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IMPLEMENTATION PLAN FOR UNSEWERED AREAS DEMONSTRATION PROJECT IN GREATER CAIRO

WASH FIELD REPORT NO. 52

SEPTEMBER 1982

Prepared for:

USAID Mission to the Arab Republic of Egypt
Order of Technical Direction No. 77

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September 17, 1982

Mr. Michael Stone
Mission Director
USAID
Cairo

Attn: Mr. Frederick Guymont
Capital Development Office

Dear Mr. Stone:

On behalf of the WASH Project I am pleased to provide you with 15 copies of a report on Implementation Plan for Unsewered Areas Demonstration Project in Greater Cairo. This is the final report by Dennis B. Warner, James Arbuthnot, Leo A. St.Michel, and Richard R. Sullivan, and is based on their trip to Egypt from 30 January to 26 February 1982.

This assistance is the result of a request by the Mission in October 1981. The work was undertaken by the WASH Project on 8 January 1982 by means of Order of Technical Direction No. 77, authorized by the USAID Office of Health in Washington.

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

Sincerely,

Dennis B. Warner

Dennis B. Warner, Ph.D., P.E.
Director
WASH Project

cc: Mr. Victor W.R.Wehman, Jr.
S&T/H/WS

WASH FIELD REPORT NO. 52

ARAB REPUBLIC OF EGYPT

IMPLEMENTATION PLAN FOR UNSEWERED AREAS DEMONSTRATION PROJECT IN GREATER CAIRO

Prepared for USAID Mission to the Arab Republic of Egypt
Under Order of Technical Direction No. 77

Prepared by:

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September 1982

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U.S. Agency for International Development
Washington, DC 20523

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Note: Currency equivalents
One Egyptian Pound (LE) = 100 piasters = US$ 1.22
or US$1.00 = LE 0.82

EXECUTIVE SUMMARY

The Cairo Sewerage Project, which was approved by the U.S. Agency for International Development (AID) in September 1978 and amended in August 1981, contains provisions for a program of interim measures for the unsewered areas of Greater Cairo. In October 1981, the USAID Mission in Egypt requested the Water and Sanitation for Health (WASH) Project to develop the unsewered areas demonstration component and to prepare an implementation plan within the context of the Cairo Sewerage Project. A four-person advance team from WASH visited Cairo in February 1982 and prepared this report with the assistance of AID, the Government of Egypt (GOE), and Giza Governorate officials.

The main purposes of the implementation plan contained within this report are the following:

1. To outline the steps needed to set up, operate, and assess a series of pilot demonstrations of improved sanitation methods in the unsewered areas of Giza governorate.

2. To identify sanitation methods with a high potential for application in the unsewered areas.

3. To recommend specific sanitation methods for pilot demonstration field trials.

4. To describe the implementation, schedule, project staffing, and institutional coordination necessary to carry out the field trials.

From a practical standpoint, the immediate objectives of the pilot demonstration projects are:

1. To provide the Organization for the Execution of the Greater Cairo Wastewater Project (CWO), the General Organization for Sanitary Drainage (GOSD) Cairo, and Giza Governorate with workable solutions that can be immediately implemented in the unsewered areas.

2. To develop the above solutions at minimum cost and in the shortest possible period of time.

These solutions should address the immediate problem of surface flooding from cesspits and sewage vaults. The greatest need is to eliminate the standing pools of sewage by improved methods of collecting and transporting sanitary and household wastewaters.

The long-term objectives of the pilot demonstration projects are to provide CWO, GOSD/Cairo, Giza Governorate, and USAID with solutions that provide long-term health, economic, and social benefits to people living in the unsewered areas. These solutions should address the more complex problems of wastewater collection, treatment, and disposal. The overall need is to improve all of these aspects in such a way that will safely allow increased usage of domestic water supplies throughout the unsewered areas. A major objective of all long-term solutions should be to develop methods which

encourage maximum financial contribution by individuals and households and thereby minimize the financial burden on public services and government in general. With proper planning and encouragement by CWO and GOSD/Cairo, it should be possible to develop and field test improved methods which are either self-constructed or self-financed by the people in the unsewered areas. These methods, if properly developed, will provide CWO and GOSD/Cairo with practical means of developing acceptable levels of sanitation in the unsewered areas at almost no cost to the public agencies, government, or foreign aid donors.

This report recommends a variety of pilot demonstration test sites and methods. One field site is recommended for methods resulting in immediate solutions and three other sites are proposed for the investigation of long-term solutions.

The recommended pilot demonstration field tests for immediate solutions are included in the following:

Improved equipment for the collection and transport of sanitary wastes from sewage vaults.

This would include: 1) new designs for improved pumper trucks, tractor drawn trailers, and possibly animal drawn carts, 2) assistance to Egyptian firms to allow local manufacturing of the necessary equipment, 3) training of operators of the new equipment, 4) field trials of the new equipment in the unsewered areas, 5) assessment of the capital and recurrent costs of the equipment, and 6) recommendations on the equipment best suited to providing immediate solutions to the problem of sewage flooding in the unsewered areas.

For long-term solutions to the problems of the unsewered areas, three pilot demonstration field tests are recommended:

1. Community-financed sewers, involving local initiative to raise funds, hire a contractor, and construct a simple gravity sewer which would link up with the existing GOSD/Cairo sewer system.

This method holds great potential for many unsewered areas since all capital costs would be borne by the users. The field tests should concentrate on the issues of design, system capacity, legal authorization, and proper supervision and control by GOSD/Cairo. Once these questions are resolved, CWO and GOSD/Cairo can put their approval on this method and thereby encourage widespread adoption of it by local community groups.

2. Small-diameter sewers, involving the linking of existing sewage vaults to a small diameter gravity sewer which would drain away only the liquids (supernatant) from the vaults.

This would expand the effective capacity of the vaults and thereby prevent the flooding of sewage into the streets. It should be possible to encourage local residents to finance the capital development and subsequent operation of these sewers with their own funds. The main issues needing

investigation and testing are treatment and disposal of the wastewaters. Potential solutions are 1) connection to the GOSD/Cairo sewer system, 2) soil discharge through infiltration trenches, and 3) direct discharge into irrigation drains.

3. Direct infiltration into the ground by means of sewage vaults and septic tanks.

This method takes advantage of the low groundwater table and high soil porosity found in the western portions of Giza City, most notably around Kafr El Gabal. Because of the above groundwater and soil conditions found there, existing sewage vaults do not malfunction, do not flood the streets with sewage, and, in fact, are rarely in need of emptying. Wastewater in this area quickly infiltrates into the soil through the unsealed base of the sewage vaults. Since this method is so successful, the field tests should define the area where it can be applied and, if necessary, improve on the design of the vaults. A major issue needing further investigation, however, is the effect of this method of wastewater disposal on the quality of the groundwater. Almost every house has a shallow-depth, suction-lift handpump situated within a few meters of a sewage vault. These handpumps are used to provide drinking water for the building residents. The field tests, therefore, should determine both the geographical area where unsealed sewage vaults would be suitable and the resulting quality of the groundwater. This should lead to recommendations regarding the use of such disposal and drinking water supply methods.

There is great potential for implementing most of the above methods with little or no government funds. In Greater Cairo, it is possible to develop these methods in such a way that the people in the serviced households will pay for most or all of the capital and recurrent costs.

Chapter 1

INTRODUCTION

1.1 Background

The Cairo Sewerage Project was initially authorized for funding by the U.S. Agency for International Development (AID) in September 1978, and a project amendment was approved in August 1981. The primary purpose of the project is to increase the conveyance capacity of the existing wastewater collection system and, as a result, to reduce surcharging and flooding at various locations in Cairo. The secondary purpose is to improve the capability to manage the system, to develop the necessary information to expand the wastewater collection system, and to implement alternative wastewater disposal solutions in unsewered areas.

The original project focused on the primary collection system. while the August 1981 amendment instructed the contractor to complete the rehabilitation work in the primary collection system, solve a number of flooding problems in the secondary system that cannot be solved by rehabilitation of the primary system, design system expansion projects, and develop solutions for wastewater disposal in unsewered areas. The subsidiary and major pump stations are scheduled for construction completion in mid-1983, while the secondary system elements are scheduled for construction completion in 1985. The construction work on the west bank conveyance system is scheduled for completion early in 1985.

The original Project Paper identified the urgent sanitation problem in the unsewered areas but concluded that the sewerage system would have to be upgraded before wastewater from these areas could be accommodated. This decision was based on the assumption that all unsewered areas could be and would be connected to the main sewerage system within a reasonable time. Studies made of these unsewered areas since authorization of the project have shown that this assumption is not valid and certain corrective actions must be planned and implemented as soon as possible. The August 1981 amendment to the Project Paper recognized the need to change the original project strategy and to address the problem of the unsewered areas. The amendment included funding of $3,500,000 for the development of a program for interim measures in unsewered areas.

1.2 WASH Scope of Work

In October 1981 the Water and Sanitation for Health (WASH) Project received initial notification that the U.S. Agency for International Development (USAID) Mission in Egypt wanted to develop the unsewered areas demonstration component of the Cairo Sewerage Project (Project 263-0091). A series of informal meetings was held in November and December among representatives of the WASH staff, Camp Dresser & McKee Inc. (the prime contractor for WASH), and USAID (including the Office of Health, the Near East Bureau, and the Egypt Mission) to discuss the potential scope of work and the associated technical and administrative support requirements. On January

8, 1982, the AID Office of Health (S&T/HEA) issued Order of Technical Direction (OTD) No. 77 (see Appendix A) requesting that WASH send an advance team to Egypt to prepare an implementation plan for the demonstration areas sub-project.

The advance team consisted of Dennis B. Warner, WASH Project Director (team leader); Richard R. Sullivan, WASH Administrative Officer; Leo St. Michel, Senior Vice President, Camp Dresser & McKee and former Project Director, Cairo Sewerage Project; and James Arbuthnot, Vice President, Camp Dresser & McKee. From January 30 to February 26, 1982 the team carried out the necessary field investigations in Egypt, during which time a final draft version of this report was prepared and presented to the USAID Mission. Officials of the USAID Mission and the various Government of Egypt (GOE) administrative and wastewater organizations were closely involved in overall plan discussion, formulation, and review. The team was assisted in this process by Joseph Haratani of the Near East Bureau of AID/Washington, who provided guidance and participated in all aspects of field investigations and report preparation.

In the authorizing OTD the WASH contractor was requested to:

(1) Prepare an overall implementation plan for pilot demonstrations of improved excreta and wastewater disposal methods in the unsewered areas of greater Cairo situated in Giza Governorate.

(2) Establish preliminary criteria for the selection of unsewered areas.

(3) Establish preliminary criteria for the selection of pilot demonstration sites.

(4) Develop a preliminary methodology for analyzing existing methods of excreta and wastewater disposal and for developing promising improved methods in pilot demonstration sites.

(5) Develop level of effort estimates for manpower, commodity, and logistics requirements and for organizational frameworks and implementation schedules.

(6) Describe the proposed test demonstration sites.

(7) Develop cost estimates in terms of levels of effort to enable the USAID Mission to request the requisite level of services and commodities.

(8) Carry out a preliminary investigation of the availability of individual consultants, subcontractor organizations, and office locations.

(9) Develop preliminary procedures for subcontracting and financial administration and determine the relative responsibilities of the organizations involved in the implementation of these pilot demonstration activities.

The remainder of this report describes the findings, conclusions, and recommendations of the advance team in response to the above scope of work.

Chapter 2

DESCRIPTION OF UNSEWERED AREAS

2.1 Unsewered Areas Site Visits

In the course of preparing this report, the Advance Team visited the following sites:

North Giza City:

Ard El Gameya
Ard El Salaam

West Giza City:

Boulac El Dakrour
Dalware
Abu Quetata
El Talbeya/El Konaysa
Kafr El Gabal

South Giza City:

Saqyet Mikki
Gizira El Dahab
El Mounit

Figure 2.1, location map, identifies the above sites.

2.2 Health Problems in Giza Governorate

Health data, or valid disease statistics, specific to Giza Governorate are not available.

Two indices reflecting the general level of health are life expectancy and infant mortality. For Eygpt as a whole life expectancy at birth is estimated to be about 55 years. This is below the life expectancy of the more industrialized world but higher then that of many developing countries. This is believed to be due to the general availability of basic medical facilities and the ability of Egypt to feed its people comparatively well. Infant mortality, however, is quite high, estimated to be about 115 per 1000 live births (others believe infant deaths to be underreported and the infant mortality rate to be as high as 180 per 1000 live births). These figures are high even in comparison with those of other developing countries and may be attributed to the prevalence of gastro-intestinal diseases resulting from the poor sanitation prevalent throughout the country except in urban centers of the largest cities. The deaths of children under five comprise about half of total deaths. Few countries in the world have such a high proportion of deaths among the young.

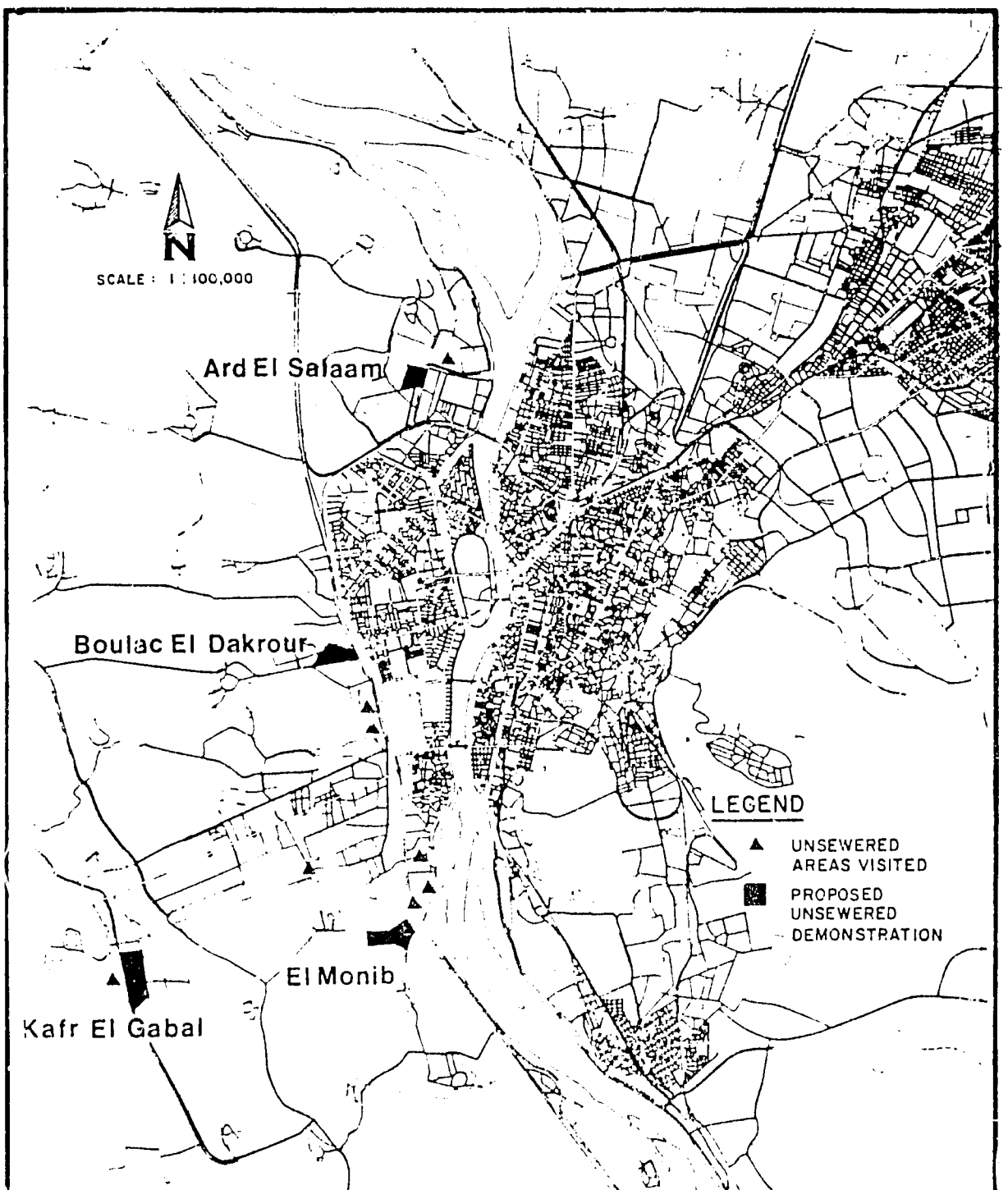


FIGURE 2.1 LOCATION MAP

The urban unsewered areas of Giza Governorate in which the sanitary disposal of human excreta has become a problem appear to have a number of hospitals and clinics. Compared with Egypt as a whole wage rates are relatively high. The principal factors operating to extend life in Egypt, relatively good medical facilities and an adequate diet, therefore appear to be operating in these areas.

Dr. Abdel Ghany El Azmerly, head of the Communicable Disease Control Department of Giza Governorate, stated that the most important diseases in the Governorate were bilharzia (schistosomiasis) and hepatitis, and that the next most important were the enteric group. In the enteric group Dr. Azmerly included summer diarrhea of children, bacillary dysentery, amoebic dysentery, typhoid and para-typhoid.

In Egypt bilharzia is primarily an occupational disease of agricultural workers. It also may affect other people who work in water polluted with human excreta or urine when that water contains certain species of snails. Bilharzia does not occur where human excreta and urine are disposed of in a sanitary manner. The other diseases listed by Dr. Azmerly as being most important in the area are also due primarily to inadequate sanitary facilities. All these diseases are infectious diseases, readily prevented by good sanitation, particularly by sanitary disposal of human excreta.

2.3 Population and Housing Patterns

The following information has been extracted from a report prepared by Sherif M. El Hakim and Associates (see Appendix E), on the socio-economic characteristics of certain unsewered areas in Giza Governorate.

Housing in the study areas has developed without government sanction. Construction and development are the aggregate effect of individual construction activities which usually occur without licensing or legally acceptable building standards on land that has not been systematically subdivided. Community services are absent when housing is begun. Services, such as electricity which is commercially self supporting, may come fairly soon. Other community services are generally still lacking in the study areas.

The study areas resemble each other in that they have been developed by the lower socio-economic groups having for the most part similar life styles but the various study areas are at different stages of development. The development of such areas involves two processes: the evolution of building materials from temporary to more permanent types and the staged vertical expansion of the structures themselves.

The plots as sold are tailored to the needs and finances of the individual buyers. Generally, little provision is made for appropriate infrastructure or green areas. Access ways between plots are minimal and often become narrow alleys. Buildings tend to be constructed first as single or two family dwellings units. Later, buildings are modified by the addition of floors. As this occurs and as vacant plots are occupied, dwelling space and the density of population increase.

For areas that develop in this way and for quarters within such areas, there is effectively a saturation point. Ultimately, physical boundaries stop horizontal expansion and the ultimate design capacity of the buildings prevents upward expansion. The population is then stable as significant changes in room densities are unlikely.

Available data are summarized as follows:

Boulac El Dakrour - The population is estimated at 120,000 and is more or less stable, as available room has been occupied. Density is estimated at about 1,100 per hectare. Five percent of the buildings are one story. Persons per room is estimated at 2.0

El-Mounib - Population is estimated as 15,000 and is still expanding as there is much vacant land. Density is estimated at 440 per hectare. Two percent of the buildings are one story. Persons per room is estimated at 2.2

Ard-El-Salam - Population is estimated at 25,000 and is more or less stable. Density is about 1,110 per hectare. Two percent of the buildings are one story. Persons per room is about 1.9

Kafr El-Gabal(1) - Population is about 11,500 and stable. Density is about 230 per hectare. Twenty percent of the buildings are one story. Persons per room is estimated at 1.7

Kafr El-Gabal(2) - Population is estimated at 6,000 and still expanding. Density of population is about 170 per hectare. Twenty percent of the buildings are one story. Persons per room is about 1.7

2.4 Existing Methods of Excreta Disposal

In 1980 American British Consultants (AMBRIC) conducted a survey of 94 households in the unsewered areas of Cairo, with the following results:

No. of Households	Type of Latrine Reported
9 (9.6%)	W.C. connected to a sewer system or a canal or drain
58 (62%)	Pour flush latrine, either with or without a water seal, connected to a vault offset from the squatting plate
18 (19%)	Vault located directly beneath the squatting plate, with no water seal and no requirement for flushing water

3 (3.2%)	Merely a hole in the ground
6 (6.4%)	No latrine

In 1979 the American University in Cairo conducted a survey of 1,236 households in unsewered areas. Of these 356 were in Giza Governorate. This survey was not completely representative of the present unsewered areas in that it was confined to households without piped water in the house.

Of 356 households interviewed in Giza, 336 households or 94 percent had their own latrines. The kinds of latrines varied and include the western type of seat toilet, the floor type pour-flush latrine, pits in the ground with wooden covers, tin barrels with wooden chairs fixed to them, and plastic or tin pans in the ground. In the entire survey, including Giza, about 72.4 percent of the households disposed of their excreta into "tanks" (which are referred to in this report as vaults). Presumably in Giza also about three-quarters of the households used pour flush latrines discharging into tanks or vaults.

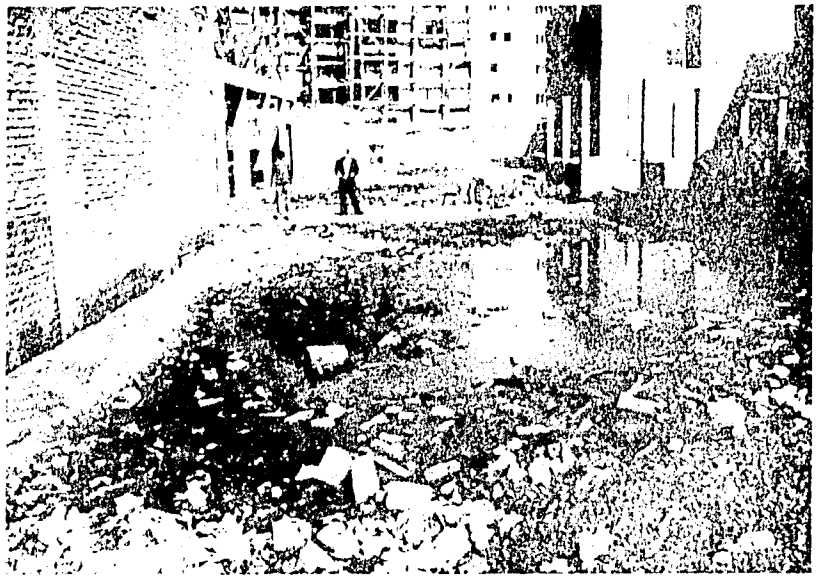
In Giza 188 of the households (53 percent) reported that they throw wastewater (not latrine or toilet wastes) "into the street or an empty space." No doubt this was done to minimize overflowing of the vaults.

In general it appears, as might be expected, that the method of excreta disposal varies with the type of housing. In the rural fringes of the area where one family and one or two story houses are the rule and where many families have animals most dwellings will have either no latrine or a pit latrine.

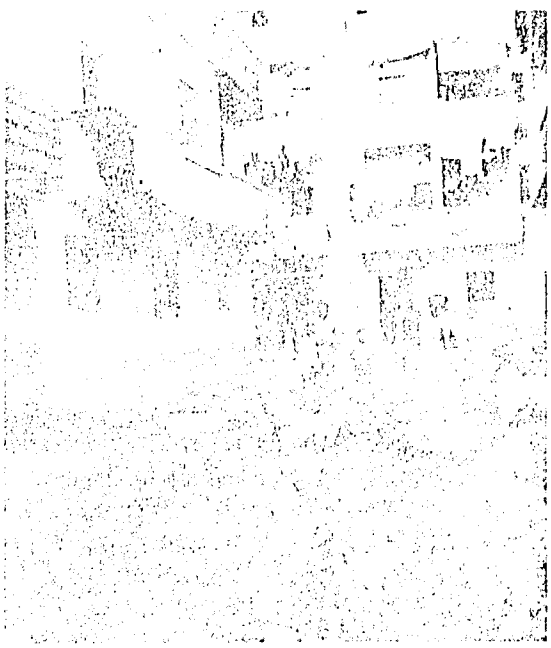
Most of the population, however, now lives in urban conditions, where multi-storied buildings are the rule, with six and seven story dwellings being common. Furthermore, in these urban areas more building is usually in progress. Vacant lots are being filled, and buildings of one story are being replaced with high ones. Such buildings are mostly occupied by tenants with a different family in each apartment. These tenants very much prefer their own latrine. Accordingly the newer buildings are almost invariably built with a water seal latrine in each flat.

In part because of the shortage of water and in part because of the difficulty of disposing of the wastewater from the latrine, the latrines are generally flushed by pouring water by hand; they are not equipped with a flush tank connected to the piped water supply. Older buildings are also being converted to this style of latrine.

The wastewater from these latrines is almost invariably discharged into an underground vault in the street constructed of brick with a reinforced concrete cover. The wastewater is supposed to seep from the vault into the ground but unfortunately all too often the dirty water either overflows the vault causing a nuisance in the street or else the building owner must arrange to have the vault emptied and its contents hauled away. Where the vault tends to overflow, discharges to the vault through the latrine are usually kept to a minimum, and other household liquid wastes such as those from bathing or washing are kept separate and separately carried away.



(a) Permanent pools of sewage amidst 4 to 8 story buildings in Ard El Gameya.

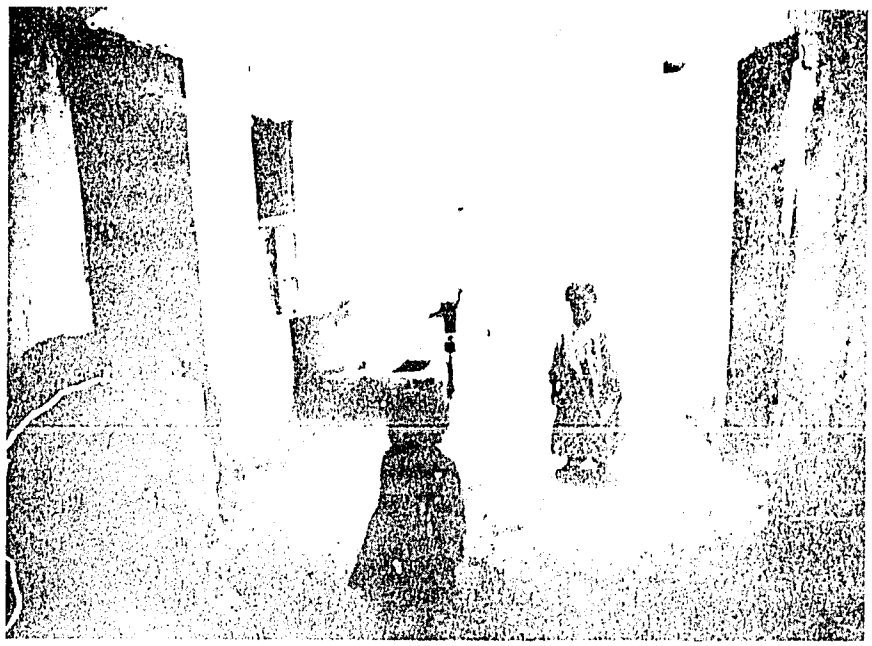


(c) Overflowing sewage vault in El Mounib.

