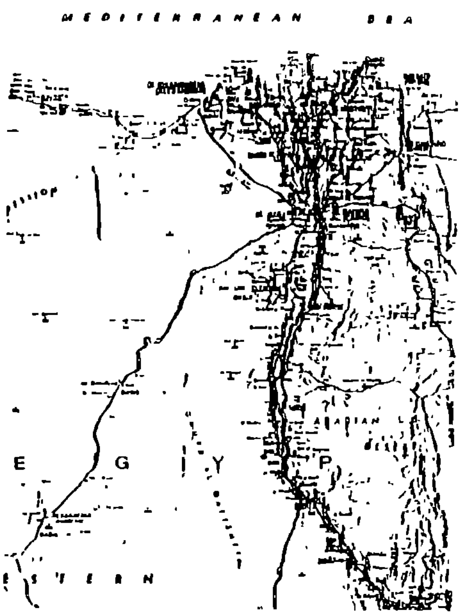

Arab Republic of Egypt
NATIONAL ORGANIZATION FOR
POTABLE WATER AND SANITARY DRAINAGE

VOLUME I

Final Report

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996

Provincial Cities Development Project

United States of America
Agency for International Development
USAID / EGYPT

MONTGOMERY-HARZA
EQI
in association with
Wardani Associated Consultants

USAID Grant No 263-0161.3

August 1996

MONTGOMERY WATSON — MONTGOMERY - HARZA — HARZA Consulting Engineers and Scientists

United States Agency for
International Development
Cairo Center Bldg. Ninth Floor
106 Kasr El Aini Street
Cairo, Egypt

Ref No. MH-AID-1777

15 August 1996

Attention: Mr. Thomas Marr
Project Officer

Subject: Provincial Cities Development Project
Water and Wastewater Improvements
USAID Project No. 263-0161.03
Institutional Team Final Report

Gentlemen:

Enclosed please find five copies of the Institutional Support Assistance Final Report for 1996. These copies are for your review and approval.

We have tried to incorporate all the comments we received from reviews of the preliminary draft. We have also attempted to insure that the report emphasized the most pressing problems facing the Governorates.

After your review and approval we will issue the necessary additional copies for necessary distribution by USAID.

If you have any questions or comments, please do not hesitate to contact me at 312-831-3810 or fax 312-831-3999.

Very truly yours,

John P. Velon
Project Manager
MONTGOMERY HARZA

Jeffrey E. Hendrich
Institutional Team Leader
MONTGOMERY HARZA

Arab Republic of Egypt
NATIONAL ORGANIZATION FOR
POTABLE WATER AND SANITARY DRAINAGE

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FOREWORD

This document presents the final observations and recommendations resulting from the USAID sponsored program of Institutional Support Assistance for 1996 performed in conjunction with the Provincial Cities Development Project. The report addresses key issues related to the development of new water and wastewater authorities in the Governorates of Minia and Beni Suef, including specific needs in the areas of:

- Organization
- Water Loss Management
- Billing and Collections
- Budgeting and Finance
- Operations and Maintenance

Observations and recommendations related to each of these aspects of the new institutions are addressed in separate chapters in the body of the main project report (Volume 1). A comprehensive action plan to promote the development of the authorities is also included in Volume 1. Supplemental and supporting information are included as annexes to the report and are presented in a separate volume (Volume II).

In order to facilitate the use of the variety of valuable information contained in the report and the annexes, these documents are presented in three-ring binders from which individual chapters or annexes may easily be removed for distribution or duplication.

ACKNOWLEDGMENTS

The project team wishes to thank and acknowledge the supportive reviews of preliminary findings provided by Adel Halim, Mostafa Dahi and Thomas Marr of the USAID staff assigned to this project. Their wise counsel at key junctures was instrumental in staying on track in completing this interesting and challenging assignment on time and within budget.

It would have been impossible to undertake a project of this magnitude without the total support of their Excellencies the Governors, Secretary Generals, and the Chairmen of the Water and Wastewater Authorities at the Minia and Beni Suef Governorates, and their staff, at all levels. We are happy to acknowledge that the cooperation and support at all levels in both governorates has been outstanding, and we trust that the Final Report, with all of its findings and recommendations, will be of continued value to the authorities' management and staff.

The Institutional Support Assistance team consisted of the following individuals:

Team Leader:	Institutional, organizational, training, operation and maintenance, and project strategy and design specialist - Egypt based: Jeff Hendrich
Institutional:	Specialist in institutional development and organization familiar with Egyptian public sector organizations, assistant team leader - Egypt based: Salah Zaki
Financial:	Costs analysis and financial systems specialist Egypt based: Jack Webber with Egyptian counterpart Said Nooman.
Technical:	Water and wastewater design and operations and maintenance specialist - Egypt based: Roberto Calvetti with Egyptian engineer Fouad Sultan and [redacted]

Short-term assistance was provided by Berry Hess and the staff of the Fayoum Office Home office backstopping and project management were provided by David Bird and John Velon. Report editing was provided by Joe Johnson.

ACRONYMS AND ABBREVIATIONS

BU	Budget Units
CAOA	Central Agency for Organization and Administration
EHP	Environmental Health Project
GOE	Government of Egypt
GASB	Government Accounting Standard Board
m^3/month	cubic meter per month
markez	political jurisdiction, subdivision of a governorate (plural: *marakez*)
NARUC	National Association of Regulatory Utility Commissioners
NOPWASD	National Organization for Potable Water and Sanitary Drainage
O&M	Operations and Maintenance
PCD	Provincial Cities Development Project (USAID-sponsored)
UAW	Unaccounted-for-Water
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

The United States Agency for International Development (USAID) has been an active sponsor of the Provincial Cities Development Program since 1982. During 1995, an Institutional Development Study and Assessment was conducted by the consulting firm, Environmental Health Project (EHP) to collect information regarding water and wastewater operations for the cities of Minia, Beni Suef, and Fayoum. In February 1996, USAID requested the consulting firm, Montgomery-Harza, to continue with a bridging project to assist the Governorates of Minia and Beni Suef in their transition toward autonomous water and wastewater organizations as directed by presidential decree.

The basic goal of this assignment has been to identify and generate programs that will foster development of managerially and financially viable and self-sustaining water and wastewater authorities in Minia and Beni Suef in 5 to 7 years. A seven point approach was identified in the scope of work:

1. Assist the governorates in designing their organizational needs and getting acceptance of the structure by the Central Agency for Organization and Administration (CAOA)

2. Prepare a comprehensive list of assets by area including age and serviceability to be used for designing a strategic maintenance program and for subsequent asset valuation

3. Develop a comprehensive program for reducing unaccounted-for water by improving billings and collections, and reducing water losses due to leaks and faulty metering

4. Develop a budget for fiscal year 1996-97 including a budgeting procedure that can be use for future years, and a recommended chart of accounts that is compatible with the GOE Unified System of Accounts

5. Assess the collection status of major accounts and develop an action plan to increase collections

6. Prepare strategic maintenance programs for water and wastewater, and design programs to reduce water loss through meter rectification and the initiation of leak detection efforts

7 Provide classroom and on-the-job training as needed to help with all of the above activities

The project team resided in each governorate as required to facilitate daily visits with governorate staff during the data gathering, meter testing, and physical observation of assets. Analysis of data was done interactively with the governorate staffs, and two workshops and three training sessions were presented to review findings and ensure sound communications.

Major Accomplishments

The efforts of the Consulting Team resulted in a number of specific accomplishments which will facilitate the development of the new water and wastewater authorities in Minia and Beni Suef. Major accomplishments included:

- Development of a proposed organization structure intended to improve the efficiency and performance of the new authorities. The proposed structure is the result of extensive discussions with authority staff, the Central Agency for Organization and Administration (CAOA) and government representatives.

- Preparation of job descriptions outlining responsibilities and qualifications for key positions within the new authorities.

- Preparation of a complete list of water, wastewater, equipment and workshop assets in the two governorates. These lists are intended to be used as the basis for asset valuations during development of the authorities.

- Development of a "bottom-up" budgeting system that provides for cost identification by fund, function, activity, and line item, and by area, department and budget unit (cost center)

- Development of a financial modeling tool for use in conjunction with the budgeting system as a mechanism for projecting the future financial condition and performance of the new authorities as they move toward self-sufficiency over the next ten years Fourteen USAID performance indicators are included in the model.

- Development of a chart of accounts that is compatible with the recommended budgeting, financial accounting and reporting systems, and with the Government of Egypt's Unified System of Accounts

- Documentation of investigations of residential, commercial and large user accounts and services within the Governorates. Results from the investigations served as

the basis for analysis of the current status of unaccounted-for-water, and projections of the potential for recovery of water and revenue.

- Preparation of a short-term action plan for improving billing and collections in the governorates in order to reduce levels of non-revenue-producing water and increase overall revenue from water sales.

- Analysis of the potential increases in revenue available to the new authorities as a result of actions to reduce water losses and improve billing and collections.

- Recommendation of actions to improve the overall performance of the commercial and consumer operations of the new water and wastewater authorities.

- Design of a strategic maintenance program, coupled with training sessions, that identifies the type and amount of maintenance required for each class of assets. The program is linked to the list of assets also developed for this study.

- Formulation of a plan for quick and necessary action required to address critical problems within the existing water systems.

- Projection of the potential reductions in unaccounted-for-water possible through implementation of facility, maintenance, metering and billing and collection improvements.

- Development and performance of a total of five workshop/training sessions, including two, two-day workshops to present project objectives and methods to governorate personnel at all levels and develop unanimity of purpose and direction; two maintenance training sessions, and one financial training session.

- Prepared a comprehensive report presenting the results and key recommendations of the bridging study along with a time line, action plan for implementation. Included in the report and associated annexes are diskettes containing copies of the budgeting system and financial model, as well as the assets lists and job descriptions.

Recommendations

Detailed recommendations address each of the critical areas examined in the study and are presented in the body of the report. General recommendations are summarized here to highlight the overall focus of the recommended plan

- Establish an organization with strong leadership and trained personnel to develop details for selected programs and implement them. Especially strong leadership is required in the billing and collection function.

- Phase in the recommended budgeting system over the next three years, using a spreadsheet format with minimal computer support in the first year, progressing to a database application by the third or forth year with computer use for remote data capture as well as for reporting.

- Evaluate the prospect of reading meters less frequently than monthly (bimonthly, quarterly, or even annually) and render billings to all accounts on a bimonthly basis.

- Initiate computerized billing systems in both authorities, and

  - Deliver bimonthly bills to customers, monthly if overdue

  - Track unpaid bills by number of days outstanding

  - Maintain billing records on all customers with minimum two year history

  - Initiate an installment program (over 2 or 3 years) for repayment of major delinquent accounts -- without interest costs

  - Implement a customer/house numbering scheme to ease the task of linking the water bills with the customer.

- Set up a minimum/estimated bill amount high enough to induce customers to replace malfunctioning meters at their own expense. Apply the minimum or estimated bill to all customers without meter readings.

- Establish an action plan to continue the large customer monitoring survey to identify under billings and force meter repair/replacement or apply a (portable) meter tested estimated billing amount.

- Using the budget and financial model systems provided, enforce/modify the targets for improvements in population served, percentage of consumption billed, and percentage of revenue collected.

- Adapt the financial model provided to changing conditions to achieve a balanced

program among O & M cost increases, tariff increases, and subsidy decreases that eliminates the need for subsidies in 5 to 7 years.

- Engage a program for testing production capacity for all plants as part of a broader program of defining real capacity and the need for new capacity This program is required to accurately define unaccounted for water.

- Evaluate alternative computerized financial accounting and reporting systems to be used for accounting and roll-up of costs for budget comparisons The system must have a database capability and the facility to report according to the GOE Unified System of Accounts.

- Establish a routine strategic maintenance system structured to facilitate the effective maintenance of facilities at appropriate levels within the organization.

- Establish a water loss management unit and implement a continued program of meter inspection and testing as the first step in an ongoing, comprehensive water loss management program.

- Establish a meter repair testing facility properly equipped for the testing, repair, and rehabilitation of residential and large meters throughout the governorates.

The project team is confident that, with the implementation of the key recommendations identified above, managerial and financial self-sufficiency can be achieved in 5 to 7 years.

Chapter 1
INTRODUCTION

1.1 Background

As part of the Provincial Cities Development Project (PCD), an Institutional Development Study and Assessment was conducted by the consulting firm, Environmental Health Project (EHP), to collect information regarding water and wastewater operations for the cities of Minia, Beni Suef, and Fayoum. Action plans were developed defining activities that could lead eventually to autonomous, self sustaining, operational authorities for the three Governorates.

During this period, Presidential Decree Number 281 of 1995 was issued providing for the legal establishment of economic authorities responsible for the operation of the water and sewerage services in seven governorates throughout Egypt, including Fayoum, Beni Suef and Minia

The Presidential Decree, included in Annex 1, gave the governorates the authority to establish an organization which would be responsible for operating all water and sewerage services within the governorate territory. The decree prescribed the makeup and operational structure of the new authority. It also addressed the following specific issues·

- Areas of responsibilities;
- Composition and role of the authority's Board of Directors;
- Limits of authority of the Board;
- Role of the Chairman of the Board;
- Authority's operating resources;
- Audit requirements;
- Rules for preparation of accounts and budgets;
- Transfer requirements for current employees;
- Methods of personnel annulments including the Board's responsibility; and
- Rules for the transfer of assets to the Authority.

With the mandate of the Presidential Decree and EHP's action plan recommendations for implementation, USAID and the Steering Committee of the Governorates, together funded the Institutional Support Bridging Project, which would assist the governorates in the transition from the current water and sewerage operations to the autonomous organization defined by the Presidential Decree.

The EHP study proposed a number of study areas which could be addressed by the governorates in their move towards autonomy in 5 to 7 years. Of these, it was decided that the main efforts of the Institutional Support Bridging Project should concentrate on the following·

- **Financial**
  Development of budgeting and financial planning methods
  Compilation of an asset inventory
  Development of methods for improving billing and collection performance
  Provision of means for increasing water and wastewater revenues, including both tariff and non-tariff mechanisms

- **Organizational**
  Development of an operational organizational structure
  Provision of job descriptions for key positions

- **Operational**
  Development of a strategic maintenance program for distribution/collection systems
  Formation of methods for effective water loss management

A scope of work was developed to address these objectives, and a project team consisting of key personnel from Montgomery HARZA, a US based consulting joint venture, and Environmental Quality International (EQI), an Egyptian firm headquartered in Cairo was approved by USAID and officially mobilized on January 21st 1996. The duration of the project was approximately six months with this document representing the final project report

1.2 Project Staffing

The Consultant Team staff assigned to the project consisted of the following:

Montgomery HARZA

Project Leader	J. Hendrich
Financial	J. Weber
Operational	R. Calvetti

EQI

Institutional/Organization	S. Zaki
Financial	S Nooman
Operations	F. Sultan
Engineer Minia	V. Whaba

Mobilization of the majority the team occurred on the 15th of February with the arrival of EQI. The Egypt-based team was completed when the project financial expert arrived in Egypt on the 28th of February.

1.3 Plan of Action

The original intent of the project was to work with Minia, Beni Suef, and Fayoum simultaneously on a six month project. However, due to time and resource constraints, coupled with local factors, a decision was made by USAID to eliminate efforts in Fayoum from the scope of this project.

1.3.1 Minia

Initial meetings were held in Minia in late January 1996, with the Governor of Minia, USAID, the project team, and key personnel from the governorate. Also in attendance was the newly appointed chairman of the to-be-created Minia Authority, Mr. Ahmed Samir El-Biblawy. The governor and his staff proved to be most cooperative. Data collection efforts on asset lists and budgets were intensive during March and April; May and June were devoted primarily to analysis, coordination, and training.

1.3.2 Beni Suef

Initial meetings were held with the Governor of Beni Suef and his staff, USAID, and the project team in late February. During this meeting discussions centered on how the Provincial Cities Project and the Institutional Support Bridging Project could be brought together. The Governor requested additional meetings and there were delays such that data collection efforts did not commence until the middle of April. The project team felt that the delayed start would not prevent completing the intended scope in Beni Suef because the delay provided time to concentrate on Minia, and the methods developed in Minia could be relatively quickly applied in Beni Suef.

Virtually all of the necessary data was collected and analyzed by the 25th of June when the Governor suspended the process on the basis of internal priorities. The only work that remained was additional customer surveys to test metering and billing practices, and various training and coordination sessions.

1.4 Report Organization

This report is organized to present methods of analysis and the findings of the various scope activities in separate chapters. Each chapter also includes specific recommendations that flow

from the data and analysis presented in the chapter. Supporting information related to the analyses is included in Annexes packaged under separate cover.

The scope of work is broken down into five distinct areas of responsibility, with training permeating all of the activities. Separate chapters are devoted to Organization, Water Loss Management, Billing and Collections, Budgeting and Finance, and Operations and Maintenance. A comprehensive action plan including all of the specific recommendations is presented in the final chapter of the document. Key elements of the chapters following this introduction are highlighted below.

- **Chapter 2 - ORGANIZATION** describes the constraints affecting the organization of the new water and wastewater authorities and presents proposed structures for the new entities. The recommendations presented are the result of extensive discussions with authority personnel and other involved agencies of the Egyptian government. Project deliverables referenced in this chapter include:

  - Proposed Organization Structure (Section 2.6)
  - Proposed Job Descriptions (Section 2.7 and Annex 2.3)

- **Chapter 3 - WATER LOSS MANAGEMENT** presents an analysis of the current status of unaccounted-for-water in the governorates. Results are presented from extensive field investigations, and the potential for reductions in unaccounted-for-water is documented for both governorates The chapter concludes with the presentation of a general plan for continued water loss management to be implemented by the new authorities. Project deliverables referenced in this chapter include:

  - Documentation of the results of the survey of large water users performed in Minia and Beni Suef (Section 3.3.1.3 and Annex 3)
  - Documentation of the results of the random sampling programs conducted in Minia and Beni Suef (Section 3.3 and Annex 3)
  - A recommended water loss program for implementation by the new authorities (Section 3 4)
  - Documentation of the potential decreases in unaccounted-for-water identified as a result of field investigations in the governorates (Sections 3.3.1.5 and 3.3.2.2)

- **Chapter 4 - BILLING AND COLLECTIONS** summarizes the current status of water billing and collection practices in the governorates and presents a recommended plan for short- and longer-term actions needed to improve the performance of the commercial sector of the authorities. Project deliverables referenced in this chapter include·

- Documentation of potential revenue increases associated with billing and collection improvements (Section 4.3)
- An action plan for improving the performance of the current billing and collection systems (Section 4 4)

- **Chapter 5 - BUDGETING AND FINANCE** presents recommendations for the development of improved budgeting, accounting and financial modeling tools for use by the new authorities. Project deliverables referenced in the chapter include:

  - A summary of a method for estimating authority budgets (Section 5.2 3)
  - Budget estimates for 1996-97 (Table 4-6)
  - A proposed chart of accounts for the new authorities (Annex 4.3)

In addition, detailed descriptions and user's guides for both the budgeting system and financial modeling tools developed are presented (Annexes 4.1 and 4 2)

- **Chapter 6 - OPERATIONS AND MAINTENANCE** begins with a brief description of the current status of operations and maintenance activities in the water and wastewater systems serving Minia and Beni Suef. Later portions of the chapter describe a recommended strategic maintenance plan for the new authorities as well as actions identified for "quick and necessary" intervention Project deliverables referenced in this chapter include:

  - An assets list for the existing water and wastewater facilities in Minia and Beni Suef (Annex 6)
  - A plan for "quick and necessary" actions required to address specific needs in the existing water and wastewater systems (Section 6.6.1)
  - A proposed strategic maintenance plan for the new authorities (Section 6 5)

- **Chapter 7 - RECOMMENDED ACTION PLAN** summarizes the recommended actions defined in the previous chapters and presents a proposed timeline for their implementation. The timeline serves as a plan to guide the governorates' efforts during the transformation to autonomous and financially viable authorities over the next five to seven years

Supporting and supplemental information presented in Volume II of the project report is organized into six separate annexes as follows·

- **Annex 1 - Presidential Decree N. 281 of 1995** includes an english translation of the decree establishing the basis for formation of the new authorities

- **Annex 2 - Organization Charts and Job Descriptions** includes the complete charts of organization proposed for the new authorities (Annex 2.1) and for regional offices under the authorities (Annex 2 2). Job descriptions for key personnel are also presented (Annex 2.3). The job descriptions attached are english translations of the originals which were produced in Arabic and are included on computer disk 2a attached. These job descriptions were done in conjunction with the LAQA and Governorate officials.

- **Annex 3 - Water Loss Reduction Data** includes detailed results from field investigations done in support of the water loss management analysis. Specific data include results of tests of water production meters (Annex 3.1), results of residential meter surveys in the Minia Governorate (Annex 3.2), results of large meter surveys in the Minia Governorate (Annex 3.3) and results of residential meter surveys in the Beni Suef Governorate (Annex 3 4).

- **Annex 4 - Chart of Accounts and Financial Model** includes the proposed Chart of Accounts for the new authorities (Annex 4.1) and the descriptions and user's guides for the proposed budgeting system (Annex 4.2) and the proposed financial model (Annex 4.3).

- **Annex 5 - Staff Development and Training** presents the documentation of training presentations and workshops conducted during the course of the study. These sessions included workshops on organizational improvements, preventative maintenance practices and assessment of training needs.

- **Annex 6 - Asset Lists** includes the complete lists of assets associated with the water and wastewater facilities in Minia and Beni Suef.

- **Annex 7 - EHP Activity Report No. 11** includes the complete EHP Report No. 11, Action Plan, Institutional Development for Water and Wastewater Utilities in the Governorates of Fayoum, Beni Suef and Menya, prepared in September 1995.

Also included on computer disk are:

- Disk 1 Financial - Presented in Excel 5 0 for Windows.

- Budgets for Minia & Beni Suef
- Financial Model for Minia and Beni Suef

- Disk 2 Assets List in Excel 5.0 for Windows.

  - Minia
  - Beni Suef

- Disk 2a - Assets List Remainder

    - Action Plan - Microsoft Project
    - Job Description in Arabic

Chapter 2
ORGANIZATION

2.1 Introduction

The creation of an autonomous utility does not guarantee that the utility will provide quality service cost-effectively. The utility requires an appropriate organization structure as a foundation for efficient and cost-effective operations An organization structure should:

- Assist in the division of work;
- Define for lines of communication;
- Rationalize efforts;
- Develop the framework for coordinating tasks and activities;
- Provide levels of authority and decision-making;
- Determine responsibilities and accountabilities;
- Provide the basis for manpower and resource utilization;
- Create need for employee specialization and determine employee skill requirements; and
- Provide the vehicle for developing policies, procedures, plans, objectives and principals

The development of an organization structure includes working within applicable laws, reviewing and incorporating cultural demands, addressing utility needs, incorporating best organization and management strategies, and providing for proper communications. Development therefore has to be performed using well thought-out plans, a clear strategy, and well-defined objectives to create the appropriate organization.

This chapter presents the development of appropriate organization structures for the new Minia and Beni Suef Water and Wastewater Authorities. Key activities in the formulation of these structures included·

- Review of the applicable laws governing the establishment of Water and Wastewater Authorities in Egypt, most importantly Presidential Decree No. 281/1995;

- Review of appropriate organization development tools;
- Review of the organizational structure of other authorities in Egypt;
- Analysis of the existing authority's efforts to develop organizations using applicable laws, organization development tools, authority needs, and communication needs;
- Holding of workshops with authority's and government personnel; and
- Preparation of appropriate organization structures in partnership with the Minia and Beni Suef Water and Wastewater Authorities and submittal of these structures for approval to the Chairman of the Authority and CAOA.

In addition, this chapter includes descriptions of the implementation status of the authorities and recommendations regarding continued implementation.

2.2 Review of Applicable Law

2.2.1 General

The organizational structure proposed for the Minia and Beni Suef Water and Wastewater Authorities must be compatible with the framework of Presidential Decree No. 281/1995. This Decree defines legal and organization guidelines for establishing a General Economic Authority to provide public water and sewer service The Minia and Beni Suef Water and Wastewater Authorities are specific examples of this type of general economic authorities For purposes of this report, it is necessary to delineate the specific requirements embodied within the Decree that affect the organizational structures designed for the authorities. A complete copy of the Presidential Decree is included in Annex 1 to this report. Key elements of the decree are outlined below as the basis for evaluation of potential organization structures.

2.2.2 Presidential Decree No. 281/1995

Presidential Decree No 281 of 1995 defines the nature of the General Economic Authority to be created to manage water and wastewater systems In addition, the decree outlines·

- The authority's objectives and functions
- The formation of the authority's board of directors,

- The authority's resources,

- and actions required for transition of responsibilities and assets to the authority.

The core essence of the General Authority as indicated in the presidential decree is that *"it shall be self-sufficient and able to create the financial conditions through tariffs, fees and other revenues, and cost saving to cover the costs of operations and maintenance"* This concept should reflect on all organizational and institutional undertakings. This overall goal could be broken down into more specific objectives as follows:

- It should be an organization that should strive to be financially self sufficient or as a minimum reduce any subsidies required from the central Government.

- It should control its own operations, fiscal, technical and administrative.

- It should be in a position to recruit the most capable and qualified staff, and to train, retain, and motivate the staff.

- It should operate the water and sewerage systems in a manner that ensures the safe and reliable supply of water and disposal of sanitary waste at minimum cost to the populations connected to its facilities.

- Operations should respond to consumer needs, and should be run in a timely fashion

- Decisions should be undertaken in an effective manner and the organization should be designed so that its operations are held accountable

- It should be able to establish clear objectives and plan its fiscal operations, capital programs and physical operations over the short and long term.

- Operations should be based on sound, accurate and meaningful data that are readily available.

