,***" Brian Grover, The World Bank, July 1983.

"***Water Supply and Sanitary Drainage for Qena and Aswan Governorates.***" Upper Egypt Consultants, June 1986, (Phase I).

"***Water Supply and Sanitary Drainage for Qena and Aswan Governorates.***" Upper Egypt Consultants, June 1987, (Phase 2).

"***Women, Water, and Sanitation: Behavioral Patterns Related to Handling and Utilizing Water for Household Purposes.***" Samiha El-Katsha et al., October 1986.