(b) Street scene in Boulac El Dukrour.

(d) Lower-density housing in Kafr El Gabel.

FIGURE 2.2 TYPICAL STREET SCENES IN THE UNSEWERED AREAS.



(a) Handpump in a courtyard in Kafr El Gabel.

(b) Handpump inside a house in El Mounib

(c) City water and an inside tap in Boulac El Dakrour.

FIGURE 2.3 WATER SUPPLIES IN THE UNSEWERED AREAS.

Chapter 3

PROJECT OBJECTIVES

3.1 USAID Objectives

A key objective of the USAID Mission in Egypt is to improve the physical quality of life of the Egyptian population, especially the poor. To achieve this objective, the Mission has undertaken several major development activities, one of which is the Cairo Sewerage Project (263-0091).

The objective of the Cairo Sewerage Project is to improve living conditions in Cairo by:

(1) Rehabilitating the existing sewerage system;

(2) Improving and extending the sewerage system;

(3) Developing improved methods of wastewater disposal in unsewered areas;

(4) And strengthening the responsible organization (the General Organization for Sanitary Drainage--GOSD /Cairo) through technical assistance and training activities.

Within these broad objectives, the unsewered areas component of the Cairo Sewerage Project is intended to develop and test innovative, low-cost excreta and wastewater collection, treatment, and disposal methods which will improve the level of sanitation in pilot demonstration areas in Giza Governorate. The long range goal of these efforts is to expand the use of improved disposal methods to other unsewered areas of greater Cairo.

3.2 GOE Objectives

3.2.1 Giza Governorate Objectives

Officials of Giza Governorate want the project to serve two primary objectives. The first is to develop practical and effective methods of dealing with the problem of flooding caused by the malfunctioning sewage vaults. Most of the unsewered areas suffer from this problem to some degree, yet city and governorate resources are inadequate to meet the need. Indeed, as the urban areas of Giza City expand outward, the problem of sewage flooding becomes continually worse.

The second objective is to determine ways of quickly implementing improved sanitation. Moreover, these methods should be developed for all areas in need of assistance, not only those containing properly registered, formal housing. According to the Honorable Ibrahim Lutfy, the Governor of Giza, the people in the unsewered areas are becoming impatient with studies and, therefore, the demonstration projects should be carried out as quickly as possible in order to get on with the subsequent implementation.

3.2.2 CWO Objectives

As implementing agency for the Government of Egypt, the Cairo Wastewater Organization (CWO), is responsible for the execution of the Greater Cairo Wastewater Project, coordination and cooperation among the various ministries and authorities, and complete control of all different aspects of the project involving three different governorates. CWO wishes to obtain, as early as possible from the "unsewered areas" subproject, confirmation of the most appropriate means to solve the sanitation problems of the unsewered areas. CWO may then coordinate an effective continuation of the resulting recommended program throughout the unsewered areas of Greater Cairo.

Because of the broad powers given to CWO to enter into contracts, to approve designs and construction plans, and to supervise construction, CWO is considered the most appropriate organization to implement a comprehensive program catering to the needs of the unsewered population.

3.2.3 Cairo/GOSD Objectives

Any interventions in the unsewered areas that involve connections to the existing sewerage system would require the approval of Cairo GOSD, and operation/maintenance would be handled by GOSD through three departments, namely the Sewer Maintenance Department, the Mechanical and Electrical Department, and the Water Pollution Control Department. In particular, GOSD objectives include (1) compliance with standard design criteria, quality control of materials, and satisfactory construction and installation procedures in order to minimize future operation and maintenance problems, and (2) installation of facilities in coordination and compliance with the implementation of the major elements of the first stage master plan improvements.

3.2.4 Community Objectives

The communities comprising the unsewered area may be divided into two types according to whether they have pour flush latrines in their homes or not. A minority do not. These are found principally in the more rural, relatively less densely populated areas. If the area is not really rural, or if new housing is being built nearby, many residents perceive disposal of their excreta as a nuisance or realize that other methods of excreta disposal would be socially superior and aspire to have pour flush latrines themselves.

Most of the people of the community live in urban conditions and do have pour flush latrines that discharge to a vault underground in the street. Most of these people either have trouble due to overflowing of their vaults or observe such troubles amoung their neighbors. The community is generally aware that insects, including flies and mosquitoes, cause diseases and that pools of wastewater are a major cause of their proliferation. Most children play in the streets; many have no other place to play. Illness of children

is often blamed on contact with wastewater which overflows into the street from vaults or is thrown in the street in an effort to avoid such overflowing.

Many members of the community would like to use more water in the house, but either limit themselves because of the difficulty of disposing of this wastewater or are forced to limit usage, for instance, by building owners who close and lock water taps. Disposing of wastewater in buildings by means of pour flush latrines is a great expense, whether measured in terms of time spent by family members who must carry it away or in the cost of getting it carried away commercially.

For all these reasons those who have pour flush latrines in unsewered areas actively desire a convenient, cheap, effective, nuisance-free and sanitary way to dispose of household wastewater.

Chapter 4

CONSTRAINTS

4.1 Legal

Egyptian law regulates most aspects of wastewater collection and disposal as well as the institutions responsible for the planning, implementation, operation, and maintenance of wastewater systems. The basic legislation affecting collection and disposal is Law No. 93 of 1962 and the associated executive regulations (Ministry of Housing Decree No. 649 of 1962). Private sewers can be constructed and connected to the government sewerage system with the approval of the official sewerage authority. Under certain circumstances, wastewater can be discharged into waterways, agricultural drains, and ponds, but approval must be given by the Ministries of Health, Irrigation, and Industry and a permit must be obtained from the sewerage authority.

According to the executive regulations of Law 93/1962, the relevant local government unit (city or district council) is the authority in charge of sewage and, thus, is responsible for authorizing the discharge of industrial and public sewage into waterways or for authorizing the connection of private sewers to the government sewerage system. The full application of this authority, however, is unclear in the case of the unsewered areas of Giza. Further investigation is needed to determine the relevant responsibilities of Giza City districts, the Giza City Council, GOSD/Cairo, and the Ministries of Health, Irrigation, and Industry.

The Ministry of Health is responsible for insuring compliance with permit conditions through periodic sampling and analyses of discharges. Unauthorized discharges may be stopped by the Ministries of Health or Irrigation. The enforcement of regulations is generally left to local government units, which traditionally have been reluctant to enforce the required standards. At present, Law 93/1962 is under revision and may be made more readily enforceable in the future.

In brief, the following institutions have responsibility for one or more aspects of wastewater in Greater Cairo:

(1) GOSD/Cairo is responsible for the administration, operation, and maintenance of public sewer systems, pumping stations, and treatment plants. It is a public authority established by Presidential Decree No. 133 of 1981. The organization reports to the Governor of Cairo.

(2) CWO is responsible for planning and supervising the implementation of the Greater Cairo Sanitary Drainage Project. It is an executive agency established by Ministrial Decree No. 497 of 1981. The agency reports to the Chairman of the Central Agency for Reconstruction, Ministry of Housing and Reconstruction.

(3) Ministry of Health is responsible for monitoring discharges and water quality in drains, canals, and rivers.

(4) Ministry of Irrigation has authority over wastewater discharges into drains.

(5) Local government units when acting as sewage authorities under Law 93/1962 are responsible for effecting house connections to public sewers.

4.2 Institutional

The City of Giza is empowered to collect certain taxes but is dependent upon the Governorate of Giza for most of its budgeted city services. The governorate, in turn is dependent on the central government for most of its budget. This dependency between the City and the Governorate and between the Governorate and the Central Government prevails at all levels of local government. Although local government units (city and governorate) are responsible for preparing budget estimates, there are at least five levels of review and approval, terminating with final review and approval by the Central Government, which makes project planning an extremely difficult and uncertain exercise.

Formal budgets are not prepared below the city level. Rather than preparing a formal budget, the district prepares a statement of needs, of which about 90 percent reflects wages and benefits. The actual capital budgets for projects are prepared only at the city and governorate levels.

Although district level technical staff are most familiar with sewerage problems and needs of specific neighborhoods, they do not directly participate in the project planning process. Effective project planning, therefore, becomes dependent on the establishment of effective relationships and communications between the district and city levels of local government.

The national ministries are represented down to the city level, except in the case of the Ministry of Irrigation which has representatives at the district level. In the case of the Ministry of Housing and Reconstruction, under which GOSD/Cairo operates, representation stops at the city level. The local government system, therefore, does not allow for direct linkages between the districts and the central governments in the planning and budgeting of sewerage projects.

GOSD/Cairo is responsible for the installation and operation of the sewage collection system, while the governorate, through the City of Giza, is responsible for wastewater disposal in the unsewered areas of the city. Because of limited budget resources, however, the City of Giza has been able to provide only emergency service for overflowing or otherwise malfunctioning individual building vaults. The governorate operates eight vacuum pumper trucks, of which seven are used exclusively in the City of Giza. There is no regular public service for emptying sewage vaults provided by either the local or central government.

Under the present administrative structure, the unsewered areas of Giza city receive virtually no official attention. At most, a few small sewer connections are made from houses to existing secondary sewers with the

assistance of district level technical staff. Virtually all wastewater collection and disposal in the unsewered areas is arranged and paid for directly by the residents themselves.

Major Problems

(1) The present administrative structure does not allow the most knowledgeable technical staff (district engineers) to make a direct input into the project planning and budgeting process.

(2) Low wages, inadequate productivity incentives, and excessive bureaucracy, has limited the ability of technical work forces at all governmental levels to plan and execute improved sewerage services.

(3) As a result of overstaffing, 90 percent of district-level budgets are absorbed by wages and benefits with very little remaining for physical infrastructure projects.

(4) Large areas of Giza city are presently unsewered. Officials estimate that as much as 50 percent of the city population live in unsewered areas.

(5) The existing sewerage system in the City of Giza is overloaded and subject to flooding due to pump failures and clogged sewer mains. This causes a continual need for emergency pumping services for the central system, which limits the availability of pumper trucks in the unsewered areas.

4.3 Socio-Cultural

This section has been extracted from Appendix E, prepared by Sherif M. El Hakim and Associates.

A discussion of the socio-cultural constraints should begin by emphasizing that these constraints favor the proper or sanitary disposal of excreta. Traditional religious teaching clearly affirms that cleanliness is a part of faith. The literature on prophetic teachings has many clear injunctions towards cleanliness and the proper disposal of waste, explicitly including defecation and urination.

Unfortunately in the poor environmental conditions of some of the study areas, it is often not possible for an individual or a family to keep the neighborhood clean. In such instances significant boundaries for cleanliness are defined in terms of the home rather than the community. Nevertheless, even these families or individuals will acknowledge the correctness of the need for cleanliness in the neighborhood and the community. Furthermore, the consequences of wastewater and solid waste accumulation on health are generally known. It is known that such wastes breed flies and mosquitoes and are likely to cause problems to the health of persons living near such wastes.

While the present systems for disposal of wastes are, in theory, acceptable, these systems, especially in the more densely populated areas, are more nearly tolerated than accepted. The residents consider the situation poor. Disposal of wastes is an ordeal especially for people who live above the ground floor and have to carry their wastewater down to the street and often to a distance on the street.

Piped water supply with private toilets and washing facilities for individual households connected to main sewer lines is considered ideal. The residents of unsewered areas expect the government either to arrange such services for them within the neighborhoods they live in or at present in comparable public housing.

4.4 Financial

The government apparently gives the Cairo sewerage improvement program a very high priority. Accordingly it is believed that financial constraints will not prevent the government from entering, or carrying through, any practicable program for improving excreta disposal and poor sanitary conditions in the unsewered areas of greater Cairo.

The report of Sherif M. El Hakim and Associates also makes it clear that the people of the unsewered areas give a high priority to obtaining better sanitary conditions and are willing to pay substantial amounts to prevent their wastewater being a hazard and a nuisance. Table 4.1 below, is abstracted from their report. The report points out that although people in the study area are of low income, they are not among the lowest of the low income groups. The income in all the studied areas is above the Cairo average, and in three of the areas is substantially above the Cairo average.

4.5 Technical

The feasibility of proposed solutions to the problem of wastewate and excreta disposal in the unsewered areas is greatly constrained by the types of latrine facilities which already exist. Latrines having waterborne waste conveyance require different solutions than those using simple pits. In the unsewered areas of Giza Governorate, housing types vary widely, but the average building rises three stories or more. The population of such areas may be very dense, often exceeding 1,000 persons per hectare of fully developed areas.

The latrines in Giza are usually flushed with water hand carried from the nearest tap or stand pipe. The resulting sewage is piped by gravity into an underground vault which is usually located in the street but sometimes under the house or in the courtyard. If the vault is watertight, all the sewage remains in the tank until removal by mechanical pumping or hand-dipping with buckets. If the vault is constructed with permeable walls and no floor, then the sewage solids are supposed to stay in the vault while the liquid seeps into the ground. In either case, the vaults often fill up faster than they are emptied, and the overflow spills out into the street and the surrounding houses. When permeable vaults become sealed by sewage

Table 4.1

ESTIMATED DATA ON INCOME, DENSITY AND OTHER INDICATORS FOR THE STUDY SITES

Item	Boulac El-Dakrour	El-Mounib	Ard-El Salam	Kafr El Gabal (1)	Kafr El Gabal (2)
Estimated population	120,000	15,000	25,000	11,500	6,000
Average Income of Head of Household LE/Month	70	60	80	50	50
Percentage of income paid on rent/month	18.5%	13%	20%	10%	10%
Percentage of income actually paid on sanitary services/month	2.8%	1.5%	2.5%	1%	1%
Lump sum willing to pay for sanitary services (per structure) - LE	120-150	50-75	250-300	30-40	30-40

solids or when residents discharge excessive amounts of water into water-tight vaults, it usually becomes necessary to pay commercial services large sums to haul away the excess wastewater. Although many aspects of this situation are undesirable, the main problem is one of removing the excess wastewater from the residential areas.

Wastewater can be taken from vaults in such a manner that it contains no heavy or large solids and practically no grease. Sewers carrying only wastewater, therefore, may be smaller and laid to flatter grades than those necessary for normal sewage. In most of the unsewered areas the flatness of the land and the fall will be a constraint upon the use of sewers. In flat land, conventional sewers carrying normal sewage can discharge only if they are pumped. Sewers carrying no large or heavy solids may flow more readily without being pumped, but over long distances with flat slopes pumping would still be necessary.

Seepage into the ground is a practical means of disposal where the permeability of the soil is suitable and the level of the groundwater is low. Where the soil is sandy, seepage will be relatively fast. Where the soil is heavy with clay, it will be extremely slow. Protection of the groundwater from wastewater seepage may be important if shallow-well handpumps are being used to provide drinking water.

The availability of piped water is a constraint on two counts. Where piped water is readily available, more water will be used in the homes and more dirty water (sullage) resulting from bathing and washing will be discharged to the vaults. On the other hand, the availability of piped water also affects the need for and the number of handpumped tube wells utilized in a community. Where piped water is available within or close to every house, the need for supplementary handpumps is greatly reduced. This, in turn, increases the potential for developing wastewater seepage facilities.

With few exceptions, the availability of equipment and materials will not be a constraint. There may be some difficulty in finding or manufacturing handpumps suitable for pumping wastewater from vaults. In addition, sewage collection vehicles will have to be designed for the narrow streets and the vault openings found in the project. In general, however, the greater Cairo area should be able to supply all of the necessary equipment and materials for the demonstration sites.

4.6 Financial Administration

4.6.1 Dollar Expenditures

Previous contractor experiences in Egypt have shown that only a minimum of dollar expenditures would originate in Egypt, primarily for some shipping and some communications expenses. Most of the dollar expenses would be payments for overseas salaries, domestic salaries, U.S. subcontractor fees, U.S. consultant fees, travel expenses, shipping, and other direct costs. These would be paid by the contractor's home office.

4.6.2 Egyptian Pound Expenditures

The Egyptian pound (LE) expenditures would be made from funds provided to the contractor's Egypt office by the AID/Egypt Mission. These funds would be used for payments for Egyptian technical and adminstrative staff, Egyptian subcontractors, office rent, commodities, local transportation, equipment and other direct project costs in Egypt.

The procedure of LE funding must be in accordance with the established AID procedures.

4.6.3 Data Collection and Invoicing

The contractor should develop a cost tracking and invoicing procedure for all dollar and Egyptian pound expenditures and receivables that conforms to AID requirements. Invoices should be presented to the Mission for administrative review prior to being submitted to AID Financial Management for payment.

4.7 Logistics and Materials Procurement

4.7.1 Egypt Office

To provide a base of operations for the project staff in Egypt, a local office will be required. The project scope requires the provision of space for management, technical services, adminstration, reception, communications, secretarial services, drafting, reproduction and storage.

To determine office location, consideration must be given to rental cost, access to project sites, access to USAID, access to the Government of Egypt, communcations, parking availability, access to lodging, meals, and public transportation.

4.7.2 Procurement

The procurement of equipment and supplies must be in accordance with the AID Handbook 11. Whenever possible, commodities and supplies should be obtained in Egypt with payment made in Egyptian pounds. Strict administrative control should be maintained throughout the project to insure that procurement is kept to a minimum and that only items that are considered to be eligible by AID and the Government of Egypt are purchased.

4.7.3 Communications

Effective and dependable communications within the project areas is often compromised by frequent breaks in telephone and telex services. International communications between Egypt and the United States have improved greatly during the past few years. However, telephone and telex communications originating in Egypt are relatively expensive.

Radio was considered as an alternative, or additional, communications method. This method has been dismissed due to the experiences of present contractors in Egypt. There has been extreme difficulty in obtaining government approval (some contractors have been waiting more than three years for approval and assignment of frequencies), and there is severe congestion of VHF bands. UHF would be highly desirable. However, the Government of Egypt has restricted UHF to the military. Radio has, therefore, been dismissed as a communications option.

4.7.4 Vehicle

Public transportation in Cairo is entirely inadequate to proide the local transportation required by the project scope. A mix of heavy duty vehicles (such as pick-up trucks and vans) will be necessary for field work, surveying and services during construction. Sedans or station wagons will be necessary for transportation between offices, to and from the airport and the numerous support service trips required daily.

4.8 Sub-Contracting

4.8.1 Local Construction Services

Each year CWO and GOSD sign unit price contracts for the provision of construction services related to sewerage extensions and improvements. The contractor should employ this procedure to implement the demonstration projects.

The subcontracting of construction services to selected contractors has been considered. However, the liability issues involved preclude further investigation of this procedure. Legal advice in this regard from Egyptian and U.S. attorneys indicates such a procedure is not a viable option for consideration by U.S. consulting firms working in Egypt. For example, the Cairo Wastewater Project was delayed for over eight months pending resolution of the liabilities associated with engineering design in Egypt.

4.8.2 Local Professional, Technical and Support Staff

The contractor must obtain local professional, technical and support staff through subcontracts with consulting firm(s) registered in Egypt and staffed to provide the services required. Such subcontracts for services would require prior approval by CWO and USAID. The subcontracts would be negotiated on the basis of actual salaries, overhead and fee expressed by man-day or man-month billing rates.

Off-shore contractors cannot directly hire professional services unless these contractors are a registered entity in Egypt. Since registration in Egypt requires major Egyptian ownership and the retention of profits in Egypt, it is not the practice of U.S. or other foreign consulting engineering firms to be registered as companies in Egypt.

Two immediate considerations prohibit direct hire of local staff without registration, namely, no mechanism is available for withholding of payroll taxes and for making contributions to social benefit programs. Such registration is also not required under the bilateral agreement between the Government of Egypt and the Government of the United States of America regarding AID financed projects.

4.9 Staffing

Comprehensive project direction and control as well as the full range of necessary technical and administrative services should be provided by full-time project staff resident in Egypt. The technical services should include those which address the engineering, social science, and health components of the project. The administrative services should include financial and procurement services, preparation and administration of sub-contracts, and office operation.

Home office support and consultant services should be available on an "as needed" basis for consultant identification and briefings, technical back-stopping, contract assistance, financial services, travel, shipping and procurement of materials and equipment.

The project should utilize the services of Egyptian professional and support personnel to the fullest extent possible. By doing so, project costs can be kept to a minimum. The Egyptian staff would also provide the U.S. staff with needed information relative to local customs, logistics, and communications within the project areas, and general guidance for operations within Egypt.

Chapter 5

PLAN METHODOLOGY

5.1 Selecting Methods of Improved Excreta Disposal

Because of the various physical, institutional, and sociocultural constraints described in Chapter 4, the range of promising methods for improving sanitation in the unsewered areas is relatively narrow. Nevertheless, by looking at the individual elements of wastewater and excreta disposal, a reasonably complete picture of the possible options emerges.

The overall process of excreta collection, transport, and disposal is shown in Figure 5.1. The process begins at the household latrine, which may be used under private or semi-private conditions and operated as a simple pit or part of a water flush system. In Giza Governorate the majority of latrines are used on a private basis although a large number of buildings have apartments which share a common latrine. There are almost no instances of communal latrines serving the public at large. Moreover, since water is traditionally used for anal cleansing in Egypt, latrines in the project area are almost exclusively water flush leading to an external vault or sewer.

Collection is the second step in the process. Waterborne wastes in the unsewered areas are normally carried outside the house to an external vault located under the street or, less commonly, under the house or in the courtyard. Although large community vaults are technically possible, the general practice is for each building to be connected to a separate vault.

The third step in the process is the transport of sewage wastes away from the house. In the unsewered areas, such transport usually is provided by motorized pumper trucks or donkey drawn sewage carts, although private sewers built by the local residents are sometimes found.

The process of waste disposal possibilities continues with the fourth step, sewage treatment. In addition to formal treatment at a wastewater treatment plant, the quality of sewage can be improved through simple storage in a vault or holding tank, filtration through the soil, or dilution in a waterway, such as an irrigation drain. In the unsewered areas, however, treatment is usally incidental to a more pressing problem--that of disposing of excessive amounts of wastewater.

As indicated above, disposal is the final and most critical step in the process of excreta management. There are only three places that can be effectively used for the ultimate disposal of wastewater: a sewer, an irrigation drain, or the soil. All three are currently being used, with irrigation drains and the soil being the main recipients of wastes in the unsewered areas.

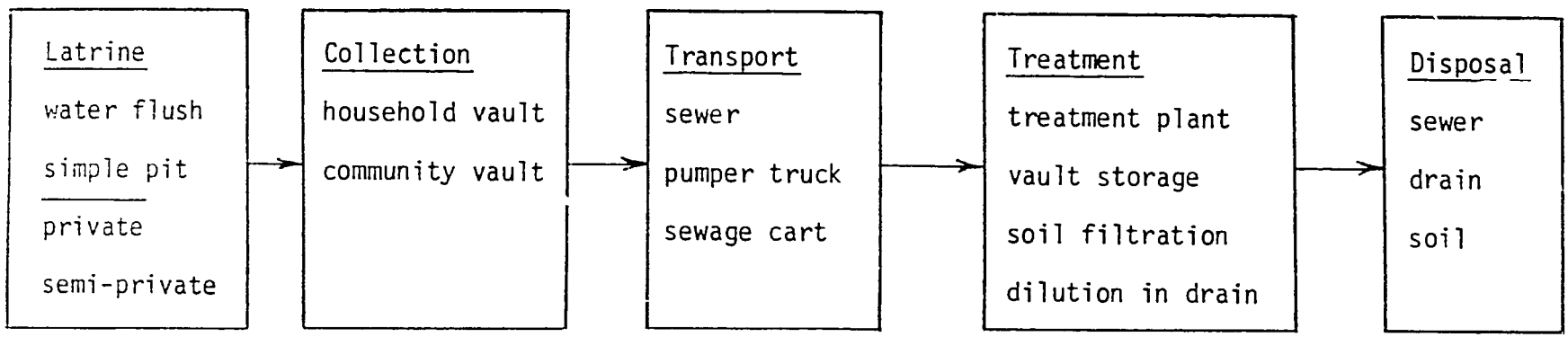


Figure 5.1. Wastewater and Excreta Disposal Options in Giza Governorate.

Figure 5.2

(a) Clean-out opening to an underground sewage vault in Boulac El Dakrour

(b) Sewage vault under construction in El Mounib.

(c) Workers emptying sewage vault with aid of horse-drawn cart in Ard El Salaam

(d) Community-financed sewer under construction in Boulac El Dakrour

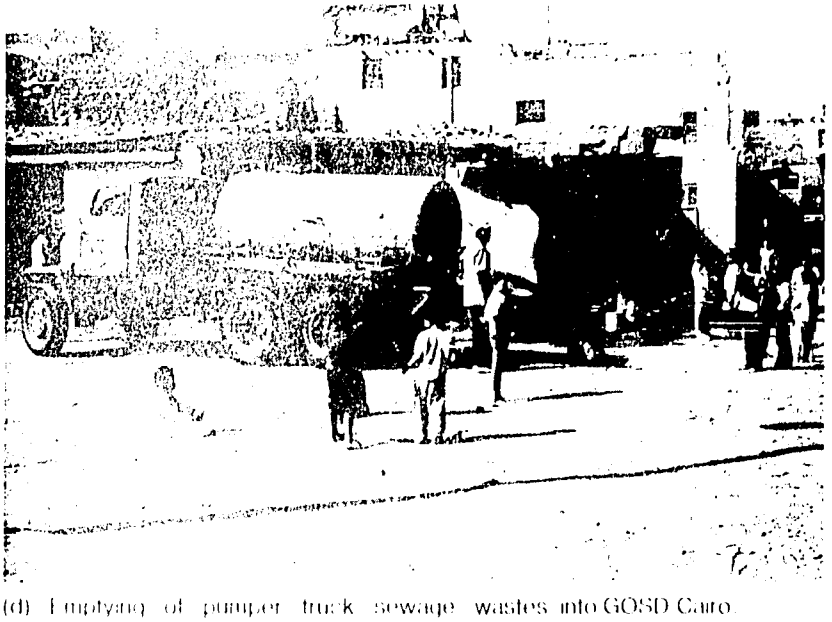
FIGURE 5.2 CURRENT SEWAGE COLLECTION PRACTICES IN THE UNSEWERED AREAS.