The Authority should be designed to allow decentralization of decision making where necessary and ensure that accountability of this staff is clearly defined

2.2.2.1 Authority Direct (Line) Functions

There are four specific functions of an Authority stated in the Decree These include:

1 Planning Functions

Preparation of general and detailed plans for water and wastewater projects and works within the governorate

2. Implementation Functions

Management, operation and maintenance of facilities of the water and wastewater utility
Implementation utility extension and support.
Collection and retention of local resources and provisions necessary for O & M works.

3. Research Functions

Conduct of studies and applied research
Conduct of economic and financial studies for water and wastewater projects.
Participation with concerned agencies in setting criteria for potable water and for liquid waste drainage.

4. New Projects Functions

Design of projects.
Setting schedules
Performance of actions for contracting new projects (preparation of tenders, invitation of local and international contractor bids, selection of contractors, execution of project contracts, and supervision of construction).

2.2.2.2 Formation of the Board of Directors

The Decree defines the Authority's Board of Directors from groups including top management of the authority, representatives of other agencies and individuals with particularly relevant expertise. Total board membership consists of 15 individuals, including the board chairman. The make up of the board is shown in Figure 2-1.

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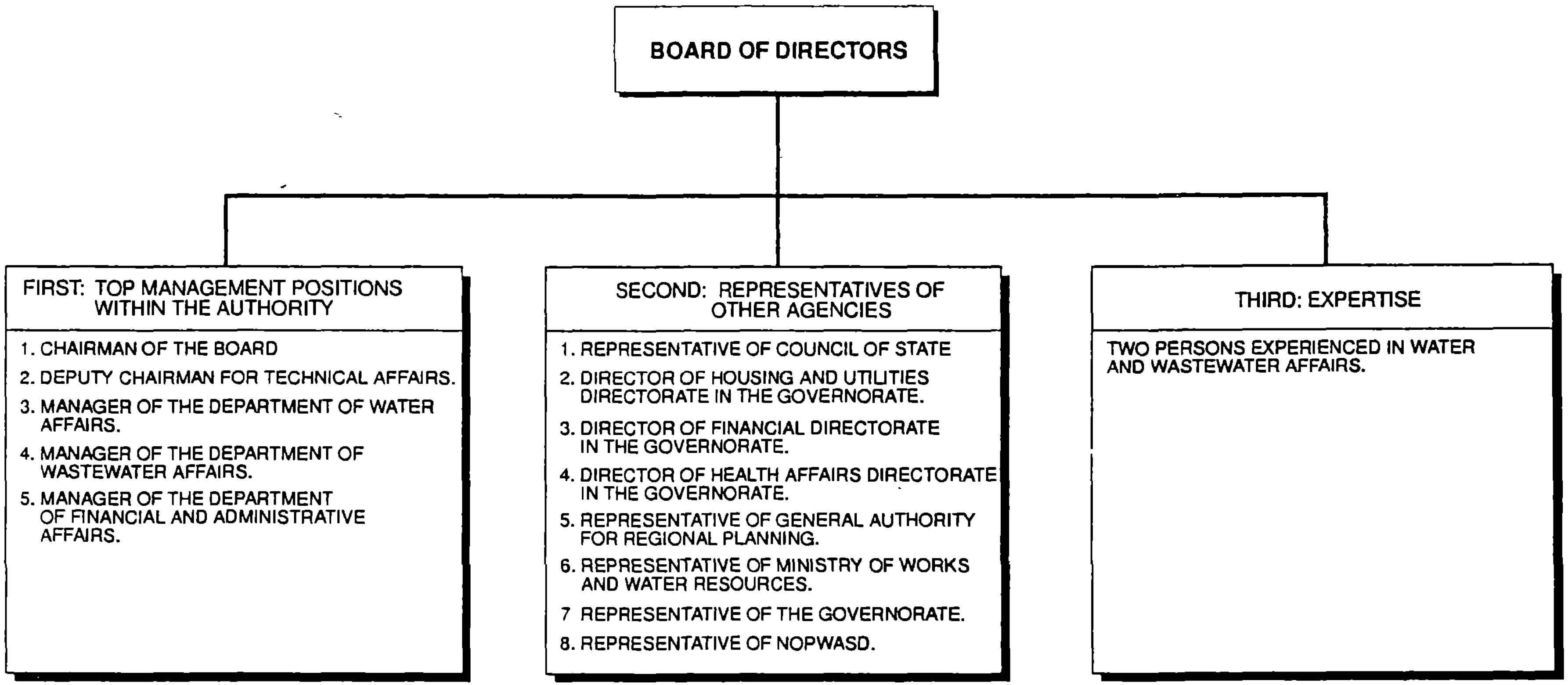


Figure 2-1

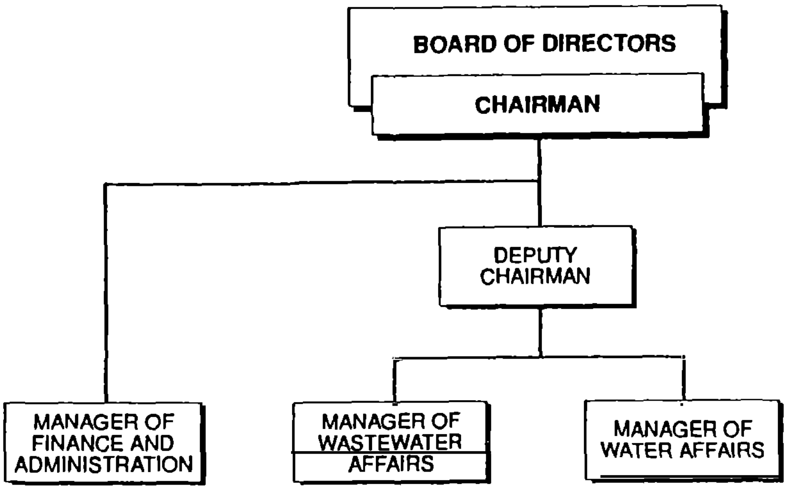
BASIS FOR FORMATION OF THE BOARD OF DIRECTORS

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

2.2.2.3 Organizational Makeup

The overall line organizational at the top level is actually determined by the Presidential Decree. This organization can be illustrated as follows.



This part of the organization structure is defined by the decree and not subject to change.

Additions can be made. Division of these basic units into sub-units need to be incorporated. The purpose of additions and sub-divisions should be to achieve efficiency, effectiveness and fulfill the flow of work among departments at the horizontal dimension and among levels of hierarchy at the vertical dimension smoothly and promptly. Principles should be also considered such as, centralization and decentralization, short channels of communication, reasonable span of control, clarity of functions, unity of command, etc.

The design of the organization structure should consider different interests as follows:

- The consumer interest who inspire to have access to water and waste-water services, in a manner which ensures safe, continuous, reliable service at least cost in order to limit the tariffs they are going to pay.
- The management interest who inspire to fulfill the goals of the presidential decree in relation to the financial self sufficiency, hence are looking forward to achieve the best degree of efficiency and effectiveness.
- The staff interest in fulfilling their hopes to ensure better career and higher income and motivations.

2.2.2.4 Transition Actions

- All employees of water and wastewater utilities in the governorate covered by the Authority's activities shall be transferred to the Authority under government conditions of service.
- All budgetary allocations pertaining to the transferred employees, shall revert to the Authority.
- Budgetary allocations pertaining to operation and maintenance shall revert to the Authority.
- Budgetary allocations pertaining to capital investment shall revert to the Authority.

2.3 Organization Development Tools

Development of utility organizations requires the use of universal principals of organization and management These principals become the tools with which alternative organizations can be prepared and the most appropriate organization can be determined

This section provides descriptions of the following organization developmental tools used to produce the organization structures of the Minia and Beni Suef Water and Wastewater Authorities:

- Manpower Planning;
- Cost Analysis;
- Productivity Requirements;
- Planning and Monitoring;
- Function and Job Descriptions; and
- Centralization/Decentralization Balance.

2.3.1 Manpower Planning

The presidential decree states that all employees of water and wastewater utilities in the governorate covered by the Authority's activities shall be transferred to the Authority under government conditions of service. A specific plan for manpower utilization is required for the

2.2.2.4 Transition Actions

- All employees of water and wastewater utilities in the governorate covered by the Authority's activities shall be transferred to the Authority under government conditions of service.
- All budgetary allocations pertaining to the transferred employees, shall revert to the Authority.
- Budgetary allocations pertaining to operation and maintenance shall revert to the Authority.
- Budgetary allocations pertaining to capital investment shall revert to the Authority.

2.3 Organization Development Tools

Development of utility organizations requires the use of universal principals of organization and management. These principals become the tools with which alternative organizations can be prepared and the most appropriate organization can be determined.

This section provides descriptions of the following organization developmental tools used to produce the organization structures of the Minia and Beni Suef Water and Wastewater Authorities:

- Manpower Planning;
- Cost Analysis;
- Productivity Requirements;
- Planning and Monitoring;
- Function and Job Descriptions; and
- Centralization/Decentralization Balance.

2.3.1 Manpower Planning

The presidential decree states that all employees of water and wastewater utilities in the governorate covered by the Authority's activities shall be transferred to the Authority under government conditions of service. A specific plan for manpower utilization is required for the

short-term. For the long term, a manpower plan needs to be established. The main objectives of the long-term plan are to:

- Build upon the short-term re-structuring of manpower (numbers, kinds and levels) according to operation and maintenance needs in different locations;

- Establish attainable long-term manpower objectives which will be accomplished in phases over a specified transition period;

- Translate the objectives into programs to be implemented over the transition period. The organization structure for the Authority must then have sufficient flexibility to accommodate the elements of the manpower plan;

- Undertake manpower allocation and training needs assessment. Based upon training needs assessment, establish training program to insure qualified/certified personnel in-place;

- Develop manpower re-trenchment plan for redundant employees.

2.3.2 Cost Analysis

The Authority should not be concerned with historical financial accounts only, but should be focused upon implementation of a cost accounting system to provide information that can help in achieving actual and standard costs per unit. Such a system should be adopted by the Authority to rationalize expenses. The long term goal would be to establish cost centers throughout the Authority and create competition. The organization structure has to provide the framework for the system.

2.3.3 Productivity Requirements

Productivity is the relationship between inputs and outputs. Productivity can be focused on equipment, capital, workers, and the production process as a whole. Efforts must be directed to using the concept of productivity as a criteria for achieving considerable improvement. Raising productivity could be achieved through manpower planning, training (including on-the-job training), leadership, incentives, personnel morale, work conditions, in addition to standardization of materials and methods used in the production process. It is important, in this regard, to demonstrate the concept of productivity as a management tool at all levels and for different purposes

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2.3.4 Planning and Monitoring

The purpose of the presidential decree is the establishment of an autonomous, self-financing authority. Because establishing such an authority is not feasible in the short term, planning is necessary to achieve the purpose of the presidential decree in the long-term. The planning needs to incorporate specific, achievable goals in defined time periods (milestones), indicators for measuring progress towards the attainment of the milestones (monitoring), and a reporting system necessary for monitoring (accountability) After approval of the authority plan, milestones identified become Authority goals, supported by Authority managers, with accountability to the Board of Directors. The organization structure has to provide the depth in skills, flexibility and lines of accountability required to support implementation of the plan.

2.3.5 Functions and Job Descriptions

Developing the functions of each division and sub-division, and establishing job descriptions for all authority jobs, is necessary when an authority is created. The organizational structure reflects the necessary specialization of personnel skills and spectrum of responsibilities. It will not be completely effective as a tool for division of work unless descriptions of functional tasks of all division and sub-division positions are clear to Authority staff.

2.3.6 Centralization/Decentralization Balance

The extent to which the Authority adopts centralization or decentralization will define the organization and characteristics of the Authority. Previously, water and wastewater services were provided by cities and villages. These services will now be provided by the Authority After the establishment of the Authority, responsibilities need to be reviewed in order to maintain a reasonable and appropriate level of decentralization within the framework of the Authority organizational structure. An analysis of the various Authority operations needs to be performed to nationalize distribution of shared operational responsibilities to regional levels

2.4 Organization Status of Minia and Beni Suef Authorities

2.4.1 Minia Water and Wastewater Authority

The new Minia Water and Wastewater Authority has made progress in the development of an organization. The development was reviewed by the consulting team and the status of the major elements of the development are summarized in this section.

A decree for the formation of the Authority's Board of Directors was issued by the Governor (Decree No. 96/1996 dated 7/5/1996)

A preliminary, organizational structure for the new Authority was prepared by the governorate

A Chairman of the Board of Directors has been nominated by the Governor. The Governor has submitted a proposal for the issuance of a Ministerial decree for the appointment, in accordance with Civil Service law, to the Ministry.

Other key nominations to the Board of Directors have been made and include:

- Deputy Chairman of the Board for Technical Affairs,
- Director of the Water Affairs Department,
- Director of the Wastewater Affairs Department, and
- Director of Financial & Administrative Affairs.

2.4.2 Beni Suef Water and Wastewater Authority

The new Beni Suef Water and Wastewater Authority has also made progress in the development of an organization. The development was reviewed by the consulting team and the status of the major elements of the development are summarized in this section.

A preliminary organizational structure for the new Authority was prepared by the governorate.

An interim Chairman of the Board of Directors was nominated by the Governor.

Other key nominations to the Board of Directors are presently being made

2.5 Workshops

Separate workshops were held in the Governorates of Minia and Beni Suef with utility, government, and consulting team personnel. The workshops focused upon organization development tools and the initiation, operation and management of a Water and Wastewater Authority.

2.6 Development of an Organization Structure

2.6.1 Organization Structure

A preliminary organizational structure was prepared by the Authorities An analysis of the preliminary organization structure was performed by the consulting team based upon outcomes of the workshops.

Based on this analysis, the consulting team and authority staff modified the preliminary organization structures to develop the team's proposed general organization structure for consideration in both Minia and Beni Suef.

The resulting organization structure is shown in Figure 2-2. As proposed, the structure includes major elements organized to support four major functions in addition to the operation of the Chairman's office. These are utility operations and maintenance; project planning, design and implementation; financial administration; and management of commercial affairs and consumer relations. In addition, the organization is structured to provide overall support and direction of the regional utility offices.

An example chart of organization down to the department level is presented in Annex 2 1.

Figures 2-3, 2-4, 2-5 and 2-6 show how the proposed authority structure will function when performing four typical utility operations:

- project planing
- procurement and handling of stores
- performance of maintenance
- establishment of new connections

At this point, the proposed organization structure is to be submitted to the Authority Board of Directors for approval Following approval, the approved organization structure will be issued in a decree by the Authority Chairman of the Board of Directors

A program to decentralize the Authority, after the immediate Authority formation period, has been approved in principal The program includes establishing "Water and Wastewater Utility" units to function as regional offices of the Authority. The recommended organization structure of these units is presented in Annex 2.2 and unit implementation is discussed in Section 2 9 of this chapter The structure implementation strategy needs to be prepared, and the structure and strategy then reviewed and approved by the Board of Directors.

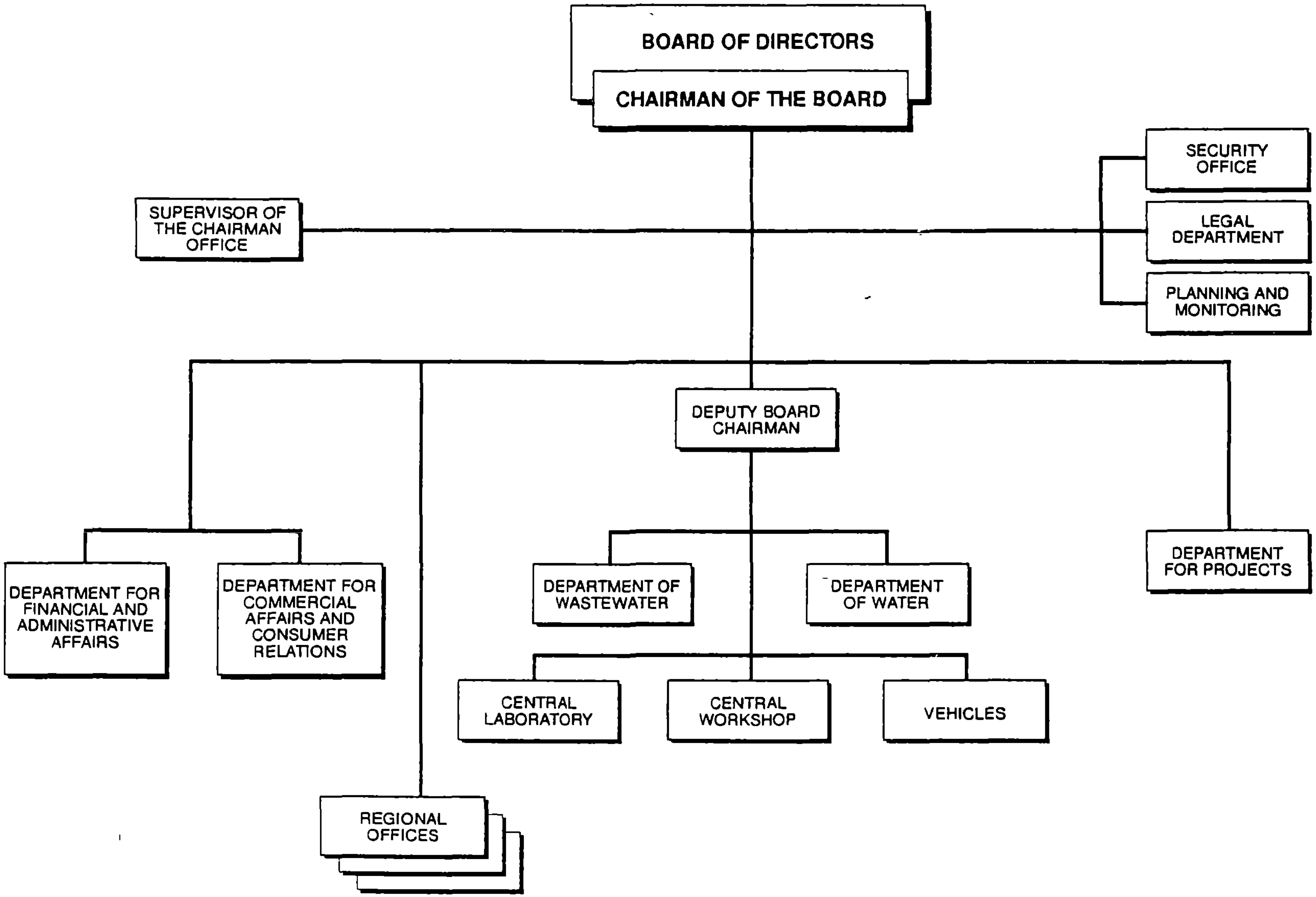

Figure 2-2
PROPOSED AUTHORITY ORGANIZATION STRUCTURE
INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

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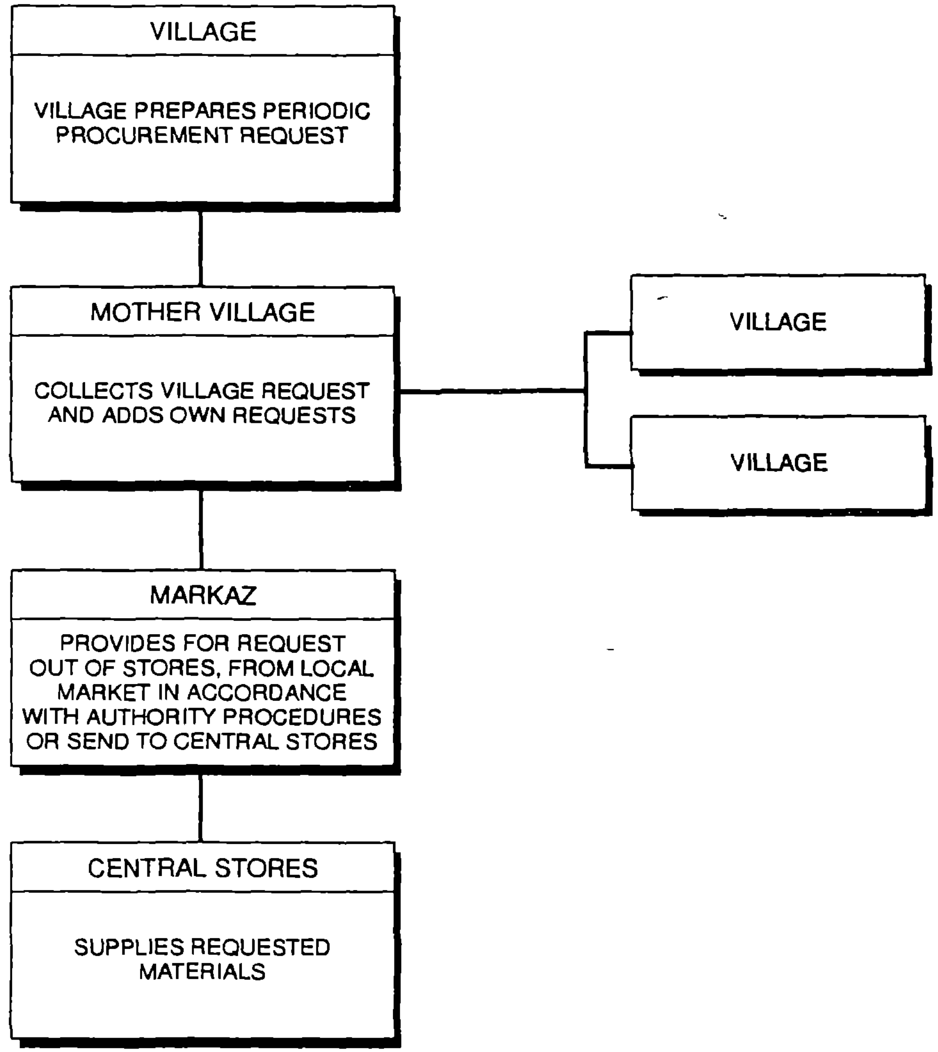

Figure 2-3

STORES AND PROCUREMENT FOR VILLAGES

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

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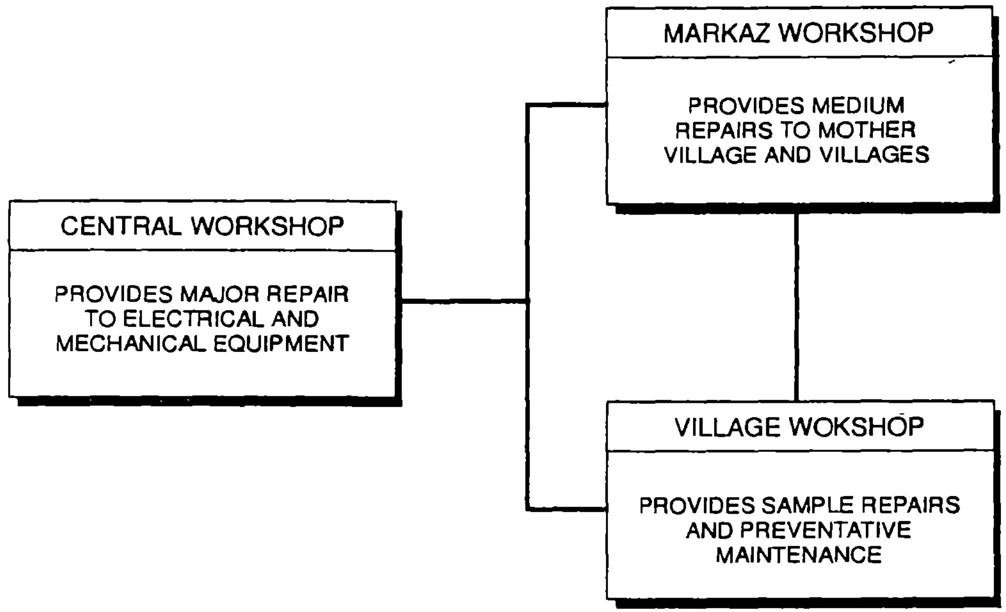

Figure 2-4

VILLAGE LEVELS OF MAINTENANCE

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

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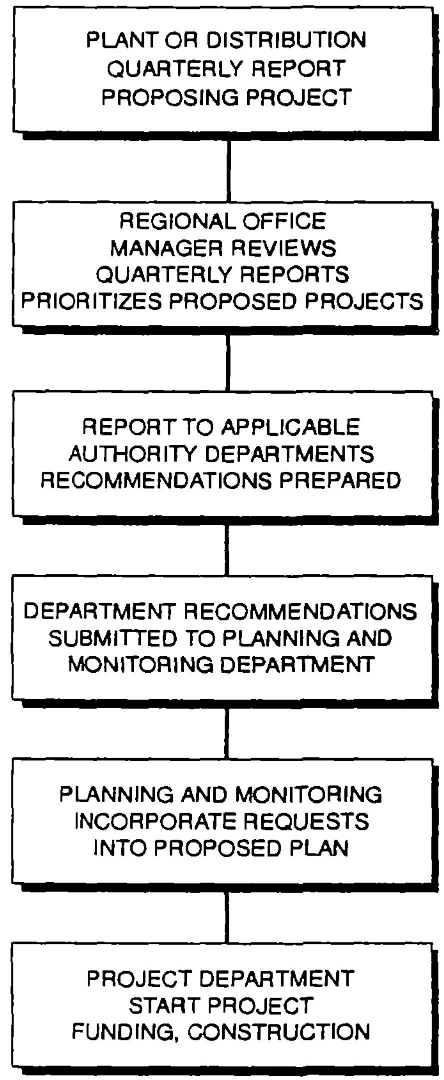

Figure 2-5

PROJECT PLANNING

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

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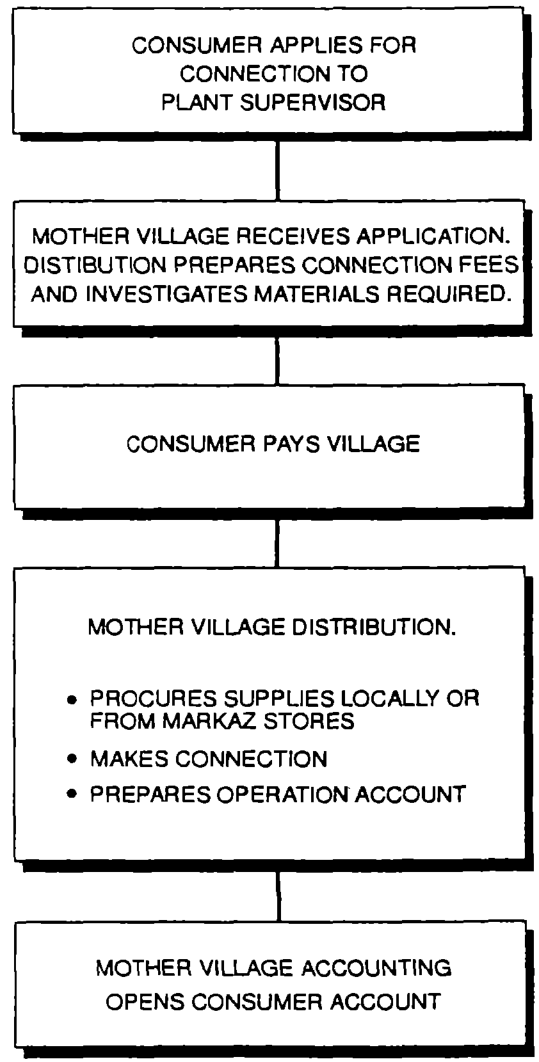

Figure 2-6

CONNECTION PROCEDURE FOR VILLAGE

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

2.6.2 Status of Minia Water and Wastewater Authority

The revised organization structure was discussed with the Authority Chairman of the Board of Directors of Minia and then submitted to CAOA for comments. After receipt of comments from CAOA, additional discussions were held with one Chairman and the following amendments were made and accepted by the Chairman:

- Establishing a unit for Legal Affairs
- Establishing a unit for Cost Accounting.
- Changing the Deputy Chairman for Technical Affairs' scope of authority to Operation and Maintenance rather than Projects.
- Establishing "Water and Wastewater Utility" units as regional offices of the Authority.
- Merging Project Planning and Project Implementation into Projects.
- Separating Procurement and Stores from the Financial Department.
- Establishing a Procurement and Stores under the Director of Financial and Administrative Affairs.
- Separating Vehicles and Workshops from Financial and Administrative Affairs, and placing them under the Deputy Chairman.