Figure 5.3

(a) Sewage dumping site for donkey and horse carts along Hanadwah Drain

(c) Emptying of hand carried sewage wastes into drainage canal near Boulac El Dakrour

(b) Emptying donkey-drawn sewage cart into Zomor Canal near Boulac El Dakrour



(d) Emptying of pumper truck sewage wastes into GOSD Cairo

FIGURE 5.3 CURRENT METHODS OF EXCRETE DISPOSAL

In summary, latrines in the unsewered areas of Giza Governorate are either private or semi-private and almost all operate with a water flush. Sanitary wastes are piped from the building to a nearby buried vault which serves only a single building. The vault may be watertight, in which case it operates as a holding tank, or it may be designed to allow infiltration into the soil, in which case the sewage sludge usually seals the bottom of the vault after a few years anyway. When wastewater inflow into the vault exceeds infiltration or pumping from the vault, the excess sewage backs up and floods the streets and ground levels of houses. Treatment of sanitary wastes is usually non-existent in unsewered areas, except insofar as it occurs in the course of ultimate disposal into the soil, an irrigation drain, or, in some cases, into a public sewer.

Thus, the most common forms of sanitation options in the unsewered areas are described above in Figure 5.1. It is assumed that improved methods of excreta and wastewater disposal will consist of variations of the above basic options.

5.2 Selection Criteria for Pilot Demonstration Sites

For the purposes of this report, unsewered areas are defined as significant population concentrations unserved by public sewer lines. Initial investigation showed that almost all such population concentrations in Giza Governorate are within the City of Giza. In order to limit travel time between demonstration sites and in order to work closely with a single local governmental jurisdiction, it was decided to restrict site selection to unsewered areas within Giza City.

During the initial field investigations, the following were expected to be potentially useful site selection criteria:

(1) Density of housing

(2) Depth of groundwater table

(3) Soil absorbtive capacity

(4) Type of water supply system

(5) Proportion of owner-occupied dwellings

(6) Current excreta disposal methods

Subsequent investigations, however, revealed that the type of water supply system (No. 4) had no appreciable effect on excreta disposal practices and that the existing excreta disposal methods (No. 6) were essentially the same in all unsewered areas, i.e. waterborne conveyance from the house latrine or latrines to a buried vault or holding tank. Moreover, available data were insufficient on the other four criteria to allow them to be used for selection purposes. The team believes that these four variables (housing density, groundwater table, soil absorbtive capacity, and owner-

occupied dwellings) may yet have potential for site selection but recommends that future investigations into the matter be carried out during the implementation phase of the project.

The criteria actually used for site selection were the following:

(1) Common problem - A site should have a sanitation problem that occurs in many areas.

(2) Technological variation - Each site should demonstrate a different technical method.

(3) Political priority - Each site should be considered important by the relevent political leaders.

(4) Different city districts - A site should be chosen from each of the three city districts (Hai).

(5) Health hazard - A site should have sanitation conditions that pose a health hazard to either the residents or the sewage collectors.

5.3 Selection Criteria for Excreta Disposal Methods

Extensive field reconnaissance, a review of the published literature, and discussion with Central Government, Giza City, and USAID officials all emphasized the need to establish broadly-based criteria for the selection of improved sanitation methods. The problems of the unsewered areas are deeply intertwined with local institutions, cultural expectations, and economic conditions. A simple technological "fix" unrelated to the true felt needs of the residents is unlikely to be fully accepted or properly maintained.

Because of the need to address a variety of objectives, the following mix of technical, socio-economic, and health criteria were established for selecting excreta and wastewater disposal methods for the demonstration sites:

(1) Technically feasible - The method must use proven technologies.

(2) Low cost - The method should not incur any greater costs than existing sanitation expenditures.

(3) Politically acceptable - The method should be acceptable to Governorate, City, and GOSD/Cairo officials.

(4) Potential for community participation - The method should allow local residents to participate in either building or maintaining the system.

(5) Sanitation improvement - The method should improve sanitation-related conditions (flooded sewage vaults, limited water use, hand carrying of sullage, etc.)

(6) Health hazard reduction - The method should reduce direct health hazards to either the residents or the sewage collectors.

(7) Opportunities for private sector involvement - The method should provide opportunities for the private sector to participate in the initiation, implementation, and operation of systems.

In selecting demonstration sites as well as selecting improved sanitation methods, the above criteria and those in the previous section were used jointly to identify the final selection of sites and methods. The overall purpose was not to rigidly apply criteria in a mechanistic way, but rather to use the criteria as general guides in the selection process. The final recommendations (described in Chapter 7) were based upon the selection criteria, additional field investigations, and further discussions with relevant officials.

5.4 Criteria for Implementation Activities

5.4.1 Project Initiation

Both the GOE and USAID officials strongly agree that there is an urgent need for the Unsewered Areas Demonstration Project to begin as soon as possible. The Cairo Sewerage Project is now entering the design phase for collectors, branch sewers, and pumping stations. Consequently, it is necessary to begin serious investigations into interim sanitation improvements in the unsewered areas. It is assumed, therefore, that all parties involved in the demonstration project, i.e., USAID, GOE, and the contractor, will expedite the review, approval, assignment, and mobilization processes that must occur between the submission of the implementation plan and the initiation of the project. The occurrence of delays during this review period, for whatever the reason, will cause corresponding delays in the overall Cairo Sewerage Project and, in a more human sense, will allow a continuance of the outrageous sanitation conditions described elsewhere in this report.

The criteria proposed for project initiation, therefore, are (1) a one-month period of the GOE and USAID to review, modify (if necessary), and approve this Implementation Plan and (2) a one-month period for the contractor to begin implementation activities in Greater Cairo after receiving contract authorization from USAID. If USAID and the GOE can avoid competitive procurement for a contractor, field activities could start within two months of the submission of this report. If a competitive process is followed, an additional eight months or more will be required. The initiation of field activities can be summed up as follows:

Type of Contractor Procurement	Starting Date
Non-competitive	1 May 1982
Competitive	1 Jan 1983

5.4.2 Project Duration

Given the desire of both USAID and GOE officials to show rapid results in the field, the development of one or more demonstration sites should begin shortly after the start of field activities in Greater Cairo. The contractor should be able to show preliminary results at the first demonstration site by the end of the sixth month and full operational results by the end of the twelfth month. By initiating the first two demonstration sites in the first two months of the project and a second pair of sites before the end of the first full year, as many as four demonstration sites could be planned, implemented, and evaluated in less than two years. It is assumed that this implementation plan will allow the contractor to begin field activities without the need for extensive reconnaissance or preliminary field orientation.

The criterion used for project duration, therefore, is a period of 20 to 24 months from the date of contract authorization by USAID. The contractor should be expected to carry out all field activities, including overall project evaluation, and submit a final report within 24 months.

5.4.3 Project Site Scheduling

To complete the project within 24 months, it will be necessary to begin work at more than one site at a time. This will probably overburden the project staff unless a careful selection of methods and sites is made. If one site required extensive field investigation, the other site should not use field personnel. Work at the first site, therefore, could involve extensive surveys and data collection by field staff, while efforts for the second site could concentrate on equipment design by an engineer. In this manner, a relatively small project staff could undertake several demonstration activities simultaneously without expanding its overall personnel.

The criteria for site scheduling, therefore, should be to initiate the first two demonstration sites at the start of the project and to begin a second pair of sites between the ninth and the twelfth months of the project. Each pair of sites should employ dissimilar methods of sanitation technology in order to optimally utilize the project staff.

Chapter 6

PROMISING METHODS OF IMPROVED EXCRETA DISPOSAL

6.1 Small Bore Sewers

As stated in Chapter 2 above, most people living in the urban unsewered areas of Giza are served by pour flush, water-seal latrines which discharge to an underground vault in the street. Wastewater entering these vaults is supposed to soak into the ground and enter the ground water table, but unfortunately the soil is often insufficiently permeable. The wastewater will not soak into the ground and will either cause a nuisance in the street or must be hauled away at considerable expense to the building owner.

The latrines themselves are a satisfactory method of removing the excreta from the family quarters. If the wastewater could be disposed of satisfactorily, the system would be considered a good and sanitary method of excreta disposal.

Small bore sewers are one means of conducting the wastewater away from the neighborhood. As the name implies they are often smaller than the minimum permitted size of standard sewers. They can be smaller because they carry only domestic sewage and then only after it has passed through a septic tank or similar facility. Small bore sewers do not, indeed could not, carry sewage solids or other solid matter. As they do not carry solids, they need not be laid to exact line and grade and often carry wastewater at less than the minimum velocity permitted in standard sewers.

The opportunity to use small bore sewers arises in Giza because of the existence of the vaults in the street which receive the wastewater from the houses.

Modifications of existing vaults can be made so that only the liquid portion of the sewage wastes flows into the small bore sewer, leaving behind both the sewage solids in the bottom of the vault and the grease and other scum at the top of the vault. Figures 6.1 and 6.2 illustrate many features of small bore sewers.

6.2 Septic Tanks with Leach Fields

In certain unsewered areas of Greater Cairo, the use of standard septic tanks with leaching fields should be tested. The most suitable areas would be characterized by low ground-water table, permeable soil, and low population density.

Existing vaults may be converted into septic tanks if the volumes are large enough and if the tanks can be modified and equipped with outlets to allow a relatively clear liquid to flow out of the tanks into a system of leach lines, as shown in Figure 6.3. Brick-lined vaults, large enough to operate as septic tanks, are currently under construction in El Mounib. These vaults could be modified easily with the installation of a proper discharge

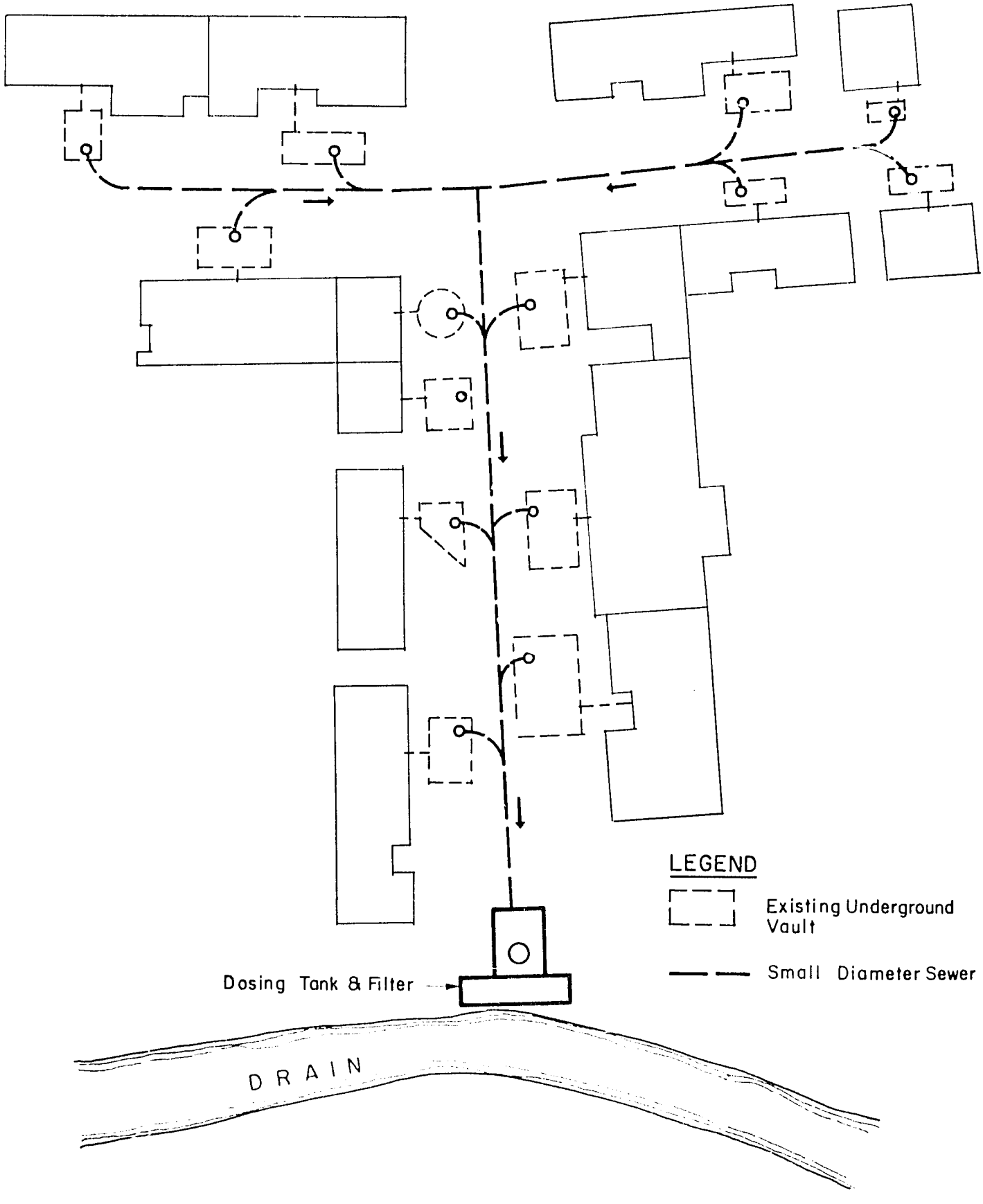
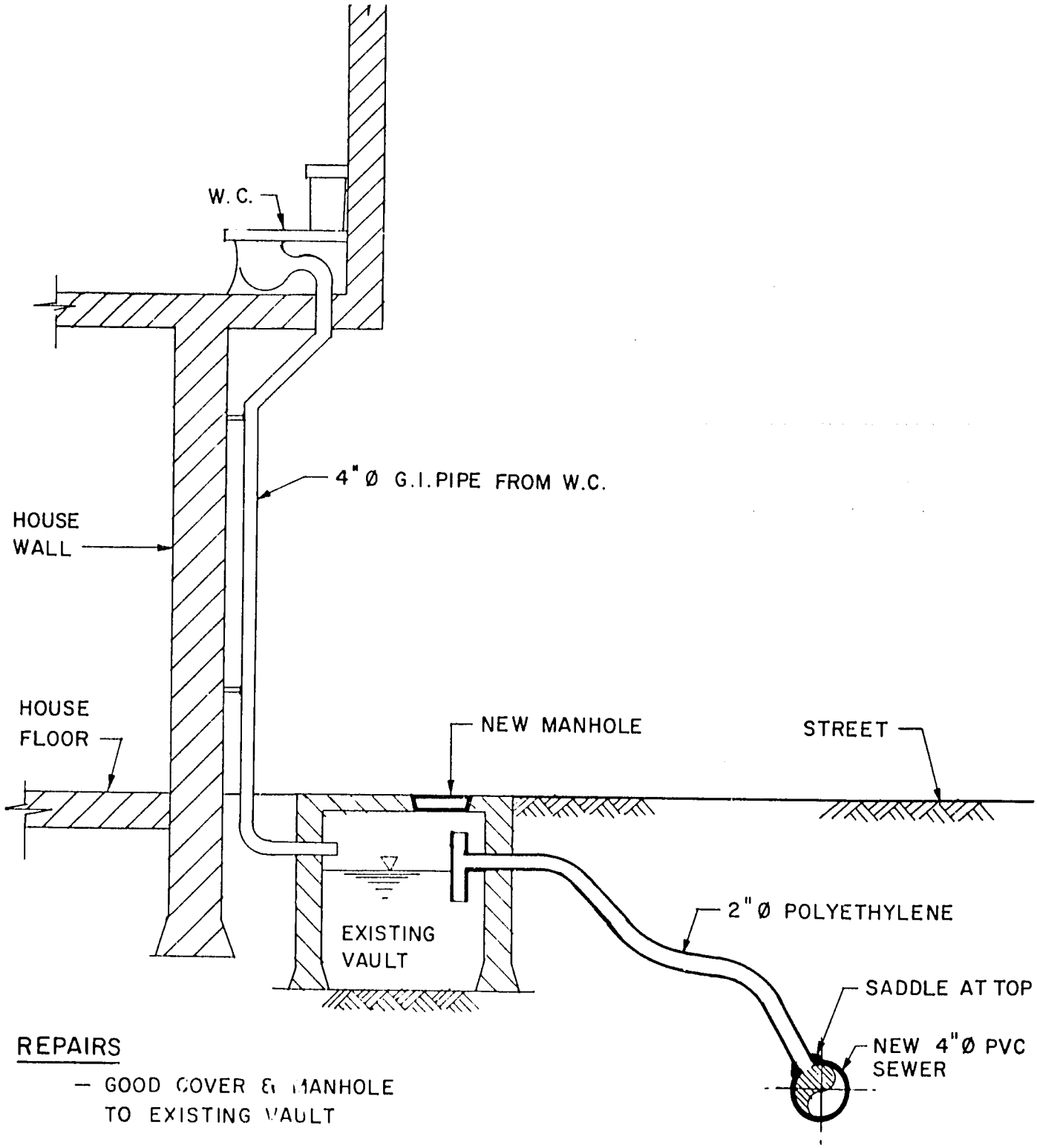


FIGURE 6.1 SMALL DIAMETER SEWER



REPAIRS

- GOOD COVER & MANHOLE TO EXISTING VAULT

NEW INSTALLATION

- DISCHARGE TEE IN VAULT – 1 1/2" PVC
- 4" Ø PVC SEWER IN STREET
- 2" Ø POLYETHYLENE CONNECTING PIPE

FIGURE 6.2 SMALL BORE SEWER INSTALLATION

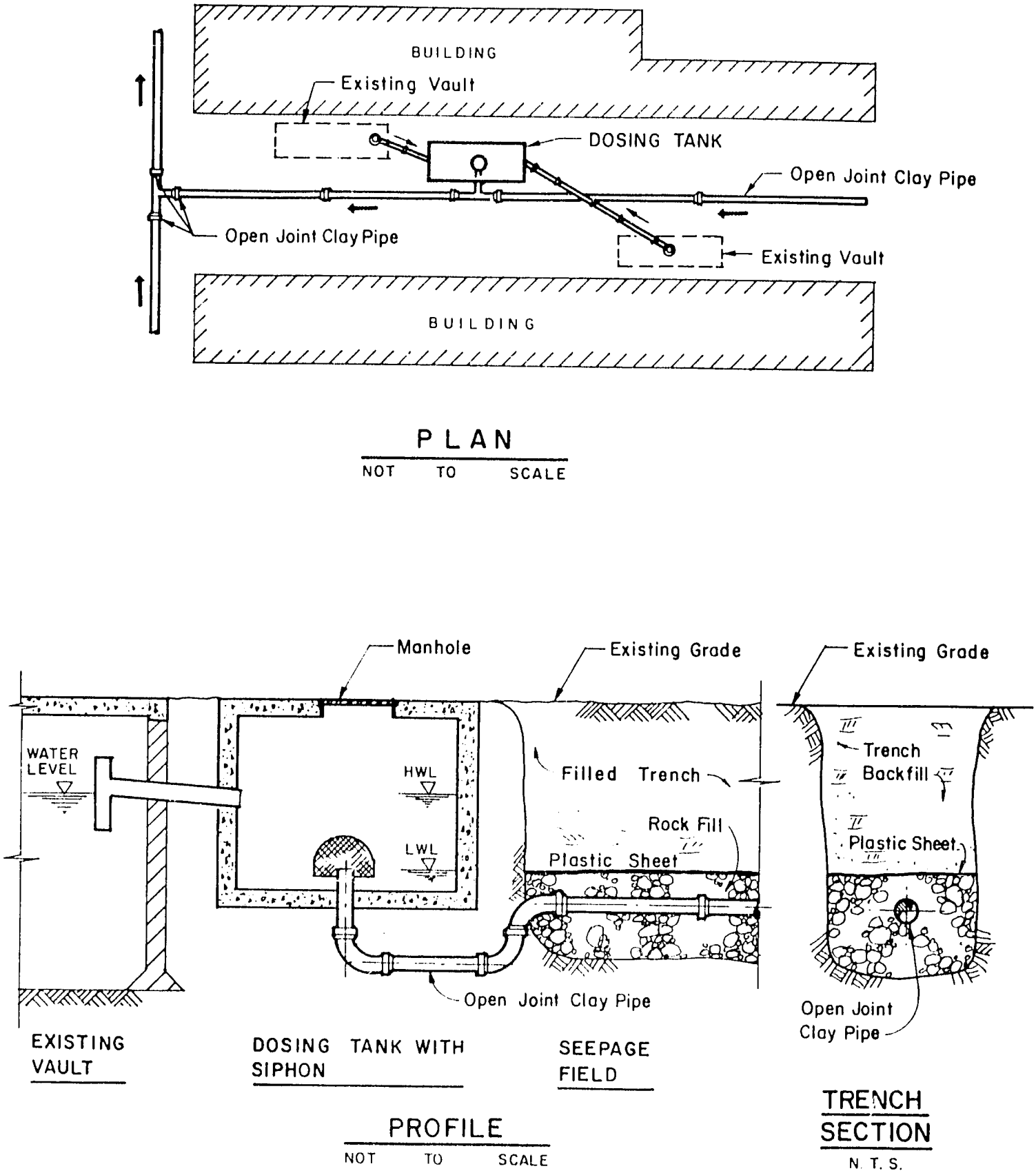


FIGURE 6.3 TYPICAL DOSING TANK AND SEEPAGE FIELD

pipe. It is uncertain, however, if the soil is permeable enough to provide sufficient infiltration and if the groundwater table at this location is low enough. Based on the field visits made to various sections of Giza City, the more favorable soil and groundwater conditions would probably be found in the area near Kafr El Gabal.

6.3 Improved Donkey Cart System

The most common method for disposing of wastewater from vaults is the use of an animal drawn cart equipped with a metal tank to transport the wastewater to a convenient disposal point--usually an irrigation drain or canal.

The wastewater and sludge is removed from the vaults by hand, using a bucket, and is poured into the metal tank on the cart. When the tank is filled, the cart is driven to a disposal point and the contents are released through a drain at the rear of the tank.

The present practice endangers the health of the workers because of their direct contact with raw sewage. It also endangers the health of the residents by the spilling of raw sewage along the streets and by dumping the sewage into irrigation drains and canals where women wash their kitchen utensils and clothes.

This system could be improved by replacing the dipping buckets with a hand-operated bilge pump and by fitting the filler opening with a tight cover, at least a curb, as shown in Figure 6.4. Temporary holding tanks should also be installed at convenient locations where the carts can dispose of the sewage.

6.4 Mechanized Carting System

The present donkey-cart system could be supplemented by a tractor-drawn tank-trailer cartage system. This system would utilize small farm-type wheeled tractors equipped with a power take-off (PTO) which would drive a vacuum pump mounted on the tank-trailer.

The tank-trailer would be fitted with a reinforced suction hose (4 to 8 inches in diameter) long enough to reach the bottom of the vaults, as shown in Figure 6.5. The tractor-trailer would make scheduled visits to each household in a predetermined service area to empty vaults before they overflow into the street and homes.

Final disposal of sewage would be to the existing sewerage system or to sewage drains.

This tractor-trailer cartage system is being utilized with excellent results in Port-Au-Prince, Haiti in a World Bank project.

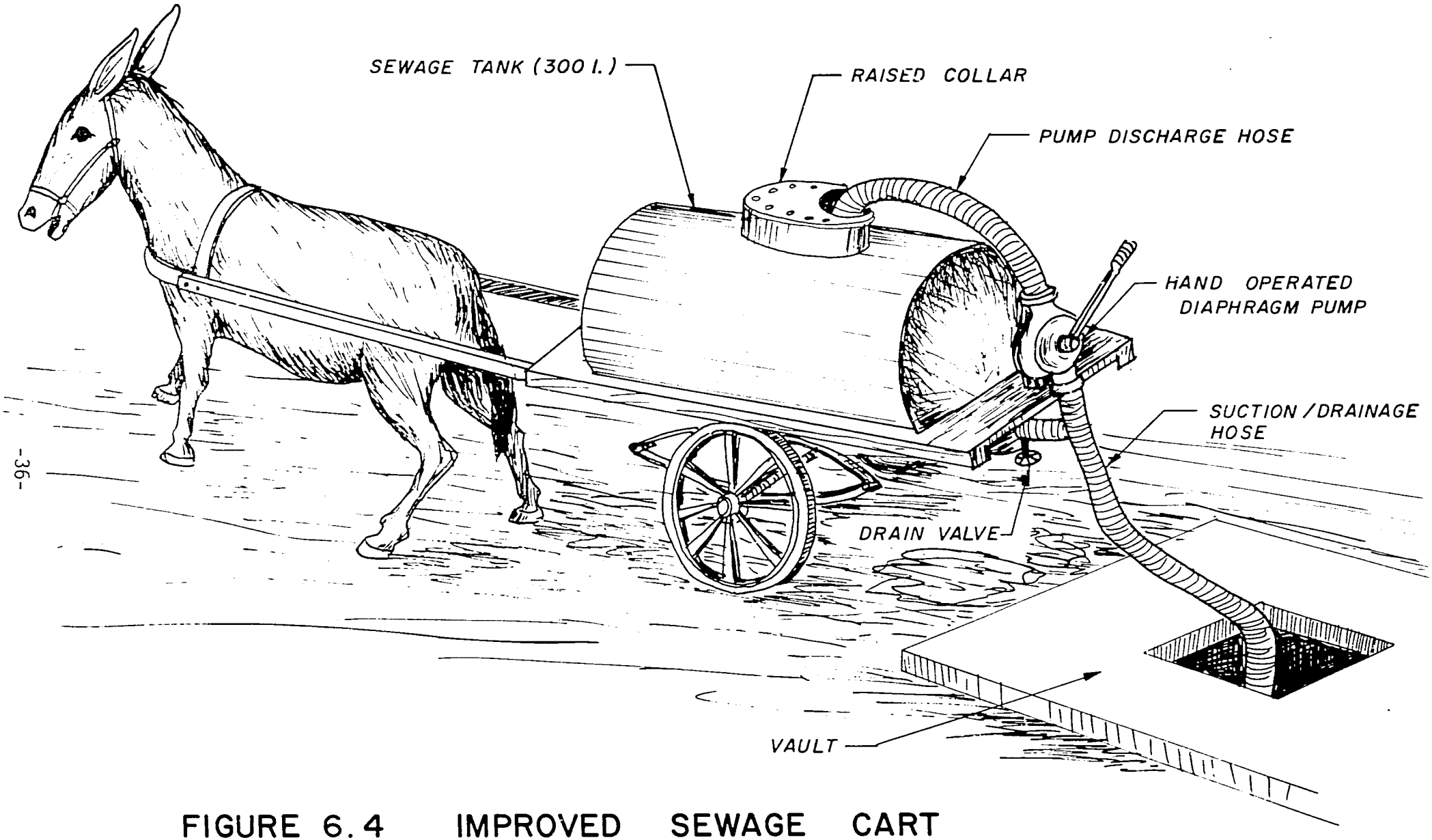


FIGURE 6.4 IMPROVED SEWAGE CART

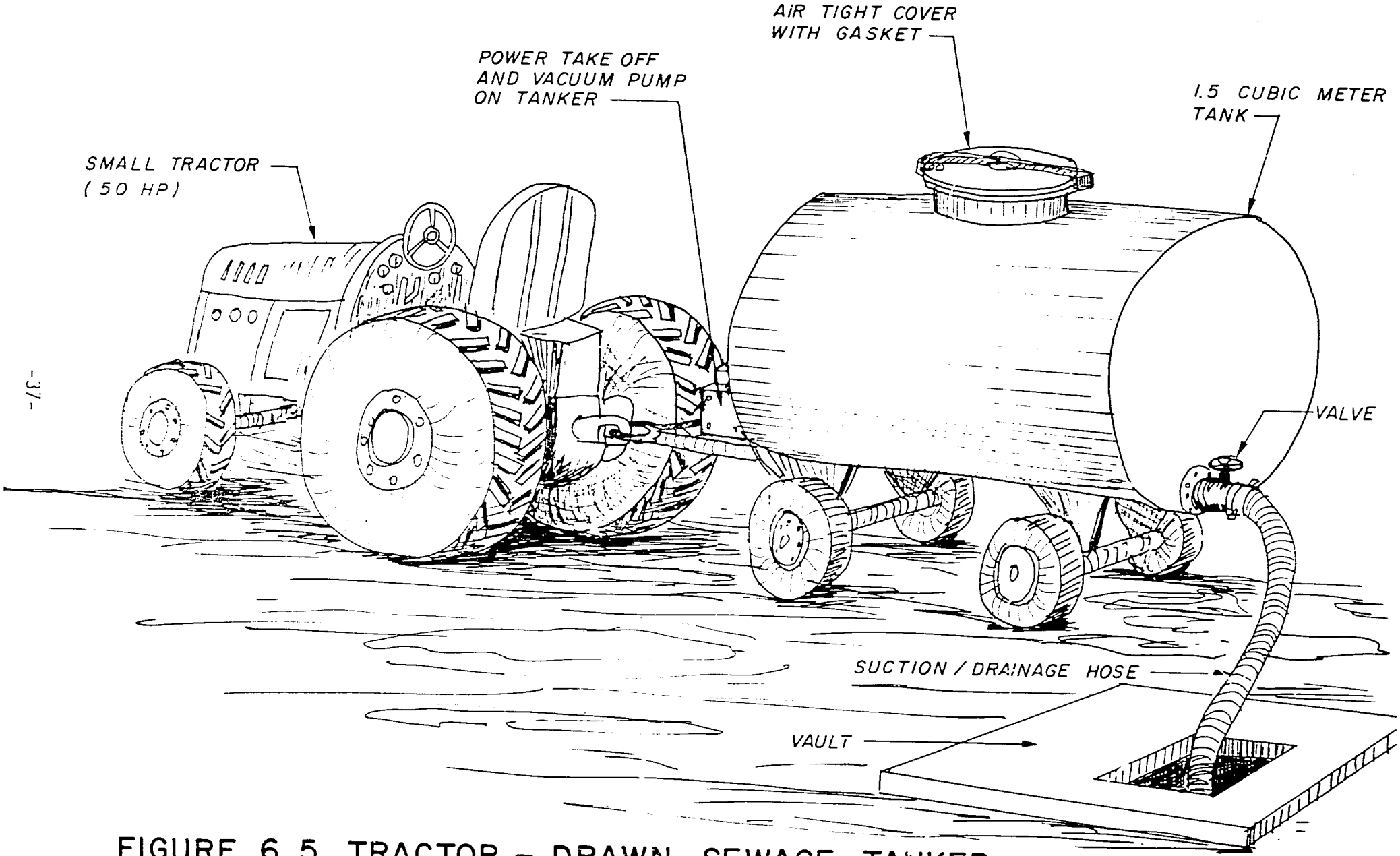


FIGURE 6.5 TRACTOR - DRAWN SEWAGE TANKER

6.5 Community-Financed Neighborhood Sewers

Because of its magnitude, the wastewater disposal problem of Greater Cairo's unsewered areas tends to overwhelm public officials who are charged with the responsibility of providing sanitation services. The problem is less formidable when seen from the viewpoint of the residents of unsewered areas. The fact is that the residents are managing to dispose of their wastewater in one manner or another. Some of these practices create a health hazard and a public nuisance. Others provide a long-term solution to the problem.