Job descriptions have been prepared by the consulting team for the 10 key Authority positions in the organization structure. The remaining Authority job descriptions are being prepared by the governorates. The job descriptions developed by the consulting team are presented in Annex 2.3.

At this point, the proposed organization structure is to be submitted to the Authority Board of Directors for approval Following approval, the approved organization structure will be issued in a decree by the Authority Chairman of the Board of Directors.

2.6.3 Status of Beni Suef Water and Wastewater Authority

The proposed organization chart needs to be finally reviewed with the Authority Chairman and then submitted to CAOA for comments

2.7 Conclusions

The Minia and Beni Suef Water and Wastewater Authorities have proposed organization structures. The structures are in the process of receiving final approval.

A program to decentralize the Authorities, after the immediate Authority formation period, has been approved in principal The program includes establishing "Water and Wastewater Utility" units as regional offices of the Authorities.

A proposed organization structure for the "Water and Wastewater Utility" units has been completed.

Lists of staffing, surveys of utility assets, estimates of 1996/97 recurrent expenses, and job descriptions of the 10 key authority positions have been completed for the Minia and Beni Suef Water and Wastewater Authorities.

2.8 Recommendations

Specific actions are needed to promote and enhance the abilities of the new water and wastewater authorities to function as effective and self-sufficient organizations. Recommended actions related to the further development of the authorities' organizational structures are described below. The role of these recommendations in the overall institutional support action plan for the governorates is illustrated in the implementation timeline presented in Chapter 7 of this report.

2.8.1 Manpower Planning

Presidential Decree 281/1995 states that all employees of water and wastewater utilities in the governorate covered by the Authority's activities shall be transferred to the Authority. This may result in an overabundance of manpower during the immediate formation period Therefore, it is recommended that each of the Board of Directors undertake "manpower planning" to allocate manpower cost-effectively.

This will require the following steps as a minimum·

- Analyze each position, develop measurements of work, and establish performance standards.
- Analyze the work load required for each position
- Determine number of staff required for each position.

- Perform personnel evaluations.

- Compare the number of staff required for each position with the present staff qualifications and determine deficit or surplus personnel for each position

- Establish policies for dealing with personnel excess or deficit by position Policies need to include actions such as training, encouraging leave without pay, encouraging early retirement, forming task forces for specific assignments, and delivering services to the public for fees

- Link appointments, transfers, etc. with the results of the manpower planning study. As an example, it is recommended that the appointment of technicians and ordinary workers be avoided, since the Minia and Beni Suef Authorities have a surplus in these categories, while they are in need of mechanics, electricians, and technical workers

- Establish a system for rating employee performance with performance standards, reporting ratings, and providing rewards and incentives.

It is recommended that task forces be used to assist in developing each of the steps and in performing system evaluations and improvement recommendations. A group of employees are formed as a task force to deal with a specific issue within a given time period For example, a task force could be formed to work on the arrangement of reading meters at the city level, register readings, issue bills, develop registers, collect arrears as a push towards a modified and improved system for billing and collections Other task forces can be formed for step development This would be a practical way of handling problems faced in implementing the Authority Task forces can be useful vehicles to reduce problems inherited from the past, as well as an economic solution to surplus manpower

2.8.2 Decentralization

Developing an Authority decentralization program to be implemented after the initial formation period will require definition of the regions to be covered by each utility unit in each Governate, regional authority and responsibilities, and the level of regional equipment and staff required for operation.

The regional offices could cover a Markaz, a grouping of villages and/or cities, or more than one Markaz, as some of the options Each regional office could provide different levels of service depending upon the customer base, geographical size of the regional office area of responsibility, and other factors The services could include a combination of customer, administrative, and technical services such as maintenance, workshops, vehicles and stores The main office provides specialized services and central administration. The lines of authority between the main and

regional offices needs to be defined. It is recommended that the decentralization options be defined with the Director and Governor and discussions be held with government officials and Authority staff to develop the most cost-effective regional office strategy

2.8.3 Personnel Regulations

It is recommended that each Authority develop and implement personnel regulations in accordance with Article IV of Presidential Decree 281/1995. Article IV states that the Board is entrusted with setting internal regulations and organizational decisions related to the financial and administrative affairs of the Authority and its employees without being restricted by governmental regulations and arrangements.

2.8.4 Training Unit

It is recommended that each Authority establish a Training Unit. The Unit could be an outgrowth of a Task Force assigned to perform personnel evaluations and position qualifications The Unit will assess training needs within the Authority, prepare training programs, prepare training incentive and recognition programs, develop systems for evaluating results of the training efforts, and schedule and oversee personnel training.

2.8.5 Training Center Feasibility Study

It is recommended that a Training Center Feasibility Study be performed to evaluate the feasibility of establishing a common Water and Wastewater Training Center for the governorates of Minia, Fayoum and Beni Suef.

2.8.6 "Training-of-Trainers Program"

It is recommended that a training program be developed for first level supervisors. The program involves training supervisors to assess the on-the-job training needs of their subordinates and to provide their subordinates the necessary training.

2.8.7 Fees

It is recommended that a study be performed to develop connection and other service fees that reflect actual costs.

2.8.8 Organization Structure

The proposed organization structure has revenue and collections as a sub-unit of the Water Department. It is recommended that discussions be held with the Directors of the Authorities to modify the proposed organization structure so that revenues and collections will be moved to a more appropriate part of the organization, such as:

- A sub-unit of the Financial Department; or

- A separate unit directly under the Chairman.

Chapter 3
WATER LOSS REDUCTION PROGRAM

3.1 Introduction

A key factor identified by the Environmental Health Project (EHP) as contributing to the inefficiency of the existing water supply systems in the Provincial Cities was the high level of unaccounted-for-water that existed in each of the systems. The levels of unaccounted-for-water found ranged from 41% to 55% and contributed significantly both to the lack of adequate supply within the cities, and to low levels of revenue generated from water sales. Implementation of a program to determine the reasons for these high levels of losses was proposed as a high priority action necessary as a part of any efforts to move the water utilities toward efficient and autonomous operation. This chapter documents the further water loss investigations conducted in the Governorate of Minia and Beni Suef and Fayoum as part of this institutional strengthening effort, and presents recommendations for implementation of further actions to achieve reductions in the current levels of water loss.

3.1.1 Definition of Unaccounted-for-Water

Within all major water systems, some discrepancy exists between the quantity of water supplied to the system and the amount that can be accounted for through metering or estimating of actual water use by customers. The difference between the total water produced from all of the sources serving a system and the amount of water that can be accounted for through metering or estimates of use is known as unaccounted-for-water (UAW) In contrast, the difference between total water production and the amount of water for which users are billed is called non-revenue-producing water. In most cases, non-revenue producing water includes both unaccounted-for-water and metered or estimated water uses by entities or organizations which are not required to pay for their water supply. Table 3-1 provides a listing of typical water uses in Egypt organized into accounted-for-water, unaccounted-for-water and non-revenue producing water.

3.1.2 Benefits of a Water Loss Management Program

A successful water loss management program can achieve substantial benefits for a water utility working to improve its overall performance and efficiency. Benefits which result from effective water loss management efforts typically include:

- Reduced water losses: An effective water loss management program can improve overall system performance by reducing the amount of water lost through physical leakage or unauthorized connections and thereby maximizing the amount of water available to its consumers.

Table 3-1

TYPICAL WATER USES

Water Use	Accounted-for-Water	Unaccounted-for-Water	Non-Revenue Producing Water
Authorized Uses			
Residential Use	X		
Commercial Use	X		
Industrial Use	X		
Municipal/Gover	X		(1)
nment Use	X		(1)
Institutional Use	X		(1)
Military Use	X		(1)
Irrigation Use			
Unauthorized Uses			
Residential		X	X
Other		X	X
Unmetered Flow due to Meter Errors		X	X
Leakage in the Distribution System		X	X

- Financial improvement: An ongoing water loss program can result in increased revenue generation from customers who are either not being charged or who are presently being undercharged due to metering inaccuracies. At the same time, identifying and repairing significant leaks can decrease recurrent operating costs by reducing power, chemical and operating costs associated with the production and delivery of water, and, in some cases, delaying the need for capital improvements required to increase system capacity.

- Increased knowledge of the physical system: In order to be effective, a water loss management program requires that utility personnel develop an increased familiarity with the system, including the location of valves, mains, and connections. The program typically leads to implementation of improved facilities mapping and inventories which facilitate routine system maintenance and operation as well as improved emergency response capabilities

- Safeguarding public health and welfare: Significant leakage in a water distribution system can be an indicator of deterioration in the condition and integrity of the network. Such deterioration is one possible source of contamination in the distribution system, and poses a possible health threat to the population served Uncontrolled leakage can also result in undermining the foundations of roads, buildings or structures built near or over the lines

- Improved public relations· An active water loss management program significantly increases the public visibility of water utility personnel and provides an opportunity for a positive public relations effort. As a result of the field activities required for an effective program, the public sees utility personnel working on the network on a regular basis. This imparts a sense of dedication of the utilities staff to the public and, when packaged with additional public information and education efforts, helps enhance the perception of the utility by its customers.

A water loss management program is a key component to efforts to improve the overall performance and efficiency of any water utility. In systems such as those in the Provincial Cities where water losses and levels of non-revenue-producing water are high however, implementation of an effective water loss reduction program is critically important and must be a high priority component in the utility's operation and maintenance program.

3.1.3 Present Situation in the Provincial Cities

Within the Governorates of Minia or Beni Suef, there are presently no ongoing water loss management programs Metering of water production rates is unreliable and provisions for flow metering within the distribution systems do not exist. While customers' service connections are generally metered, many of the meters are not functioning and there are no utility standards for meter installation Some leak detection equipment is available in the cities of Minia and Beni Suef, but there are no regular leak detection programs in place. Repairs to water main breaks are reported to be made on an individual basis when the effects of the break are sufficient to impact the supply of water to customers in the area However, main repair data is not available and there are no regular programs for distribution valve maintenance in place.

Available records of the two Governorates indicate that a large percentage of the water supplied to the water systems is not accounted for Data presented in the August 1995 EHP report estimated unaccounted-for-water in Beni Suef to be 52% of total production. The estimate of unaccounted-for-water in Minia was 55%. Based on currently available information, indications are, that production exceeds billings by over 40%. However, in both Governorates it is difficult to precisely quantify the actual levels of unaccounted-for-flow Metering of production is accurate only at the recently constructed US plant At other locations production is generally

determined on the basis of equipment running times and original plant design parameters. Much of the plant equipment is old, modifications to the piping and equipment have been made without detailed documentation/design, and accurate, up-dated plans of the system are not available Therefore, the reliability of these estimated flows is questionable

Given the present water supply situation in the Provincial Cities, it is critically important that the real magnitude of this problem be defined and that a proactive program of action to reduce the overall levels of unaccounted-for-water and non-revenue-producing water be implemented The balance of this chapter presents the results of field investigations performed to more accurately quantity the levels of unaccounted-for-water in the systems and recommended water loss reduction strategies to be implemented. The results of these analyses are incorporated into the recommended action plan and implementation timeline presented in the final chapter of the document.

3.2 Approach to the Analysis of Unaccounted-for-Water

In order to efficiently assess the impacts of unaccounted-for-water on the water utilities in the Provincial Cities, an approach based on selected testing of current conditions through limited sampling was adopted and implemented. The approach was structured to use the information collected as the basis for projecting conditions throughout the area Investigations conducted included:

- analysis of actual water production rates,
- random surveys of residential service meters and accounts, and
- random surveys of commercial and industrial user accounts.

These analyses were performed for locations within the Governorates of Minia and Beni Suef to obtain accurate information on water production, residential metering effectiveness, and commercial and industrial metering effectiveness.

3.2.1 Sampling Approach

Two possible approaches to the field investigations of unaccounted-for-flow were considered. The first involves selection of a pilot area judged to be representative of the consumer base of the overall water system. The second involves the sampling of customer connections at random sites throughout the overall service area.

3.2.1.1 Pilot Area Approach

Under the pilot area approach, detailed flow measurements and field inspections would be performed to accurately determine the total supply into the area and the total amount of metered consumption by users. The difference between these values provides an indication of the quantity of unaccounted-for-flow in the area. A detailed assessment of the condition and performance of the meters in the pilot area would also be conducted so that a distinction can be made between water that is lost through physical leakage and water not accounted-for due to inoperable or inaccurate meters. Leak detection equipment would be used to locate and quantify leaks for repair. Assuming that the pilot area is representative of the larger consumer base, the results of the assessment can then be extrapolated to provide an indication of conditions throughout the system.

In order for the pilot area approach to be effective, however, a number of criteria must be satisfied. These criteria include:

- Adequate knowledge of the distribution system - Reliable mapping and facility data must be available for the Pilot Area.
- Representative socio-economic distribution of the consumer base - The Pilot Area must provide a representative sample of the total system service area.
- Ability to isolate the area - It must be possible for the Pilot Area to be isolated so that all flow into and/or out of the area can be accurately metered.
- Proper metering and availability of reliable customer information - The majority of the customer connections within the Pilot Area should be metered and identified in a customer database.
- Easy access to the meters - Easy access is required to facilitate reading of the meters on a frequent basis during the test period.
- Approximately 300 metered services - An area containing approximately 300 services is needed to provide sufficient flow and consumption for a reliable analysis.

As a result of a comparison of the criteria above against existing conditions in Minia and Beni Suef, it was determined that:

- Information within the Govenorates would not allow for the proper identification of an area which could be isolated for use in a pilot effort;

- The existing lack of systems mapping of valve and line locations and documented metering information would hinder any attempt to implement an effective pilot program; and

- A pilot leak detection program would not be practical due to a lack of equipment and trained staff. Field conditions were also found to be poor for use of conventional leak detection methods

Therefore the pilot area approach was judged not to be suitable for the analysis of unaccounted-for-water in Minia or Beni Suef.

3.2.1.2 Random Sampling Approach

The second method of field investigation considered for assessing unaccounted-for-flow would involve the random inspection of customer connections at locations throughout the service area. This approach eliminates the need for identification of specific pilot areas satisfying all of the criteria described above. Rather, a representative sample of the customer base would be generated by the random selection of a statistically significant number of individual sites for inspection Results gained from the inspection of this random sample would then serve as the basis for projection of conditions throughout the service area.

The random sampling approach was determined to be well-suited to the difficult conditions found in Minia and Beni Suef. In contrast to the pilot approach, the random sampling method provided a practical mechanism for developing reliable projections of systemwide conditions. Specific elements of the random sampling approach included:

- Statistical analysis to determine the number of sites required for a representative sample;

- Random selection of the required number of service connections for inspection and testing;

- Field inspection of customer service connections at the selected sample sites;

- Assessment of the condition of meters in place at the sample sites;

- Field testing of working meters to assess meter accuracy; and

- Comparison of recent billing records against field measurements of consumption

3.2.2 Analysis Procedures

As indicated above, three types of tests were conducted in conjunction with the analysis of unaccounted-for-water in Minia and Beni Suef In each case, procedures were developed to provide a representative indication of conditions throughout the system service areas. Brief descriptions of the procedures utilized follow.

3.2.2.1 Analysis of Water Production

Accurate measurements of water production rates are critical to the effective management of water losses in a water supply system. Without accurate production data, system managers have no means of assessing levels of unaccounted-for-flow.

Within the Governorates of Minia and Beni Suef, daily water production rates are estimated on the basis of rated facility capacity and monitored running time. Facilities at which such flow estimates are made include pumping stations and treatment plants.

For the purpose of this investigation, detailed measurements of water production for each system were made using a portable Peek Doppler Ultrasonic Flow Meter. Accuracy of the metering device was reported to be ± 5% of the average velocity.

3.2.2.2 Analysis of Residential Meters

Residential meter readings serve as the basis for billing of water customers and generation of significant operating revenue for a utility. As such, inaccuracies in residential metering can result in direct loss of revenue. For the purpose of this investigation, a total of approximately 737 residential accounts were selected at random from study areas. For each account, a field investigation of the status of the existing metering equipment was performed The result of these investigations were then compared against authority records of water consumption and billings in order to evaluate the effectiveness of the existing metering system. Where time permitted, a second survey of a random sample of services within the initial survey population was conducted to confirm preliminary findings.

The accuracy of individual service meters was assessed through field testing with Muni 1 Test Meters The Muni 1 system allows existing meters to be tested in place and is reported to provide an accuracy of ±5%. Based on the results of the meter tests, representative estimates were computed for:

- percentage of services metered
- percentage of meters working
- percentage of meters accurate to within ±5%
- percentage of meters not accurate to within ±5%

Test results were also used to project the quantity of water unaccounted-for due to metering errors throughout the service area.

3.2.2.3 Commercial and Industrial Meter Survey

Although large commercial and industrial water users typically make up a small percentage of the total number of customers in a water system, they often account for a large percentage of the total water used. As a result, accurate metering of consumption by large users is an especially important element of water loss management programs.

In order to assess the current status of large user metering in Minia and Beni Suef, a survey of water use records and metering was performed for a number of the largest users in the Governorates. Initially, a total of 32 service connections were examined to determine the status of metering. Subsequently, recent water use records were compared with actual measurements of usage to identify and quantify discrepancies associated with meter inaccuracies at 10 of the survey locations.

Results of these measurements provided the basis for an evaluation assessment of metering practices for large users in the two systems, and an assessment of the relative contribution of inaccuracies in the metering of large customers to the overall level of unaccounted-for-water

3.3 Results of the Water Loss Assessment

Results of the water loss assessment efforts conducted in Minia and Beni Suef provided valuable information on the present impact of unaccounted-for-water on overall system operations. The detailed data gained through the survey provides a reliable basis for the assessment of the current problem and the formulation of a recommended action plan for improved water loss management Results of the field investigations are presented in Annex 3 to this report.

3.3.1 Results for Minia Governorate

Within the Governorate of Minia, water production tests and random meter surveys were performed in three areas: Minia City, Samalut Town and Talla Village. These areas were selected to provide a representative sample of the types of communities served by the existing water systems in the Governorate. Investigations performed included tests of water production meters at four water treatment plants (three in Minia City, one in Tala Village), tests of a total of 473 residential meters, and tests of 32 meters serving large commercial customers distributed throughout the governorate. Results of these investigations provided a representative basis for estimating water losses throughout the water systems in the governorate.

3.3.1.1 Water Production Monitoring

Water is presently supplied to Minia City from three water treatment plants with a reported total water production capacity of 620 liters per second (lps). However, records of historic flows are based solely on estimates of production generated by operating staff. As shown in Table 3-2, on-site measurements of water production at the plants found discrepancies between reported and actual flows ranging from 0% to more than 18%. Flow reporting errors at both the recently constructed US Plant and the Czechoslovakian Plant were found to be less than 5%, while reported flows at the British Plant were found to be approximately 20% higher than the measured flows Overall, the test found that the reported flow was within 5% of the measured flow.

Detailed results of the production meter tests for Minia are included in Annex 3.1 to this report.

Table 3-2

ANALYSIS OF WATER PRODUCTION MEASUREMENTS
MINIA GOVERNORATE: MINIA CITY

Water Production Facility	Design Flow (l/sec)	Reported Flow (l/sec)	Measured Flow (l/sec)	Difference in Flows (l/sec)
British Plant	120	95	80	-15
Czechoslovakian Plant	200	170	165	-5
US Plant	300	300	300	0
Total	620	565	545	-20

These data suggest that the flow metering procedures currently in place at the treatment plants in Minia provide a reasonably accurate estimate of total flow delivered to the system Efforts should be undertaken to reduce the discrepancies in metered and reported flow at the British Plant however.

Samalut is served by a single water production facility, but treated water from the plant is conveyed to the town through three separate distribution mains Attempts to identify acceptable locations on these mains for flow metering using the Doppler meter were unsuccessful As a result, no check of the water production records for Samalut was possible.

Talla Village is also served by a single water production facility. As shown in Table 3-3, monitoring of discharge flows from the Talla Village facility found that reported flows from the plant were approximately 145% of the actual measured flows As a result, the actual quantity of water supplied to the Talla distribution system from the plant is significantly lower than previously estimated.

Table 3-3

**ANALYSIS OF WATER PRODUCTION MEASUREMENTS
MINIA GOVERNORATE: TALLA VILLAGE**

Water Production Facility	Design Flow (l/sec)	Reported Flow (l/sec)	Measured Flow (l/sec)	Difference in Flows (l/sec)
Talla Village Plant	NA	20.3	14 1	-6 2
Total	NA	20 3	14 1	-6 2

Given these results, it is clear that improved metering equipment is needed at the Talla Village water treatment plant

3.3.1.2 Residential Meter Survey Results

The effectiveness of metering of water consumption at individual residential properties in Minia was analyzed through the inspection and testing of 473 services and meters within the Minia City, Samalut Town, and Talla Village systems. Table 3-4 provides a summary of the number of services inspected in each area.

Table 3-4

**NUMBER OF CUSTOMER SERVICES INSPECTED
MINIA GOVERNORATE**

Area	Number of Consumers Inspected
Minia City Urban	362
Samalut Town	94
Talla Satellite Village to Minia City	17
Total	473

Results of the residential meter survey are presented in Table 3-5. Data from the areas sampled indicates that while 56-65% of the residential services in the governorate have working meters, less than 25% of the working meters are measuring flows accurately. In total, it would appear that consumption is being accurately metered for only about 15% of the residential services in the governorate.

One factor identified as contributing to this low level of accurate metering is Minia City's current practice of billing customers with non-working meters for usage of only 1 cubic meter of water per month. For example, billing records indicated that in Minia City, only three of the customers with non-working meters were being charged for use of more than 1 cubic meter per month As a result, there is presently an incentive for vandalism of meters, since customers with non-working meters are generally billed significantly less than customers whose services are metered.

Consumption data collected from working residential meters indicated typical per connection water consumption rates of 23.0 m^3/month in Minia City and 17.8 m^3/month in Samalut In contrast, data collected in Talla Village indicated per connection consumption rates of more than 80 m^3/month. It is possible that outdoor water use for livestock or gardening may be accounting for a part of the high usage in Talla It is recommended that further study of water use in Talla be conducted to definitively determine the reason for these high values.

Table 3-5

RESIDENTIAL METER SURVEY RESULTS
MINIA GOVERNORATE

Survey Parameter	Minia City	Samalut Town	Talla Village
Meter Conditions			
Services Inspected	330	94	17
No of Meters Working	186	54	11
% of Meters Working	56%	57%	65%
No of Meters Not Working	144	40	6
% of Meters Not Working	44%	43%	35%
Meter Accuracy			
No of Meters Tested	92	16	5
No of Meters Reading within ±5%	16	4	1
% of Meters Reading within ±5%	17%	25%	20%
No of Meters Reading outside ±5%	76	12	4
% of Meters Reading outside ±5%	83%	75%	80%
Computed Consumption			
No of Meters Working	186	54	11
Metered Consumption (m^3/month)	4286	963	884
Average Consumption per Service (m^3/month)	23 0	17 8	80 4

The survey results presented above also provide a means of estimating the quantity of unaccounted-for-water associated with non-working meters Table 3-6 summarizes the results of this analysis. Based on the data collected from the random sampling program, it is estimated that as much as 425,000 m^3/month of water is going unaccounted-for due to the lack of working meters throughout Minia City and Samalut Town.