One of the most promising methods for wastewater disposal is being used by the residents of Boulac El Dakrour. There, the residents of certain streets have joined together and collected money to pay a private contractor to install sewers which are connected to the official collector system. In this scheme each household is required to contribute a set fee (for example, on one street the household fee is LE. 85, or $103.70) to have the sewer installed in the street. In addition to this fee each household must pay an additional cost to connect the house to the sewer. The cost of this house connection varies according to the distance from the house to the nearest manhole connecting box. The cost ranges from a minimum of LE.50 ($61.00) upward. Figure 6.6 illustrates a private branch sewer leading to a connection with a public sewer.

These community-financed sewers could provide an acceptable long-term solution if properly designed and built by competent people. While there appears to be no official program to encourage this spontaneous activity at the present time, we believe that the development of an officially sanctioned program should be explored because of the multiple benefits it could produce: (1) the provision of acceptable wastewater disposal; (2) the saving of limited government funds by investing private capital; (3) the development of community level problem solving capability; and (4) the development of small construction entrepreneurs.

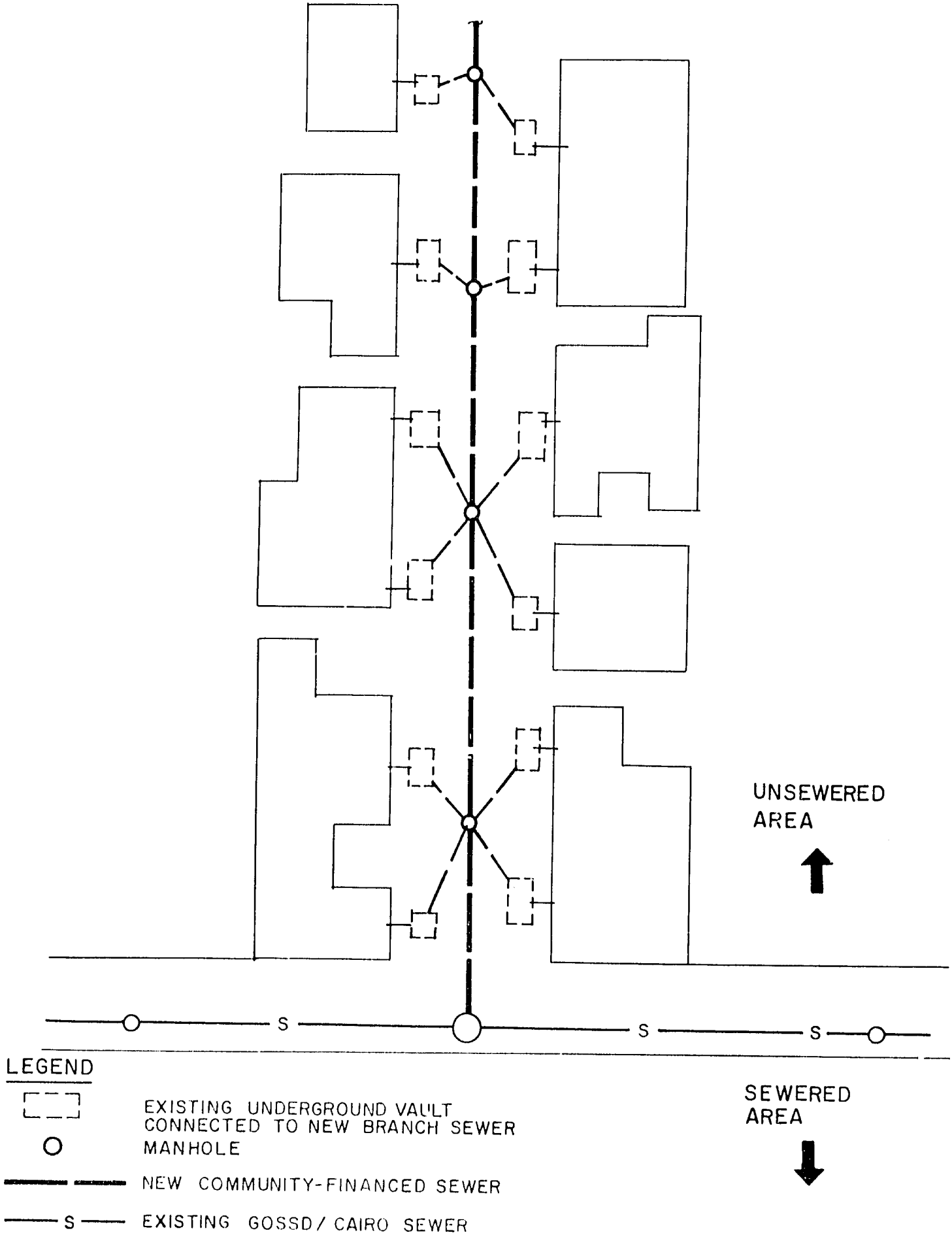


FIGURE 6.6 COMMUNITY-FINANCED SEWER

Chapter 7

RECOMMENDED PLAN

7.1 Technical Elements

7.1.1 Demonstration Sites

It is proposed that pilot demonstration activities be conducted at four sites: Ard El Salaam, Boulac El Dakrour, Kafr El Gabal, and El Mounib.

Ard El Salaam is located in the North Giza District immediately to the west and across the Sawahel Canal from East Munira. The project site, shown in Figure 7.1, is fully developed and contains buildings ranging from two to six stories in height. Household incomes are relatively high, and residents are willing to pay considerable sums for sewage collection and disposal. As a result, the underground vaults in Ard El Salaam are generally operating well. There are only a few locations in the community with open pools of sewage. Sanitary wastes are collected by horse-drawn sewage carts and dumped in or near the Hanadwah Drain.

Boulac El Dakrour is located in West Giza District in an area bounded on the east by the Zomor Canal and on the west by the community of Zenein. The northern part of Boulac El Dakrour is sewered, while the southern part, which is shown in Figure 7.2, is unsewered. Boulac El Dakrour is an old and stable community with buildings averaging three or four stories. Household incomes are probably slightly lower than those found in Ard El Salaam. Although most buildings are served by donkey-drawn sewage carts, there are four streets along which the residents have paid for and are constructing private sewers. These sewers are being connected to the existing GOSD/Cairo sewer main which runs along the northern boundary of the unsewered area.

Kafr El Gabal is situated in West Giza District on the east side of the Mansoureya Canal and approximately 0.5 km southwest of the Giza Pyramids. The site is a fully-developed and stable community of predominantly Bedouin people living in one and two-story buildings. Each building has an underground vault located in a central courtyard. These vaults are constructed without a sealed floor in order to take advantage of the low groundwater table and highly permeable soils. As a result, household wastewaters rapidly drain into the surrounding soils. There are no signs of malfunctioning vaults in Kafr El Gabal. It is reported that vaults are emptied every few years, but some vaults never need servicing. This site is shown on Figure 7.3.

El Mounib is located in South Giza District and is bounded by the Zomor Canal on the north, and the Konaysah Drain in the south. This is the youngest community among the four demonstration sites. New three to four-story buildings are currently under construction, and the developed area is rapidly advancing into the surrounding agricultural lands. Among the newer buildings, the underground sewage vaults are designed to allow direct infiltration into the soil. After two to three years, however, the

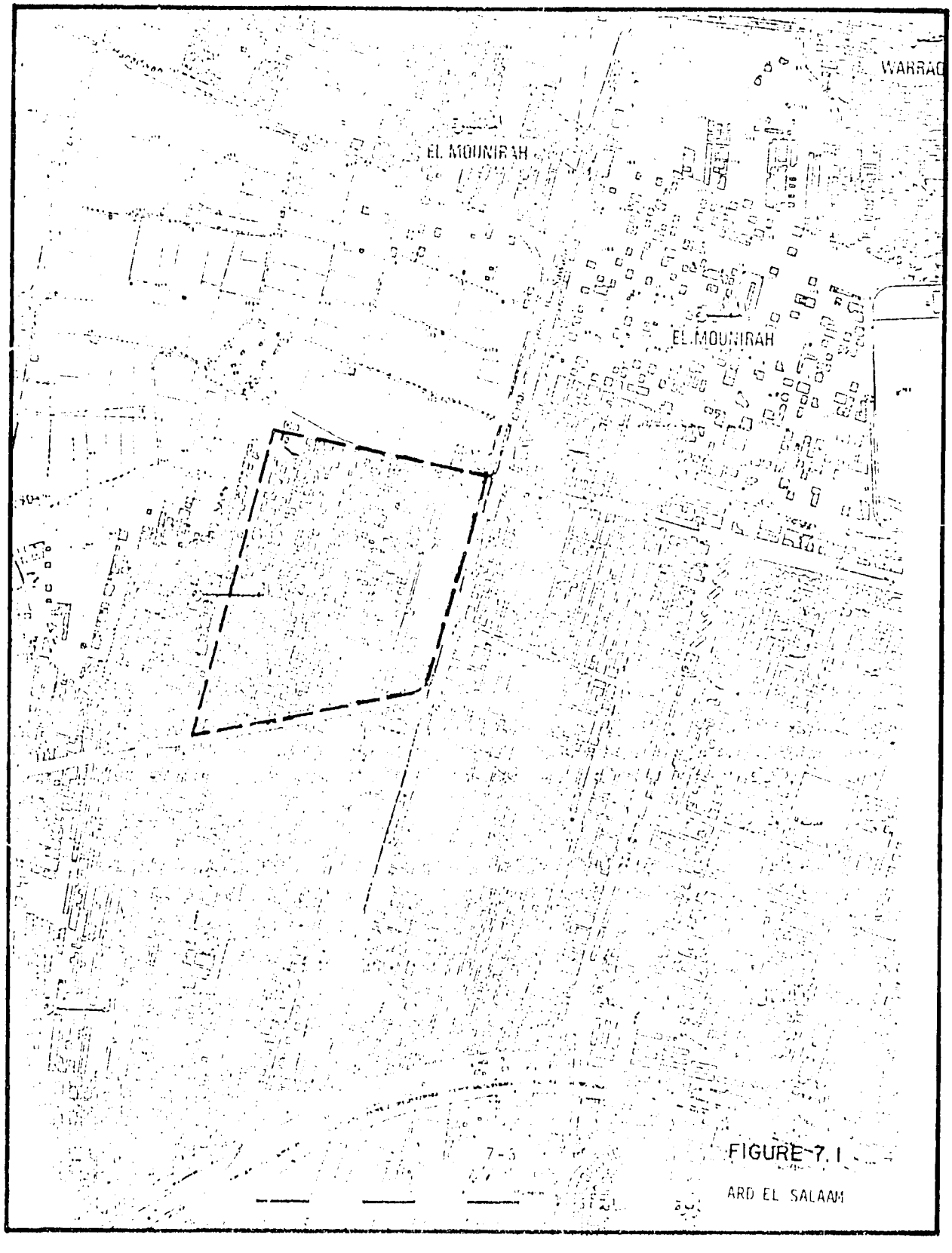


FIGURE 7.1

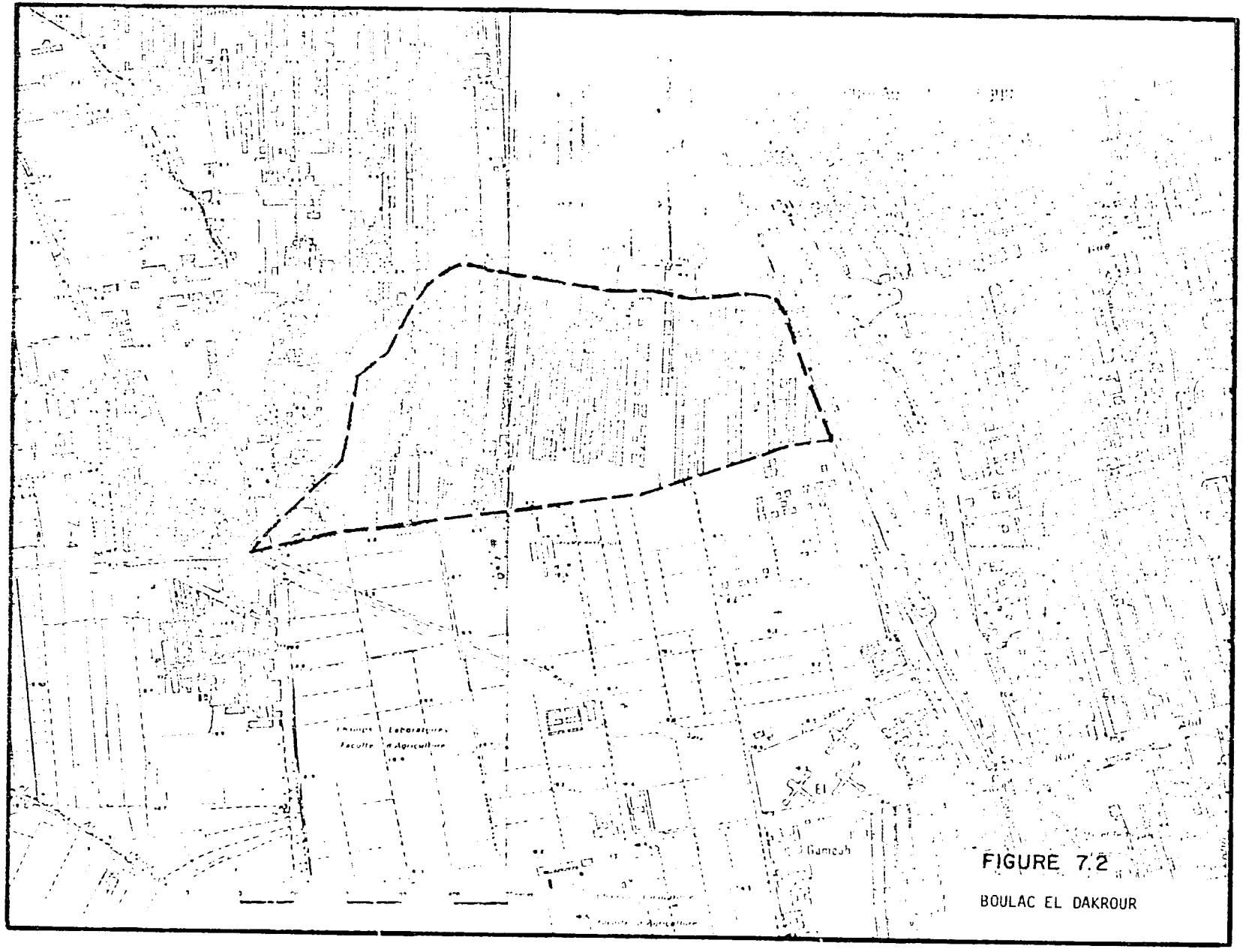


FIGURE 7.2

BOULAC EL DAKROUR

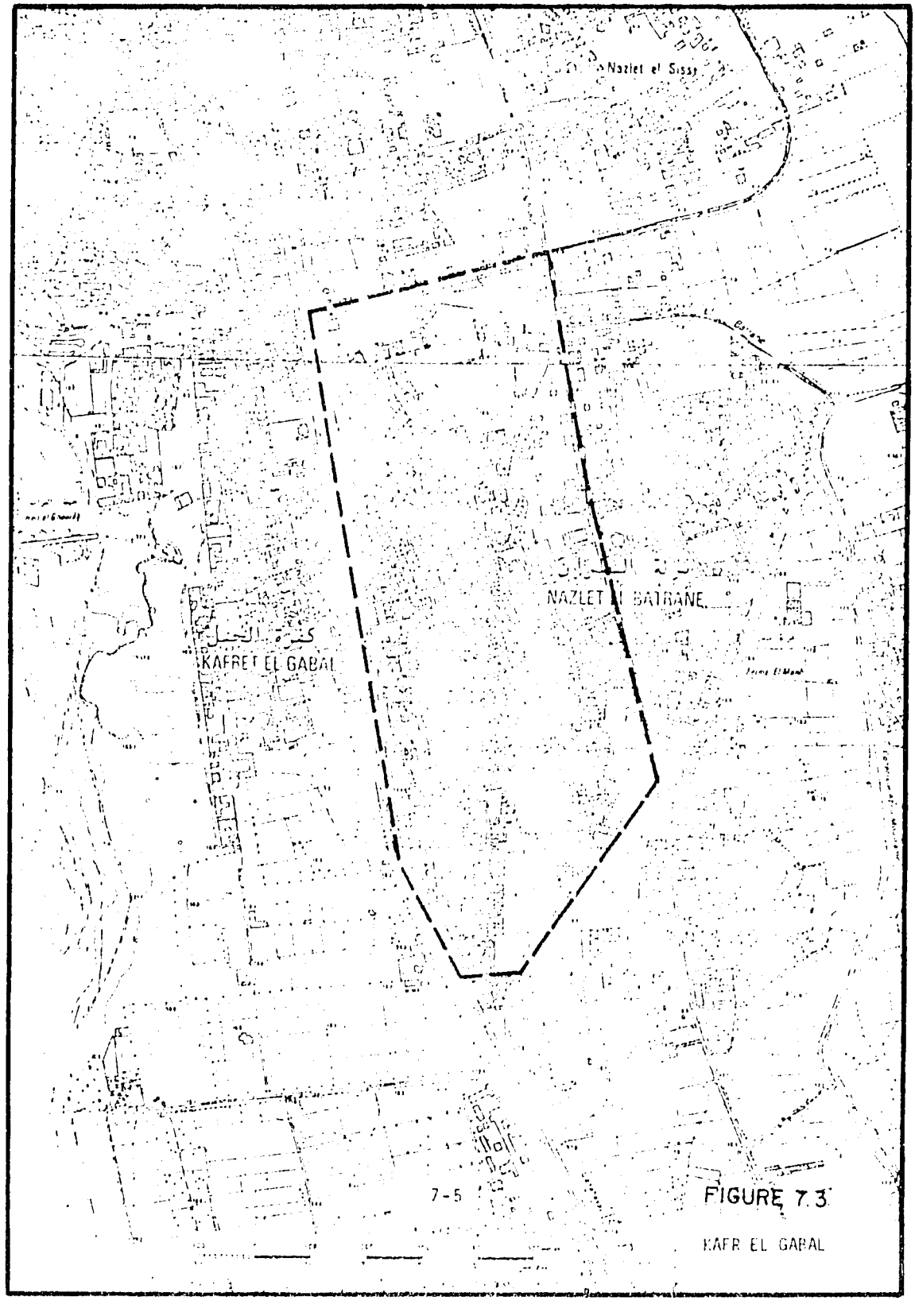


FIGURE 7.3

KAFR EL GABAL

unsealed floors of the vaults become clogged with sludge and further infiltration is stopped. The vaults then quickly fill with sanitary wastes and the overflow spills out into the street. Figure 7.4 shows the El Mounib demonstration site.

7.1.2 Improved Sanitation Methods

The greatest potential for improving sanitation conditions in the unsewered areas of Giza City lies in practices associated with the transport and disposal of excreta and wastewater (see Figure 5-1). Minor benefits can be obtained also from improved methods of collection and treatment, but the primary emphasis should be placed on the transport and disposal of the wastes.

Four basic systems are proposed for use at demonstration sites, the first two stress transport and disposal, the third emphasizes collection and disposal, and the fourth highlights transport alone. In order of decreasing social and technical complexity, the four systems are as follows:

(1) Community-Financed Sewers. (Figure 6.6)
This system involves the construction of sewers with money raised by the immediate users of the service. Official government participation may be very small although permission to connect the community sewer to a nearby public sewer must be obtained from the sewage authority.

(2) Small-Bore Sewers. (Figures 6.1 and 6.2)
A small-bore sewer system involves the connection of existing sewage vaults on to a small-diameter sewer line. The wastewater (supernatant) from the vaults flows into the sewer system leaving the solids and heavy sludge behind. The small diameter sewer flows by gravity into a large holding tank for later removal or into either an infiltration trench or a gravel filter leading to an irrigation drain. The decomposing sludge remaining in the vaults slowly accumulates and will require removal by conventional means every few years.

(3) Infiltration Vaults. (Figure 7.5)
In areas with a low groundwater table and high soil permeability, sewage vaults with unsealed floors and side walls will allow much of the wastewater (supernatant) to infiltrate into the surrounding soil. As in the case of small-bore sewers, the sludge remaining in the vaults will continually decompose but will accumulate at a relatively slow rate. Sludge removal, therefore, will not be necessary very often.