Table 3-6

ANALYSIS OF UNACCOUNTED-FOR-WATER ASSOCIATED WITH NON-WORKING RESIDENTIAL METERS MINIA GOVERNORATE

Surv y Parameter	Minia City	Samalut Town
No of Registered Customers[1]	35,300	11,481
Estimated No of Customers Billed at Minimum Rate[2]	15,532	4,937
Average Consumption per Residential Customer (m^3/month)	23 05	17 83
Estimated Actual Consumption by Customers with non-working Meters[3] (m^3/month)	358,012	88,024
Accounted-for-Water in Present Billing at Minimum Charge[4] (m^3/month)	15,532	4,937
Estimated Unaccounted-for-Water due to non-working Meters (m^3/month)	342,480	83,087

[1] Number of registered customers from Minia records
[2] Number of registered customers times % non working meters from pilot study
[3] Number of customers billed at minimum charge times average consumption/customer from pilot study
[4] Number of customers billed at minimum charge times minimum volume of 1 m^3/month

Table 3-9

POTENTIAL REDUCTION IN UNACCOUNTED-FOR-FLOW
MINIA GOVERNORATE

	Minia City	Samalut	Talla
Reported Production (m^3/month)	1,485,000	840,300	53,350
Measured Production (m^3/month)	1,432,000	(1)	37,050
UAF due to Production Meter Error (m^3/month)	53,000	(1)	16,300
UAF due to Residential Metering Problems (m^3/month)	342,480	83,087	(2)
UAF due to Commercial Metering Problems (m^3/month)	41,667	(3)	(3)
UAF due to Unmetered Public Use (m^3/month)	58,800	(3)	(3)
Identified Unaccounted for-Flow (m^3/month)	495,947	83,087	16,300

Notes (1) *Attempts at field metering unsuccessful*
(2) *No estimate made due to lack of accurate meters*
(3) *Areas not sampled*

3.3.2 Results for Beni Suef Governorate

Efforts aimed at further defining levels of unaccounted-for-water in Beni Suef were similar to those implemented in Minia Investigations of water production meter accuracy and residential meter performance were conducted, and plans were developed for large meter inspections. Observations presented for Beni Suef include the results of the water production meter tests and residential meter surveys performed in Beni Suef and Beba City Work related to the collection of additional data was halted by the Governor of Beni Suef due to time constraints.

3.3.2.1 Water Production Monitoring

As in Minia City, Beni Suef is supplied with treated water from three water treatment plants The total reported production capacity of the plants is 720 liters per second; however, records of historic flows are based primarily on estimates of production generated by operating staff. As shown in Table 3-9, on-site measurements of water production at the plants found discrepancies between reported and actual flows ranging from 0% to nearly 50%. Flow reporting errors at both the recently constructed US Plant and the British Plant were found to be less than 10%, while reported flows at the Czechoslovakian Plant were found to be approximately 50% higher than the measured flows.

These data suggest that improvements to the flow metering equipment and procedures currently in place at the treatment plants in Beni Suef are needed to improve the reliability of the utility's water production metering. Across the system, the noted discrepancies in flow measurement would result in an overestimate of total system production of about 144,460 m^3/month, or about 10% of the system flow. As such, prompt action aimed at repairing, replacing and/or periodic calibrating of the production meters is strongly recommended.

Table 3-10

ANALYSIS OF WATER PRODUCTION MEASUREMENTS
BENI SUEF GOVERNORATE: BENI SUEF

Water Production Facility	Design Flow (l/sec)	Reported Flow (l/sec)	Measured Flow (l/sec)	Difference in Flows (l/sec)
British Plant	210	160	150	10
Czechoslovakian Plant	210	150	103	47
US Plant	300	300	300	0
Total	720	610	553	57

3.3.2.2 Residential Meter Survey Results

The effectiveness of metering of water consumption at individual residential properties in the Governorate of Beni Suef was analyzed through the inspection and testing of 259 services and meters within the Beni Suef and Beba City systems.

Results of the residential meter survey are presented in Table 3-11 Data from the areas sampled indicates that while approximately 39% of the residential services in the governorate have

working meters, only about 23% of the working meters are measuring flows accurately. In total, it would appear that consumption is being accurately metered for less than 10% of the residential services in the governorate.

Consumption data collected from working residential meters indicated typical per connection water consumption rates of 39.8 m^3/month in Beni Suef and 17.8 m^3/month in Beba.

Table 3-11

RESIDENTIAL METER SURVEY RESULTS
BENI SUEF GOVERNORATE

Survey Parameter	Beni Suef	Beba City
Meter Conditions		
Services Inspected	193	66
No of Meters Working	74	26
% of Meters Working	38%	39%
No of Meters Not Working	119	40
% of Meters Not Working	62%	61%
Meter Accuracy		
No of Meters Tested	23	7
No of Meters Reading within $\pm$5%	6	1
% of Meters Reading within $\pm$5%	26%	14%
No of Meters Reading outside $\pm$5%	17	6
% of Meters Reading outside $\pm$5%	74%	86%
Computed Consumption		
No of Meters Working	38	26
Metered Consumption (m^3/month)	1,513	431
Average Consumption per Service (m^3/month)	39 8	16 6

The survey results presented above also provide a means of estimating the quantity of unaccounted-for-water associated with non-working meters. Table 3-12 summarizes the results of this analysis. Based on the data collected from the random sampling program, it is estimated that as much as 401,000 m^3/month of water is going unaccounted-for due to the lack of working meters throughout Beni Suef and Beba City.

Table 3-12

ANALYSIS OF UNACCOUNTED-FOR-WATER ASSOCIATED WITH NON-WORKING RESIDENTIAL METERS BENI SUEF GOVERNORATE

Survey Parameter	Beni Suef
No. of Registered Customers[1]	32,650
Estimated No of Customers Billed at Minimum Rate[2]	20,243
Average Consumption per Residential Customer (m^3/month)	39 82
Estimated Actual Consumption by Customers with non-working Meters[3] (m^3/month)	806,076
Accounted-for-Water in Present Billing at Minimum Charge[4] (m^3/month)	404,860
Estimated Unaccounted-for-Water due to non-working Meters (m^3/month)	401,216

1 *Number of registered customers from Beni Suef records*

2 *Number of registered customers times % non working meters from pilot study*

3 *Number of customers billed at minimum charge times average consumption/customer from pilot study*

4 *Number of customers billed at minimum charge times minimum volume of 1 m^3/month*

3.4.2.1 Further Assessment of Water Loss Problems and Development of Basic Information and Equipment Resources

The investigations performed as part of this institutional support assistance project have documented in detail the degree to which water loss and unaccounted-for-water impact the operations of the existing water systems in Minia and Beni Suef. However, before an effective, systemwide water loss management program can be implemented further investigations and development efforts are required In particular, basic system information and equipment resources must be developed in order for target areas to be identified and prioritized. Specific elements of this activity are described further below.

Task 1.1 - Compilation of System Information: Reliable information related to system facilities and operation must be available if a water loss management program is to be effective As a start, available system maps showing the locations of distribution mains, pumping stations, reservoirs and valves should be compiled along with operating records so that critical missing data can be identified. The status of the existing customer database should also be reviewed in order to assess the completeness and accuracy of the customer information available. Provisions for obtaining missing data can then be incorporated into the implementation plan for the water loss management program.

Task 1.2 - Identification of Sources of Supply: Accurate records of water production are essential to the implementation of an effective water loss management program. Operating staff must have reliable data on the quantity of water being supplied to the water system. As a starting point, a detailed inventory of all of the sources of supply to the water system must be performed. Information on the location, type and capacity of each source of supply should be collected and added to the system maps.

3.4.2.2 Establishment and Training of Water Loss Management Teams

In order to gain the full benefits of water loss management, it will be necessary for the Management of each utility to establish within its organization a unit which is fully responsible for the implementation of the water loss management program. The success of the water loss management program will depend to a great extent on the capabilities and efforts of the staff assigned to this unit As such, it is critical that the unit be given specific objectives, be structured to effectively meet those objectives, include staff trained and qualified to direct the program, and have in place specific procedures for coordination of efforts and sharing of information.

Task 2.1 - Define Specific Objectives for Water Loss Management Teams: Before activating the water loss management teams, the Management of the utility must define and document specific objectives to be accomplished by the teams. These may includes specific achievements in selected high priority areas and/or throughout the system In any case, the objectives should

relate to well-defined indicators which can be measured and monitored to provide an indication of the success of the effort.

Task 2.2 - Develop Detailed Listing of Staffing Requirements for Water Loss Management Teams: Staffing requirements for the water loss management teams should be defined in detail based on the specific objectives and timetables set for the water loss management program At a minimum, it is expected that the team will include:

- an Engineer-in-Charge;
- a two man crew responsible for survey and testing of residential meters and investigation of unauthorized and/or unmetered connections;
- a two man crew responsible for survey and testing of large commercial meters;
- a two man crew responsible for leak detection;
- two individuals responsible for the set-up and operation of a meter repair workshop, and
- a contact within the Consumer Accounting Department who is responsible for providing access to customer billing data.

Specific responsibilities associated with each of these elements of the team are described below.

Engineer-in-Charge is responsible for:
- coordination of the activities of the water loss management unit;
- scheduling of the unit's work activities;
- confirming that reports required from the unit are completed in a timely fashion;
- analysis of information and results compiled by the unit;
- preparation and presentation of reports to Management as required.

The Residential Meter Survey Team is responsible for:
- performance of field surveys of residential consumer connections;
- field testing of residential meters;
- identification of unauthorized and/or unmetered residential connections;
- compilation of data and completion of required reporting forms; and
- coordination of efforts with the Consumer Accounting Department (notification of inoperable or damaged meters, unmetered accounts, unauthorized connection, etc.)

The Large Meter Survey Team is responsible for:
- performance of field surveys of large commercial customer connections;
- performance of field surveys of municipal, government and utility service connections;
- field testing of large service meters;

- identification of unauthorized and/or unmetered commercial connections;
- recommendation of action to address unauthorized or unmetered connection problems;
- performance of field surveys of production meters;
- field inspection, testing and calibration of production meters;
- compilation of data and completion of required reporting forms, including periodic summaries of production metering accuracy; and
- coordination of efforts with the Consumer Accounting Department (notification of inoperable or damaged meters, unmetered accounts, unauthorized connection, etc.) and the Water Department (coordination of repair/calibration efforts required for the production meters)

The Leak Detection crew is responsible for:

- planning and implementation of leak detection efforts in accordance with the utility's prioritized plan;
- location, inspection and assessment of the conditions of valves and other appurtenances within the existing distribution system;
- location of water lines and/or valves in areas identified as high priority for leak detection;
- maintenance and upgrading of the utility's leak detection equipment; and
- compilation of data and preparation of required reporting forms.

Access to a Meter Repair Workshop is important to the sustainability of the water loss management program. In areas where funds for replacement of meters may be limited, and operating conditions are harsh, a utility must have the resources to repair meters if its metering program is to continue to be effective If immediate development of a meter repair workshop in Minia and Beni Suef is not possible, the proposed water loss management program can continue. However, efforts should continue to be made to procure the equipment and staff necessary for the workshop in the shortest time possible

Lastly, the Water Loss Management Team must have the ability to coordinate readily with the Consumer Accounting Department on a daily basis. It is recommended that one individual in the Department be designated the liason with the Water Loss Management Team. This individual will be responsible for coordinating the development and transfer of customer data to the team as required, as well as for the coordination of actions required to address problems with unauthorized and unmetered connections, and inoperable or damaged meters.

Task 2.3 - Identify Staff for Water Loss Management Teams: Careful consideration must be given to the selection of staff to fill the positions identified within the water loss management team. Selected staff must have a basic understanding of system operations and facilities, must be capable of learning new skills, and should be enthusiastic about taking on the challenges associated with implementation of this new program As, indicated previously, these staff should be dedicated to the utility's water loss management effort.

Task 2.4 - Assess Training Needs/Conduct Initial Training of Water Loss Management Teams: Depending on the capabilities of the available staff, additional training will be required in order to activate the proposed water loss management team. During the creation of the team, a training needs analysis of team members (and other utility staff involved in water loss management) should be conducted. Based on the findings of this assessment, detailed staff training with the leak detection and meter testing equipment to be used should occur.

Task 2.5 - Develop Reporting Procedures and Forms for Water Loss Management Teams: In order to be effective, data collected as part of a water loss management program must be efficiently and accurately compiled, organized and distributed to the appropriate teams and supporting staff within the utility. Effective management of this data is critical to the accurate assessment of the impacts of water losses on system performance and the efficient planning and implementation of program activities. Data generated also provides Management with a basis for monitoring the benefit of the program and developing strategies to further reduce levels of unaccounted-for-water and non-revenue-producing water.

An example of one possible reporting strategy is shown below in Figure 3-1.

3.4.2.3 Investigation of Bulk Metering Improvements at Points of Supply

In order for a water loss management program to become effective in a short-time it is important that the program be focused and prioritized. It is not realistic to assume that a system-wide program can be implemented immediately. Accurate metering of water production rates and flow rates at key locations in the distribution system provides the data required to begin to draw general conclusions regarding sources of unaccounted-for-water and leakage and develop a prioritized strategy for plan implementation.

Task 3.1 - Assess Equipment Needs for Bulk Metering of Principal Sources and Major Distribution Facilities: Early on in the water loss management program, the large meter team should inspect the existing bulk metering equipment at water production facilities and key distribution facilities (pumping stations, etc.) to assess the need for repair, calibration or replacement of equipment. Specific equipment needs should be defined in sufficient detail to support the procurement and installation of the required items. Specific steps in the assessment should include:

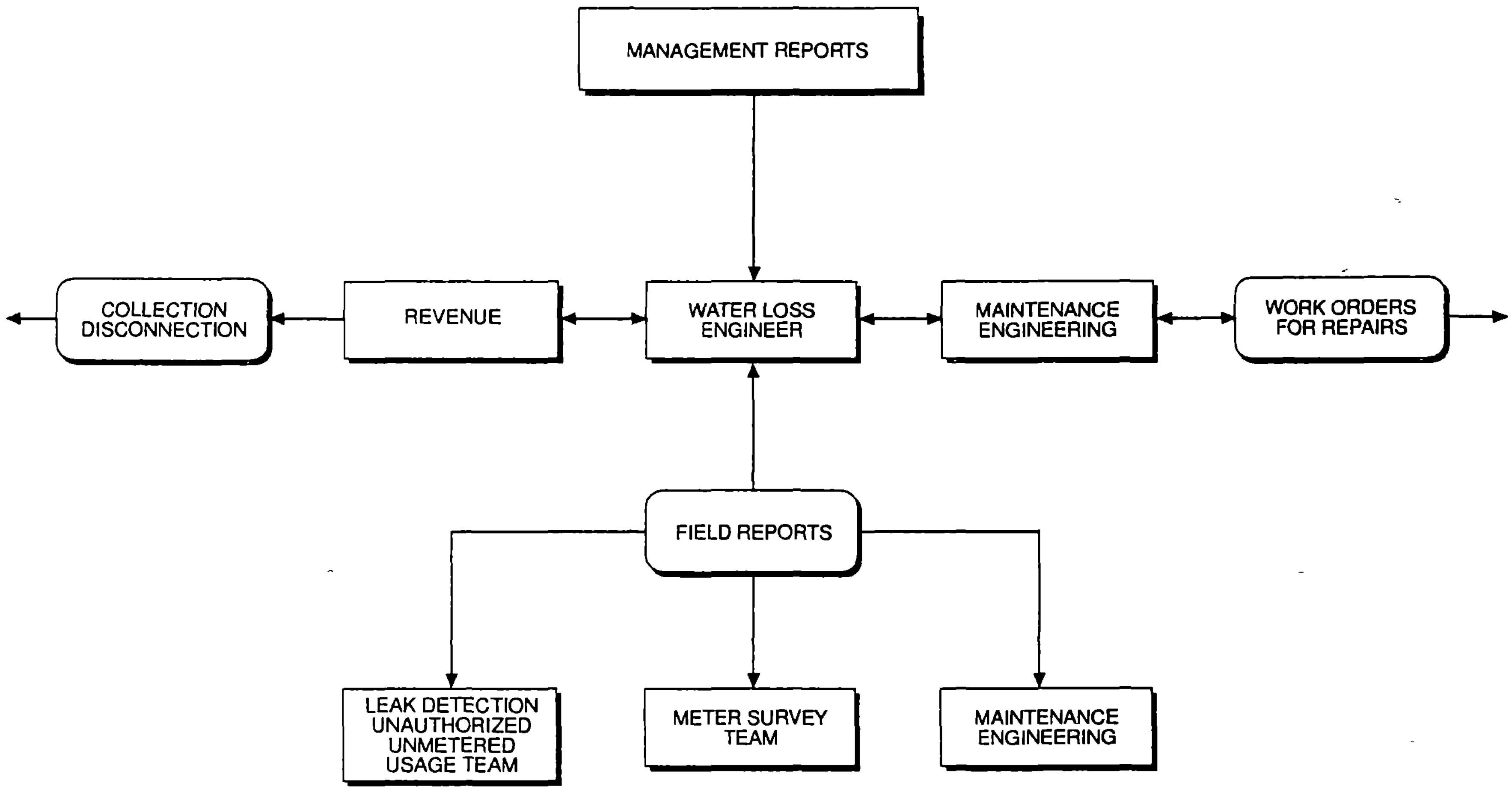

Figure 3-1
WATER LOSS MANAGEMENT REPORTING STRATEGY
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Provincial Cities, Egypt

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- determination of the presence of a meter
- determination of the make, model and characteristics of the meter
- assessment of the condition of the meter
- evaluation of the security of the metering installation
- preparation of the facility for installation of a portable test meter
- installation of a portable flow meter
- one hour test of meter accuracy
- documentation of pumping conditions during the test
- comparison of existing meter and portable meter performance
- assessment of need for meter repair, calibration, replacement
- compilation of test results and transfer of data to the Engineer-in-Charge

Task 3.2 - Procure/Install Equipment for Bulk Metering of Principal Sources and Major Distribution Facilities: Based on the assessment defined above, repair/calibration services and new bulk metering equipment should be procured and installed where required It is anticipated that during the initial phases of the program, installation of the equipment will have to be performed by outside contractors under agreements with the utility. All agreements should, however, include a requirement for hands-on training of large meter staff in the basic installation, set-up, calibration, repair and maintenance of the meters.

Task 3.3 - Initiate Monitoring/Maintenance of Bulk Metering Equipment: Following installation of the equipment, the large meter team should monitor the performance of these units and take action as required to keep the units operating It is anticipated that daily monitoring of water production rates and volumes will be performed by Water Department Production staff However, the large meter team should establish clear procedures for obtaining the data from the production staff and for performing periodic checks of the performance of the meters.

3.4.2.4 Implementation of Additional Meter Survey and Leak Detection Efforts

The random sampling programs of meter survey/testing and leak detection conducted as part of the institutional support assistance project illustrated the potential significance of unaccounted-for-water on the performance of the water utilities in Minia and Beni Suef. Given the value of these findings, it is recommended that the water loss management programs to be implemented by the utilities include performance of additional meter survey and leak detection efforts in representative portions of the system.

Task 4.1 - Develop Plans for Additional Focused Meter Survey and Leak Detection Efforts: Using results from previous investigations as well as additional water production and operating data, the Water Loss Management Team should develop a prioritized plan for additional meter survey and leak detection efforts. The meter survey efforts should include additional

investigations of both residential and large/commercial meters. The plan should be structured to emphasize efforts in areas where the potential for reductions in unaccounted-for-water is expected to be the greatest This plan should serve as a dynamic workplan for the team and should be reviewed and refined periodically based on the results of ongoing efforts

Task 4.2 - Identify Additional Equipment Needed to Support Meter Survey and Leak Detection Efforts: Some leak detection and flow measuring equipment was provided to utilities in Minia and Beni Suef as part of the Provincial Cities Water and Wastewater Development Project. As the longer-term plan for implementation of additional survey and testing is developed, additional equipment needs should be identified, and efforts made to procure the required items Potential funding sources for the equipment include the newly established Authorities, the Government of Egypt, and/or international donors. Example lists of equipment requirements for the crews proposed to make up the Water Loss Management Team are presented in a later part of this chapter.

Task 4.3 - Procure Needed Equipment/Train Water Loss Management Staff in Equipment Use: All agreements for the purchase of additional equipment should include requirements for on-site training of Water Loss Management Team staff in the use, maintenance and basic repair of the items.

Task 4.4 - Conduct Additional Focused Meter Survey and Leak Detection Investigations in Identified Areas: Once the Water Loss Management Team is properly staffed, trained and equipped, the team should initiate additional efforts in accordance with the established plan. The goals of the additional surveys and field investigations should be:

- To identify areas where immediate action can be taken to reduce levels of unaccounted-for or non-revenue producing water; and

- To refine the prioritized plan for expansion of the water loss management efforts based on sampling results.

3.4.2.5. Development of a Prioritized Water Loss Management Action Plan

Task 5.1 - Compile Data from Bulk Metering, Additional Focused Meter Surveys and Leak Detection Efforts. Data obtained from the improved production metering and additional meter surveys and leak detection efforts should be compiled and analyzed by the Engineer-in-Charge of the Water Loss Management Team. The analysis should focus on updating and refining estimates of the current status of unaccounted-for-water and physical leakage in specific areas of the water system, as well as on a system-wide basis

Task 5.2 - Review Updated Customer Listings and Billing Data: Findings from the additional residential and large meter surveys should be reviewed with the Customer Accounting Department's records to develop area-specific estimates of unaccounted-for-water, and to assess the relative importance of metering errors and physical leakage on system performance Results from the analysis should be used to develop recommendations for improvements to the Customer Accounting Department's consumer database.

Task 5.3 - Use Data from Investigations to Develop a Prioritized Plan for On-going Meter Survey and Leak Detection Efforts As a result of the analyses described above, a comprehensive, prioritized water loss management action plan should be formulated for the utility. The plan should include specific recommended actions to be undertaken by each of the crews working within the Water Loss Management Team and should establish measurable targets for indicators such as percent of services metered, percent of meters working, level of accounted-for-water, etc

3.4.2.6 Implementation of the Prioritized Water Loss Management Action Plan

Elements of the Recommended Water Loss Management Program described to this point deal primarily with limited efforts and investigations aimed at defining a practical and cost-effective plan for implementing water loss management activities on a systemwide basis The prioritized Water Loss Management Action Plan is intended to be the result of these efforts This plan will also establish the framework for proceeding with activities as required to address problems on a systemwide basis Once this framework is established, specific programs can be implemented as follows:

Task 6.1 - Implement Production Metering Activities: Permanent facilities for accurately monitoring water production and delivery to the water system should be designed and installed. Information collected from the assessment of water production performed in the initial stages of the water loss program will provide valuable background for this effort. Figure 3-2 shows a proposed work flow plan for production metering activities

Task 6.2 - Implement Systemwide Survey of Unmetered and/or Unauthorized Water Use: Based on the results of the additional random sampling of residential and large user connections, systemwide efforts aimed at rationalizing unmetered and unauthorized water use should be implemented. Such efforts should be coordinated with improved meter reading efforts in both the residential and commercial sectors. Figure 3-3 shows a proposed work flow plan for this survey.

Task 6.3 - Implement Survey/Repair/Replacement of Residential Service Meters: The results of the additional sampling of residential connections will also provide the basis for phased, systemwide efforts aimed at improving both the coverage and quality of residential metering. Specific activities included in this element of the program may include widespread repair/replacement of meters or localized meter installation efforts aimed at eliminating clusters of unmetered connections. Such activities will have to be coordinated with the development of meter repair workshop capabilities within each utility. Figure 3-4 shows a proposed work flow plan for this continued survey of residential meters.

Task 6.4 - Implement Survey/Repair/Replacement of Commercial and Large User Meters: Results from the expanded survey of large service meters should clearly indicate the benefit that an aggressive large meter testing/repair/replacement program could have. Based on results of the random sampling conducted for the institutional assistance program, it is anticipated that this will be one of the areas where large quantities of unaccounted-for-water can be found and eliminated in a relatively short period of time. As a result, it is recommended that this effort receive a high priority. Figure 3-5 shows a proposed work flow plan for the survey of commercial and large meters

Task 6.5 - Implement Staged Program of Leak Detection/Repair: Preliminary investigations performed in conjunction with this effort have shown that conventional leak detection efforts are of limited effectiveness within the present Minia and Beni Suef water systems. However, as the other elements of the water loss program are implemented, it is believed that it will be possible to identify specific areas where leak detection techniques can be useful in locating segments of the system requiring repair. Thus, initial phases of the leak detection efforts should be aimed at procuring equipment and developing procedures that can be effective on a localized basis within the Minia and Beni Suef systems.

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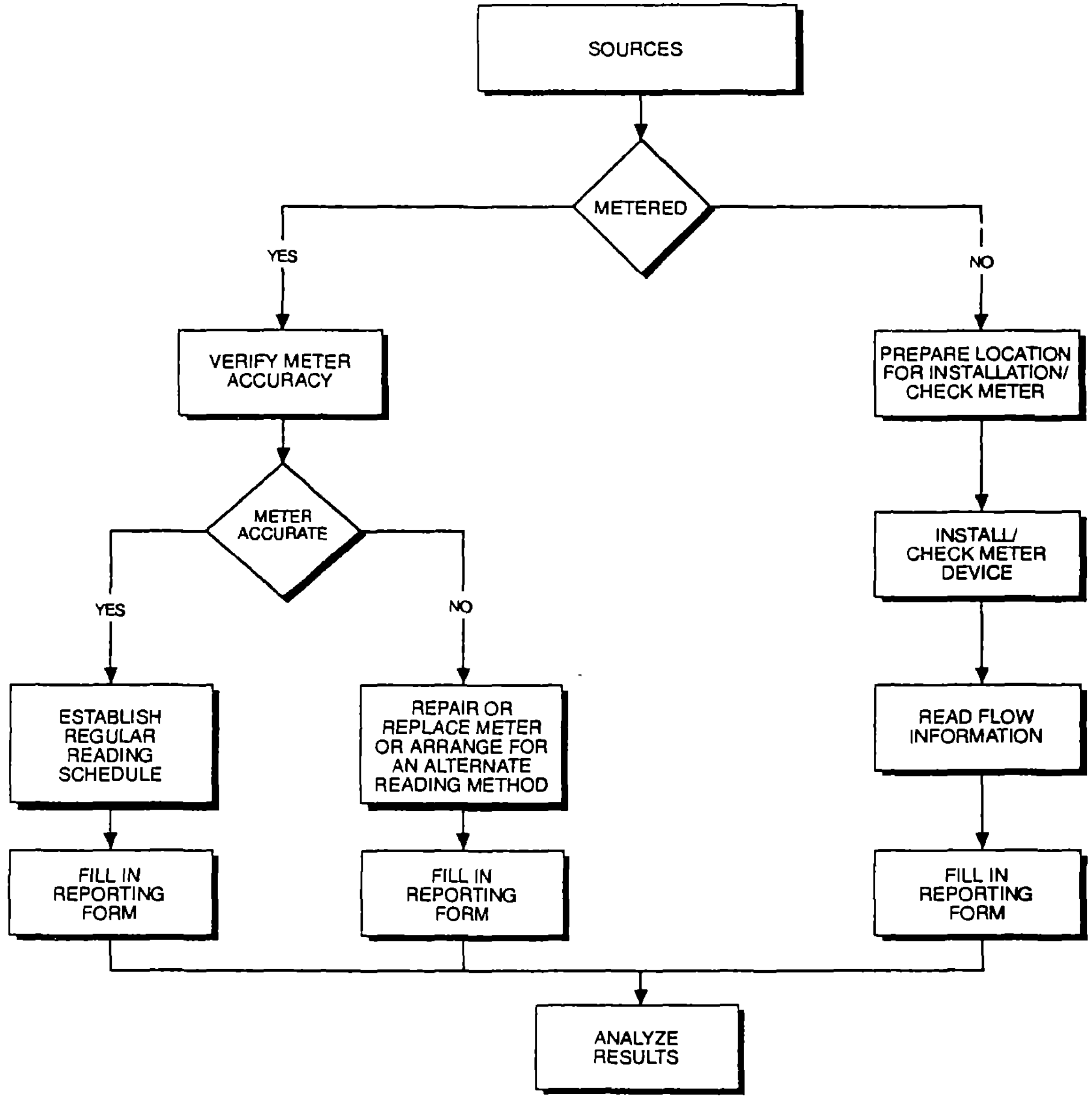

Figure 3-2

PROPOSED WORK FLOW
LARGE METER SURVEY TEAM
WATER PRODUCTION METERS

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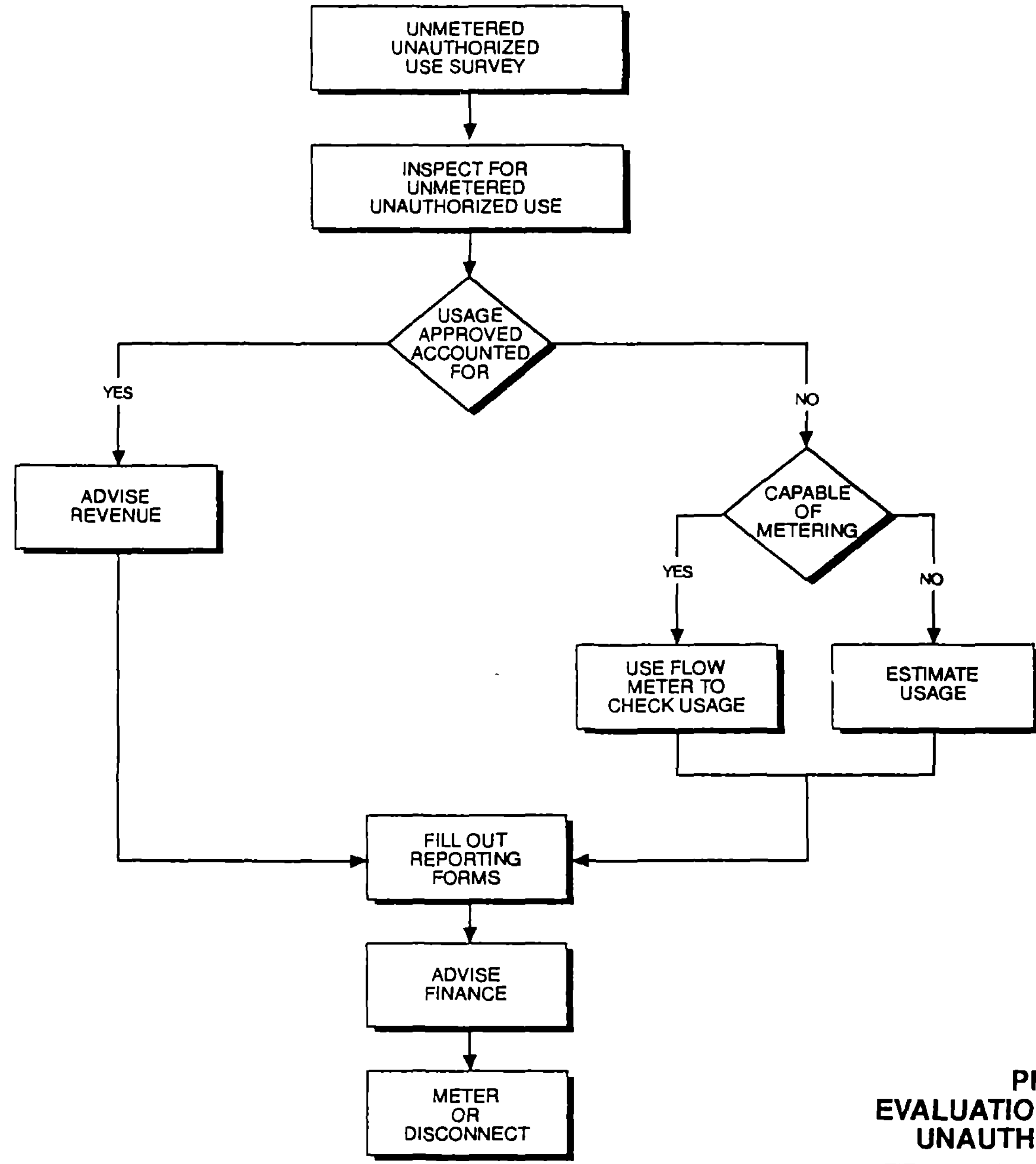

Figure 3-3

PROPOSED WORK FLOW
EVALUATION OF UNMETERED AND UNAUTHORIZED CONNECTIONS

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

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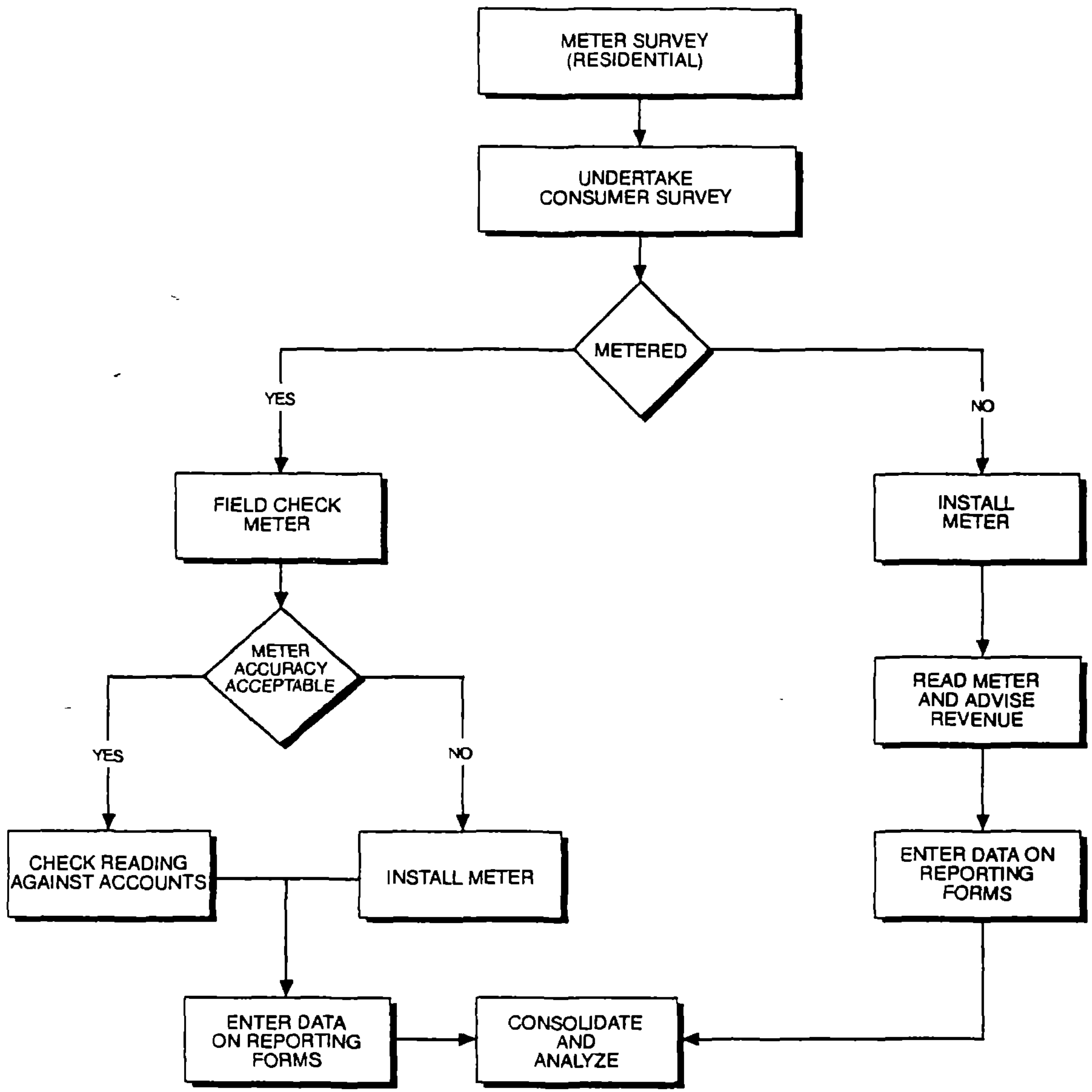

Figure 3-4

PROPOSED WORK FLOW RESIDENTIAL METER SURVEY TEAM

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

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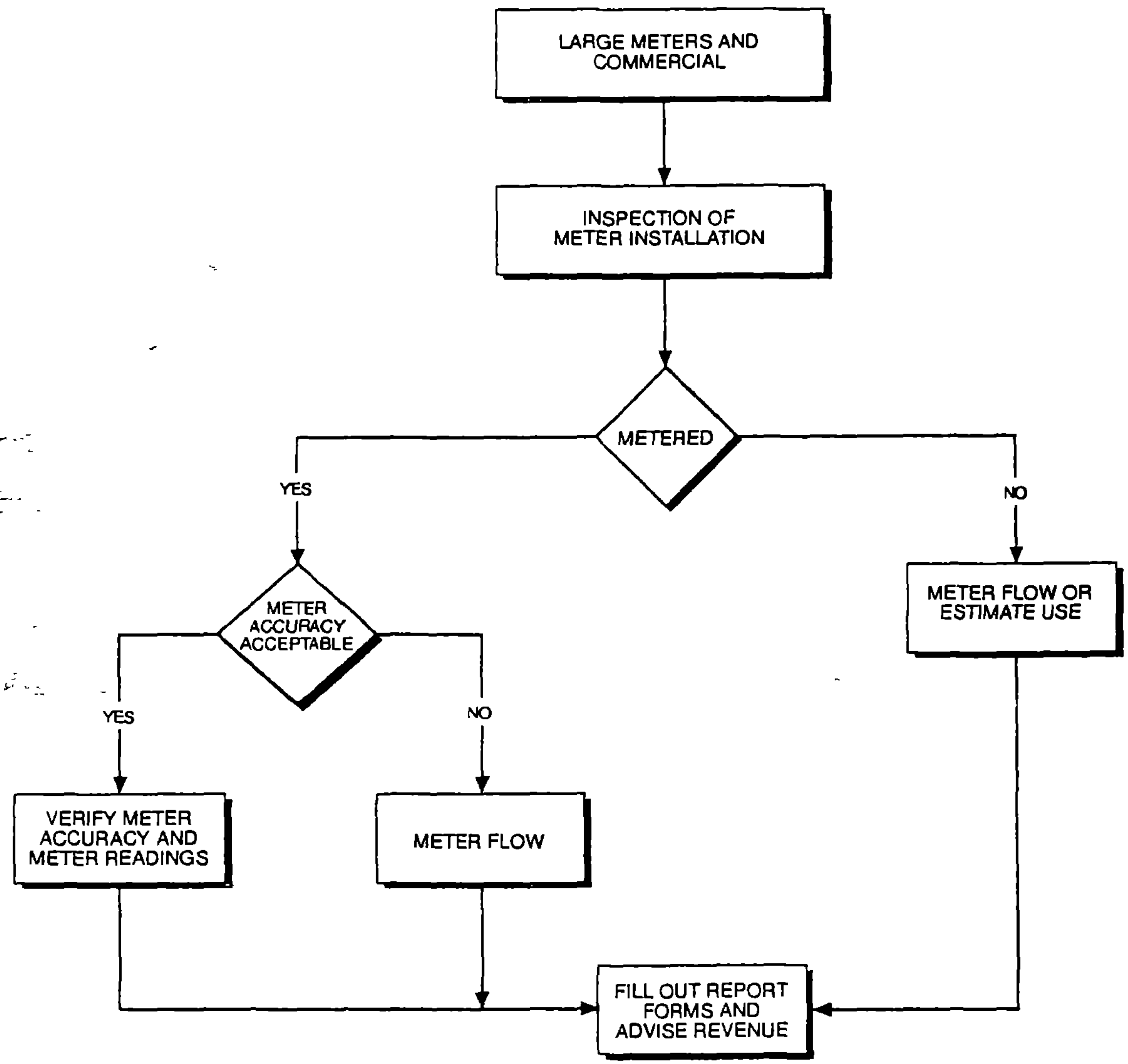

Figure 3-5
PROPOSED WORK FLOW
LARGE METER SURVEY TEAM
LARGE AND COMMERCIAL METERS
INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

3.4.2.7 Continued Support of On-going Water Loss Management Efforts

Water Loss Management is not a one-time activity for any utility. Therefore, as the authorities in Egypt move forward with the formulation and implementation of these programs it is important that they also recognize that certain elements of these programs will have to be continued well into the future. In fact, most aspects of the water loss management program should eventually become part of the utility's routine, daily operations. Early planning for this transition from an intensive effort aimed at achieving dramatic improvements in a short period of time, to a routine effort intended to prevent unaccounted-for-water from becoming a recurring problem will foster the establishment of a sustainable water loss management program. Key elements of this long-term strategy should include the following tasks:

- Performing periodic reviews of program impacts, benefits and costs;
- Refining the comprehensive program based on results of activities; and
- Identifying/addressing changing staffing and equipment needs.

3.4.3 Equipment Requirements

In order to be effective, water utility staff assigned responsibility for water loss management must have access to basic tools and equipment. Specific equipment needs identified for each of the crews which make up the proposed water loss management teams follow·

Residential Meter Survey Team

- hand tools for working on residential meters
- spare meters and meter yokes
- Muni 1 Meter Test Set (or equal for testing of residential meters in the field)
- mini-tapping machine
- corporation stops (1-inch diameter)
- repair clamps of various sizes
- clipboards, reporting forms, stopwatches, pens, etc
- team vehicle

Large Meter Survey Team

- hand tools for working with large meters
- portable magnetic flow meter
- portable Doppler ultrasonic flow meter
- meter installation equipment

- tapping machine for pressurized lines
- corporation stops (1-inch diameter)
- tapping clamps and supplies
- repair clamps of various sizes
- clipboards, reporting forms, stopwatches, pens, etc.
- team vehicle

Leak Detection Team

- hand tools for working with leak detection equipment
- leak locators
- pipe locators
- leak correlator
- valve listening device
- clipboards, reporting forms, pens, etc.
- team vehicle

Unauthorized/Unmetered Connection Equipment

- hand tools for working with water distribution facilities
- pipe/valve box locators
- portable magnetic flow meter
- portable ultrasonic flow meter
- installation equipment for portable flow meters
- Muni 1 Meter Test Set (or equal for testing of residential meters in the field)
- valve listening device
- mini-tapping machine
- corporation stops (1-inch diameter)
- repair clamps of various sizes

General Office Equipment

- communication radios
- personal computers (100 MHz Pentium or better)
- computer printers
- miscellaneous office equipment and supplies

Table 3-13 provides a summary listing of the equipment recommended for the water loss management team along with estimated purchase costs.

3.5 Conclusions and Recommendations

By following a structured approach in implementing a Water Loss Management Program the Governorates of Minia and Beni Suef can make marked improvements in their accounting of the water produced. Estimates developed based on random sampling of services within the Governorate of Minia suggest that improved metering alone could result in the elimination of almost 500,000 m^3 month of unaccounted-for-flow. However, given the existing conditions in the areas, it will not be possible to achieve all of the benefits of such a program immediately. Rather, the overall benefits of the program will become increasingly evident as improved mapping becomes available, accurate bulk metering is put in place, residential and commercial meters are replaced, and meter repair capabilities come on line.

Even so, short-term benefits can result from the effective and planned implementation of a water loss management program.

Specific actions recommended to achieve these short-term benefits include:

- Document the location, character and capacity of all existing sources of supply to the water systems;
- Assess the equipment/improvement needs required to implement reliable metering of water production;
- Implement the improvements required to obtain reliable metering of water production;
- Expand the program of random residential meter inspection and testing as the basis for identifying critical areas where meter repair/replacement is necessary;

Table 3-13

EQUIPMENT NEEDS FOR WATER LOSS MANAGEMENT GOVERNORATES OF MINIA AND BENI SUEF

Unit	Equipment	Number	Cost/Unit	Total Cost
Water Loss Management				
	Communication Radio	10	$1,000 00	$10,000 00
	Computer 100 Mhz Pentium	2	$3,000 00	$6,000 00
	Printers	2	$800 00	$1,600 00
	Miscellaneous Equiment	1	$5,000 00	$5,000 00
		Sub Total		$22,600 00
Leak Detection				
	Leak Locators	2	$2,000 00	$4,000 00
	Pipe Locators	2	$800 00	$1,600 00
	Leak Correlator	1	$20,000 00	$20,000 00
	Valve Listening Device	3	$150 00	$450 00
	Vehicle	1	$20,000 00	$20,000 00
	Miscellaneous Tools	1	$5,000 00	$5,000 00
		Sub Total		$51,050 00
Major Meters				
	Magnetic Portable Meter	2	$10,000 00	$20,000 00
	Portable Ultra Sonic	1	$10,000 00	$10,000 00
	Muni 1 Meter Tester	2	$800 00	$1,600 00
	Meter Listening Device	2	$150 00	$300 00
	Valve Locator	2	$800 00	$1,600 00
	Mini Tapping Machine	1	$5,000 00	$5,000 00
	1" Corporation Stops	100	$75 00	$7,500 00
	Clamps Various sizes	200	$125 00	$25,000.00
	Miscellaneous Tools	1	$5,000 00	$5,000 00
	Vehicle	1	$20,000 00	$20,000 00
		Sub Total		$96,000 00
Unauthorized Flow				
	Pipe/Valve Box Locators	2	$800 00	$1,600 00
	Magnetic Portable Meter	2	$10,000 00	$20,000 00
	Portable Ultra Sonic	1	$10,000 00	$10,000 00
	Muni 1 Meter Tester	2	$800 00	$1,600 00
	Meter Listening Device	2	$150 00	$300 00
	Mini Tapping Machine	1	$5,000 00	$5,000 00
	1" Corporation Stops	100	$75 00	$7,500 00
	Clamps Various sizes	200	$125 00	$25,000 00
	Miscellaneous Tools	1	$5,000 00	$5,000 00
	Vehicle	1	$20,000 00	$20,000 00
		Sub Total		$96,000.00
Meter Repair Workshop				
	One Complete In Place	1	$50,000 00	$50,000 00
		Sub Total		$50,000 00
Water Line Repair Clamps	Various Sizes	1000	$120 00	$120,000 00
Valve Repair Equipment		1000	$50 00	$50,000 00
		Total		$485,650.00

- Continue the program of inspection and testing of commercial and large service meters;
- Continue the program of inspection of municipal, public and governate connections for unmetered water use;
- Dedicate, train and equip selected staff to lead water loss management efforts in the utility; and
- Promote the implementation of the full water loss management program recommended.

As outlined, the recommended program for expanding activities conducted under this institutional support assistance project and working toward comprehensive programs will provide the two authorities with the opportunity to begin to tackle the pressing problem of water accountability. By reducing unaccounted-for-water the authorities will improve their abilities to manage the available supplies of water and improve the levels of service that they provide to their customers. Activities required by the program will result in improved records and knowledge of key system facilities, increased training of staff in water loss management efforts, and increased education of customers in the importance of water loss reduction efforts. The program will also enable the utilities to increase the revenues generated through the sale of water under the current tarriff structure. The relationship of the water loss management program to improvements in billing and collection activities and the financial performance of the utility are discussed in the following chapter. The relationship of these recommendations to the overall improvement action plans for the authorities is shown in the implementation timeline presented in Chapter 7.

Chapter 4
BILLING AND COLLECTIONS

4.1 Introduction

Budgeted Total Revenue Requirements (BAB 1 & 2) for the new Minia Water Authority for 1995-96 are projected to be 17 4 million LE while billed revenue and cash receipts are projected at 12.7 and 10.4 million LE respectively. In the new Beni Suef Water Authority Total Revenue Requirements for 1995-96 are projected to be 8.9 million LE with billed revenue and cash receipts at 5.5 and 3.2 million LE respectively. With the differences between revenue requirements and cash receipts (7.0 million LE for Minia and 5.7 million LE for Beni Suef) made up by subsidies from the Ministry of Finance, improving cash receipts is probably the most critical challenge facing both of the new authorities. The solution process is difficult and multi-faceted. It requires the correct organization and strong, dedicated leadership in the customer service function; it requires a thorough review of expenditures to eliminate any unnecessary costs; it requires a comprehensive program for improving billed consumption and revenue collections; and it requires social, political, and institutional acceptance of a new concept for providing water.

It will take years to completely implement many of the necessary programs, which means that relatively high levels of subsidy will still be required in the early transition years. The time required relates to customer and institutional acceptance of change as well as the shear size of the work load that must be assimilated by the many new personnel accepting major responsibilities for improvements in the new organizational structure. A method of prioritizing improvement projects must be devised to ensure that discretionary programs are undertaken on the basis of productivity while essential programs are undertaken irrespective of productivity. The basic method for prioritizing discretionary projects should be to select the projects in descending order of the positive net present values of cash flows associated with each project. Allowance must be made in this process, however, for essential elements that might not have an early payback. For example, a computerized billing system is an essential component of improving revenue collections, but it is costly to implement because of equipment cost, personnel training, and implementation time.

This chapter presents a prioritized plan of recommended actions intended to yield real, short-term improvements in water billings and collections for the new authorities. The chapter includes an analysis of the current state of water billings and collections in the two governorates and recommendations for immediate actions The actions recommended will complement parallel short-term improvements in the areas of water loss management and financial budgeting and accounting

4.2 Current Methods

Minia and Beni Suef use essentially the same system for billing and collections, but with some important differences. The basic methods and some of the exceptions are described below:

- Virtually all customers are metered but approximately 43 percent of the meters in Minia and 62 percent in Beni Suef do not work or cannot be read.

- Meters are read monthly in most cities and the readings are turned-in to the revenue office which calculates the bills. Customers pay their bills at the revenue office. Most customers go to the revenue office and pay their bills at their convenience every 3 to 6 months

- Meters are also supposed to be "read" monthly in villages but in these cases the meter reader also collects the amount owed. In reality, meter readers in villages read meters every 2 to 6 months and charge an estimated amount (because most meters don't work) even where meters are working.

- Meter readers do not stop at meters they know don't work or cannot be read; generally they do not stop at customers they know are on a minimum or fixed (estimated) charge, or customers who do not pay their bills, such as mosques, churches, or certain judicial or other "exempt" customers Since avoiding these meters reduces the reader's workload there is no motivation for meter readers to cooperate with the revenue office in identifying non-operable meters for repair or replacement.

- Meter readers are supposed to report all meters that do not work; however, actual reports are commonly delayed or not made at all

- In Minia, during the period between the meter malfunction and the meter reader's notification of the malfunction, the customer is charged a minimum bill, which for residential customers is for one cubic meter of water costing 23 piastres. After a malfunctioning meter is reported, the customer is charged an estimated bill based on the average of the last three months of meter readings. The average bill is retroactively applied through the minimum billing period This method biases the estimated charge downward because meters almost always under-record just prior to breakdown. There is no inducement for customers to remedy their malfunctioning meter in either the minimum or the estimated bill situation.

- In Beni Suef, when a monthly meter reading is not turned in to the revenue or collection office, a minimum charge is established for 20 cubic meters of water per month, (4 60 LE per month), or the average of their last three months readings, whichever is higher. Most

residential accounts use 10 or less cubic meters per month; so the minimum charge is a significant inducement for the customer to repair or replace his meter at his own expense.

- In Minia, the water bills for primary, prep, and secondary schools are supposed to be paid by the Ministry of Education. No payments have been made since June 1992.

- The same system used for small customers is also applied to large customers except that bills are delivered to the customers by revenue office personnel and payment is collected at the customer's site. The customers frequently request that the collector come back for various reasons and many delay payment indefinitely.

- Records are not kept of delinquent accounts at the revenue office; so there is no follow-up mechanism to press for payments. Many customers who don't pay are simply lost after a period of time In Minia, the meter reading/billing records prior to 1990 have been discarded so that there is no way to document receivables prior to 1990. In Beni Suef, accounts have an identification number on the house as part of a developing computerized billing system which currently includes only a listing of various account data. Billings are not currently generated In addition, Beni Suef has been divided into 27 zones with 5 collection offices to facilitate customers access to bill payment centers.

- In Minia, a number of large accounts do not pay for their water For example, the meter for the airport (part of the military) cannot be found; and the customer does not pay the estimated bills (440 m^3 per month) which equates to about 2,000 LE annually.

- Significant water losses occur from free water dispensed from hydrants at the Minia treatment plant to tanker trucks.