(4) Improved Collection Equipment. (Figures 6-4 and 6-5)
The laborers who clean out sewage vaults, called by the term "Sorabatia", are in a high risk occupation because of their daily exposure to sanitary wastes. Those who work with the donkey-drawn sewage carts have the greatest health hazards. Improving the sewage carts with the addition of a handpump, flexible suction and drainage hoses, and a cover, will provide a considerable degree of

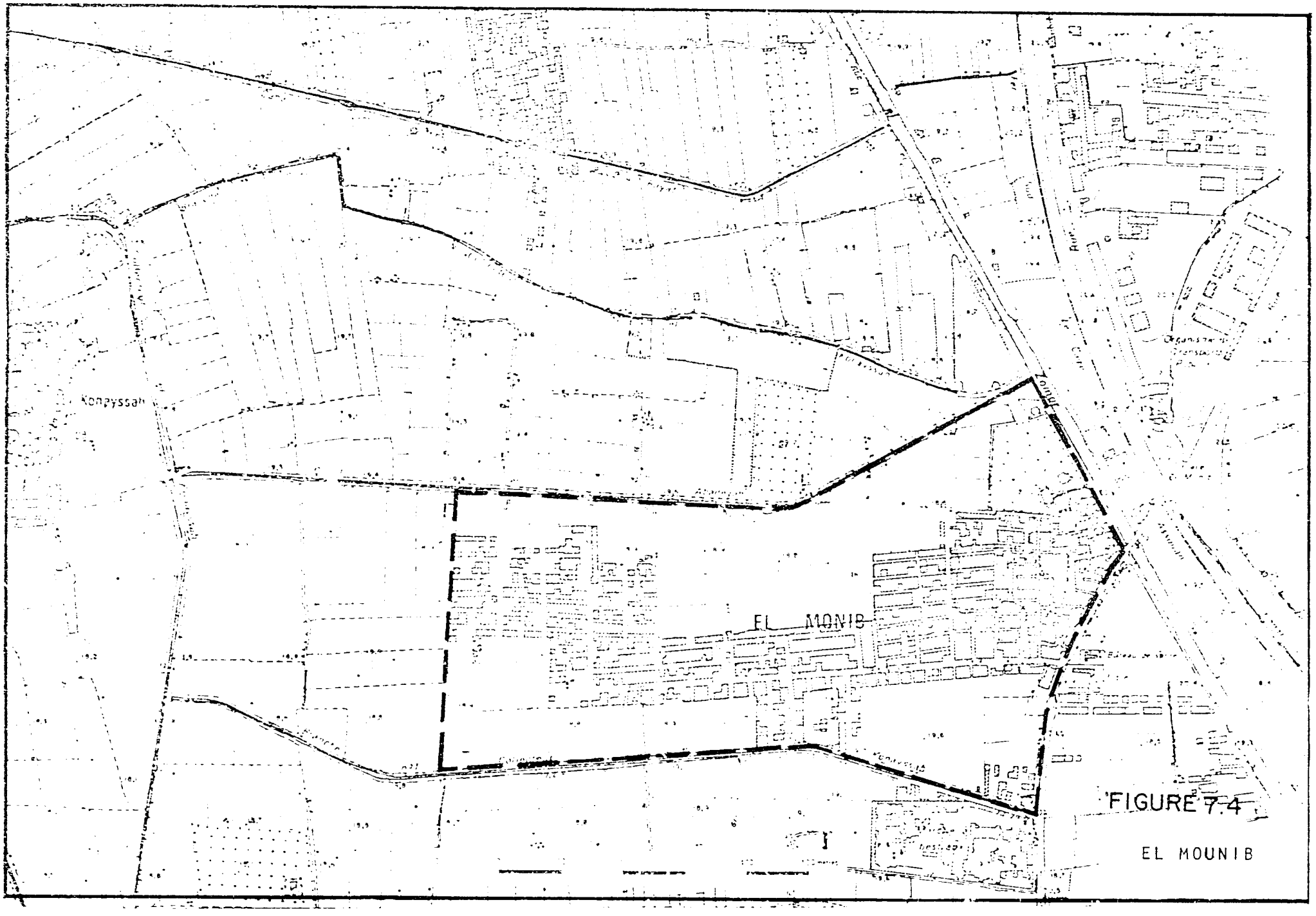


FIGURE 7.4

EL MOUNIB

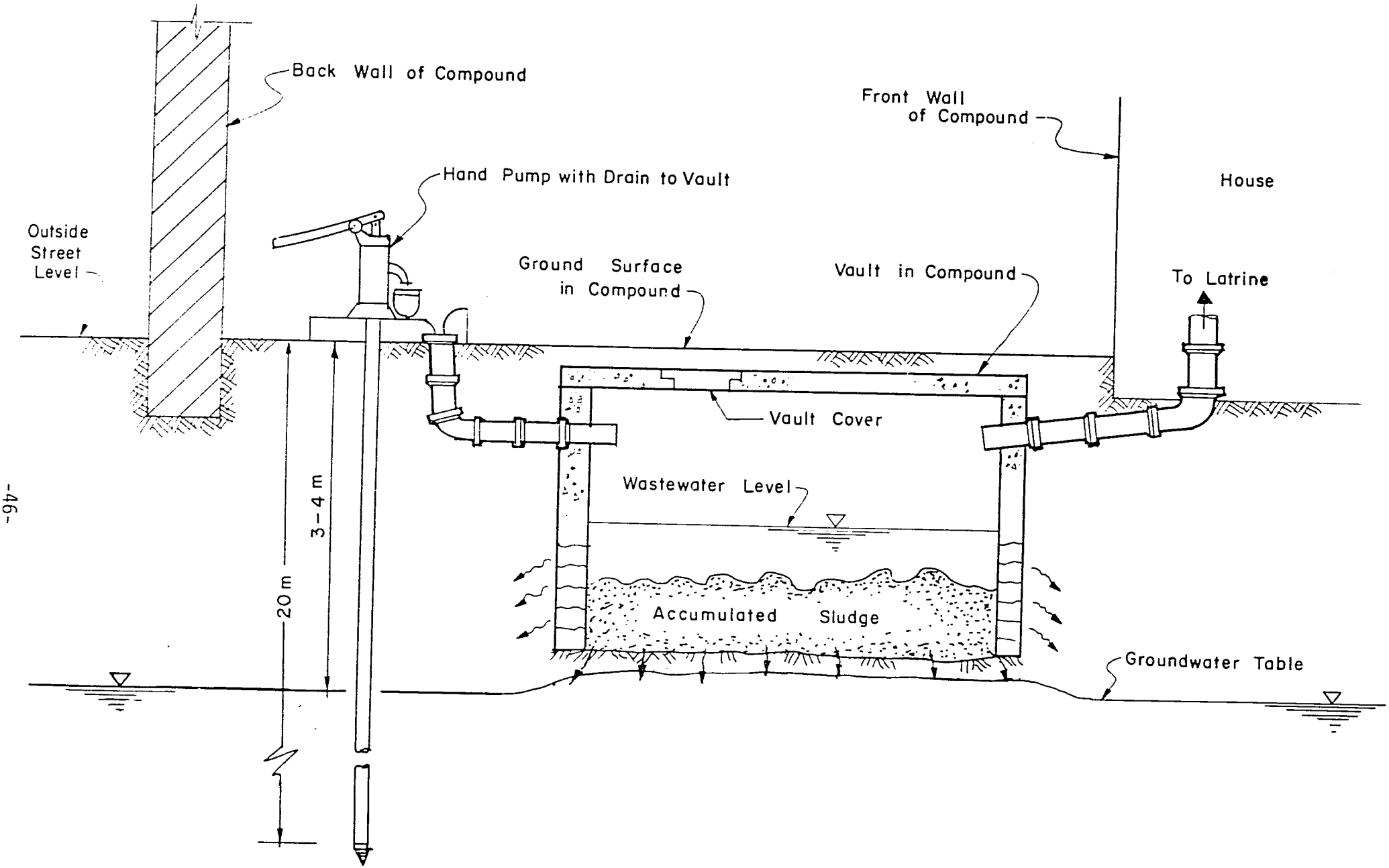


FIGURE 7.5 Elevation View of Unsealed Vault with Percolation to Groundwater Table

protection to the laborers. Similarly, the development of a small tractor drawn trailer carrying a 1.5 cubic meter tank will combine the advantages of mechanical pumping, a high production rate, and a small vehicle.

7.1.3 Proposed Demonstration Projects

It is recommended that the following pilot demonstration projects be undertaken:

(1) Site: Boulac El Dakrour
Method: Community-Financed Sewers
Objective: This site should be used to determine the organizational nature and technical design of the sewers currently being built by the residents. Any deficiencies that may exist in community organization, technical design, construction supervision, or legal authorization should be identified and eliminated so that this form of improved sanitation may be officially encouraged in other areas. It will be necessary for the project to work very closely with GOSD/Cairo and the city of Giza on this activity.

(2) Site: El Mounib
Method: Small-Bore Sewers Discharging to a Holding Tank or Infiltration Trench
Objective: Small-bore sewers should be promoted in this fast growing community in order to avoid the flooding problems that occur with sewage vaults after two or three years of operation. Community financing of capital costs should also be investigated here. Disposal of wastewater from the sewers should be via an infiltration trench parallel to the Konaysah Drain. The project will have to work closely with the Ministry of Irrigation regarding wastewater disposal near the drain.

(3) Site: Kafr El Gabal
Method: Infiltration Vaults
Objective: This site should be investigated to determine the physical and design conditions under which the existing sewage vaults operate for years without any direct maintenance or cleaning. Through an inspection of existing vaults, soil infiltration tests, and groundwater quality analysis, the project should identify the factors necessary for similar vaults in other areas. In addition, the project should attempt to define the areas over which such vaults will give similar operating results. The project must give serious attention, however, to the potential problem of groundwater contamination by wastewater seeping from the unlined vaults.

(4) Site: Ard El Salaam
Method: Improved Collection Equipment
Objective: The project should develop and promote the use of improved equipment for emptying sewage vaults in order to improve the productivity, raise the income, and protect the health of the

"Sorabatia", the vault cleaning workers. An improved sewage cart with a handpump, flexible hoses, and a cover should be developed, as well as a tractor-drawn tank trailer of 1.5 cubic meter capacity. The current sewage workers should be encouraged and trained, if necessary, to use the new equipment to determine if it is likely to be adopted by Sorabatia and communities in other areas of the city. The project will need to work closely with the organization to which many Sorabatia belong in order to introduce new equipment to a group which has used the same methods for many years.

7.2 Staffing

7.2.1 Project Direction

Overall project operation and control should be the responsibility of an experienced U.S. Project Manager. His responsibilities would include project planning, overall technical and administrative supervision, progress reporting to the Mission and the contractor's home office, review and approval of project progress, and coordination with CWO and Giza Officials. It is expected that the Project Manager will function in this position in Egypt for the entire period of the project.

7.2.2 Engineering Services

All engineering and technical support services should be coordinated and supervised by a U.S. Chief Engineer. The Chief Engineer's responsibilities should include engineering evaluations, design supervision and review, construction control and review, and technical reporting to the Project Manager. The Chief Engineer should also act as Deputy Project Manager.

A U.S. Senior Field Engineer should be assigned to the project to be responsible for technical data collection, design, technical implementation (including engineering services during construction), and the evaluation of applied technology. It is recommended that the U.S. Senior Field Engineer hold this position in Egypt for the initial 12 months of the project. During this period, he will work closely with a qualified Egyptian Field Engineer and help prepare him to take over the Senior Field Engineer position starting in month 13.

Full-time Egyptian personnel and part-time U.S. and Egyptian consultants should be employed to provide technical services under the direction of the Senior Field Engineer. These services will include assistance in aspects of engineering, local manufacturing, training, surveying, and graphics.

7.2.3 Public Health Services

Because of the serious public health implications associated with wastewater and excreta disposal, a U.S. Public Health Expert should be assigned to the project for the first twelve months of field work. This individual

should provide guidance on the health impacts of sanitation improvements, conduct baseline public health surveys, encourage the participation of Giza public health personnel in the project, and assist in overall project evaluation. It is expected that the public health needs of the project after month twelve can be served by short-term consultants.

7.2.4 Socio-economic Services

Socio-economic services, especially in the areas of economics, sociology, institutional development, training, community participation, and legal affairs, should be obtained from short-term U.S. and Egyptian consultants. Although these inputs are essential to the success of the project, adequate professional resources are available in both the U.S. and Egypt to assist the project on an as-needed basis.

7.2.5 Administrative and Financial Services

A full-time Egyptian Administrative Assistant should be responsible for the financial control and reporting of project expenditures, employment and supervision of the Egyptian support staff, travel, and project logistics. It is not anticipated that an American will be needed for this position because adequate training and periodic instructions could be provided by the contractor's home office staff.

Adequate adminstrative support can be provided by an Egyptian staff consisting of an accountant, two secretaries, two clerks, six drivers, and a mechanic.

7.2.6 Home Office Support

The contractor's home office should provide technical and administrative support through communications, periodic staff visits, and the provision of consultant services. For research and demonstration projects of the type described in this report, the necessary home office support would include technical backstopping, consultant identification and briefing, final report production and distribution, and assistance in invoicing. It is recommended that a part-time technical coordinator and a part-time secretary be officially assigned to the project in the home office for a combined total of 18 person-months. It should be recognized, however, that for the project to achieve its full potential with regard to unsewered areas in Greater Cairo and elsewhere, a much higher level of home office support will be required. For example, home office support similar to that normally provided by the WASH Project would require an additional 24 to 30 person-months for senior staff review, public meetings and presentations, equipment and supplies procurement, and report distribution.

7.2.7 Summary

The proposed project organization chart is shown as Figure No. 7.6 in this report. The estimated person-months of service recommended by position classifications are as follows:

RECOMMENDED STAFFING SUMMARY

Positions	No of Persons	Person Months American	Person Months Egyptian
Staff in Egypt - Professional			
Project Manager	1	20	-
Chief Engineer	1	20	-
Sr. Field Engineer	1	12	-
Public Health Advisor	1	12	-
Asst. Sr. Field Engineer	1	-	20
Engineer	1	-	20
Consultants & Home Office Visits	-	20	20
Chief Drafter	1	-	20
Drafters	2(p)	-	34
Chief Surveyor	1	-	20
Surveyors	3(p)	-	36
Sub-total		84	170
Staff in Egypt - Non Professional			
Administrative Assistant	1	-	20
Accountant	1	-	20
Secretaries	2	-	40
Clerks	2	-	40
Drivers	6	-	120
Mechanic	1	-	20
Sub-total			260
Total Egypt Office		84	430
Home Office Staff			
Technical Coordinator	1	12	
Secretary	1(p)	6	
Total Home Office		18	

Notes: Person months based upon an estimated project duration of 20 months.
(p) indicates part-time services.

PROPOSED ORGANIZATION CHART

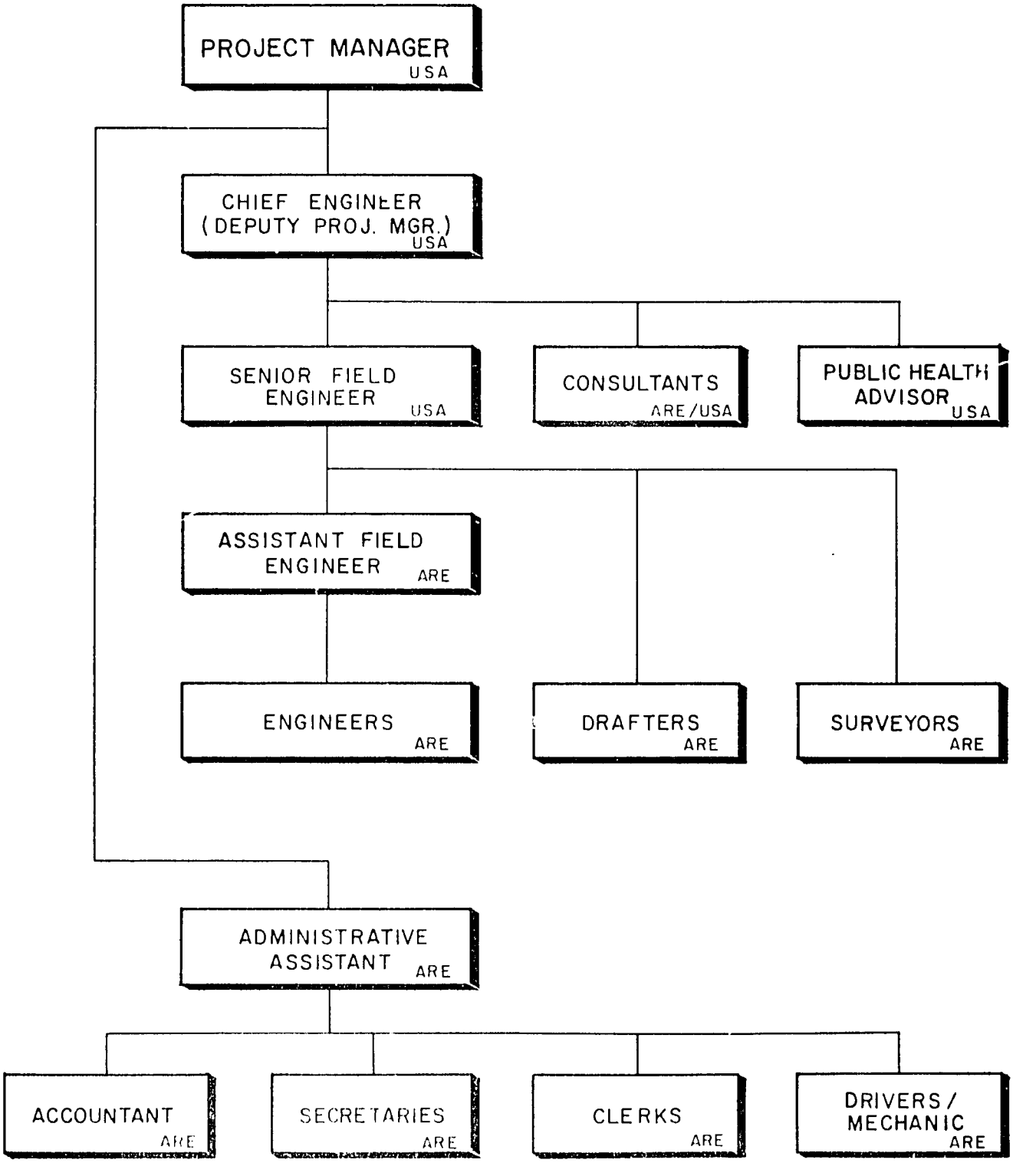


FIGURE 7.6

7.3. Egypt Office

7.3.1. Location

Various locations within greater Cairo were considered for a possible office location. In order to be responsive to the project needs and to provide coordination with USAID/Cairo, the Giza Governorate and CWO, two locations were field evaluated for comparison. The locations evaluation were the Garden City area of Cairo and the Mohandessin area of Giza. The following is a comparative evaluation of the two locations.

Item for Consideration	Possible Points	Garden City	Giza	Comments
1. Cost	20	5	20	Garden City 4 to 5 times more expensive than Mohandessin
2. Communications	5	4	4	Equally available
3. Parking	10	2	10	A major problem in Garden City
4. Suitable housing in immediate area	5	1	5	Extremely expensive in Garden City
5. Access to outside lodging and meals	5	5	3	
6. Public Transportation	5	5	2	Giza much preferred for access by vehicle; Garden City better served by public transportation
7. Access to				
a. CWO	15	10	14	
b. Giza	20	15	20	
c. USAID	15	15	8	
	100	62	86	

Based upon the above evaluation, field investigation, and discussions with USAID/Cairo personnel, the preferred location is Mohandessin area of Giza.

7.3.2 Office Space

Based on project scope and a proposed staff, it was determined that office space would be required as follows:

Project management	150 sq.ft.
Professional staff	300 sq.ft.
Consultants and visitors	160 sq.ft.
Drafting	200 sq.ft.
Administration	80 sq.ft.
Support staff	160 sq.ft.
Reproduction	60 sq.ft.
Conference area	260 sq.ft.
Storage	80 sq.ft.
W.C.	100 sq.ft.
	1,550 sq.ft.

Field investigations were made to examine typical available office space of the approximate size required. It was found that adequate space is available at a cost of approximately 7 to 8 LE ($8.50 to $9.75) per square foot per year. A sketch of a typical office area, that consists of 1,550 square feet, is shown as Figure No. 7.7 in this report. The recommended budget for this particular office is LE 1,000 ($1,220) per month.

7.3.3 Furniture and Equipment

In addition to normal office operating supplies, the following items will be needed in the project office.

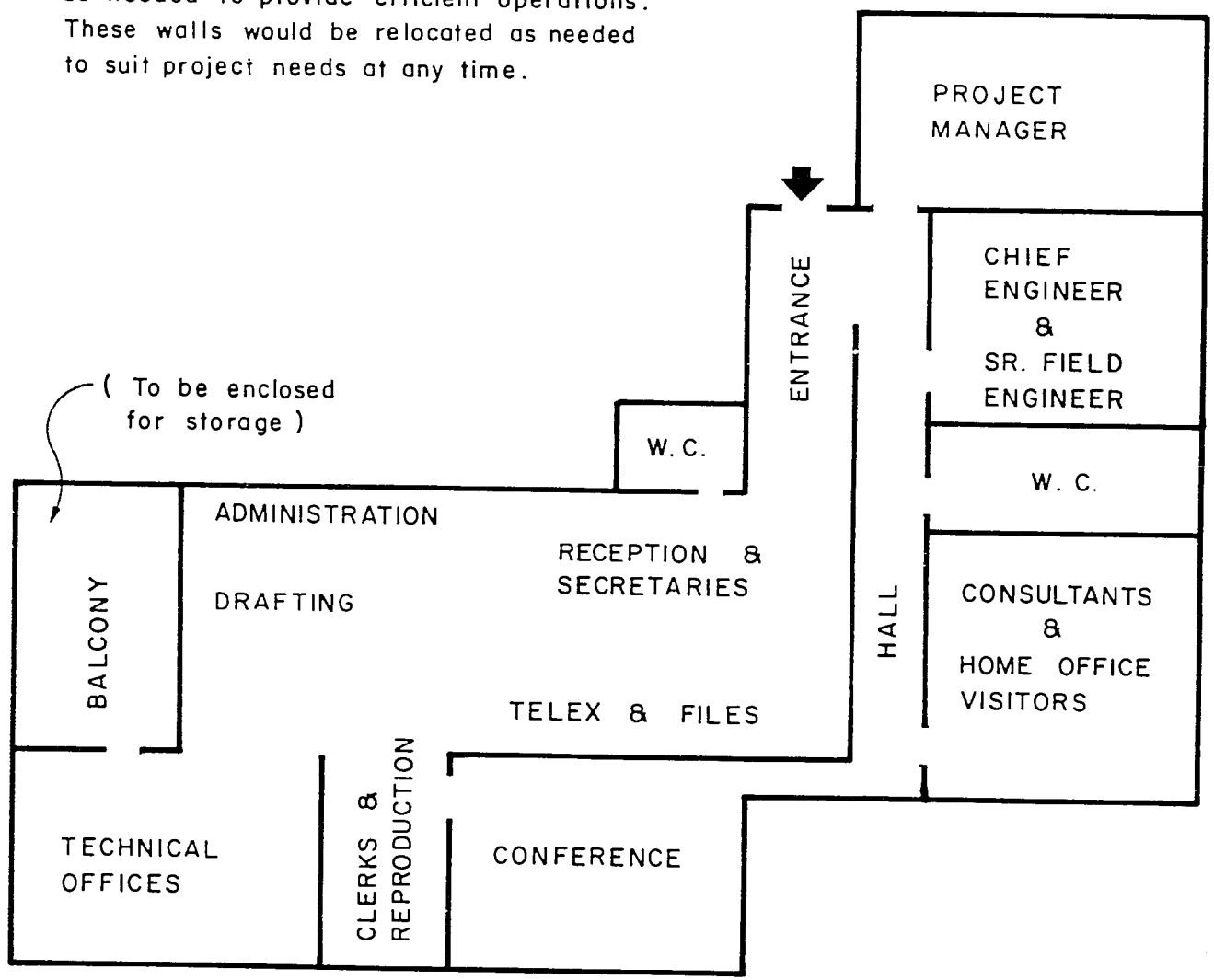
Furniture:

- Engineering desks and chairs
- Secretarial desks and chairs
- Side chairs
- Reference tables
- Book cases
- Reception furniture
- Conference table and chairs
- Filing cabinets

Office Equipment:

- Air conditioners
- Electric typewriters
- Arabic typewriter
- Dictation recording and transcribing machines
- Accounting calculator
- Photocopier
- Binding equipment
- Voltage regulators/transformers
- Refrigerator
- Stove

NOTE : Temporary divider walls can be installed as needed to provide efficient operations. These walls would be relocated as needed to suit project needs at any time.



TYPICAL OFFICE PLAN

NOT TO SCALE

FIGURE 7.7

Technical Equipment:

Drafting tables and chairs
Light table
Drafting machines
Drafting lamps
Technical calculators
Field cameras
Slide projector and screen
Overhead projector
Technical reference library
Flip chart stand

Communications Equipment:

Telephones
Domestic telex
International telex

7.3.4 Communications

It will be essential that the project office be able to communicate with USAID/Cairo, the Governorate of Giza, CWO, and firms providing services to the project. In order to provide the maximum degree of domestic communications service, both telephone and domestic telex service is recommended.

Communications with the contractor's home office must be as dependable as possible. The least expensive option for international communications is an international telex capability. To provide dependable and rapid international written communications, it is recommended that courier services also be obtained.

7.3.5 Vehicles

Comparison

The local transportation options available in Cairo are taxis, vehicle rental, and vehicle purchase. The following is a comparison of these options.

- Taxis

The hourly rate, depending on size and condition of vehicle, would range from LE 3 to LE 5 ($3.65 to $6.10). It would be necessary to have at least 11 hours of use available during each work day. The daily rate would therefore be LE 33 to LE 55 ($40 to $67) per day, or a monthly rate of LE 715 to LE 1192 ($872 to 1,454).

Advantage:

1. No initial project capital cost for transportation.

Disadvantage:

1. Travel entirely dependent upon taxis being available when and where desired.

2. Major inconveniences in conducting business in the Cairo metropolitan area.

3. Poor response capability to urgent business or emergency conditions.

4. Excessive cost.

- Vehicle Rental

The rental rates for vehicles depend upon the size and type of the vehicle. Typical long-term (at least six months) rental rates are:

Fiat 131	LE 16 ($20) per day or LE 480 ($585) per month
Peugeot 504	LE 25 ($30) per day or LE 750 ($915) per month
Pick-up or van	LE 30 ($37) per day or LE 900 ($1,100) per month

Operation and maintenance cost is estimated at LE 100 ($122) per month. When added to rental rates, the monthly cost of rental vehicles is estimated at LE 580 to LE 1000 ($708 to $ 1,220).

Advantages:

1. No initial project capital cost for transportation.

2. Transportation would be available when required.

3. U.S. staff would be able to drive themselves, when required.

4. Less costly than taxis.

Disadvantages:

1. Dependent upon others for repairs and maintenance.

2. More expensive than purchase and resale.

- Vehicle Purchase

Vehicles can be purchased on a duty free basis employing procedures in conformance with AID procurement procedures. Consideration would be given to procurement from the tax free zone at Port Said. Vehicles may be sold after the completion of the project. If the period of use is greater than two years, vehicles may be sold to local people without the payment of duty.

The estimated purchase price of a medium size station wagon or pick-up truck is $10,000. Assuming the worst depreciation at 50 percent, the end of project value would be $5,000. (A more conservative depreciation would be 30 percent. Present value of vehicles purchased for the AMBRIC Project are equivalent to the purchase prices in 1979 and 1980). Assuming a monthly operation and maintenance cost of LE 150 (US$ 183)and 17 months of use, the monthly cost would be LE 444 (US$ 541.68). (It is estimated that at least 3 months will be required for purchase and delivery of vehicles).

Advantages:

1. Transportation would be available when required.
2. U.S. staff would be able to drive themselves, when required.
3. Less costly than taxis or rented vehicles.
4. Vehicle control entirely within the project.
5. Vehicles could be transferred to the appropriate agency for continuation of the program upon completion of the demonstration portion of the program.

Disadvantage:

1. Large initial capital cost.

Recommendation

Since USAID/Washington has stated that vehicles cannot be purchased under a level of effort contract, it is recommended that vehicles either be rented or be provided by CWO in accordance with USAID procurement regulations.

Required Vehicles

Vehicle No.	Assigned to	Principal Uses
1	Project Manager	Meetings with CWO, USAID and Giza officials; trips to and from airport to receive consultants and home office visitors; available for field work only as required by demands on other vehicles.
2	Chief Engineer	To and from demonstration sites; office visits to CWO, USAID, and Giza Authorities.
3	Sr. Field Engineer	Principal field vehicle. Suggest a heavy duty pick-up.

4	Consultants	This vehicle would be reserved for the use of off-shore and local consultants assigned to the project. The consultants role is an important one and to optimize productivity it is essential that adequate local transportation be provided.
5	Support Staff	Trips to visa office, police registration, and other offices; procurement of supplies, commodities, repairs, and tickets; numerous logistical matters.
6	Survey Team/ Construction Services	Full time assignment to surveying team during the first 12 months of the project, and available for surveying and construction services subsequently.

7.4 Financial Administration

7.4.1 General

The detailed financial administration procedures to meet the requirements of the contractor and AID will, to a large degree, depend upon the established accounting procedures of the contractor selected for the project.

7.4.2 Task and Activity Identification

A cost accounting system should be developed by the contractor to continually identify the dollar and LE costs of the various activities of the project. These activities could include such items as technical assistance, support services, training, health education, social science, and others that may be requested by the mission.