These conditions are indicative of several general problems in the existing billing and collection systems.

- First, the existing residential metering system is in poor condition. Of the meters in place in the two governorates roughly half are inoperable or cannot be read Where meters are working, spot checks suggest that only about 25% are reasonably accurate. As a result, the new authorities lack the hardware to reliably meter customer consumption.

- Secondly, the current billing and collections procedures are not conducive to the identification or repair of inoperable meters. Meter readers have no incentive to check all of the meters on their route, and , in Minia, customers have no incentive to pay for repair or replacement of their meters when they fail

4.3 Meter Survey Results

As a result of many of the practices described above, the revenue generated by a significant portion of the water that is produced, distributed and consumed within Minia and Beni Suef is far less than should be generated. The actual impact of these practices on the financial condition of the new authorities is illustrated by the results of field inspections and tests of residential and commercial meters performed in the governorates.

4.3.1 Survey Results - Residential Meters

In order to quantify the impact of unread and inoperable meters on the revenue stream of the utilities in Minia and Beni Suef, results from the analysis of unaccounted-for-water were analyzed on a cost basis.

Randomly selected blocks of accounts were surveyed to identify if the meters were working and how the billing process was applied to those that were not working. Details of the survey procedures are provided in Chapter 3. In this chapter potential increase in revenue that could result from improved metering of billing and collection practices. In Table 4-1, results of the residential customer survey are summarized and used to project potential revenue increases for the total authorities.

TABLE 4-1

RESIDENTIAL CUSTOMER SURVEY RESULTS

City/Village	Total Accts	Sample Size	% Not Working	Avg Use m^3/mo	Under Billed[1]	Potential Revenue[2]
Minia Water Authority						
Minia City	35,300	330	43 6	23 1		
Samalut Town	11,481	94	42 6	17 8		
Talla Village	2,596	17	35 3	80 4		
Total Sample Areas	49,377		43 1	24 9		
Total Authority	205,823		43 1	24 9	12 7	2 9
% of Total 1995-96 production and cash receipts					31 7%	28.0%
Beni Suef Authority						
Beni Suef City	32,650	194	61 9	39 8		
Beba City	5,400	66	60 6	16 6		
Total	38,050	260	61.5	36 5		
Total Authority	109,489		61 5	36 5	6 7	1 5
% of Total 1995-96 total m^3 and cash receipts					52.3%	46.3%

1 *Minia = 205,823 * 431 *(24 9-1) * 50% * 12 = 12 7 million m^3 water per year*
*Beni Suef = 109,489 * 615 * (36 5 - 20) * 50 % = 6 7 million m^3 water per year*
2 *Minia = 12 7 * 23 LE = 2 9 millions of LE per year*
*Beni Suef = 6 7 * 23 LE = 1 5 millions of LE per year*

The projections of under-billing and potential additional revenue are based on estimates of the percentage of inoperable meters in each service area, estimates of average actual consumption (determined from readings of working meters), and current unit costs for water. In the Minia sample, 43.1% of the meters checked were found to be not working Of these, all but three were found to have been billed for the minimum consumption of 1 m^3/month, even though the estimated average monthly consumption in Minia was found to be 24 9 m^3/month As shown in the table, if one half of the customers with non-working meters were to be billed the average consumption rate for the area (rather than the 1 m^3/month minimum), the Authority could recognize an increase in annual revenue of approximately 2.9 million LE

In Beni Suef, customers with non-working meters are charged for a minimum usage of 20 m^3/month even though the average usage determined from the sample of working meters was 36.5 m^3/month. If accurate metering or a revised billing policy were to result in one-half of these customers being charged for the estimated actual average use, the Authority could recognize an increase in annual revenue of approximately 1.5 million LE

Even with the conservative assumptions used, the potential increases in annual revenue for the authorities are significant. In Minia, the additional 2.9 million LE would be equivalent to a 28 percent increase in annual revenues. In Beni Suef, the additional 1 5 million LE would increase annual revenues by more than 46 percent. Such increases would provide both utilities with critically needed additional financial resources during their transition to self-sufficiency.

It should be noted that in Minia a significant increase in revenue can be achieved immediately through adjustment of the current minimum charge billed to customers with non-working meters. This action can be taken regardless of the status of discussions concerning ownership, repair and replacement of meters. For the present, the increase in the minimum charge should serve as an incentive to customers to repair and protect their meters. In the future, when ownership of the meters is transferred to the Authority, the higher minimum charge will continue to serve as an incentive for customers to protect their meters and/or notify the authority when problems with the unit occur. As such, it is recommended that testing of meters and measurements of actual consumption continue to be made in order to support efforts to establish a more realistic minimum charge in Minia. Further sampling should also be conducted in Beni Suef in order to determine whether any adjustment in the current minimum charge is warranted.

Once the minimum charge is increased in Minia, the recovery of additional revenue in both of the governorates will depend on progress made in terms of the physical metering of customer services. As the percentage of working meters is increased and more accurate readings of actual consumption are obtained, further increases in revenue production will occur.

4.3.2 Survey Results - Large Accounts

The survey of large customers was concentrated in the Minia area A total of 32 accounts were investigated and 18 were found non-working meters Of the 18, nine were found to be paying a minimum charge, which for large commercial accounts is the charge for use of 40 cubic meters of water per month M-ter testing showed that these nine accounts actually used 41,667 cubic meters per month or 0.5 million units per year at a billing value of 0 2 million LE as shown in Table 4-2

TABLE 4-2

LARGE CUSTOMER SURVEY RESULTS

City / Village	Selected Accounts	% Not Working	Avg Use m^3/mo	Under Billed (1)	Potential Revenue (2)
Minia Area Accounts	9	100 0	41,667	0 5	0 2
% of Total 1995-96 total production and cash receipts				1 2%	1 9%

*Note 1 41,667 *12 = 5 million m^3*
*Note 2 0 5 million m^3 * 40 LE/unit = 2 million LE*

Data required to project this sample to a larger population is not presently available; however, there are additional large accounts in the governorates for which this situation applies Further work should be undertaken to inspect and test the meters of large accounts, or periodically flow test the meters to allow realistic bills to be prepared

The results of the residential and large meter surveys indicate a very large potential for the capture of increased revenue from the sale of water by the new authorities in Minia and Beni Suef. The potential for increased income is particularly significant in the area of residential metering and billing. Based on these results, projections of increased revenue through improved metering, billing and collection have been incorporated into the financial analysis of the utilities. The impact of this increased revenue source is discussed in the Financial Modeling section of the following chapter.

4.4 Recommendations

The results of the analysis described above clearly demonstrate the importance of improvements in the areas of metering, billing and collections to the financial success of the new authorities Specific actions required to achieve such improvements are presented below in the form of an immediate action plan for billings and collections. The role of these improvements in the overall action plan for the new authorities is illustrated in Chapter 7 of this report

Based on the review of current practices and consultation with authority personnel, the following are recommendations to be implemented during the first 18 months of operation for each Authority·

- Perform a consumer survey intended to identify all customers served by the utility
- Design a consumer identification system that does not rely on mailing addresses
- Update the consumer data base with information on user identification, meter status, meter data, etc.
- Increase the minimum charge for non-working meters to induce meter repair or replacement.
- Promote improved metering of residential and large customers in coordination with water loss management efforts.
- Adopt a policy to transfer ownership of all water meters to the authorities.
- Rationalize illegal connections.
- Rationalize past due bills by developing alternative payment plans to facilitate gradual repayment.
- Prepare billing policies and initiate billing of municipal and all legal consumers
- Analyze the cost savings associated with reductions in the frequency of meter reading and billing periods.
- Develop and implement a system to decentralize bill collection.
- Prepare and implement strong collection enforcement policies. Initiate discussions regarding new policies at the ministerial level
- Adopt policies to encourage meter readers to read all meters and participate in identification of non-working meters.
- Prepare and implement a consumer education program that includes such items as system information, billing information services, new collection and enforcement policies, and water conservation issues.

- Purchase additional computer hardware and software as required to support current billing and collections procedures

Over the longer-term, the authorities should continue efforts to improve the effectiveness of the billing and collections practices through:

- Increased inspection, testing, repair and replacement of service meters, particularly those used by large water users;

- Further development of a comprehensive customer information database;

- Regular review and revision of billing policies and tariffs;

- Addition of new payment collection centers in conjunction with the development of improved database and computer facilities; and

- Coordination of plans for improved billing and collections with plans for on-going water loss management efforts.

Chapter 5
BUDGETING AND FINANCE

5.1 Introduction

A primary objective of the Provincial Cities Project is to identify needs and prepare programs that, when implemented, will provide financial viability and self-sustainability to the Minia and Beni Suef Water and Wastewater Authorities over a 5 to 7 year period

The project team's approach to preparing the programs was to:

- Collect data on the current budget, financial and tariff systems;
- Build a model of the existing systems used to test for impacts from various alternative improvement programs;
- Incorporate the most effective programs into a proposed budget/tariff system (Financial Model) for each of the governorates that allows for flexible planning and monitoring of results over a ten year period; and
- Prepare a financial action plan.

The methods employed and a summary of findings are presented in this chapter. Recommendations for actions programs that should be implemented as soon as possible are identified and discussed.

Financial viability (revenues equal to or greater than expenditures) is anticipated during a 5 to 7 year period only for Operations and Maintenance expenditures. Nevertheless, the budget system and financial model have been developed to include capital spending requirements as well, to be used when capital spending is integrated into the authority's responsibilities

Financial viability will be achieved primarily by improving the billing and collection process to include a higher percentage of billed consumption, and a higher percentage of revenue collections. Tariff increases will also be required, partly to pay for real increases in costs and partly to recover the effect of inflation on Operations and Maintenance (O&M) costs. In addition, increased water sales from population growth and improvements in the percentage of population served will add approximately 4 percent annually to revenues Reduced unaccounted-for-water (UAW), and strategic O & M cost reduction programs will also contribute to financial viability.

Subsidies will be required to pay the costs of operations during the transition period, and these are expected to diminish The current subsidies for Minia and Beni Suef are 7.0 and 5.7 million LE respectively. Elimination of subsidies for O & M is projected in 2003 for Minia and 2004 for Beni Suef. A balanced program is envisioned that includes increasing costs, increasing revenues including tariff increases, and decreasing subsidies over the entire transition period. All of the increased revenues realized cannot be applied to decreasing the subsidy since additional funds are required to design and implement the revenue improvement programs, as well as undertake other programs to extend and improve service.

5.2 Budgeting

The initial portion of the Project was to understand and evaluate the existing budgeting systems used in the Minia and Beni Suef Governorates From the results of the evaluation, a recommended budgeting system was designed and adapted that could not only be implemented immediately but also grow in sophistication as the water authorities exert their organizational and financial independence. Budgeting systems can be very simple or complex depending on their purpose and the degree of computer power that is used in their preparation. The intent during the design of the recommended system was to maintain simplicity for near-term implementation but provide a structural and procedural basis for enhancements over time. The scope of work undertaken was not to implement a definitive budgeting system for the authorities, but rather to identify and recommend a system that can feasibly be implemented, giving consideration to needs and capabilities of the authorities, in the short and long term.

5.2.1 Data Collection and Compilation

The major thrust with the existing 1994-95 budget has been to compile the data in detail both geographically within the proposed authority and by line item of expenditure The number of line items of expenditure being used is about 30 with only 22 reflecting significant activity. The number of line items needed for expenditures can evolve over time to include any significant items of controllable cost. (Refer to the Chart of Accounts in Annex 4-1 for suggested additional expenditure items.) A summary of the 1995-96 budget, which is used as the 1996-97 budget for financial modeling, is provided in Table 5-1 for Minia and Table 5-2 for Beni Suef.

The detail data came primarily from the Housing Directory for city and village budget data, and from the Housing Directory and the Information Center for population and customer connection data. There were substantial inconsistencies between the data sources for population, population served, connections, and billed water as the data was initially collected. A consensus was reached that the Information Center data for population and connections is the official data and should be used for all analyses. The differences point out the need for a sound data reporting component in the budgeting system In addition, the differences reinforce the fact that the budgets, as

Table 5-1

MINIA WATER AUTHORITY

1996-1997 BUDGET

	A	B	E	F	G	H	I	J	K	L	M	P
1						MINIA WATER AUTHORITY						
2		USAID - PROVINCIAL CITIES DEVELOPMENT PROJECT				1996-97 BUDGET						
3												
4		15-Aug-96	SUMMARY BY MARKAZ									
5		05 43 PM										
6	Object	Category	Minia	El Edwa	Samalut	Matai	Beni Mazar	Maghagha	Abo Qurqass	Mallawi	Deir Mawaas	Total
7	Code		Markaz	Markaz	Markaz	Markaz	Markaz	Markaz	Markaz	Markaz	Markaz	
8												
9		Population	657 475	167,702	465,994	214,810	399,015	355,595	409 896	614 918	288,398	3,573,803
10		Population Served	615,879	154,218	323,600	161,912	329,269	324,400	328,226	542,193	211,879	2,991,576
11		Population Not Served	41,596	13,484	142,394	52,898	69,746	31,195	81,670	72,725	582,227	582,227
12		% Population Served	93 7%	92 0%	69 4%	75 4%	82 5%	91 2%	80 1%	88 2%	73 5%	83 7%
13												
14		Number of Connections										
15		Residential	49,635	9,545	24,456	9,970	25,679	21,475	22 270	32 465	10,328	205,823
16		Comm'l Stores	1,760	133	801	190	1,237	1,038	147	1,899	126	7,331
17		Municipal	1,012	179	331	173	214	445	378	437	330	3,499
18		Other	0	0	0	0	0	0	0	0	0	0
19		Total	52,407	9,857	25,588	10,333	27,130	22,958	22,795	34,801	10,784	216,653
20		Pop / connection - Total	11 75	15 65	12 65	15 67	12 14	14 13	14 40	15 58	20	13 81
21		Pop / connection - Residential	12 41	16 16	13 23	16 24	12 82	15 11	14 74	16 70	20 52	14 53
22												
23		Water Production m3	23,540,580	3,162,820	12,907,358	3,150,362	9,496,080	8,869,802	6 025 953	12,943,860	6 553,160	86,649,975
24		Production per population served	38 2	20 5	39 9	19 5	28 8	27 3	18 4	23 9	30 9	29 0
25		Production per connection	449 2	320 9	504 4	304 9	350 0	386 3	264 4	371 9	607 7	399 9
26												
27		Water Sold m3	11 990,864	1,798,172	9,799,213	1 789,994	5,139,876	4,838,813	2,949,838	9,080,615	1 737,480	49,124,865
28		Percentage of Production	50 9%	56 9%	75 9%	56 8%	54 1%	54 6%	49 0%	70 2%	26 5%	56 7%
29		Water Sold per population served	19 5	11 7	30 3	11 1	15 6	14 9	9 0	16 7	8 2	16 4
30		Water Sold per connection	228 8	182 4	383 0	173 2	189 5	210 8	129 4	260 9	161 1	226 7
31												
32		Water Sold LE	3 324,263	472,108	2,655,862	292,613	1 152,273	1 256,349	784,492	2 375,751	392,773	12,706,484
33		Annual Revenue per Connection	63 43	47 90	103 79	28 32	42 47	54 72	34 42	68 27	36 42	58 65
34		Average Price per Unit	0 28	0 26	0 27	0 16	0 22	0 26	0 27	0 26	0 23	0 26
35		Amount Collected LE	2 368,965	387,963	2,232,929	248,490	822,277	1,135,526	713,165	2,050,408	392,209	10,351,933
36		Percentage Collected	71 3%	82.2%	84 1%	84 9%	71 4%	90 4%	90 9%	86 3%	99 9%	81 5%
37		Average Price per Unit Sold	0 20	0 22	0 23	0 14	0 16	0 23			0 23	0 21
38		Average Price per Unit Paid for	0 28	0.26	0 27	0 16	0 22	0 26	0 27	0 26	0 23	0 26
39		Arears LE	955 297	84,145	422,933	44,123	329,996	120,823	71,327	325,343	564	2 354 551
40												
41												
42		**REVENUE REQUIREMENTS**										
43		Salaries and Related Expenditures.										
44	601	Salaries	934 762	95,068	506 622	184,162	329,147	276,563	429,781	453,310	188,832	3,598,247
45	603	Incentive Compensation	261,773	76,062	94,796	23,450	143,762	126,141	206 883	193,920	44,105	1,202,434
46	605	Allowances for Conditions	348,139	19,700	154,699	39 625	102,866	94,852	54 200	157,729	40,290	1,140,250
47	607	Performance & COL Salary Adjmts	218,348	22,400	199,311	37,080	61,900	107,088	85,142	81,600	43,183	952,002
48	608	Pension and Insurance	165 941	35,426	156 120	28,500	141,188	104 869	151,042	162,389	53,570	1,097,545
49	609	Other Salary Expense										
50		Total Salary and Related Expenditun	1 928,963	248,656	1,111,548	312,817	778,863	709,513	927,048	1,048,948	369,980	7,990,478
51		Cost per unit of water produced	0 08	0 08	0 09	0 10	0 08	0 08	0 15	0 08	0 06	0 09
52		Cost per unit of water sold	0 16	0 14	0 11	0 17	0 15	0 15	0 31	0 12	0 21	0 16
53		Cost per unit of water paid for	0 23	0 17	0 13	0 21	0 21	0 16	0 35	0 13	0 21	0 20
54												
55		Operations and Maintenance.										
56	695	O & M Unspecified	118,650	0	0	0	0	0	0	-	0	118,650
57	615	Materials Direct & Indirect	541,000	14,409	39,150	0	26,162	40,938	5,950	2,800	11,000	689,409
58	620	Fuel and Oil	21 800	28 791	8,870	2,000	15,104	10,309	3 071	2,000	3,351	135 296
59	622	Oil & Grease	11,650	500	1,000	500	500	500	500	500	500	50,650
60	625	Electricity as function of production	686,949	213,152	360,993	136 381	478,667	398,438	293,206	735,228	395,966	3,701,980
61	627	Gasoline	900	900	900	900	900	900	900	900	900	14 000
62	629	Solar Fuel	0	0	760	0	0	0	0	13,600	0	15,360
63	630	Oil	100	100	100	100	100	100	100	1,330	100	5,230
64	640	Small Capital, Spare Parts	303,910	81 018	8,520	1,010	12,155	31,991	1 010	65,706	2,511	526 841
65	650	Lighting	50	0	50	0	50	50	50	50	50	3,500
66	652	Water	60	0	0	0	60	60	0	60	0	1 300
67	660	Supplies	50 600	100	100	100	100	100	100	100	100	51,900
68	670	Building and Equip Maintenance	86,370	1,270	1,570	1 270	1,320	1,320	1,570	91,234	8,310	222,704
69	675	Printing Expenditures	16,150	0	0	0	0	0	0	1,100	0	18,250
70	680	Trans & Comm Expense	80,140	290	290	290	390	390	390	2,190	410	87,450
71	685	Training	0	0	0	0	0	0	0	-	0	0
72	690	Other Contract Services	10	5 262	4,094	10	310	7 022	10	2,759	10	19,497
73		Total O & M Expenditures	1 918,339	345,792	426,397	142,561	535,818	492,118	306,857	919,557	423,208	5,662,017
74		Cost per unit of water produced	0 08	0 11	0 03	0 05	0 06	0 06	0 05	0 07	0 06	0 07
75		Cost per unit of water sold	0 16	0 19	0 04	0 08	0 10	0 10	0 10	0 10	0 24	0 12
76		Cost per unit of water paid for	0 22	0 23	0 05	0 09	0 15	0 11	0 11	0 12	0 24	0 14
77												
78		Total Operating Expenses	3 847,302	594,448	1 537,945	455 378	1,314,681	1,201,631	1 233,905	1 968,505	793,188	13,652,495
79		Cost per unit of water produced	0 16	0 19	0 12	0 14	0 14	0 14	0 20	0 15	0 12	0 16
80		Cost per unit of water sold	0 32	0 33	0 16	0 25	0 26	0 25	0 42	0 22	0 46	0 28
81		Cost per unit of water paid for	0 45	0 40	0 19	0 30	0 36	0 27	0 46	0 25	0 46	0 34

Table 5-2

BENI SUEF WATER AUTHORITY
1996-1997 BUDGET

	A	B	C	D	E	F	G	H	I	J
1							BENI SUEF WATER AUTHORITY			
2		USAID - PROVINCIAL CITIES DEVELOPMENT PROJECT					1996-97 BUDGET			
3		Budget Yr=	1996						Year =	96-97
4		15-Aug-96	SUMMARY BY MARKAZ							Total
5		03 15 PM								City +
6	Object	Category	Beni Suef	Al Fashn	Ahnasia	Beba	Ahwasta	Nasser	Sumosta	Villages
7	Code		Markaz	Markaz	Markaz	Markaz	Markaz	Markaz	Markaz	(C thru K)
8										
9		Population	403,221	264,593	228,012	259,622	187,830	189,243	148,155	1,680,676
10		Population Served	345,470	237,600	174,132	112,500	140,873	151,838	138,155	1,300,567
11		Population Not Served	57,751	0	11,238	0	0	0	0	167,411
12		% Population Served	85 7%	89 8%	76 4%	43 3%	75 0%	80 2%	93 3%	77 4%
13										
14		Number of Connections	46,895	12,600	9,513	9,930	11,775	10,717	8,059	109,489
15		Population per Connection	7 37	18 86	18 30	11 33	11 96	14 17	17 14	11 88
16										
17		Water Production m3	19,994,391	3,411,825	5,976,900	5,045,760	4,930,538	3,188,160	1,986,000	44,533,574
18		Production per population served	57 9	14 4	34 3	44 9	35 0	21 0	14 4	34 2
19		Production per connection	426 4	270 8	628 3	508 1	418 7	297 5	246 4	406 7
20										
21		Water Sold m3	9,382,424	3,259,825	991,944	3,567,020	2,465,269	1,136,284	1,089,095	21,891,861
22		Percentage of Production	46 9%	95 5%	16 6%	70 7%	50 0%	35 6%	54 8%	49 2%
23		Water Sold per population served	27 2	13 7	5 7	31 7	17 5	7 5	7 9	16 8
24		Water Sold per connection	200 1	258 7	104 3	359 2	209 4	106 0	135 1	199 9
25										
26		Water Sold LE	2,315,477	912,751	231,906	820,415	616,317	288,888	281,651	5,467,405
27		Annual Revenue per Connection	49 38	72 44	24 38	82 62	52 34	26 96	34 95	49 94
28		Average Price per Unit	0 23	0 23	0 23	0 23	0 23	0 23	0 23	0 25
29		Amount Collected LE	1,656,713	394,597	63,727	334,815	308,159	241,795	238,277	3,238,082
30		Percentage Collected	71 5%	43 2%	27 5%	40 8%	50 0%	83 7%	84 6%	59 2%
31		Average Price per Unit Sold	0 18	0 12	0 06	0 09	0 13	0 21		0 15
32		Average Price per Unit Paid for	0 25	0 28	0 23	0 23	0 25	0 25	0 26	0 25
33		Arears LE	658,764	518,154	168,179	485 600	308,159	47,093	43,374	2,229,323
34										
35										
36		REVENUE REQUIREMENTS								
37		Salaries and Related Expenditures.								
38	601	Salaries								1,848,873
39	603	Incentive Compensation								570,260
40	605	Allowances for Conditions								652,049
41	607	Performance & COL Salary Adjmts								1,090 210
42	608	Pension and Insurance								744,060
43	609	Other Salary Expense								
44		Total Salary and Related Expenditures								4,905,452
45		Cost per unit of water produced								0 11
46		Cost per unit of water sold								0 22
47		Cost per unit of water paid for								0 38
48										
49		Operations and Maintenance.								
50	695	O & M Unspecified								0
51	615	Materials Direct & Indirect								1,191,000
52	620	Fuel and Oil								32,450
53	622	Oil & Grease								5 816
54	625	Electricity as function of production								0
55	627	Gasoline								
56	629	Solar Fuel								
57	630	Oil								
58	640	Small Capital, Spare Parts								24,680
59	650	Lighting								36,750
60	652	Water								440
61	660	Supplies								34,540
62	670	Building and Equip Maintenance								50,470
63	675	Printing Expenditures								1,060
64	680	Trans & Comm Expense								3,495
65	685	Training								4,000
66	690	Other Contract Services								4,900
67		Total O & M Expenditures								1 389,601
68		Cost per unit of water produced								0 03
69		Cost per unit of water sold								0 06
70		Cost per unit of water paid for								0 11
71										
72		Total Operating Expenses								6,295,053
73		Cost per unit of water produced								0 14
74		Cost per unit of water sold								0 29
75		Cost per unit of water paid for								0 49

provided, must be treated as working tools rather than finished products because some of the data has been estimated by the Information Center or the Housing Directory. It will probably take several years before all of the data for some of the villages and sub-villages can be complied, but this is a normal budgeting process.

The level of detail for data by village was not consistent from village to village or from markaz to markaz within the Minia Water Authority, and for Beni Suef, budget data is simply not available by village in any usable format. The budget data that was received and then cycled through various corrections and additions with authority personnel, has been summarized and built into computerized financial models. Changes can be made in the future, but information presented in this report reflects conditions as of June 22, 1996.

The models developed for Minia were easily modified for use in Beni Suef through modification of the input data; however, for most marakez the separation of city and village data was not possible.

5.2.2 The Current Budgeting Process

The governorate prepares an annual budget for labor (BAB 1) and operations and maintenance costs (BAB 2). The latest detailed budget available from the governorates is for the 1994-95 budget year This budget is used as the base year (1996-97) for the financial model that projects revenues, expenditures, subsidies, and tariff requirements through 2006. In a normal budgeting situation, use of a nearly two-year old budget as the base year would be suspect, but given the methods currently used in Minia and Beni Suef, the loss of accuracy with the old budget is considered negligible.

The current budgeting system is thought to be a "Bottom Up" approach, which is highly recommended, because the needs of all villages and marakez are considered in the budget compiled for the Ministry of Finance for approval. However, the severe cutbacks that are imposed by the Ministry of Finance result in a total budget amount which is then allocated to the areas and functions. This is effectively a "Top Down" approach of allocating an acceptable total budget amount The current methods for budgeting have a number of shortcomings for long-term use, some of which are enumerated below:

- <u>The budget should reflect needs</u>. The current budgets are developed by averaging the last three years of budgets (or actual data if available) for the markaz cities and for the village councils, which include the smaller villages. This is not a legitimate budgeting process because inadequate budgets from the prior years are simply perpetuated year after year. A comparison of the Minia and Beni Suef budgets for key elements with four other utilities areas is provided in Table 5-3

TABLE 5-3

COSTS OF AVAILABLE WATER PER CUBIC METER FOR SIX EGYPTIAN LOCATIONS (In Piastres per cubic meter of water produced)

Cost Category	Minia 1994-95	Beni Suef 1994-95	El Azab 1994-95	Fayoum 1994-95	Damietta 1993-94	Alexandria 1993-94
Salaries	9 22	11 02	7.24	16 20	6 53	3 70
Commodity Costs						
Chemicals			4 04	6 14	1 96	1 19
Energy	8 62	7 00	8.80	6 97	7 67	4.29
Spare Parts			1 08	0 03	0 49	1 08
Other Mat'ls			0 08		0 14	
Subtotal	10 88	9 12	14 00	13 14	10 26	6 56
Services			0.36	0 07	0 52	0 45
Total O & M	20 10	20 14	21 60	29 41	17 31	10 71

Source IWACO, Fayoum Drinking Water & Sanitation Project, "Cost Recovery Strategy 1995-2000", February 1996

For the Minia Governorate, the labor budget, at 9.22 piastres per cubic meter of water produced, is slightly high compared to four other Egyptian cities, and the O & M budget (excluding labor), at 10.88 piastres, is comparable with the other utilities. For the Beni Suef Governorate, the labor cost of 11.02 piastres per cubic meter of production is higher than three of the other cities; however, the total O & M costs for Beni Suef are in the same range as the other cities.

- The budget process must require accountability. There is little or no accountability in the current budget process. There should be a true needs assessment at every budget unit level by the manager/supervisor in charge. The performance of the operation should reflect the satisfaction of the derived needs. The managers should be involved in budget preparation and must be held accountable.

- The budget must include reserves for operational emergencies It is impossible to accurately assess, for an entire year, the needs for every facility in every location. Available cash reserves of approximately 20 percent of annual O & M should be built into the budget over a period of time.

- The budget must include controls. Tracking actual spending compared to budget, by budget unit, is a necessity to ensure that necessary work is being done (within the budget) and that work not approved is not done Spending must sometimes exceed budget estimates, but additional spending should be approved before undertaken.

5.2.3 Proposed Budgeting System

The existing budgeting systems were assessed and an enhanced budgeting system is recommended to be used for future years. The recommended methods were presented to the Minia Water Authority's Chief Financial Officer in a day-long training session in late June. A record of that workshop is presented in Annex 5 to this report The recommended budgeting system, which is outlined and discussed below, is presented in some detail with a user guide and copy of the budget model for both Minia and Beni Suef on disk in Annex 4-2.

The recommended budgeting system is one that is used quite generally in the U.S , often in a database system such as Access, dbase III, Focus, Paradox, or Oracle Most of the recommended budget system is totally straightforward, requiring only a good orientation at all levels for use The more difficult aspect is that many of the data collection and reporting features should use a database computer system for data capture and reporting. A phasing-in process is suggested over the period that will be required to afford and assimilate computers and software, which could be 5 to 7 years. One computer should be employed, using Microsoft Excel and grow into a database system such as Microsoft Access as soon as possible The manually collected data from all of the marakez shall be recorded and reported to the authority for approval and back to the budget units as their performance targets Actual incurred costs should be reported at least quarterly, monthly for some key elements, to reinforce the need for budgeting accuracy and accountability to the budget unit managers.

The essence of the system is that budgeted costs are entered with sufficient coded detail such that reports and tracking can be rolled up by any organizational or functional level or combination of them. This requires the establishment of separate funds (accounting units with separate financial statements) for water and wastewater systems, separate functional areas of activity, such as Source of Water, Treatment, and Distribution for the water system and Collection, Primary Treatment, and Secondary Treatment for the

wastewater system. In addition, department codes must be entered and activity codes for work performed within the departments. Budget units should also be used to track controllable costs for different cost centers within a department or activity. With this information in the database, it is possible to summarize costs by any combination within the database, for example, power costs by functional area, activity, and department Another example is that all line item expenditures can be summarized by department, area, function, and for the total authority.

The basic structure of the reporting scheme is by Fund, Function, Activity, and Object Code -- with Departments and Budget Units crossing functional and activity lines as needed. The format of the recommended system is laid out in Table 5-4 with suggested coding. A brief explanation of the structural elements is presented to illustrate the pattern of activity.

TABLE 5-4

ANATOMY OF A BUDGET SYSTEM - WATER

	CODES
• **FUND**	
♦ **WATER**	**01**
♦ WASTEWATER	02
• **DEPARTMENT (and BUDGET UNIT)**	
♦ ENGINEERING	100
♦ OPERATIONS	200
♦ MAINTENANCE	300
♦ ADMINISTRATION & GENERAL	400
• **FUNCTIONS (FOR WATER)**	
♦ SOURCE OF WATER	10
♦ TRANSMISSION	20
♦ TREATMENT	30
♦ DISTRIBUTION	40
♦ ADMINISTRATION	50
• **ACTIVITY FOR SOURCE OF WATER**	
♦ DRILLING WELLS	1010
♦ PUMPING	1020
♦ WELL MAINTENANCE	1030
♦ SURFACE WATER MAINTENANCE	1040
• **OBJECT CODE (LINE ITEMS)**	
♦ SALARIES AND WAGES	601
♦ INCENTIVE COMPENSATION	603
♦ PENSIONS AND INSURANCE	608
♦ MATERIALS - OPERATIONS	615
♦ ELECTRICITY	625

BUDGET UNITS: FUNCTIONAL ACTIVITY CENTERS DOING COST CONTROLLABLE WORK

DEPARTMENTS: GROUP OF BUDGET UNITS WITH A COMMON PURPOSE (ENGINEERING, MAINTENANCE, ...)

- Fund - The Government Accounting Standard Board (GASB) defines a fund as a fiscal and accounting entity with a self-balancing set of accounts recording all cash and other financial transactions which are segregated for the purpose of carrying on specific activities in accordance with special regulations, restrictions, and limitations. In the recommended budget system, the Water System and the Wastewater System are separate funds that must have their own management, budgeting, financing, and financial statements. Both funds will report to the Chairman of the Authority The primary reasons for having separate funds are: 1) that the operational characteristics are very different, requiring different operational and management skills, and 2) the costs of providing the respective services are generated in very different ways and need to be recovered in different types of tariff systems to fairly distribute the costs among the customer groups. These two funds are simply designated 01 for Water and 02 for Wastewater.

- Function - The water industry has for many years been recording balance sheet and income statement data by functional areas of activity. The functions used by almost all utilities are:

  - Source of Water
  - Transmission Pumping
  - Treatment
  - Distribution and Storage
  - Administration

  All of these basic functions are broken down into sub-categories. For example, Source of Water can be split into ground water, surface water, and purchased water; and Administration can be broken-down into numerous categories including customer service, information systems, personnel, purchasing, legal, accounting, and the executive offices. For financial statement reporting, a relatively small number of functions is desirable simply to break-up this very large category of spending and asset values, and to provide a consistent comparison with other utilities. Most utilities also use the breakdown in their cost-of-service analysis to more fairly recover costs form different customer groups. Various schemes might be used to classify costs by function such as suffixes on expenditure codes, blocks of expenditure codes, and unique function codes. The use of unique function codes in a separate field is recommended because of the flexibility that is provided for system enhancement as, for example, in a database system like Microsoft Access. Just about any unique number scheme can be used for function codes The recommended scheme uses the numbers 10, 20, 30, 40, and 50 for the functions in ascending sequence of application in producing water. Gaps are left between the number to accommodate additions.

- Activity - Activity codes are used to record separate elements of effort within a function, department, or budget unit For example, under the Source of Supply, activities might include· drilling wells, maintenance of wells, and source treatment programs; and for the personnel department activities might include· salary administration, employee search and hiring, pension programs, and employee records. The major criterion for setting up activity codes should be to manage the expenditures for unique spending elements No more codes should be set up than will provide meaningful operational or performance feedback. For example, if financial planning and tariff development are integral functions performed by the same staff, a single activity would suffice Remember that all labor hours and expenditures must be recorded to these activities; so the fewer activities the better within a sound management reporting system. The recommended system assigns one thousand potential activity numbers to each function. For example, the Source of Supply can identify activities using numbers 1,000 through 1,999, and the Administration function can identify activities using numbers 5,000 through 5,999. Technically, the activity numbers do not need to be separated by function, but it is easier to allocate them and review results with a clustered group of numbers A separate block of numbers, 7,000 through 7,999, has been assigned to capital spending activities, such as design, systems planning, new and existing facility improvements, computers, vehicles, and so forth. Capital spending will usually be planned and incurred by the engineering and/or the maintenance departments Most of the activities permeate all functional areas. For example, "design elements" can be applicable to any function Consequently, a set of "generic" capital activities is recommended, but they could be structured somewhat to functional areas

- Object Code - The object code (or line item expenditure) is used to record spending on each object of expense such as salaries, supplies, electricity, printing, and training Object codes are also applicable for revenues or cash receipts, such as metered water sales, unmetered water sales, connection charge receipts, account establishment charges, and so forth. The full array of object codes is available to all using functions, activities, departments, and budget units Any series of numbers could be used for object codes The recommended system uses the numbers from 600 to 699 for expenditures and for 460 to 479 for revenues in keeping with the National Association of Regulatory Utility Commissioners (NARUC) Chart of Accounts The suffixes used in the standard NARUC system are not used in the recommended system to designate expenditures by function because a separate field is provided with function numbers for greater flexibility.

- Departments and Budget Units (BUs) - There are numerous departmental responsibilities within water and wastewater entities, such as, engineering, operations, maintenance, personnel, accounting, customer service, information systems, etc. These departments often are broken-down into smaller budget units

that perform a basic function For example, the maintenance department could have BUs for pipeline replacement, treatment plant repair, flushing lines, etc. In some cases these BUs could be the same as the activity, sometimes a part of an activity, and sometimes encompass several activities The recommended budget system has established departments and department numbers for the basic functional operations of engineering (100), operations (200), maintenance (300), and administration (400) Additional departments can be established with the remaining numbers (500, 600, 700, 800, 900) and budget unit can be established with the 99 numbers within each department cluster.

- Markaz and Villages - Many water utilities organize by function For example, all treatment plant operations would be under a single manager, but with the authority spread out longitudinally along the Nile, there is a basis for continuing the organization by markaz and by village council within the markaz. The current budgets are prepared by area and can be continued that way by appropriate coding The recommended approach is to code the markaz 01, 02, 03, . . . nn, and the villages within 01, 02, 03, . . . nn. The combination of these number provides a unique area designation that can be rolled-up for markaz totals and then authority totals.

A great deal of coding has been described above which can be time-consuming to record and to compile. Some of it (fund, object code, markaz and village, department, and BU) can be pre-coded on worksheets, but there remains a large amount of coding to be undertaken. The following progression to a fully computerized system is recommended.

- With a manual system (like the current system) or with a central computer (PC) only, use only the fund, markaz, village, and object code designations The 1996-97 and possibly the 1997-98 budget should be prepared in this manner because of the training and assimilation required for the greater use of computers

- With local computers for data capture and a central computer for data compilation, use the fund, function, base department numbers, activity, markaz, village, and object codes The 1998-99 (and maybe the 1997-98) should be done in this mode so that all stations become familiar with the use of PCs in the budget application. If progress is very rapid in 1997 and 1998, this mode might be skipped in 1998-99 in favor of the database approach

- With a database system (like Microsoft Access) and local computer input, use all codes desired. This approach should be implemented no later than 1999-00, possibly in 1998-99 because it provides the greatest flexibility in preparation and in making modifications. The greatest benefit of the database system is that the budget can be rolled-up in any way desired, for example, by department or budget

unit by object code, by activity by object code, and so forth These roll-ups will be of great value in measuring progress and performance.

The degree of progress that is made in this area will depend on the commitment that is made to training and the provision of computers. The PCs used for budgeting would be required about 75 percent of the time during the budget preparation period of about three months and about 25 percent of the time during the balance of the year for accumulation and reporting of actual costs and other budget related matters.

5.2.4 Budgeting Cash Receipts

Expenditures are what has been referred to as the budget in the governorates, but revenues must also be budgeted, that is, estimated for actual and projected conditions, many of which are controllable by authority management A list of budgeted elements that affect revenues would include:

- Population growth
- Population served
- Number of accounts by customer type
- Billed consumption by customer type
- Revenue collections
- Tariff rates
- Non-tariff revenues
- Percentage of water use metered
- Accuracy of non-metered water use estimates
- Subsidies from the Ministry of Finance

These elements of revenue must be estimated and controlled to know the limit of revenue availability so that the level of expenditures can be constrained to that level. Population growth and subsidies might be the only elements above that are not (directly) controllable by the authority. All other elements should have defined programs for improvement and be included in the budget as key programs.

5.2.5 Collecting Population, Production, Consumption, and Collections Data

There are a number of data items that should be collected as part of the budget process.

- Population and population served and the number of connections for each village, sub-village, and city can best be identified or estimated by the local budgeting unit. Population served is defined as the number of people served by a direct connection to the water system; so it excludes those who get water from a standpipe or public well. Population served is often estimated by multiplying the

number of residential connections by an estimated number of people served per connection. The substantial differences in the reported percentage of population served among villages and markaz cities suggest either very different stages of water service development or great imprecision in the estimates Population growth and the change in percent population served are critical factors in planning for facilities and budgeted costs and revenues

- Total water production in every village and city is an estimate of production that appears to be consistantly higher than actual production Consequently, unaccounted-for water and the need for new capacity are overstated. A study of metered capacity should be undertaken, probably as part of a water master plan, to accurately identify this critical element of planning.

- Total billed water consumption has been derived in each location by the revenue offices. Since not all accounts are billed and up to 50 percent of billings are estimates, billed water consumption is, at best, a crude estimate of the potential billings for water actually provided. Programs are recommended in Chapter 4 of this report to address this need so that, over time, all water customers will be billed for their actual water use or sound estimates of their actual use.

- Revenue collections are currently made at the local collection stations, but sent directly to the Minister of Finance so that all of the cash receipts information is not available at the markaz and governorate levels. Moreover, the timing of collections coupled with a lack of proper billing records makes it difficult, if not impossible, to accurately identify collections. Many of the villages and markaz cities estimate the percentage of revenue collected, which may account for the range of 50 to 100 percent among villages. Programs are recommended that will improve the percentage of collection and the accuracy of reporting over time

5.2.6 Budgeting for Wastewater

Currently there is only one operational wastewater plant in Minia and one in Beni Suef, but many new plants are planned for which no capital or operating cost data is available. In addition, the service area boundaries with customers served, the volume of wastewater flow, and the discharge strengths for the existing plants are not available so that no unit cost data can be developed for a projection of wastewater services to expanded service areas. Consequently, the data presented is simply a summary of the budgets provided by the two authorities for the existing plants, and the conceptual planning for the wastewater system is restricted to the budget planning process.

The conceptual framework for the wastewater system is essentially the same as for the water system, but with functional categories for wastewater operations, which are shown

in Table 5-5. The explanations of the coding structure that was provided for the water system are identical for wastewater except for the different fund and functions.

The total budgets for wastewater service in Minia and Beni Suef are provided in Table 5-6. The budgeted amounts are considered grossly understated for the same reasons as for the water system The only accurate way to compile a good budget for the wastewater systems is to go through the recommended budget process for one or two years Data on flow and strength, or loadings on the plants, must also be prepared to be able to derive unit costs and develop a tariff system that relates directly to customer discharges

TABLE 5-5

ANATOMY OF A BUDGET SYSTEM - WASTEWATER

• **FUND**	**CODE**
♦ WATER	01
♦ **WASTEWATER**	**02**
• **DEPARTMENT (and BUDGET UNIT)**	
♦ ENGINEERING	100
♦ OPERATIONS	200
♦ MAINTENANCE	300
♦ ADMINISTRATION & GENERAL	400
• **FUNCTIONS (FOR WASTEWATER)**	
♦ COLLECTION SYSTEM	10
♦ PRIMARY TREATMENT	20
♦ SECONDARY TREATMENT	30
♦ DISPOSaL	40
♦ ADMINISTRATION	50
• **ACTIVITY FOR COLLECTIONS SYSTEM**	
♦ INSPECTING LINES	1010
♦ REPAIR OF LIFT STATION	1020
♦ INSTALLING SERVICE CONNECTIONS	1030
♦ TRUNK LINE MAINTENANCE	1040
• **OBJECT CODE (LINE ITEMS)**	
♦ SALARIES AND WAGES	601
♦ INCENTIVE COMPENSATION	603
♦ PENSIONS AND INSURANCE	608
♦ MATERIALS - OPERATIONS	615
♦ ELECTRICITY	625

BUDGET UNITS: FUNCTIONAL ACTIVITY CENTERS DOING COST CONTROLLABLE WORK

DEPARTMENTS: GROUP OF BUDGET UNITS WITH A COMMON PURPOSE (ENGINEERING, MAINTENANCE, ...)

TABLE 5.6

MINIA AND BENI SUEF
WASTEWATER BUDGETS - 1995-96

(In Egyptian Pounds)

COST ELEMENTS	MINIA	BENI SUEF
Salaries and Related Expenditures BAB 1		
Salaries	565,087	319,700
Incentive Compensation	113,517	103,419
Allowances for Conditions	321,777	199,260
Perf & COL Salary Adjmts	254,312	222,820
Pension and Insurance	143,155	164,810
Total Salary and Related Expense	1,397,848	1,010,009 Note 1
Operations and Maintenance BAB 2.		
O & M Unspecified		
Materials For Operations	9,000	
Oil & Grease	2,000	
Oil & Grease	1,900	
Electricity		
Gasoline		
Solar Fuel		
Oil		
Small Capital, Spare Parts	3,050	
Lighting	-	
Water		
Supplies	500	
Building & Equipment Maintenance	3,750	
Printing Expenditures	150	
Communications Expense	750	
Training	-	
Other Contract Services		
Total O & M Expenditures	21,100	
Total Operating Expenses	1,418,948	1,010,009

Source Governorate Offices, Director of Finance
Note 1 O & M expenditures for Beni Suef are not separately identified

5.2.7 Budget System versus an Accounting System

The annual budget is basically a planning document that identifies and communicates short-range plans for all areas of the authority's operations to the responsible managers who must buy into and achieve the goals set forth for their areas of responsibility. The budget, therefore, also provides a means for measuring the performance of each cost center and for educating managers and other personnel on the flow and complexity of the entire process of efficiently producing and distributing water The budget documents are usually produced and compiled over a three to six month period, depending on the size and complexity of the operation. The budget then becomes a plan for implementation and a basis for measuring performance.

Changes are usually not made to the budget after implementation so that the performance measurement is true to the starting base. However, no budget should ever be a fixed or rigid control device for spending Things change, and even within the short period of one year, many unanticipated needs will surface that must be satisfied to ensure efficient operations. Other needs will not arise as anticipated so that some planned expenditures will not be made. At the end of the budget period, the deviations of actual spending on major budget items from the planned level can be explained, which should help to make the next year's budget all the more accurate. In many government operations (in the US), the approved budget is the legal authority to spend up to the amounts approved to accomplish the goals identified in the budget document. Spending in excess of the approved budget would constitute a misuse of government funds.

Accounting systems, on the other hand, are basically a means of recording and accumulating actual and committed expenditures, cash receipts, and other transactions related to the purchase and disposal of assets, the incurring and payment of liabilities, and the preparation of various statements that depict the net revenue (profit) of the entity for a period of time and the value of the entity at the end of that period. The accounting system is not a planning system, but the data that is compiled by the accounting system is indispensable to the budget, financial planning, and tariff sections of the Financial Department.

The consultant recommends using the Government of Egypt (GOE) Unified System of Accounts, coupled with portions of the National Association of Regulatory Utility (NARUC) Chart of Accounts initially for the preparation of budgets, and then evaluating continued use when the implementation of an accounting system is undertaken in a year or two Revenue and expenditure line-items in the NARUC Chart of Accounts have been modified for use in the recommended budget system to facilitate a more detailed reporting system than is possible with the NARUC numbering system. Section 5 4 describes for

the recommended system and Annex 4-1 includes a copy of the complete Unified System of Accounts

5.2.8 Cash versus Accrual Methods

Virtually all water and wastewater utilities use the accrual method of accounting Under the accrual method, revenues are recorded in the period in which the service is given, although payments may be received in a subsequent period. Expenses are recorded in the period in which the benefits are received, although payments may be made in a prior or a subsequent period Using the cash basis, revenues are recognized as earned when cash is received, and expenses are charged when cash is disbursed.

Notwithstanding the use of the accrual method of accounting by virtually all water utilities, most government owned water (and wastewater) utilities use the cash needs approach for calculating their tariff requirements which are based on the annual budget, with projections usually five years into the future The cash needs approach to tariff requirements is based on cash flow primarily in the sense that depreciation expense (a systematic writing-off of the value of assets over their useful lives) is not a cash expenditure and is not included in the cash needs approach (Estimated equipment replacement and capital improvement expenditures are usually substituted for depreciation.) Therefore, the budgets of most government owned utilities are prepared on a cash basis which is inconsistent with the accounting system, although reconciliation between the two is quite feasible. In order to preserve the comparability between the budget and the accounting system, some utilities use the accrual system for revenue and expenditures and the cash method in terms of depreciation when preparing the budget This mixture is referred to as the modified accrual method of budgeting.

The cash approach is recommended for the budget and tariff requirements primarily because of the low collection rates in Minia and Beni Suef. The authorities cannot rely on accounts receivable to provide for self-sufficiency. The cash approach is also much easier to prepare and understand. Actual expenditures are used to measure performances, and the fact that total cash spending in the budget is different from total spending in the accounting statements is of no consequence For capital replacement, budgeting equipment replacement requirements based on need is recommended since this method is virtually always a better means for capital planning than using depreciation of original cost.

5.2.9 Asset Valuation

The importance of asset valuation is that the value given to the assets will be a major element in calculating the accounting profitability of the authorities. If the values of

assets are high, the depreciation will be high and the profit will be low (or the loss will be high) In terms of cash flow, however, the authority might be completely self-sufficient since depreciation does not enter into the revenue requirements. The accounting statements could indicate that a subsidy is required, while the cash requirements show no need for a subsidy

The consultants recommend that both the income statement and cash flow statement methods be used to provide assurance that the cash requirements for capital replacement are not understated The income statement method, however, cannot be completed until the assets have been valued and the depreciation methods put in place.

5.2.10 Computer Applications

The current budgets for the governorates were prepared manually, but were input to a Microsoft Excel spreadsheet for compilation and presentation. Budgets for the next few years could be prepared in the same manner, but at least one improvement should be incorporated: the budgets for each markaz, including the separate budgets for villages in the markaz area, should be compiled on the same Excel spreadsheet so that modifications can readily be made through the approval process. The markaz budget spreadsheets, when completed, can then be summed electronically to the total for the authority. Using this basic computer method, the budget representatives can spend most of their time analyzing their needs and communicating the results to local management who, in turn, can communicate with authority management to develop a feasible budget. Revising the detailed elements of the budget is not a major task on the computers; so there should be no reluctance to make the changes necessary to have the budget as accurate as possible

The consultants recommend use of an Excel spreadsheet for the first year or two of budgeting because it requires little incremental cost and is easy to learn. Ideally, each markaz would have computer time available to prepare the markaz and village budgets, but these local budgets could be prepared manually for a year or two if necessary The authority, however, must have the budget model on a computer so that necessary changes can be made with ease to both the budget and the financial model that is linked to the budget. Both the budget and the financial model spreadsheets have been prepared for Minia and Beni Suef and are provided in hard copy and on disk in Annexes 4.2 and 4.3 An improvement to the Excel spreadsheet approach is recommended for implementation in the second year or later. The improvement is to input the same model in a database program such as Microsoft's Access, which allows sorting and printing the budget data by department, function, activity, object code, and budget location (or any combination of these elements) with ease. Sorting and printing can be very tedious in the spreadsheet program.

5.3 Financial Modeling

An annual budget might suffice to control costs or channel spending according to a set of priorities, but it does not provide long-term direction for where expenditures should be made nor how they will be paid for Every water authority must have a financial plan, a strategic plan, or model that identifies the needs of all operating centers and sets the limits of what can be funded from existing revenues, projected new revenues, and (temporarily) from government subsidies The newly formed water authorities have particular need for a planning tool to set specific objectives that will achieve financial self-sufficiency in 5 to 7 years. It is also critical to track progress in meeting specific objectives.

5.3.1 Introduction

A financial model has been developed and is provided in Annex 4-3 (hard copy and on disk) that includes all major elements of revenues and expenditures. This model is linked to the budget model, and changes made to any element of the budget, or to the financial model itself, are reflected in revenue requirements, subsidy and tariff requirements for the authority. Water sales are tied to population and account growth, and to improvements in billed consumption by village and markaz over a ten year period so that progress toward self-sufficiency can be viewed over time

Most of the data in the base year of the financial model is linked directly to the budget spreadsheet, and the 10 year projections are driven by factors or growth rates that are input as constants that apply to all ten years. The accuracy and usefulness of the model is directly dependent on the accuracy of the input data. At the current stage of development of the budgeting system and financial planning process, there are many estimates included in the data provided by the authorities. All of the component elements of the model should be reviewed, at least annually at budget time, and fine tuned so that over time the model will reflect as accurate a picture of the reality as is possible.