7.4.3 Dollar Expenditures

Since a minimum of dollar expenditures would originate in Egypt, most of the dollar expenses would probably be paid by the contractor's home office. The contractor's funds would be reimbursed by AID Financial Management when the contractor's invoices are paid.

7.4.4 LE (Egyptian Pound) Expenditures

All LE expenditures would be made from funds directly provided to the contractor's Egypt office by the mission.

7.4.5 Cost Data Collection

A system should be established by the contractor to collect and combine all data pertaining to LE and dollar receivables and expenses. Invoices would be prepared from this cost data collection center.

7.4.6 Invoice Preparation and Submittal

All contractor expenses are to be itemized on the invoices in accordance with the classifications required by AID. The invoices are to be submitted to the Mission for approval and then submitted to AID Financial Management for payment.

7.4.7 Financial Flow Pattern

The financial flow pattern chart shown as Figure No. 7.8 in this report, summarizes the project financial activities.

7.5 Implementation Elements

7.5.1 Project Initiation

It is recommended that the project begin as quickly as possible and that the contractor be instructed to begin work in Egypt within one month of receiving contract authorization from USAID. If it is assumed that the GOE and USAID will require one month to review and approve this report and that non-competitive procurement procedures are used to designate a contractor, then contract authorization should be given by 1 April 1982, and the contractor should begin activites in Egypt by 1 May 1982. Figure 7-9 presents recommended project initiation, duration, and scheduling for a non-competitive procurement.

On the other hand, if competitive procurement procedures are followed, contract authorization will be delayed until 1 December 1982, and field activities will not begin until 1 January 1983.

7.5.2 Project Duration

As described in Section 5.4.2, the duration of the project should be between 20 and 24 months. It is recommended that the project be carried out within a 21-month period, as shown in Figure 7.9. For a non-competitive procurement, the starting date will be 1 April 1982, and the completion date will be 31 December 1983.

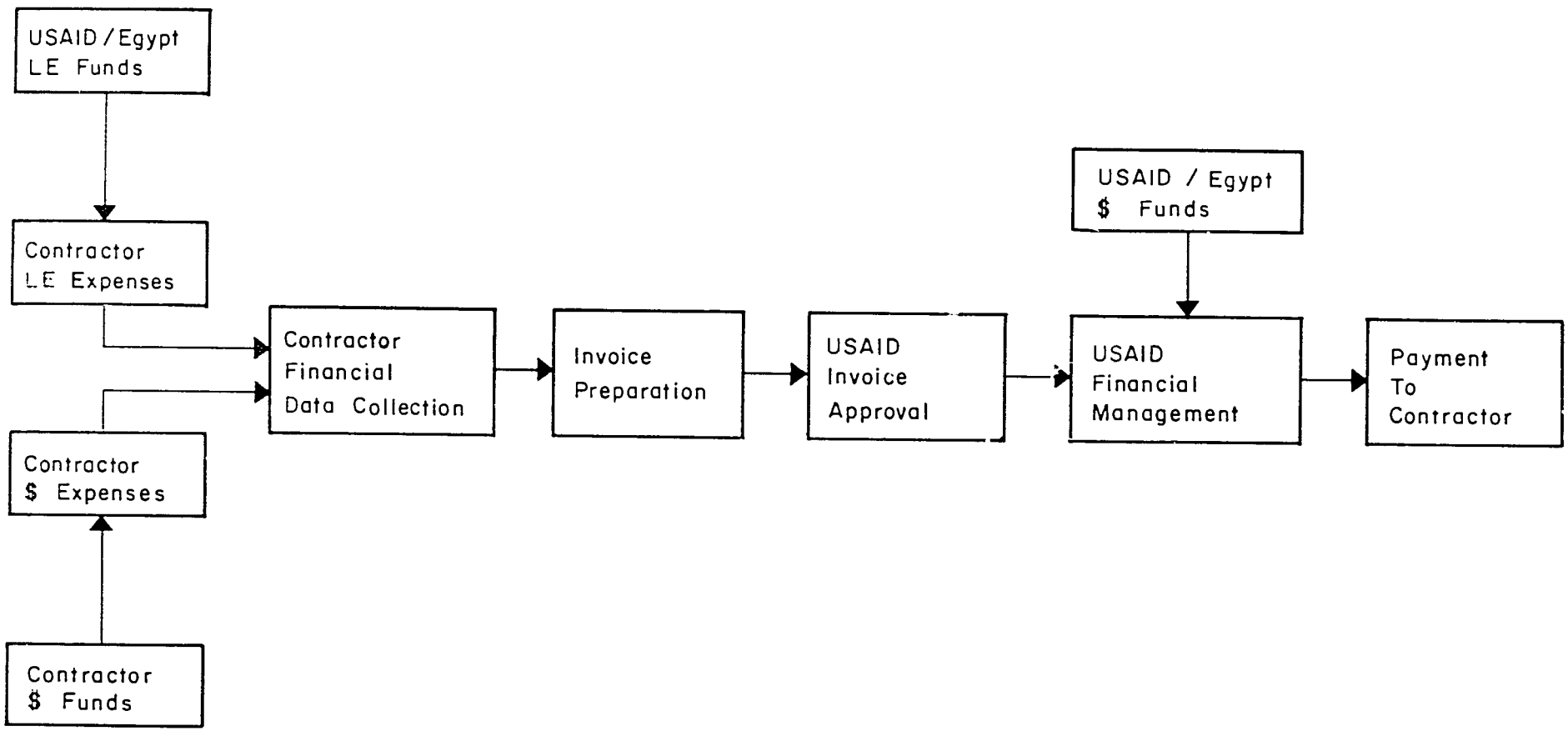


FIGURE 7.8 FINANCIAL FLOW PATTERN

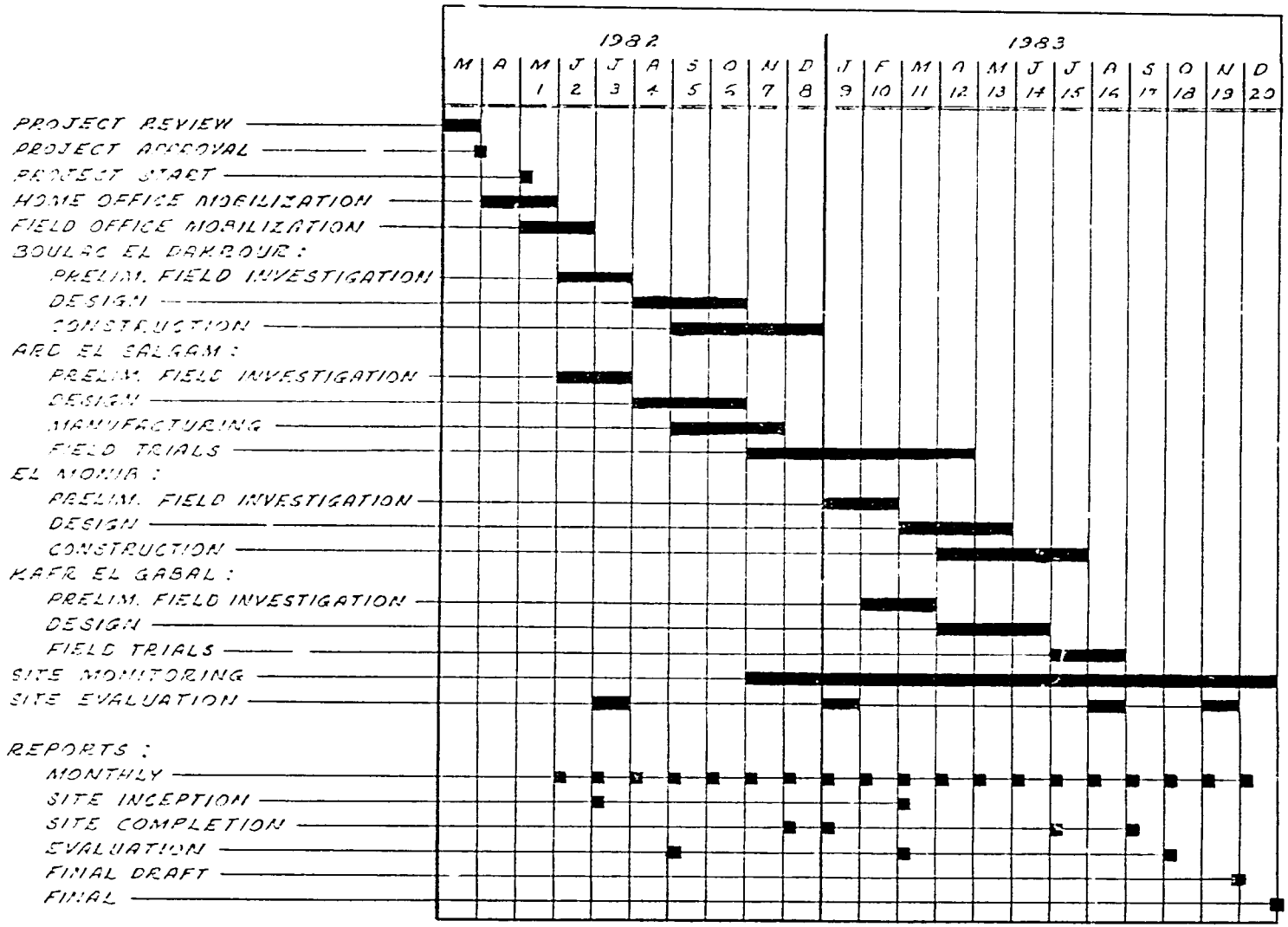


FIGURE 7.9 IMPLEMENTATION SCHEDULE

7.5.3 Project Site Scheduling

Two demonstration sites should be undertaken at a time, as described in Section 5.4.2. The first two sites should be Boulac El Dakrour (community-financed sewers) and Ard El Salaam (improved collection equipment). The investigation, design, manufacturing, and construction work at these two sites should be completed by the ninth month, as shown in Figure 7.9. Field trials and monitoring will continue for the remainder of the project.

The second two sites should be Al Mounib (small-bore sewers) and Kafr El Gabal (infiltration vaults). Field investigations should begin by the start of month ten and construction should be completed by the end of month 16. As for the first two sites, field trials and monitoring will be carried on until the end of the project.

7.5.4 Project Reports

A monthly progress report will be prepared for the USAID Mission and the CWO. Inception reports will be prepared for each demonstration site prior to the initiation of design activites for that site. Upon completion of construction, a site completion report will also be prepared.

There should be a series of evaluation reports over the course of the project. A baseline report should be prepared by the sixth month, and end-of-construction reports should follow in months 12 and 19. A final evaluation report should be included in the final project report.

A draft final report for the entire project should be submitted to the Mission and CWO during month 20 and the final report should be ready by the end of the project. Figure 7.9 illustrates the type and scheduling of above reports.

7.6 Level of Effort Estimate

The recommended staffing of the project including position responsibilities has been presented in Section 7.2 and is summarized in tabular form by position, location of services, and type of services. The recommended level of effort includes 84 person months of U.S. field personnel, 18 person months of U.S. home office personnel, 170 person months of Egyptian professional personnel, and 260 Egyptian non-professional person months.

The level of international travel required for the recommended program is based on four-long term U.S. positions (12 months or longer), all on family status and with the assumption that one of the families would have two children of school age. In addition, the program calls for periodic senior home staff visits and the provision of consultant services. The estimated number of round trips between USA and Egypt is 40.

The recommended level of relocation and storage effort is also based on four long-term positions in Egypt. Housing and per-diem levels of effort are those required to accomodate the proposed long and short-term visitors with appropriate facilities and is based on rental of flats for long-term

staff. Consideration should be given to the operation of a guest house for short-term visitors. The recommended scheduling provides for 64 months of housing and 788 days of temporary lodging.

The recommended office space, office furniture, and equipment has been described in Section 7-3. The recommended office location is in the Mohandessin area of Giza and would have floor area of approximately 1500 square feet (140 square meters).

The proposed level of effort requires a minimum of six vehicles. It is recommended that the distribution include three sedans, one heavy duty pick-up, and two vans.

Level of Effort Estimate (Summary)

U.S. Field Personnel	84 person months
U.S. Home Office Personnel	18 person months
Egyptian Professional Personnel	190 person months
Egyptian Non-Professional Personnel	240 person months
International Travel Costs	Based on 40 round trips between U.S.A. and Egypt
Relocation and Storage Costs	Based on 4 long term positions in Egypt
Communications	Telex, telephone and courier service
Office Costs	Furnished office space in Giza (approx. 1500 ft^2), with allowances for consumables, office equipment.
Transportation (Egypt)	Vehicles and miscellaneous local transportation costs.
Housing and Per Diem Costs	Based on 64 months of housing rental and approximately 788 days of temporary lodging.

Chapter 8

RECOMMENDED INITIAL PILOT DEMONSTRATION SITE

8.1 Technical Elements

It is recommended that Boulac El Dakrour be the first demonstration site and that community-financed sewers be the basis of the initial demonstration activity. This site has several advantages for the initial demonstration work, including on-going community sewer projects, residents willing to pay for improved sanitation, and a development model holding great potential for other unsewered areas. The predominant factor in choosing an initial site is the need to show results in the field as quickly as possible.

The key issue in community-financed sewers is whether such systems can be legally connected to the public sewerage system operated by GOSD/Cairo. In Boulac El Dakrour, it will be necessary to assess the technical design and construction of the private sewers as well as the carrying capacity and hook-up regulations of the public system. The project team will have to work very closely with GOSD/Cairo officials to insure that all future works are acceptable to GOSD/Cairo.

The first priority for the project team will be to initiate discussions with GOSD/Cairo officials and determine whether community-financed sewers can be officially encouraged without dampening the enthusiasm and willingness of the people to improve their own sanitation facilities.If it appears that a good cooperative relationship can be developed between GOSD/Cairo and the residents of Boulac El Dakrour, the project team should proceed with the technical and organizational modifications required for linking private sewers to the public system. If, however, a cooperative relationship cannot be quickly established between GOSD/Cairo and the residents wanting sewers, Boulac El Dakrour should not be used as the first demonstration site. The project team should shift their effort to El Mounib and the development of small-bore sewers.

As indicated above, the initial demonstration site should show activity in the field without delay. Boulac El Dakrour appears to have good potential for immediate action and, therefore, should be chosen as the initial site. In the event that the necessary agreements between GOSD/Cairo and the community will be significantly delayed, El Mounib with small-bore sewers should be immediately substituted as the initial demonstration project.

8.2 Implementation Elements

It is assumed that non-competitive procurement procedures will be followed and the contractor will be authorized to begin work on 1 April 1982. As shown in Table 7.1, contractor personnel should begin work in Egypt by 1 May 1982. Setting up an office and hiring the Egyptian staff will be the first task in Egypt. Preliminary field investigations should begin at Boulac El Dakrour by 1 June 1982. This work will include technical investigations of the types of community-financed sewers being constructed

and socio-economic investigations of the local organizations and willingness-to-pay of the residents. At the same time, discussions should begin between GOSD/Cairo, Giza City, and Giza Governorate to determine the requirements for linking private sewers to the public sewer system. To the maximum extent possible, representatives of these organizations should work with the project team on all aspects of this initial demonstration activity.

Technical design of new sewers and mobilization of the local residents will occur over the period August to October 1982. Initial field construction of sewer trenches should begin by September 1982 and be completed by the end of the year. The inception report for this first demonstration site should be submitted by 1 June 1982, while the completion of construction report should be prepared in December 1982.

APPENDIX A

WATER AND SANITATION FOR HEALTH (WASH) PROJECT
ORDER OF TECHNICAL DIRECTION (OTD) NUMBER 77

January 8, 1982

TO: Dr. Dennis Warner, Ph.D., P.E.
WASH Contract Project Director

FROM: Victor W.R. Wehman, Jr., P.E., R.S.
A.I.D. WASH Project Manager
S&T/HEA/CWSS

SUBJECT: Provision of Technical Assistance Under WASH Project Scope of Work for U.S. A.I.D./Egypt (Cairo)

REF: A) Cairo 30352
B) Terms of Reference and Scope of Work, dated 28 December 1981

1. WASH contractor requested to provide technical assistance to U.S. A.I.D./Cairo as per reference A, paragraph five, (modified in this OTD with participation of NE/TECH, Mr. Haratani).

2. WASH contractor/subcontractor/consultants authorized to expend up to one hundred and eighty-five (185) person days of effort over a three (3) month period to accomplish this technical assistance effort.

3. Contractor authorized up to one hundred and seventy (170) person days of international and/or domestic per diem to accomplish this effort.

4. Contractor to coordinate with NE/TECH (Mr. Haratani, 632-0215), Egypt Desk Officer, NE/PD/ENGR (Mr. Hotvedt), and U.S. A.I.D./Egypt (Mr. Guymont) and should provide copies of this OTD along with progress reports as requested by S&T/HEA or NE Bureau or U.S. A.I.D/Egypt.

5. Effort is to be an intensive one with most of the travel authorized in paragraphs two and three above to be accomplished basically within effectively a one to one and one-half (1 to 1-1/2) month period, i.e., mid-January to the end of February 1982.

6. Advance team authorized to contain U.S. professionals and local Egyptian professionals as necessary to remain up to one month (four weeks) in Egypt within the time constraints identified in paragraphs two and three of this OTD.

7. Contractor authorized to provide up to four (4) international round trips from consultant's home base through Washington for briefing to Cairo, Egypt and return to consultant's home base. Team leader (recommended to be Dr. Warner-WASH Contract Project Director) required to lead debriefing and coordination activities for WASH project.

8. Contractor authorized local travel in Egypt in metro Cairo/Giza area as appropriate and necessary.

9 Contractor authorized to obtain secretarial graphics and/or reproduction services in Egypt as necessary to accomplish task. These services are in addition to the level of effort specified in paragraphs two and three above, but should not exceed $1,000 without official approval of A.I.D. WASH Project Manager.

10 Professional services provided under this OTD by the WASH Project Contractor will be managed in the U.S and Egypt (as is usual in all WASH Project activities) by the A.I.D. WASH Project Manager in S&T/HEA working in close collaboration with NE/TECH NE/PD/ENGR and the U.S. A I.D offices to resolve any possible problems that might occur during implementation of this OTD activity.

11. Contractor authorized to provide for car(s) rental if necessary to facilitate effort Contractor should take every opportunity to use local taxis or local conveyances where possible. If Mission offers to provide any logistical support in the area of transportation contractor authorized to utilize Mission vehicles.

12. Contractor authorized to take a manual typewriter and graphic equipment as necessary to Egypt to accomplish technical assistance effort i e. excess baggage for equipment is authorized as necessary.

13 WASH contractor will adhere to the normal established administrative and financial controls as established for the WASH mechanism in the WASH contract with S&T/HEA.

14. WASH contractor and WASH CIC should definitely be prepared to administratively or technically backstop the field advance team consultants or subcontractors.

15. Contractor should prepare overall final draft report and coordinate this report with U.S A I.D./Egypt, NE/TECH representative in field (Mr Haratani) and with CWO or Giza Government representatives. This report should be prepared and agreed to before team leader leaves Egypt Final report should be prepared within 30 days of return of project director to WASH CIC. Draft final report in field should be used as draft official agreement document for subsequent implementation of any U.S. A.I.D./Egypt requests.

16 Scope of work modifications to reference A are as follows:

Paragraph five of reference A amended to read:

> "Working within the general framework described in the terms of reference and scope of work " (reference B in this OTD) for the unsewered areas of Cairo Sewerage Project (263 0091) the WASH advance team will prepare an overall implementation plan and level of effort estimate for pilot demonstrations of improved excreta and wastewater disposal methods in areas of greater Cairo situated in the Giza Governorate This plan and level of effort estimate will include, but not be limited to the following components:

a) Establish preliminary criteria to be agreed upon by parties involved for the selection of unsewered areas and delineate these areas at least preliminarily on a large scale map of the Giza Governorate.

b) Establish specific preliminary criteria to be agreed upon by parties involved for the selection of pilot demonstration sites within unsewered target areas in Giza Governorate. If possible, delineate some of the sites subject to further study on small scale maps.

c) Describe and/or develop a preliminary methodology and attempt to obtain agreement by U S A.I D and CWO/Giza personnel on a preliminary methodology for collecting information on and analyzing existing methods of collecting, treating and disposing of excreta and wastewaters in proposed pilot demonstration sites and for identifying selecting, designing, implementing and evaluating a range of promising improved methods for the collection treatment and disposal of excreta and wastewater in pilot demonstration sites. In association with this prepare and attempt to obtain agreement on a relative responsibilities document that outlines the responsibilities roles and duties of the various organizations involved in the implementation of this pilot demonstration activity.

d) Develop overall preliminary, best judgment level of effort estimates showing levels of manpower commodity and logistics requirements, scheduling, organizational frameworks and at least preliminary best guess implementation schedules for the complete pilot demonstration effort.

e) Describe to the extent possible the numbers types size and locations of proposed test demonstrations. (This element may not be able to be provided until intensive implementation assessment under actual proposed pilot demonstration begins.)

f) Develop level of effort cost estimates for proposed pilot demonstration for purposes of enabling the Mission to request levels of services or commodities in terms of person days type of expertise, number of and types of commodities, etc., but not in terms of dollar or local Egyptian pound figures Provide a document that does not represent a Government Independent Estimate for negotiation purposes.

g) Preliminarily investigate the availability of individual consultants and/or subcontractor organizations local labor, contacts, financial procedures relating to Egyptian pounds, availability and appropriateness of coordination center site in Egypt for carrying out implementation activity should CWO, S&T/HEA HE/TECH and U.S A.I D decide to implement activity using WASH project contractor.

h) Develop preliminary procedures for subcontract and financial administration, project billing methods, cash disbursements, project budgets and financial reporting. In association with this, prepare and attempt to obtain agreement on a relative responsibilities document that outlines the responsibilities, roles, duties and authorities of the various organizations involved in the implementation of this pilot demonstration authority under the scope of work of the S&T/HEA WASH project contract.

17. Mission and NE/TECH should be contacted immediately and technical assistance initiated by February 1, 1982.

18. Appreciate your prompt attention to this matter.

APPENDIX B

Cairo Unsewered Areas

Advance Team

Outline of Field Investigations

1. Carry out preliminary identification of unsewered areas in Giza Governorate.

2. Carry out preliminary identification of existing excreta and wastewater disposal methods in these areas.

3. Make preliminary identification of promising improved methods for the collection, treatment, and disposal of excreta and wastewater in these areas.

4. Carry out preliminary identification of the social, economic, financial, institutional, and political constraints influencing the choice of improved methods in these areas.

5. Determine the operational objectives of the unsewered areas sub-project. This will require close involvement of USAID/Cairo, Giza Governorate, and the GOE.

6. Formulate a preliminary implementation plan for the unsewered areas sub-project. This plan should give consideration to potential choices of technologies, number of pilot demonstration sites, and duration of field work.

7. Formulate preliminary criteria for pilot demonstration site selections within the unsewered areas.

8. Formulate preliminary criteria for the selection of disposal methods.

9. Prepare a preliminary design for method to be used in the initial pilot demonstration site.

10. Develop the final plan proposal. This proposal should include recommendations for a preliminary implementation schedule, required resource inputs, institutional relationships, and contract and financial relationships between the WASH contractor, USAID/Egypt, and S&T/HEA.

APPENDIX C

Itinerary

29 Jan	Leave Washington National Airport 4:02 pm. Fly to JKF/New York. Fly to Rome.
30 Jan	Arrive Rome. Fly to Athens. Fly to Cairo. Arrive Cairo 5:30 pm. Go to USAID Guest House Annex.
1 Feb	Meet with Dr. William Oldham, USAID, Head of Office of Health. Give him 5 copies of environmental health assessment report. In afternoon meet with Fred Guymont (also J. Haratani, L. St.Michel, R. Sullivan, J. Arbuthnot). Discuss scope of work (SOW) of WASH activities.
2 Feb	Meeting at CWO with Eng. Atalla Safwat (Chairman, CWO), Engr. Mounir Tewfik (Tech. Dir., CWO), John Drake (Director, AMBRIC), James Wright (Dep. Dir., AMBRIC). Discussed SOW generally. Prepared statement of project for Chairman Safwat. Called WASH Office.
3 Feb	Meeting at Office of Governor of Giza. Meet with the Honorable Ibrahim Lutfy and R. Redman. Visit to Boulac el Dakour Hospital, met Dr. Ismael Kamel, A. Elfiky, M.T. Elawady, A.G. Montaser, K.I. Ahmed. Visit Boulac el Dakrour unsewered areas.
4 Feb	Pick up M. Mitwally at Giza Gov. Office. Meeting at Giza Governorate HQ with Engr. A.M. Elfiky, Ibrahim Abuleuon. Visit area between El Talbeya and El Konaysa and visit Kafr El Gabal near pyramids; all areas in Giza West. Discuss contract issues with team in evening. Meeting with Sharif El-Hakim.
5 Feb	Visit Khan El Khalili. Work in office in afternoon.
6 Feb	Meeting Giza Health Directorate with Dr. A. Azmerly (Director, Dept. of CDC). Field trip to Saakut Mikki.
7 Feb	Meetings at AMBRIC (J. Wright, R. Spolton). Meeting at USAID (F. Guymont, J. Haratani) to discuss status of work.
8 Feb	Meetings at Giza City HQ (N. Bahgat, T. Hussein, R. Ghobrial, A. Yosry). Meeting with Dr. Sharif, Dep. Minister of Health, Giza Governorate and with Dr. M.A.G. Azmerly. Meeting at USAID with F. Guymont and R. Redman. Visit Gezira El Dahab and El Mounib areas (South Giza).
9 Feb	Meetings at Giza City HQ with A. Yosry, T. Hussein, S. Allam. Visit Ard El Gameya, Abu Qetata, and West Munira areas. Meet with Engr. M.E. Rafat, Giza Irrigation Dept. Meet at Sharif El-Hakim & Assoc. to discuss contract.

10 Feb	Meeting at USAID with F. Guymont and R. Redman on SEH subcontract. Meeting at Giza City Garage with Abu Zeit. Field trip to El Mounib and El Monira. Meeting at S. El-Hakim to discuss sub-contract.
11 Feb	Meeting at Giza City HQ (R. Ghobrial, S. Farag, Y. Shaykhoun). Meetings at CWO with A. Safwat and M. Mitwally.
12 Feb	Day off.
13 Feb	Visit proposed office location in Mohandessin. Meeting with S. El-Hakim to sign contract (El-Hakim, M. Hussein). Start day with Advance team meeting.
14 Feb	Meeting at Giza City HQ with A. El Fiky. Visit Boulac El Dakrour area and Abu Qetata area again.
15 Feb	Meeting at CWO with M. Mitwally (briefing on technical options). Meeting at NOPWSP with A. Ashmawy and F. Kassem. Meeting at GOSD/C with G. Eid and F. Kassem.
16 Feb	Meeting at CWO to brief on preliminary results - A. Safwat, J. Drake, F. Guymont, R. Redman and others. Meeting at AMBRIC with J. Wright and L. Gutierrez. Meeting at GOPP with M. Fouad. Meeting at USAID with F. Guymont.
17 Feb	Meeting at Giza City HQ with T. Hussein, F. Salem, A. Zeit, F. Moustafa, M. Mitwally, N. Bahgat and others to give preliminary findings. Visit to El Mounib area for second time. Meeting at Sharif M. El-Hakim and Associates.
18 Feb	Meeting at USAID with B. Oldham and G. Boostrum. Meeting at USAID with F. Guymont, R. Redman, J. Haratani.
19 Feb	Work at Guest House. Telephone call to F. Guymont. Telephone call to WASH (Donaldson).
20 Feb	Meeting at Inspectorate Office of the Pyramids, General Organization of Antiquities, with N. El Hassan, Director, and M. Naguib. Visit to Kafr El Gabal area. Visit to Fahim Raghab Factories, Cairo, M.F. Raghab. Meeting with S. El-hakim.
21 Feb	Work at Guest House. Meeting at S. El-Hakim to collect final report.
22 Feb	Project briefing at USAID (R. Dangler, M. Kingery, F. Guymont, R. Redman). Work at Guest House.
23 Feb	Project briefing with A. Safwat, CWO. Work at Guest House.
24 Feb	Final typing of draft report.

25 Feb	Presentation of findings and recommendations to the Governor of Giza, Giza Governorate officials, Chairman Atalla Safwat and CWO officials, and USAID officials. Printing and binding of draft final report. Delivery of report to USAID (R. Redman)
26 Feb	Team departs Egypt.

APPENDIX D

List of Officials Visited

USAID/Egypt, Cairo Center, Kasr el Aini, Carden City, Cairo (Tel. 28211)

Richard Dangler, Assistant Mission Director
Michael T. Kingery, Office of the Director
Frederick Guymond, Office of Infrastructure Development and Program Support
Gary R. Redman, Capital Projects, Development Officer
Dr. William Oldham, Health Officer

Organization for the Execution of the Greater Cairo Wastewater Project (CWO), CWO Building, Galaa Street (Tel. 757062)

Eng. Atalla Safwat, Chairman
Eng. Mounir Tewfik, Deputy
Eng. Mohammed Mitwally

National Organization for Potable Water and Sanitary Drainage (NOPWSD), Mogamma Building, Tahrir Square, Cairo (Tel. 777293, 29894)

Eng. Abdel Moneim Ashmawy, Chairman
Eng. Youssef Hanna, General Manager
Eng. Farouk K. Kassem, General Director, Design Section (Tel. 24949)
Eng. Galal Eid, Chief Engineer, Design Section (Tel. 779309)

General Organization for Sanitary Drainage (GOSD) Cairo (Tel. 779309)

American British Consultants (AMBRIC), P.O. Box 2265, Ataba Square, Cairo (Tel. 749636)

John Drake, Director
James Wright, Deputy Director
L.V. Gutierrez, Jr., Project Manager
Roger L. Spolton

Giza Governorate

Honorable Ibrahim Lutfy, Governor
Medhat Deray, Director, Giza Governorate (Tel. 85393)
Dr. Ismael Kamel, Director, Boulac el Dakrour Hospital, City of Giza, Representative
Chief Eng. Ahmed Mohammed El Fiky, Giza West
Dr. Mohamed Taha Elawady, Resident, Boulac el Dakrour Hospital
Eng. Ahmed Galal Montaser, Giza West
Eng. Ibrahim Abuleuon, Director of Highways and New Projects, Giza West
Eng. Karam Ibrahim Ahmed, Giza West
Nabil Mahmoud Bahgat, Secretary, Office of the Governor
Talaat Mohamed Hussein, Chairman, Giza City Council
Raafat Ghobrial, Under Secretary for Housing
Fathy Sallam, District Chief, South District

Giza Governorate (cont.)

Eng. Noomam Saleh, Chief Engineer, South District
Eng. Fawzy Moustafa, Chief Engineer, South District
Asman Salem, Representative People's Council
General Ali Yosry, District Chief, North District
Eng. Saad Zaglool Allam, Chief Engineer, North District
Eng. Showky, North District
Dr. Sherif, Deputy Minister of Health
Dr. M. Abdel Ghany Azmerly, Director Communicable Disease Control
Arch. Yossef Shaykhoun, Deputy Director, Department of Housing (Tel. 72505)
Arch. Samir Sadek Farag, Chief Architecture and Planning, Department of Housing
Eng. Mohammed Abu Zeit, General manager Electrical and Mechanical Department, Giza City (Tel. 701825)

General Organization for Physical Planning (GOPP)

Michel Fouad, Chairman (Tel. 23122)

Inspectorate Office of the Pyramids, Cairo, General Organization of Antiquities

Nassif El Hassan, Director
Mohammed Naguib

Irrigation Department

Eng. Mohammed Ehal Rafat, General Director, Giza

Sherif M. El-Hakim and Associates, 12, Dr. Mahmoud El-Hofny Street, Apt. 4, Garden City, Cairo (Tel. 21843)

Dr. Sharif M. El-Hakim, Principal
Mahmoud Hussein, Economist
Mohamed Hasuna

Others

Ismail Abdul Rahman, Private Sewer Contractor, Boulac el Dakrour
Mohamed Fahim Raghab, Owner Fahim Raghab Factories, Morniche El Nil (Shoubra El-Khaima) Cairo (Tel. 946460)

APPENDIX E

SHERIF M. EL-HAKIM & ASSOCIATES
SOCIO ECONOMIC AND PLANNING CONSULTANTS

SOCIO-ECONOMIC CHARACTERISTICS
AND WASTE MANAGEMENT SYSTEMS OF
SELECTED UNSEWERED AREAS,
CAIRO WEST BANK.

21.2.1982

REPORT TO THE WATER AND SANITATION
FOR HEALTH PROJECT, CAIRO.

CONTRACT REF. 77

11, DR. MAHMOUD EL-HEFNY STREET, GARDEN CITY - APT. 4
CAIRO - EGYPT - TEL. 21843 - TELEX 93997 SAAD UN

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INTRODUCTION

The purpose of this report is to provide order of magnitude type socio-economic information regarding selected unsewered areas in the west bank of Cairo.

The information is based on field work between 12.2.82 and 18.2.82 supplemented by available information from other surveys and data on informal settlement areas in Cairo.

The main findings of this work can be summarised as follows:

That the study area residents are highly concerned with their environmental problems;

That they are able and willing to pay substancially to improve their conditions;

That the present costs of waste water management are rising to a level that is nearly beyond the means of some households;

That to lower overall costs the residents actively engage in self help projects;

That the study areas and the waste water removal labour force have well developed organisational structures and methods of cooperation that could serve as the basis for waste water management and upgrading implementation projects.

For the purposes of implementation further more detailed survey work is necessary to establish more systematic socio-economic data for each of the study sites and the labour force (sorabatia) engaged in waste water management. In depth study of the local organizational structures is also necessary to identify the most appropriate structures and leadership for the subsequent stages of the environmental improvement projects.

A solid waste management upgrading project and a public health project related to the sorabatia is also recommended.

PATTERNS OF LAND DEVELOPMENT AND BUILDING TYPES

Informal settlement areas of which the study areas are part, develop according to specific evolutionary stages. Such settlement areas develop mainly as a result of the aggregate effect of individual construction activities which take place usually without proper licensing or legally acceptable standards on land that is rarely subdivided systematically. Proper infrastructure and services are almost always completely absent.

Although the study areas resemble each other in that they represent the lower socio-economic groups having for the most part similar life styles, they differ in their morphology because they represent different stages in the development process of such areas.

The development of such areas involves two processes: the evolution of building materials from temporary to more permanent types, and the staged horizontal and vertical expansion of the structures themselves.

Building materials are selected not only on the basis of cost but also by consideration to the question of tenure security. If the land in question has not been bought but is being squatted on then more temporary materials such as mud and stone are used to minimise the risk of losing more capital in the event of an eviction. Temporary structures built in this way are replaced after a few years of residence when squatting rights are secured and if finances are available.

The existence of mud and other temporary structures in the study areas, however, cannot only be explained on the basis of the question of tenure. Informal settlement areas usually develop on agricultural lands adjacent to the city and frequently stem out from the older and traditional settlements and individual mud houses that existed before the in-migration was initiated. Indeed roughly two percent of the structures standing in Cairo are of the temporary materials.

Agricultural land when located near built-up areas is always more valuable as a potential building site than as farm land. Often the farmers themselves initiate the settlement process by investing in construction themselves. In addition, owners of such land are usually willing to sell small plots especially because holdings tend to be small due to fragmentation under the inheritance laws. Desert areas are seldom suitable for settlement purposes since even the minimal requirements of food and transport which are available in agricultural areas are lacking.

Although for the most part land is sold unsystematically and the transactions tend to be individual, land in such areas is sometimes subject to more systematic speculation through the operations of a private real estate dealer. Large tracts of land or many small holdings are bought for subdivision as housing plots.

The subdivided plots are tailored to the needs and finances of the individual buyers and therefore little if any planning is carried out. No provisions are made for appropriate infrastructure or green areas. Access ways between plots are minimal and for the most part become narrow alleys as both the speculator and the buyers refuse to give up land for such purposes freely.

In El Munib the Valley of the Kings real estate company is operating and most land transactions take place with it being a party to the sale. Ard El Gabal and Bulak gave no indication of such an operation but the Ard Sallam and the Ard El Gamia sites both are the result of larger tract subdivision affected essentially by the rulings of a narrow set square.

The anatomy of the construction cycle and settlement pattern on such agricultural land is as follows: all transactions related to the development of the areas and the individual construction activity is in cash. Cash for the first stages of the buildings is raised by borrowing from relatives or through the sale of jewelry or land and the participation in informal

credit associations. In recent years the earnings from working abroad in Arab countries has also become a significant source for the required financing.

Further construction is often partially financed by taking advances on the rent although key money was once more prevalent than it is today under the stricter law. Construction therefore is viewed as a worthwhile investment to satisfy the housing needs of the investors while providing a supplementary source to augment the household income and provide security for the children.

The buildings tend to be constructed first as single or two family dwelling units but are always conceived with the objective of ultimate expansion to multifamily dwelling units. The construction techniques of the core house are such that they would allow for this when finances become available or when the need arises. In this way the housing stock and the densities in these areas continuously increase as buildings are modified by the addition of floors to accomodate more people.

For areas that develop in this way and quarters within such areas there is however a saturation point which when reached tends to stabilise growth. Physical boundaries prevent horizontal expansion of areas and the ultimate design capacity of buildings limit local neighbourhoods within areas from becoming more densely populated. This is because in Cairo local neighbourhoods seldom change in their socio-economic make-up and drastic changes in room densities are highly unlikely.

SOCIO-ECONOMIC CHARACTERISTICS OF THE STUDY SITES

The table attached presents in summary form our estimates of the significant indicators for each of the six study areas surveyed. It must be emphasized that these are rough order of magnitude figures which are subject to revision when more thorough investigation is carried out. For convenience, the average figures for low income areas in Cairo are also presented. These later figures are based on results of separate sample surveys conducted between 1979 and 1981.

It is to be noted that although all of the studies area populations have low incomes, they do not represent the lowest of the low income groups as our estimates indicate. Their incomes are slightly above the average for Cairo.

The table also indicates the dynamic status of the study sites. This has been derived on the basis of the type of housing in the area, the occupancy rates, density and available open space within the study areas in relation to boundaries.

Kafr el Gabal (1) is an old community basically consisting of settled bedouins who now are engaged in agriculture, tourism-related activities and other commercial ventures. Kafr el Gabal (2) (West) is occupied primarily by newcomers who have settled around a core of older residents who have

ESTIMATED DATA ON INCOME, DENSITY AND OTHER INDICATORS FOR THE STUDY SITES

ITEM	Boulac El-Dakrour	El-Mounib	Ard-El-Gameya	Ard El-Salam	Kafr El-Gabal (1)	Kafr El-Gabal (2)	Average for Cairo*
Dynamic Status	STABLE	EXPANDING	STABLE	STABLE	STABLE	EXPANDING	--
Estimated Population	120,000	15,000	60,000	25,000	11,500	6,000	--
Percentage of shared toilets	18%	10%	0%	0	1%	1%	46.5%
Average persons per room	2.0	2.2	1.4	1.9	1.7	1.7	2.51
Average density per Km^2	109,000	44,000	160,000	113,000	23,000	16,700	61,577
Average [illegible] of Head in household - LE/Month	70	60	100	80	50	50	45
Percentage of income Paid on rent/month	18.5%	13%	35%	20%	10%	10%	10.3%
Percentage of Income actually paid on sanitary services/ month	2.8%	1.5%	4%	2.5%	1%	1%	2.7%
Lump sum willing to pay for sanitary services (per structure) - LE	120-150	50-75	250-300	250-300	30-40	30-40	--
Percentage types of dwelling structure:							
- single floor units	5 %	2%	0%	2%	20%	20%	--
- Multiple floor unit (2-4)	65%	78%	5%	68%	65%	70%	--
- High Rise above 4 stories	30%	20%	95%	30%	15%	10%	--

*Low income.

sold their agricultural land for housing purposes. This community is also a traditional community and consists of residents with primarily rural backgrounds.

Ard El Salam area consists of lower echelon government officials and returning migrants from the Arab countries who have been able to build for themselves or partially finance apartments by giving advances for rent or key-money.

Ard el Gameya is mimilar to Ard el Salam but is of a higher standard and includes a higher percentage of young newly married couples without children.

El Mounib is occupied by people of rural background who also have migrated to Arab countries and are now in commercial ventures such as taxi drivers, owners of small pick-up trucks, merchants, etc. There is also a significant farming community based primarily in old Mounib.

Boulac el Dakrour is occupied by artisans and craftsmen, taxi drivers and lower echelon government employees. This area is probably one of the oldest areas of the informal settlement of the target sites, especially the southern part.

ENVIRONMENTAL CHARACTERISTICS

Informal settlement areas within Cairo are typically areas with a high degree of solid waste accumulation in the streets, empty lots and other public areas and with pools of waste water adjacent to buildings.

Domestic solid waste is carried out by the household members to informal dumps on street corners or empty lots. Animals such as goats, dogs, chickens and ducks, common in the areas, feed on the dumps. Waste water from households is also disposed of manually in this way on the same dumps or sprayed on the unpaved streets and roads for evaporation.

Such practices of community waste management may be tolerable in more rural areas or areas with lower population densities, such as the areas had in their inception. As the density of the community increases, such practices no longer become effective. Too much waste is produced in a concentrated area for the local environment to absorb and the dumps are only sporadically cleaned or burnt.

Domestic waste is very seldom delt with by the district authorities. Such areas do not always fall within the official jurisdiction for services or if incorporated lack appropriate budgetary amendments for the extention of service. Private waste haulers seldom serve the areas since they depend on extracting saleable items from the waste for a great part of their income and in such areas the waste content is not rich. Ard el Salam and Ard el Gamaya are exceptions in that some zabalin carts enter the areas and service households that pay.

It is interesting to not that in areas with sewage facilities waste water often accumulates around high rise and densely inhabited buildings where multiple families occupy the same dwelling unit or apartment. This is because very often under these conditions the buildings sewers are misused and solid waste clogs up the trunk lines. Water threatens to back up into lower level apartments unless the residents of those apartments crack the pipes outside the buildings to protect themselves. Smaller scale buildings suffer less from this phenomenon as social control and cooperation increases. In the study areas, the phenomenon of cracking the pipes seems to be absent.

VALUES RELATED TO WASTE WATER AND SOLID WASTE MANAGEMENT

Traditional religious teaching makes it absolutely clear that cleanliness is a part of faith.

The literature on even prophetic teachings gives outstanding injunctions towards the practice of cleanliness and the disposal of waste. For example, defecation and urination under trees where people may likely seek shade and in water sources is forbidden. The disposal of obstructive items such as the dumping of garbage in the streets, and the practice of spitting where people normally congregate is also enjoined against. There is an emphasis on cleaning and beautifying the environment, tne home and the physical body.

Frequent washing is required in connection with many daily activities. Abolution before prayers, washing the hands before eating complete, abolution or bathing after intercourse, the washing of the anus after defecation; all emphasise the importance of cleanliness as a value.

On the other hand, wastes are defined as polluting and the concept of pollution is well developed in the distinction between the concepts of Nagasa and Tahara. Tahara being ritually clean and Nagasa being ritually polluting.

Ritual pollution can stem from bodily functions and also by contact with dirty matter. Under some schools of thought, for example, even contact with a pet dog can necessitate the performance of a ritual abolution before prayer.

Individual practise however is not sufficient to keep the environment clean. Waste water sprayed on the unpaved streents for evaporation or solid waste dumped neatly in empty lots and informal dumps accumulates in conditions of high density settlements without adequate service.

When communities live under poor environmental conditions people become used to different standards for their environment. Habits become adjusted so that the significant boundries for cleanliness get defined in terms of their homes rather than the community.

In less dense residential areas, where the residents use the public streets more often for social occasions the area adjacent to the houses of these streets are often swept. However, the sweepings themselves are difficult to

dispose of especially in larger settlements where carrying the sweepings outside the community could be a long and hard task.

Among the rural migrants, who are well represented in the study areas solid waste is stored as a fuel for baking purposes when the housing type allows for a traditional mud brick oven.

HEALTH AWARENESS

The consequences of waste water and solid waste accumulation on health are generally known. It is known that such wastes breed flies and mosquitoes and other insects and that such wastes are likely to cause health problems for the people living adjacent to them. The offensive smells and unsightliness of the area are repungent to the people.

Although the precise mechanisms of transmission are not quite understood, there is an awareness that permeable tanks can affect the quality of the ground water pumped by hand pumps.

TYPES OF WASTE WATER AND WASTE WATER MANAGEMENT SYSTEMS

A. Types of Waste

In the unsewered areas a practical distinction is made between two types of waste water which are usually handled by different means. Although sometimes when densities are low they get mixed together.

Waste water generated from bathing and cooking, diswashing and other household uses is usually handled separately by the housewife who carries it out of the household and disposes of it in the streets in open areas on informal dumps for evaporation. Frequently, this waste water is mixed with domestic solid waste, since the house wife also has to dispose of the solid waste in a similar manner.

Human waste is disposed of through the trench or vault system which in the study areas is almost always connected to the individual dwelling units. Only small children defecate in public areas during the day time.

B. The Storage of Waste

In the unsewered areas the pattern of storage of both types of waste water tends to be very similar to the rural areas. Domestic waste water is stored in buckets for possible further use and for washing floors before disposal.

Human wastes are stored in trenches or tanks of which there are basically two types. The first type is the permeable tank which allows for the percolation of water through the tank itself while the tank retains the sludge which in the end, when the tank fills up, has to be removed. The

second type of tank is the impermeable tank usually constructed of concrete. These tanks do not allow for the percolation of the water and therefore they tend to be of larger capacity than the permeable tanks.

The type of tank used is determined by the level of the ground water and in dense areas as the study areas the water table is almost always shallow. This condition makes the use of permeable type tanks impossible. Permeable type tanks are also inappropriate in areas where hand pumps are commonly used for the potable water supply of the community. This consideration does not seem to prevent the use of such tanks since in some areas where hand pumps are prevalent such as Munib they are used. Permeable type tanks are not now commonly installed because of the awareness that as the settlement density increases the water table is also likely to rise.

Problems of overflowing tanks can be traced to their initial design capacity and the population density that the structures eventually develop. Contractors interviewed did not seem to have fixed standards of capacity per capita. They installed tanks along the length or width of buildings on the owners land and seldom went beyond the depth of two meters in depth and two in width. The tanks are constructed with their openings higher than the street level so that rain water or domestic waste water does not find its way to the tank.

C. The Evacuation of the Tanks and the Removal of Sludge

Two types of systems are in operation: mechanical pumping and manual removal.

The mechanical evacuation system basically involves four meter capacity tanks mounted on trucks with a pump. This equipment is either owned by the public sector or privately owned by a waste removal contractor. To the residents in the study areas the differences between the public sector service and the private contractor are not significant since public sector crew operate discriminantly and service those who tip them to the value of the service.

The advantage of this system is that tanks may be rapidly emptied without close contact with the waste water. The mechanical method of removal is considered more appropriate to the impermeable tanks. The permeable tanks wastes are too viscus to be pumped out by the trucks since they either clog the hoses or damage the equipment and the pumping itself is likely to damage the permeable tanks.

A more serious disadvantage of this system is that, given the poor planning of the informal settlements, the equipment cannot always negotiate the narrow streets and alleys. For this reason manual service is always a necessity.

Manual evacuation of the two types of tanks is carried out by a certain specialised labour force known by the term "Sorabatia". The method used is the carrying out of the waste in two tin cans or buckets on a stick held by the shoulder and carried away for disposal or emptied in a cart for further transportation.

Horse-drawn carts have a capacity of 44 tins or one cubic meter since the standard tin is 20 liters. Another type of cart used is a donkey-drawn cart with the capacity of 33 tins or 3/4 of a cubic meter.

Manual evacuation is an established practice. It requires a minimum of two people who interchange their roles during the activity. The tools used are the tins or buckets tied to a rope and a spade used to locate the entrance of the vault and scrape the bed. Only two people are required for the operation.

The operation is carried out by lowering the tins into the tank to haul away the water. As the level of the water declines towards the bottom of the vault, one of the labourers discends into the vault with the spade and the bucket to scrape the bottom and the sides of the accumulated wastes.

The labourer in the tank cannot remain inside for longer than 15 to 30 minutes. The second man is hauling the waste by means of a rope before he exchanges roles with his partner.

This operation is generally known to be dangerous as the men working sometimes fall into the full vault or upon entering into it step on glass and other dangerous items. The workers generally lack protective clothing and often enter these vaults in the nude. The labourers complain frequently about bad eye sight, chest pains and bone aches.

The type of equipment and method of operation tends to be standard and is generally owned by a fleet operator who rents out equipment to free lancers or retained employees. There are also some individual operators who own their own equipment produced by specialised workshops. The determining factor in the type of organization servicing an area is its degree of stability and the extent to which territory is controlled.

The main headquarters for the fleet operators is the district of El Guiara in old Cairo who run both mechanical and manual systems. These operators are licenced to use sewers for the lumping of the collected waste waters and control well defined territories. Other operators are based in Munira Imbaba but they do not control any mechanised equipment. With the exception of Ard el Salam there is no evidence of operators based in the study areas. The Ard el Salam operator controls no mechanical equipment.

PREFERENCES AND ACCEPTABLE LEVELS OF SERVICES

Pipes water supply with private toilets and washing facilities for individual households connected to main sewer lines is what families consider ideal. The residents of unsewered areas expect that in the future the government would eventually make it possible for them to find housing with such service either within the neighbourhoods that they presently live in or in other areas such as in public housing.

While the present disposal systems are acceptable the residents are acutely aware that the present performance especially in the denser areas is extremely poor. This is mainly because the costs of evacuating vaults are mounting to a point where some residents are unable to pay. Waste water

has to be hand carried out into the streets to conserve the vault while in the same area vaults may be overflowing. Piped water, although available in the study areas, is not connected to the individual households because land lords want to discourage the excessive use of water that connections would cause.

This situation makes day to day living a special ordeal for at least three quarters of the residents of the areas who live beyond the ground floor and have to carry their fresh water up to their homes and carry their waste water down again to the street. For those who live on the ground floors being innundated bacause of full vaults is a real danger.

Households frequently complain by sending telegrams to the Governor or approaching the district or even the police to solve some of these problems. In some of the study areas as Ard Salam the resident have had to struggle with the monopoly situation imposed by the vault cleaners who continuously try to raise their prices.

TYPES OF COMMUNITY SELF-HELP PROJECTS

Activities carried out for the common good appear in all the study areas in different forms with various degrees of organization. These activities have a wide range of purpose and include the burying of the dead, providing information on job opportunities and installing sewer lines in the neighbourhood.

There are at least four different levels of such cooperative activity. Only those relevant to the community environment will be outlined here:

First on the individual level whereby a single household may struggle to cope with a community's environmental problems by visiting public offices, sending telegrams, attending political meetings and so on. Sometimes this individual activity for the common good extends to carrying out or financing occasional street sweeping.

Second, cooperation among the residents of a given multi-family structure. These cooperate to pay for the cost of maintaining and evacuating the storage tanks of their building and financing connections to a self-help sewage line.

Third, cooperation of a neighbourhood. The residents of a street or alley sometimes cooperate to lay a sewage pipe when the distance to a convenient discharge point is not prohibitive.

This activity is not always legal since the discharge points are often agricultural drains but local authorities do not seem to demolish such works. Residents along the pathway of these schemes who refuse to contribute are excluded from the service and often social pressure for cooperation is such that it is difficult for them not to join in.

These types of projects are organised according to a definite pattern. They are usually first initiated by an enterprising individual who is usually motivated to solve his own personal problem regarding the disposal of waste

water from his storage tanks. The initiated usually finances all of the initial capital cost required to lay a line from his house to the discharge point. During the course of this activity, residents from buildings along the path of the line joint in by paying a subscription fee. The line is usually of 8-inch earthen piping. The level of subscription paid by the houses in Ard El Gameya runs between LE 150-200, which is shared by the residents of the building.

Fourth, community-wide cooperation. Many community-wide formal and informal associations exist in the study areas. Although at this level they are seldom for the purposes of environmental improvement and sewage self-help projects, they are worthy of consideration for their potential in future implementation of sanitation projects. There are migrants' associations (who provide information on jobs, housing, and money to families who need help), community development associations (involved primarily in the programs of the Ministry of Social Affairs), and religious charitable organisations (for teaching the Koran and distributing alms to the needy).

FORMAL INSTITUTIONAL UNITS AND CENSUS TRACTS

The diagram below presents the structure of the Giza Governorate indicating the smallest units for which demographic and other information are available from the Central Agency for Public Mobilization and Statistics (CAPMAS).

GIZA GOVERNORATE

3 Districts (Hai) (Local Govt. Unit) Urban Areas	4 Marakez Local Govt. Unit Rural Area Police Unit Census Unit
6 Kisms (Police Unit) Census Unit	Villages (Karias) Local Govt. Unit Census Unit
Numerous Shiakas (Census Tracts)	

KAFR EL GABAL (1)

Water Source

1. Hand pumps (potable water)
2. Water pipes - house connections.

Storage and Disposal

1. Permeable tanks
2. Impermeable tanks
3. Drainage pipes, 8-inches (self-help activity)

Disposal Sites

1. Mansouria Canal
2. Adjacent agricultural land
3. Remote open areas

Evacuation

Manual

Waste Water Transport Facilities, Employment and Service Cost

- Eight groups of "Sorabatia" (couples).
  Shoulder labourers, 5 of these groups come to the area from Nazlat el Saman, and 3 of them are area-residents. Transport is carried out by shoulder and not cart. The cost per round is PT 25.

- Two donkey-drawn carts, the cost per round is PT 80 to LE 1.

Most of the residents are bedouins, the houses are occupied by owners only, and mostly never rented. Most of the domestic waste water is disposed of in Al Mansouria Canal rather than the trenches, and sandy nature of land helps to absorb the filtered water waste so the tanks only hold sludge. The tanks therefore need cleaning only after a period of 8 to 12 months.

Location and Present Administrative Contest

With the Republican Decree No. 4731 (1966) Kafr El Gabal ceased to be part of Markaz El Giza administrative boundry, but was subordinated to Al Ahram Kism with the Ministerial Decree No. 174 (1967), as part of its change from rural to urban status.

Kism Al Ahram includes the following Shiakhas, of which the study site is one:

1. Shiakhet El Talbia
2. Shiakhet Ghatati
3. Shiakhet Al Kom Al Akhdar
4. Shiakhet Kafr El Gabal
5. Shiakhet Kafr Nassar & Mena House Hotel
6. Shiakhet Menshat El Bakri
7. Shiakhet Nazlet El Batran
8. Shiakhet Nazlet El Samman

Population

The population of Kism El Ahram was 129,459 in 1978 according to the Central Agency for Public Mobilization and Statistics, (Ref. 93-15111-78). The population of Kafr El Gabal was 9666 in 1978 according to the same reference. By extrapolation and field visit, we estimate the present study site to be 11,500.

Community Organizations:

Due to the fact that most of the area residents come from bedouin origins, the social structure is much more cohesive and tends to be organized around lineages. Financial aid in cases of death, etc., is collected by donations from among them and extended to families in the same lineage.

The leaderships in the community comes mainly from old, well established families like El Batran Family (the oldest family in the area).

Sanitation-related Community Self-Help Activities:

There is no evidence of any organized activities since there does not seem to be any mounting waste water management crisis.

ARD EL GAMEYA

Water Sources

Piped water supply - Household connections.

Storage and Disposal

1. Drainage pipes: 8-inch (self-help)
2. Impermeable tanks.

Disposal Sites

1. The Canal
2. Public sewers

Evacuation

Mechanical

Waste Water Transport Facilities, Employment and Service Cost

- Two mechanical trucks with a pump (Public Sector) cost per round between LE 3-5.

- One mechanical truck (Private Sector) with a pump, cost per round between LE 3-5.

It should be noted here that there are no permeable tanks. The area is characterized by a high level of community self-help activity to make necessary connections. Manual evacuation methods are not necessary since land division was carried out more carefully to allow wider access roads between buildings.

The area is relatively new and divides Markaz Imbaba and Kism Imbaba but has not been incorporated to either. Only a small police station has been established there.

Population

It is our estimation without any back-up data that the population of the area is about 60,000.

Community Organizations and Sanitation-Related Community Self-Help Activities

There seem to be no special organizations or societies in the area, but, nonetheless, there are self-help community activities related to sewer connections. There is a main connection installed to serve seven structures, extended from Al-Basra Street and under the railway, and the owner who wishes to have a connection has to pay LE 200 to compensate the people who paid the initial costs of the main connection.

In the interviews conducted with some of the residents, they indicated a willingness to pay from LE 200 to LE 300 per structure to complete the sewage operations.

Development History

Ard El Gameya is a new area. It belonged to the Agricultural Cooperative Society of Imbaba which divided the land into small lots as building sites. The first house was built in 1958, but the area started growing steadily in 1961. The original sale price for the divided lots was LE 1 per square meter, now it ranges between LE 50 to LE 200.

BOULAC EL-DAKROUR

Water Sources

Ninety-five percent of this area has water pipes connections in at least one floor of the buildings. Stand pipes are also available.

Storage and Disposal

1. Impermeable tanks
2. Permeable tanks
3. Public sewers connections (at Delawar)
4. Drainage pipes (8 inches) by self-help activities.

Disposal Sites (Other than public sewer connections)

El Zumor Canal

Evacuation

- Manual
- Mechanical

Waste Water Transport Facilities, Employment and Service Cost

- 5 Mechanical trucks with pumps (Public Sector) cost per round: LE 5.
- 4 mechanical trucks with pumps (Private Sector) cost per round: LE 5.
- 28 Donkey-drawn carts with a barrel (18 tins capacity)
- 3 Groups of shoulder labourers operating on contracting basis. They service the houses which the donkey-drawn carts cannot reach, and they evacuate trenches from sludge.

Donkey-Drawn Carts and the Subcription System

These barrel carts operate on a subscription basis especially in Abu Qatata area. This system is based on a LE 5 payment per month for evacuating a tank once a day, and LE 10 payment per month for evacuation the tank twice a day. The system follows verbal agreements rather than contracts between building owners and sorabatia. In case the Sorabati fail to perform the service on any day, the owner files a complaint in the Police Station and the police send for the sorabati and issue a statement that he has to sign and afflict a financial penalty on him. This system came to its present form for several reasons, namely:

1. Most structures have water pipes and households are in possession of modern electric equipment like washers.

2. The population density is high and, therefore, the amount of waste water is very large and the tanks have to be partially evacuated daily.

Location and Present Administrative Context

The following "Shiakha's" belong to boulak El-Dakrour Kism:

1. Shiakhet Boulak el-Dakrour
2. Shiakhet El Kotaiba
3. Shiakhet Zenein
4. Shiakhet Kafr Tohormos
5. Shiakhet Nazlet Khalaf
6. Shiakhet Nazlet Bahgat
7. Shiakhet Menshat Alyan
8. Shiakhet Abu Qatada
9. Shiakhet Al Omrania Al Gharbia
10. Shiakhet Al Omrania Al Sharkia
11. Shiakhet Al Haram

Boulak El-Dakrour Police Department (Kism) physically falls in the middle of the study area which consists of only parts of the Boulak Kism.

To the South of the Department, there are the areas of Delawar, Abu Qetada and Nofal which fall under one "shikha". To the North of the station, there is Shiakhet Boulak and a small part of Shiakhet Zein.

Population

The total population of Boulak el Dakrour Kism is 321,931. The study falls mainly in Shiakhet Boulak and Shiakhet Abu Qatada only. The population of Shiakhet Boulak is 98,817, and Shiakhet Abu Qatada (including Nofal) 27,692. (These figures are extrapolations from figures of the Central Agency for Public Mobilisation and Statistics, Reference No. 93-15111-1978).

Community Organizations

Voluntary organizations existing in this area are as follows:

1. The Charitable Society for Al Sharquia Sons, for burying the dead, visiting patients and helping the poor.

2. The Charitable Society for El Minya Sons to bury the dead.

3. The Charitable Society for El Ossarat Sons to bury the dead.

4. The Legal Society for Holy Koraan and Mohamedan Methods (Delawar Branch).

5. The Cooperative Society for Shiakhet Yassine.

6. The Charitable Islamic Society.

7. The Cooperative Domestic Society.

Sanitation-Related Community Self-Help Activities

The self-help activities in the area are quite noticeable, especially in the following streets:

1. Nasser Street
2. Hassan Imam Street
3. Abd El Ghany Street
4. Abd El Latif Street

In these areas the residents have on their own account, installed 8-inch drainage pipes. The name of the contractor in charge of the execution is Ismail Abdel Rahman.

AL MONEIB AREA

Water Source

1. Water pipes - house connections

2. Hand pumps (mostly not used for drinking, due to pollution from permeable tanks).
3. One public tap.

Methods of Storage and Disposal

1. Permeable tanks
2. Impermeable tanks
3. Disposal pipes (self-help)

Disposal Sites

1. El Zumour Canal
2. Adjacent Agricultural areas as a fertilizer (sludge only)

Evacuation

1. Mechanical
2. Manual

Waste Water Transport Facilities, Employment and Service Cost

- Four mechanical trucks with a pump (Private Sector) from El Gayara Area, the cost per round is LE 4.

- Two mechanical trucks with a pump (Public Sector), belong to Abu El Numrous City Council & Giza City Council. They service only after an application has been filed by the resident requiring the service who has to wait for his turn on a waiting list.

The official cost of a round is LE 2, but it actually amounts to LE 5.

- Two donkey-drawn carts with the capacity of 3/4 cubic meters; cost per round here is LE 0.80 to LE 1.

- Two horse-drawn carts with the capacity of 1 cubic meter; cost per round is LE 1.50 to LE 2. (Private Sector).

It should be noted that the cost of waste water removal ranges from LE 4 to 20 for a structure per month. Removal cost is usually distributed among residents and sometimes it is added in the lease contract as a fixed monthly payment, varying between LE 0.50 to LE 1. Due to the high cost of removal services some would rather leave their tanks overflow to avoid payment for the services.

Location and present administrative context

The area became part of Markaz El Giza in 1982. In addition to Al Moneib, Markaz El Giza also includes:

- Abul Numrus
- Al Harania
- Al Manawat
- Tersa (includes Al Moneib)

- Zaweyet Abu Moslem
- Shabrament
- Tamwa
- Manyal Shiha
- Mit Shammas
- Mit Qados
- Nazlet El Ashtar

Al Moneib and Tersa are considered to be one area, administratively, and have the same Mayor. It is divided into two parts, old Moneib and new Moneib.

Population

The population of Markaz El Giza was 94,169 in 1978 according to the Central Agency for Public Mobilization and Statistics, (Ref. 93-15111-78). The population of Tersa and Moneib was 17,142 in 1978. According to the same reference, by extrapolation and field visits, we estimate the present study site to be 15,000.

Community Organizations

One of the main characteristics of the area residents is that they are mostly migrants who found Moneib an appropriate place for settlement because of the work opportunities on the opposite side of the canal.

The established organisations are based on migrants originating from common origins or home towns, e.g. Sons of Sohag, Sons of Menoufeya, etc.

These Organizations take an active part in financing and organizing funerals, weddings, pilgrimage, etc.

ARD EL SALAM

Water Sources

Stand Pipes - Household connections.

Storage and Disposal

Impermeable tanks

Disposal Sites

The agricultural drainage canal adjacent to the area

Evacuation

- Manual
- Mechanical

Waste Water Transport Facilities, Employment and Service Cost

- Horse-drawn carts
- Mechanical

Location and Present Administrative Context

Ard El Salam is a Shiakha (also called Al Mounira El Gharbia), and is part of Kism Imbaba, which also includes:

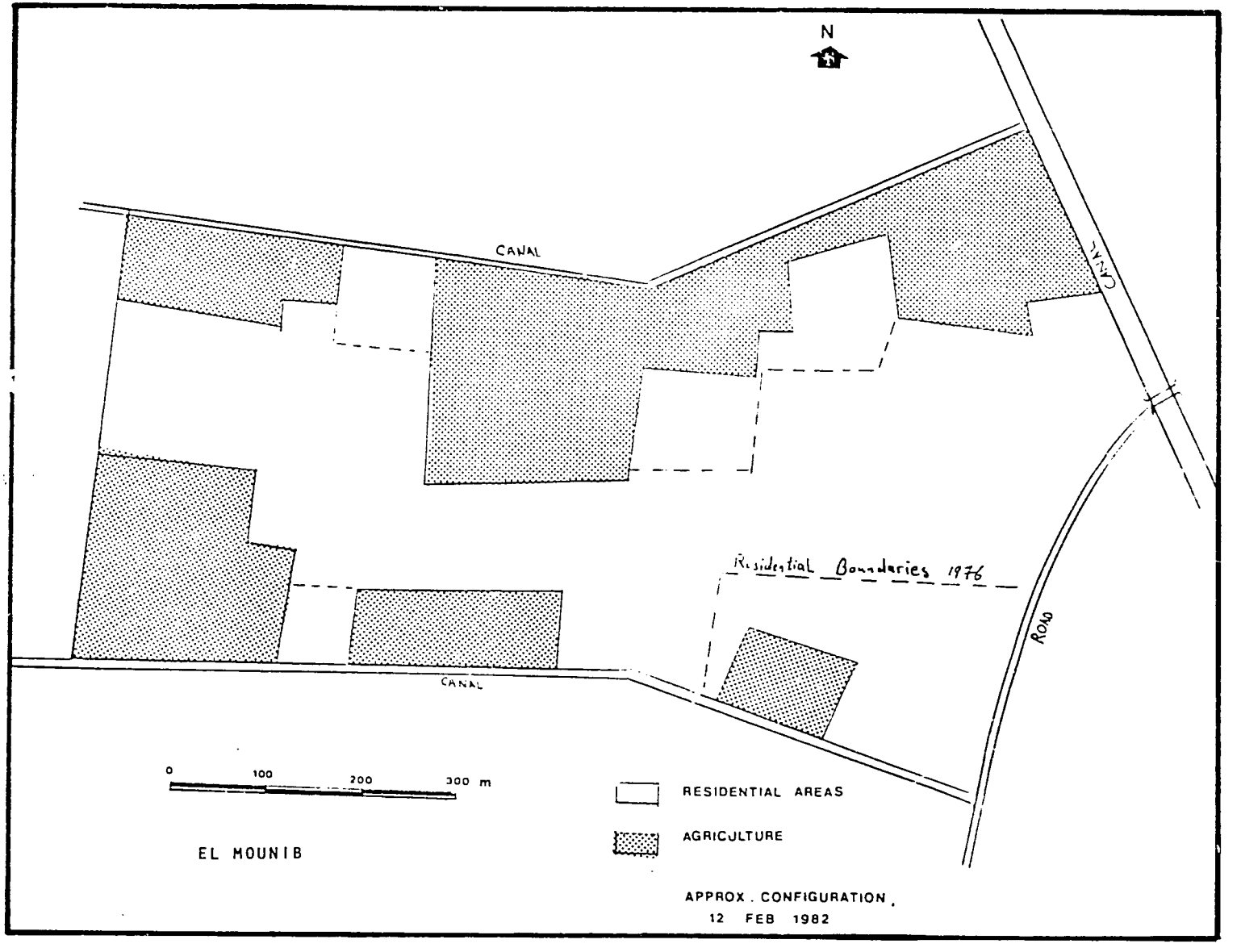
- Shiakhet Al Masaken Al Shabia
- Shiakhet Al Monira
- Shiakhet Tag El Dowal
- Shiakhet Guizieret Imbaba
- Shiakhet Ezbet El Sai'da
- Shiakhet Kafr El Shawam
- Shiakhet Kafr El Sheikh Ismail
- Shiakhet Madinet El Omal
- Shiakhet Matar Embaba
- Shiakhet Mit Kurduk

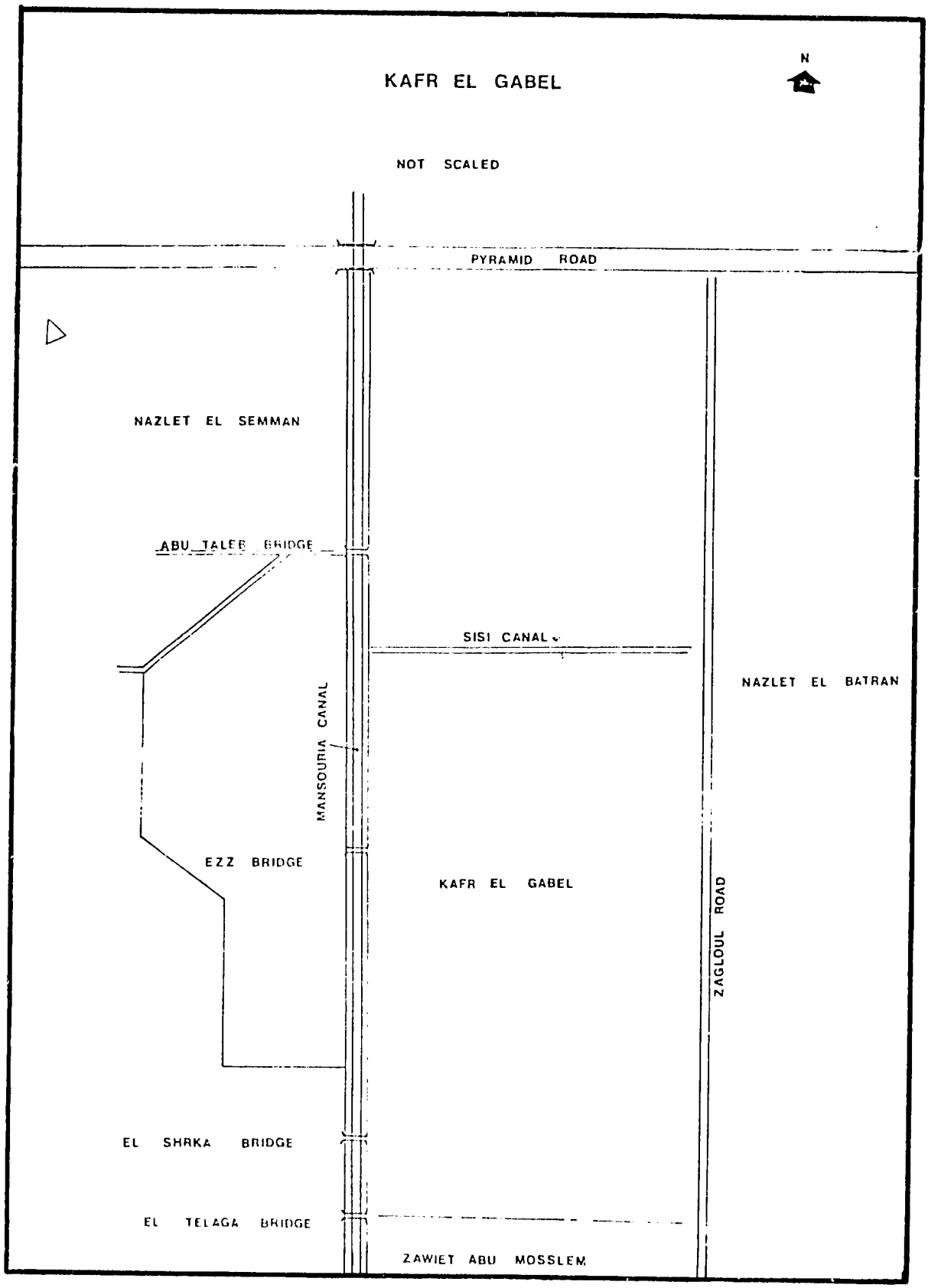
Population

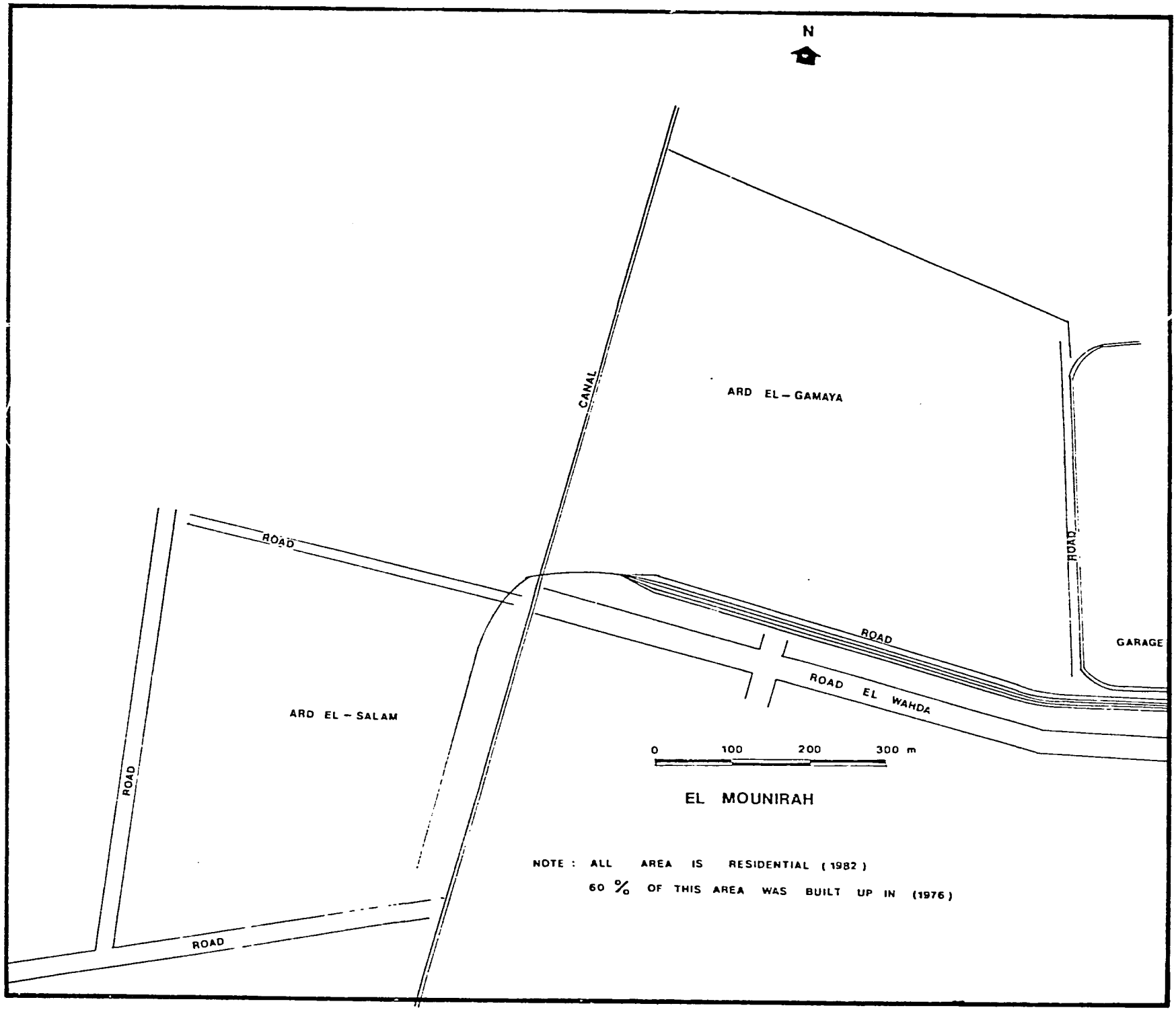
The population of Kism Imbaba was 325,023 in 1978 according to the Central Agency for Public Mobilisation and Statistics (Ref. 93-15111-1978). By extrapolation and field visits we estimate the present study site to be 25,000.

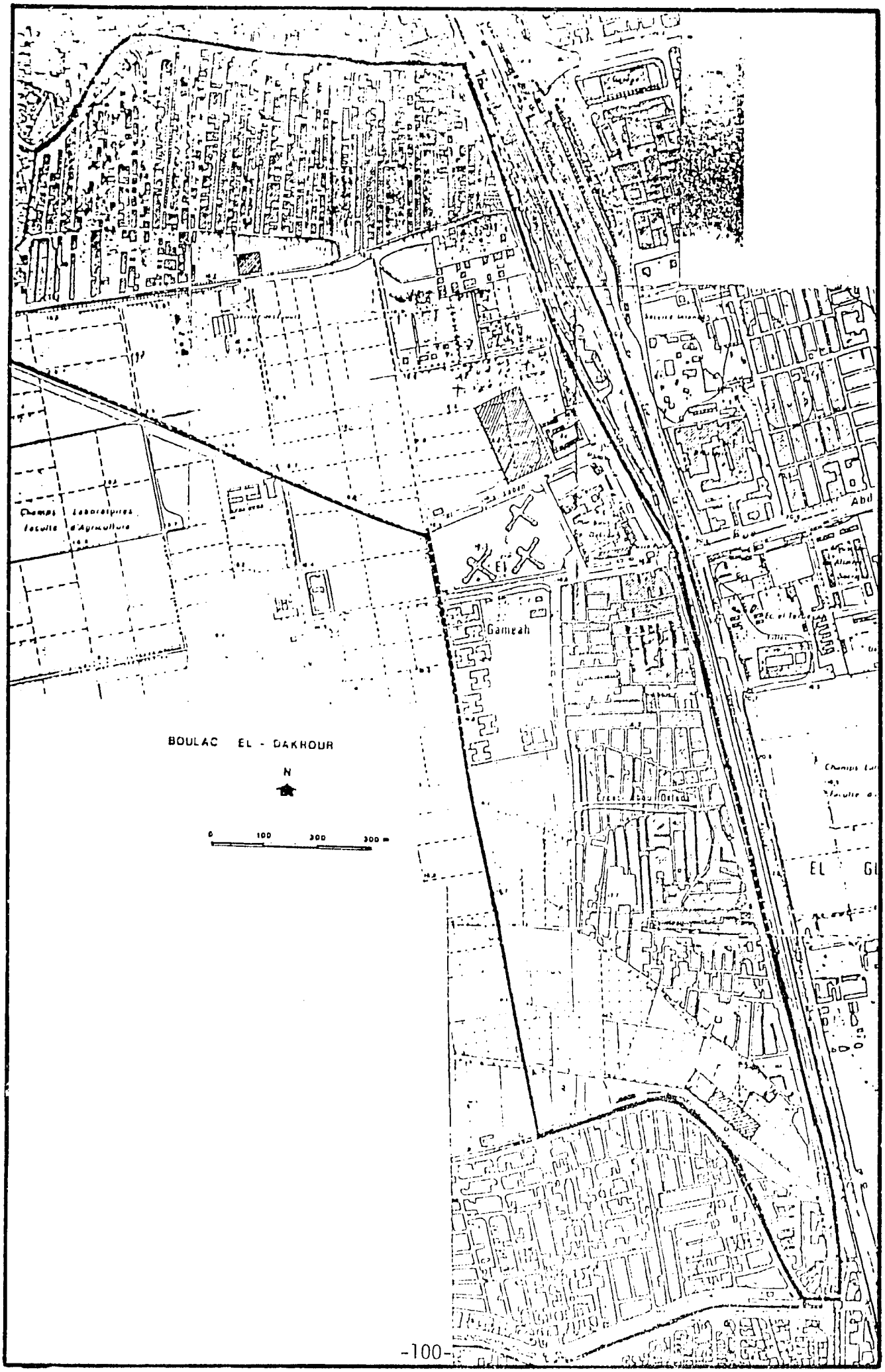
Community Organizations & Sanitation-Related Community Self-Help Activities

No apparent self-help activities for sewage line installation. Local organizations not investigated.


N
CANAL
CANAL
CANAL
ROAD
Residential Boundaries 1976
0
100
200
300 m
RESIDENTIAL AREAS
AGRICULTURE
EL MOUNIB
APPROX. CONFIGURATION
12 FEB 1982


KAFR EL GABEL
N
NOT SCALED
PYRAMID ROAD
NAZLET EL SEMMAN
ABU TALEB BRIDGE
SISI CANAL
NAZLET EL BATRAN
MANSOURIA CANAL
EZZ BRIDGE
KAFR EL GABEL
ZAGLOUL ROAD
EL SHRKA BRIDGE
EL TELAGA BRIDGE
ZAWIET ABU MOSSLEM


N
CANAL
ARD EL – GAMAYA
ROAD
ROAD
ROAD
GARAGE
ROAD EL WAHDA
ARD EL – SALAM
ROAD
ROAD
0 100 200 300 m
EL MOUNIRAH
NOTE : ALL AREA IS RESIDENTIAL (1982)
60 % OF THIS AREA WAS BUILT UP IN (1976)


Champs Laboratoires
Faculté d'Agriculture
Gameah
BOULAC EL - DAKHOUR
N
0 100 200 300 m
EL
Abd