The financial model should not be viewed as an accounting statement; rather, it is a working tool for management to develop strategic plans and identify specific needs for all operating centers and set the limits of what can be funded from existing revenues, projected new revenues, and (temporarily) from continued subsidies The model is fully integrated so that a change in any village, markaz, department, activity, or line item is reflected throughout the model, including the bottom line of requirements for tariff revenues or subsidies. The budget is an annual operational plan, but a provision has been made in the spreadsheets for a ten year projection so that normal and non-recurring future needs can be identified and included in the planning for revenues to meet those needs.

With this model, senior management of the authority will be able to perform such tasks as:

- Analyze over ten years the impact on revenues, subsidies, and tariff requirements from different rates of population growth, percentages of population served, billed water consumption, and percentages of billed water collected.

- Analyze over ten years the impact on subsidies and tariff requirements from increases in O & M and capital costs from increased levels of service and from inflation.

- Plan and then measure annual progress toward financial self-sufficiency using fourteen performance indicators that are built into the model.

There is provision in the budget spreadsheets for each authority to project all budget line items over a five year period. However, the projections have not been filled out by village and markaz at this time because the existing data does not reflect real needs and their is no detailed system in place to provide accurate projections of costs and needs. Instead, the financial model projects aggregated data for the entire authority for ten years. When population growth and the changes in percentage of population served are available by village and markaz for future years, this detailed data should be aggregated in the database system and used rather than the current projection in the financial model of total base year data. The same approach should be applied to all other budget elements such as local production, percentage of billed consumption, percentage of revenue collected, and all O & M expenditures. The water authorities must grow into this detailed budgeting and planning process.

5.3.2. Inflation versus a Constant Monetary Unit

Inflation is a fact of life in all countries of the world and must be allowed for in budgeting and financial planning. The basic choices are to state all budget numbers in terms of the monetary unit of a base year, usually the budget year, or to add inflation to all budget numbers to reflect the estimated current value of the monetary unit for expenditures of each year The constant monetary unit has the appeal of not having to estimate the value of future expenditures, while the inflation adjusted expenditures have the appeal of identifying the LE that will actually be required either from tariffs or subsidies.

It is recommended that inflation be included in the projections of expenditures because this method fully exposes the revenue requirements of future years, particularly those

required from tariffs. The need for tariff increases just to keep pace with inflation are not fully exposed when using a constant monetary unit Furthermore, when modeling for capital programs, which will be included sometime in the future, the diminishing impact of including debt service (not subject to inflation) is more appropriately displayed when inflation is included for O & M expenditures

5.3.3 Components of the Model

Most of the base year data in the model are linked to the budget spreadsheet, but there are five additional components that drive the model over the 10 year planning period

- Cash Reserves - The model includes a provision for cash reserves that should be established to provide a means of funding emergency expenditure requirements during the year No budgeting process can anticipate every need, and critical needs must be filled. The cash reserves are designed to meet these needs. A reserve of 20 percent of total O & M expenditures is recommended. In the models for Minia and Beni Suef, the cash reserve is assumed to be available in the beginning month, that is, the development of reserve funds (3 5 and 1.8 million LE for Minia and Beni Suef respectively) has not been included in revenue requirements. If these reserve funds are not available initially, a gradual build-up of reserves should be undertaken The requirements for cash reserves grows with the increase in O & M so that by 2006, with 5 percent increases in O & M, the targeted cash reserves are 5.4 and 2.8 million LE for Minia and Beni Suef respectively. The increases from the 1996 levels are built into the revenue requirements as deviations from the targeted 20 percent levels

- Non-tariff Revenues - The model includes provision for any cash receipts (other than proceeds from debt) that might result from installation charges, reimbursements for capital spending such as meter replacements, sales of property, lease revenue, or any other non-tariff revenue. However, no estimates of receipts are included in the models because the programs must be devised. Various programs are included in the recommendations at the end of this chapter

- Subsidies from the Ministry of Finance - Subsidies are not budgeted in the same sense as electrical power costs; rather they are a residual between net revenue requirements (BAB 1 & 2 less non-tariff revenues) and tariff cash receipts It is very clear that continued subsidies will be required through a period of transition to self-sufficiency.

- Tariff Increases - Tariff adjustments are implemented at the discretion of the Board of Directors, and can be for any amount including zero Allowing that

budgeted expenditures will be efficiently planned and revenues from growth, increased billings, and collections will be increased to their optimum levels, there will be a one-to-one inverse correspondence between tariff increases and subsidies. If there are no tariff increases, all of the difference between expenditures and cash receipts flows to subsidies. The financial models for Minia and Beni Suef clearly show that the subsidies can "never" be eliminated without tariff increases, even allowing for all the other improvements.

Tariffs should be a part of the self-sufficiency equation. Certainly, tariff increases equal to inflation should be enacted so that inflation is not a part of the subsidies. In the recommended scenario, the model includes 7 percent inflationary tariff increases per year, which is the most recent overall rate for Egypt Inflationary cost increases built into the financial model are estimated at 5 percent The model allows for various trial tariff increases on line 110 to immediately observe the impact of alternative increases.

- Performance indicators - If the goal of self-sufficiency is to be a reality, numerous improvements to the existing situation must be made. These improvements must be identified as specific goals or objectives and then tracked for performance. At the USAID Workshop held in Cairo on May 14-15, twenty-nine specific performance indicators were identified that should be used by all water utilities in Egypt The recommended financial model includes fourteen of the twenty-nine, the balance being non financial, mostly organizational and customer service related. Since the model projects all of its elements over ten years, projected performance improvement, as measured by the indices, can be view ten years into the future. The performance indicators included in the model, in order of appearance, are provided in Table 5-7.

5.3.4 Financial Model - Minia Example

The models for both Minia and Beni Suef are provided in Annex 4-3, but only Minia is analyzed here to illustrate the methods and results. A copy of the recommended Minia model for selected years is provided in Table 5-8. The recommended scenario includes 5 percent O & M cost escalation and 7 percent annual tariff increases. The years not shown in this table are shown in the annex.

TABLE 5-7

USAID PERFORMANCE INDICATORS

Code	Description	Formula
SW 1	Percentage population served by direct connection	Population served / Total population
SW 2	Annual percentage improvement in population served	Estimated annual % change
SD 5	Percentage increase in number of connections	Current year connections / Previous year connections - 1
SD 2	Billed consumption as percentage of total production	Billed consumption / Total production
SD 3	Percentage decrease in unaccounted-for water	Annual change in billed consumption
SW 3	Billed consumption per population served	Billed consumption / Population served
CR 1	Percentage of billings collected	Revenue collected / Total billings
CR 2	O & M cost per cubic meter of water sold	Total O & M cost / Cubic meters of water sold
CR 2A	O & M cost per cubic meter of water collected	Total O & M cost / Cubic meters of water collected
SD 1	Cost per cubic meter of water produced	Total O & M cost / Total water produced
CR 6	Non-tariff revenue as percentage of total cost	Non-tariff revenue / Total O & M costs
CR 3	Subsidy as percentage of total O & M costs	Subsidy / Total O & M costs
SW 5	Subsidy as percentage of total O & M costs	Subsidy / Total O & M costs
SW 7	Tariff revenue as percentage of total O & M costs	Tariff revenue / Total O & M costs
CR 5	Cash receipts a percentage of Total Revenue Requirements	Cash Receipts / Total Revenue Requirements

Category designations
SW = Sector Wide, SD = Service & Delivery, CR = Cost Recovery

Table 5-8 (Sheet 1 of 2)

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MINIA WATER AUTHORITY
FINANCIAL MODEL
CASH FLOW STATEMENT - NET REVENUE REQUIREMENTS - TARIFF REQUIREMENTS

USAID - PROVINCIAL CITIES DEVELOPMENT PROJECT

File: Finmod1.xls

(monetary unit = Egyptian Pounds)

Row	Object Code	Cost Category	Performance Indicators	Base Year Cities	Maintenance Centers	Villages	1996 Total Water	Cities	Maintenance Centers	Villages	2001 Total Water	Cities	Maintenance Centers	Villages	2006 Total Water	Growth Factors Cities	Maintenance Centers	Villages	Total Water
9		Beginning Cash Reserves					3 483,842				4,032,882				5 147,221				
10																			
11		**GROWTH DATA**																	
12		Total Population		832,910		2,740,893	3,573,803	919,600		3,101,069	4,020,669	1,015,313		3,508,575	4,523,887	2.0%		2.6%	
13		Total Population Served		752,791		2,238,785	2 991,576	877,122		2,843 087	3 720,209	1,015,313		3,508,575	4,523,887				
14		Percentage Population Served	SW 1&2	90 4%		81 7%	83 7%	95 4%		91 7%	92.5%	100 0%		100.0%	100.0%	1.0%		2.0%	
15																			
16		Number of Connections		109,417		107,236	216,653	127,488		136,182	263,670	147,574		168,058	315,632	Calculated		Calculated	
17		Percentage Change in Connections	SD 5	NA		NA	NA	3 1%		4.8%	4.0%	2.6%		2.8%	2.7%				
18		Population Served per Connection		6 9		20.9	13.8	6 9		20.9	14 1	6.9		20.9	14.3	Fixed		Fixed	
19																			
20		Total Production m3		50,222,852		36 427,123	86,649,975	50,222,852		36,427,123	86,649,975	50,222,852		36,427,123	86,649,975	Fixed		Fixed	
21		Per Population Served		66 7		16.3	29 0	57.3		12.8	23.3	49 5		10 4	19.2	Calculated		Calculated	
22																			
23		Total Consumption m3		31,339,060		22,949,087	54,288,147	36,362 941		28,353,330	64,716,271	42,091,921		34,668,536	76,760,457	Estimated		Estimated	
24		Percentage of Total Production		62 4%		63.0%	62.7%	72 4%		77.8%	74 7%	83.8%		95.2%	88.6%				
25																			
26		Billed Consumption m3		29,552,815		19,572,050	49 124,865	36,362,941		26,307,539	62,670 480	42,091,921		34,668,536	76,760 457	Calculated		Calculated	
27		Percentage of Total Production		58 8%		53 7%	56 7%	72 4%		72.2%	72.3%	83.8%		95.2%	88 6%				
28		Percentage of Unaccounted-for Water		41.2%		46.3%	43.3%	27 6%		27.8%	27 7%	16.2%		4.8%	11.4%				
29		Percentage Change in Unaccounted-for Water	SD 3	NA		NA	NA	-2.2%		-4 1%	-3.0%	-2.2%		-3 7%	-2.8%				
30		Percentage of Total Consumption	SD 2	94.3%		85.3%	90.5%	100 0%		92.8%	96.8%	100.0%		100.0%	100.0%	1.5%		1.5%	
31		Billed Consumption per Pop Served	SW 3	39.3		8 7	16 4	41.5		9.3	16.8	41.5		9.9	17.0	Calculated		Calculated	
32		Billed Consumption per Connection		270 1		182.5	226 7	285.2		193.2	237 7	285.2		206.3	243.2	Calculated		Calculated	
33																			
34		**CASH RECEIPTS**																	
35		Average Price per Unit (prior year rates)		0.27		0.24	0.26	0.36		0.31	0.34	0.50		0 44	0 47	Derived		Derived	
36	461	Billed Water LE @ prior year's rates		8,035,588		4,670,896	12,706,484	12,960,236		8,229,609	21,189,845	21,041,250		15,210,846	36,252,096	Derived		Derived	
37	462	Water Cash Receipts LE		6,293,256		4,058,677	10,351,933	11,446,132		7 768,166	19,214,298	20,887,191		15,210,846	35,898,036	Derived		Derived	
38		Percentage of Billed Consumption Collected	CR 1	78.3%		86 9%	81.5%	88.3%		94 4%	90 7%	98.3%		100.0%	99.0%	2.0%		1.5%	
39																			
40	271	Installation Fees									-			-		5.0%		5.0%	
41	273	Grant Receipts					$0				-								CAPITAL
42	474	Other Revenues					-	-		-		-		-	-	5.0%		6.0%	
43		TOTAL CASH RECEIPTS		6,293,257		4,058,677	10,351,933	11,446 132		7,768,166	19,214,298	20,887,191		15,210,846	35,898,038				
44		Percentage Increase from Growth					NA	12.9%		15.3%	13.8%	12 1%		11.3%	11.8%				
45																			
46		**REVENUE REQUIREMENTS**																	
47		Salaries and Related Expenditures.																	
48	601	Salaries		1,268,731	868,516	1,463,000	3,598,247	1,619,258	1,105,918	1,867,200	4,592,376	2,066,629	1,411 463	2,383,073	5,861,165	5.0%	5 0%	5 0%	
49	603	Incentive Compensation		607,289	395 623	199,542	1,202,434	775 046	504,926	254,672	1,534,644	969,177	644 428	325,033	1,958,638	5.0%	5 0%	5 0%	
50	605	Allowances for Conditions		371,291	187,664	581,295	1,140,250	473,872	239,512	741,896	1,455,280	604,794	305,685	946,868	1,857,347	5.0%	5.0%	5 0%	
51	607	Performance & COL Salary Adjmts		227,491	112,611	611,900	952,002	290,343	143,723	780,957	1,215,023	370,559	183,431	996,721	1,550,711	5.0%	5.0%	5.0%	
52	608	Pension and Insurance		367,249	169,196	561 100	1,097,545	468,713	215,942	716,122	1,400,776	598,210	275,602	913,973	1,787,785	5.0%	5.0%	5.0%	
53	609	Other Salary Expense			-	-	-	-						-					
54		Total Salary and Related Expenditures		2,842,031	1,731,610	3,418,837	7,990,478	3,627,232	2,210,022	4,360,846	10,198,100	4,629,369	2,820 610	5,565 667	13,015,(				
55																			
56		Operations and Maintenance.																	
57	695	O & M Unspecified			118,650		118 650	-	151,431	-	151,431	-	193,268		193,268	5.0%	5 0%	5.0%	
58	615	Materials For Operations		622,447	29,962	37,000	689,409	794,418	38,240	47,222	879,880	1,013,901	48,805	60,269	1,122,975	5.0%	5.0%	5.0%	
59	620	Fuel and Oil		32,388	42,908	60,000	135,296	41,336	54,763	76,577	172,676	52,757	69,893	97,734	220,383	5.0%	5.0%	5.0%	
60	622	Oil & Grease		10,650		40,000	50,650	13,592		51,051	64 644	17,348	-	65,156	82,504	5.0%	5.0%	5.0%	
61	625	Electricity		3,766,714	602,674	3,099,305	7 468 694	4,807,388	769,182	3,955,586	9,532,156	6,135,580	981,893	5,048 442	12,165,715	5.0%	5.0%	5.0%	
62	627	Gasoline				14,000	14,000	-	-	17,868	17,868			22,805	22,805	5.0%	5 0%	5 0%	
63	629	Solar Fuel		13,600	760	1,000	15,360	17,357	970	1,276	19 604	22,153	1,238	1,629	25 020	5.0%	5.0%	5 0%	
64	630	Oil		1,230	-	4,000	5,230	1,570	-	5 105	6 675	2,004	-	6,516	8,519	5.0%	5 0%	5 0%	
65	640	Small Capital, Spare Parts		400,897	97,844	28,100	526,841	511,857	124,876	35,864	672,397	653,019	159,378	45,772	858 168	5.0%	5 0%	5.0%	
66	650	Lighting				3,500	3,500	-		4 467	4,467		-	5 701	5,701	5.0%	5 0%	5 0%	
67	652	Water				1,300	1,300	-		1 659	1,659	-		2,118	2,118	5.0%	5 0%	5 0%	
68	660	Supplies		50,500		1,400	51,900	64,452		1,787	66,239	82,259	-	2,280	84,540	5.0%	5 0%	5 0%	
69	670	Building and Equipment Maintenance		181,204		41,500	222,704	231,267	-	52,966	284,233	295,162		67,599	362 761	5.0%	5 0%	5 0%	
70	675	Printing Expenditures		17,250		1,000	18,250	22 016	-	1,276	23,292	28 098	-	1,629	29,727	5 0%	5 0%	5 0%	
71	680	Communications Expense		81,550	-	5,900	87,450	104,061		7,530	111 611	132 636		9,810	142,447	5.0%	5 0%	5.0%	
72	685	Training				-		-	-				-		-	5.0%	5 0%	5 0%	
73	690	Other Contract Services		8 012	11,385	100	19 497	10,226	14,530	128	24,884	13 051	18,545	163	31,759	5.0%	5 0%	5.0%	
74		Total O & M Expenditures		5 186,442	904,183	3,336,105	9 428 731	6,619,360	1,153 992	4,260,362	12,033 715	8 448 167	1,472,819	5,437,422	15,358 409				
75																			
76		TOTAL OPERATING EXPENDITURES		8 028 473	2,635,793	6 754,942	17,419,209	10,246,592	3,364 014	8,621,208	22,231,815	13,077,536	4,293,429	11,003,089	28,374,055				
77		Per Unit of Water Produced	SD 1				0.20				0.26				0.33				
78		Per Unit of Water Sold	CR 2				0.35				0.35				0.37				
79		Per Unit of Water Revenue Collected	CR 2A				0.39				0.37				0.37				
80																			

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MINIA WATER AUTHORITY
FINANCIAL MODEL

USAID - PROVINCIAL CITIES DEVELOPMENT PROJECT

CASH FLOW STATEMENT - NET REVENUE REQUIREMENTS - TARIFF REQUIREMENTS

File Finmod1.xls (monitary unit = Egyptian Pounds)

Row	Object Code	Cost Category	Performance Indicators	Base Year 1996 Total Water	2001 Total Water	2006 Total Water	Growth Factors: Cities	Growth Factors: Maintenance Centers	Growth Factors: Villages	Growth Factors: Total Water
81		CAPTIAL FUNDED FROM TARIFFS.								
82	710	Tariff Funded Capital		-	-	-	Input		Input	CAPITAL
83	720	Debt Service on Bonds		-	-		Debt Exhibit		Debt Exhibit	DEBT
84	730	Grant Funded Capital Programs		-	-	-	Capital Exhibit		Capital Exhib	CAPITAL
85		TOTAL CAPITAL FUNDED FROM TARIFFS		-	-	-				
86										
87		Debt Service Coverage Requirement					Calculated		Calculated	
88		*Debt Service on non-capital Loans*		-	-	-	Calculated		Calculated	
89										
90		**TOTAL GROSS REVENUE REQUIREMENTS**		17,419,209	22,231,815	28,374,055				
91		Per Unit of Water Sold		0.35	0.35	0.37				
92										
93		Less Non-tariff Revenues		-	-	-				
94		Percentage of Gross Revenue Requirements	CR 6	0 0%	0 0%	0.0%				
95										
96		**TOTAL REVENUE REQUIREMENTS FROM SUBSIDIES & TARIFFS**		17,419,209	22,231,815	28,374,055				
97										
98		**SUBSIDY FROM MINISTRY OF FINANCE**		7,067,276	1,874,165	(9 779,484)				
99		% of Total Revenue Reqmts from Subsidies & Tariffs	CR 3 & SW 5	40 6%	8 4%	-34.5%				
100										
101		Cash Reserves - (over)/short		-	201,649	257,361				
102										
103		NET REVENUE REQMTS FROM TARIFFS		10,351,933	20,357,650	38,153,539				
104		REVENUE FROM EXISTING TARIFFS		10,351,933	19,214,298	35,898,038				
105		Percentage Revenue Increase from Growth		NA	13.8%	11.8%				
106		Required Tariff Increase for the Year		0 0%	6 0%	6.3%				
107										
108		NET REVENUE REQMTS FROM TARIFFS		10,351,933	20,357,650	38 153,539				
109		Projected Revenue with Prior Trial Tariffs		10,351,933	19,214,298	35,898,038				
110		TRIAL TARIFF % INCREASE (effective end or prior year)		0 0%	7 0%	7.0%				7 0%
111		TOTAL REVENUE WITH TRIAL INCREASES	SW 7	10,351,933	20,559,299	38,410,900				
112		Average Price per Unit of Water Collected		0.26	0.36	0.51				
113		Deferred Tariff Increases		0 0%	0 0%	0 0%				
114										
115		*Cash Receipts / Total Revenue Requirements*	CR 5	59 4%	92.5%	135.4%				
116										
117		Target Cash Reserves		3,483,842	4,448,363	5,674,811				
118		Projected Cash Reserves -with Trial Tariffs		3,483,842	4,234,631	5,404,582				
119		Cash Reserves - (over)short of target		-	211,732	270,229				
120										
121		Debt Service Coverage Ratio		-	-	-				
122		Debt Service as % of Rate Revenue		-	-					

Row			
123			
124	Summary of USAID Performance Indicators		
125	(in order of appearance)	SW 1	Percentage Population Served by Direct Connections
126		SW 2	Annual Percentage Improvement in Population Served
127		SD 5	Percentage Increase in Number of Connections
128		SD 2	Billed Consumption as Percentage of Total Production
129	SW = Sector Wide	SD 3	Percentage Decrease in Unaccounted-for Water
130	SD = Service & Delivery	SW 3	Billed Consumption per Population Served
131	CR = Cost Recovery	CR 1	Percentage of Billings Collected
132		CR 2	O & M Cost per cubic meter of water sold
133		C 2A	O & M per cubic meter of water revenue collected
134		SD 1	Cost per cubic meter of water produced
135		CR 6	Non-tariff revenue as percent of total cost
136		CR 3	Subsidy as percent of total O & M Costs
137		SW 5	Subsidy as percent of total O & M Costs
138		SW 7	Tariff Revenue as percentage of Total O & M Cost
139		CR 5	Cash Receipts as percentage of Total Revenue Requirements
140			

There are literally hundreds of important or interesting pieces of data in this model that could be pointed out and discussed. Only a representative few are discussed here to provide the flavor of what is in the model. It will be useful in discussing many of the results to have a summary of some key elements which are provided in Table 5-9.

TABLE 5-9

MINIA WATER AUTHORITY
SUMMARY OF KEY ELEMENTS OF THE FINANCIAL MODEL

(numbers except percentages are in millions of units)

Element	1996	2001	2006
Population served	3 0	3 7	4 5
Percentage change from 1996	-	24 4	51 2
Billed consumption	49 1	62 7	76 7
Percentage change from 1996	-	27 6	56 3
Percentage of billed collected	81 5	90 7	99 0
Total billed consumption collected	40 0	56 8	76 0
Percentage change from 1996	-	42 0	89 8
Total Cash Receipts	10 4	19 2	35 9
Percentage change from 1996	-	85 6	246.8
O & M Expenditures	17 4	22 2	28 4
Percentage change from 1996	-	27 6	62 9

5.3.4.1 Factors Affecting Cash Receipts

- Growth Factors - The last cluster of columns in the model has the factors that are used to forecast population, various improvement elements, and O & M expenditures. All of these factors have been estimated, either from published sources, data provided by the authorities, or based on judgment. In any case, any factors can be changed in these columns (for cities or villages) and the projections for all the years will also change to reflect the new factors. Two of the factors, the O & M cost inflation rate (5 percent in the example) and the trial tariff increase rate (7 percent in the model) can be changed globally rather than line-by-line if desired. The global changes are made in the Parameter sheet of the model, which comprises a list of parameters, including the cost and tariff rate increases.

- Population and population served - There two factors used here: 1) population growth which is estimated at 2.0 percent for cities and 2.5 percent for villages, and 2) the improvement in population served which is estimated at 1.0 percentage points per year for cities and 1.5 percentage points per year for villages. The combined effect of these two factors is reflected in the percentage change in connections (line 17) which is directly related to additional population served. The combined effect is about 4 percent (cell AF 17) until 100 percent of population served is achieved in 2006, which reflects only a 2 7 percent increase. The total increase in consumption from changes in the population served is 24.4 percent by 2001 and 51.2 percent by 2006 as shown in Table 5-9.

- Total Production - Estimated water production has been held constant at 86.6 million cubic meters per year which is probably an overstated estimate since it is based on theoretical capacity in many locations. By definition in Egypt, total production less billed consumption equals unaccounted-for water (UAW), which is 43.3 percent in 1996 (cell G 28). A major portion of the UAW is really not unaccounted for; rather, it is simply consumption that is not billed. As a result of various improvement programs, billed consumption will increase during the 10 year period and unaccounted-for water, with fixed production, will decreases Calculated unaccounted-for water is down to 27.7 percent in 2001 and to 11 4 percent in 2006, which is impossible to achieve with the current system.

- If increases in billed consumption relate to billing current customer accounts that simply are not now billed, the increases will not affect capacity, but they will affect unaccounted-for water by the Egyptian definition However, if account growth is increasing billed consumption, capacity is used up and unaccounted-for water should remain unchanged because production should be increased to meet the new demand. It is obvious that increasing billed consumption does not reduce real unaccounted-for water stemming from water losses in the system. If system water losses are not reduced, increasing consumption (and related billings) simply adds to the need for more capacity. A proper assessment of water losses, capacity requirements, and the cost of production to meet incremental water sales is needed, and a water master plan to resolve these issues.

- Total Consumption - Provision is made in the model (lines 23 and 24) for estimated total consumption, which includes all metered consumption even if it is not billed This consumption-not-billed information is not available for all marakez in Minia The starting year percentage has been estimated from available data, as a percentage of production, at 6 percentage points greater than billed consumption It would be useful to accurately identify the metered water use that is not billed if a means of deriving this information can be devised because it would help to identify the real quantity of unaccounted-for water, which is currently calculated as the difference between production and billed water.

- Total consumption as a percentage of total production will increase from two major forces: 1) population growth and the related population served which are identified on lines 12 and 14 of the model, and 2) increased metering of existing connections, which is assumed to be 1 percent of production per year.

- Billed Consumption - Total billings were provided by the revenue offices within each authority. A large percentage, estimated at 50 percent, of meters are not working properly so that billings are based on minimum usage or on estimated actual usage The accuracy of the estimated billings will directly affect the estimated amount of unaccounted-for water The goal in both authorities is to bill all water consumed and to accurately measure billed consumption. Billed consumption is currently reported to be 52 4 percent of production for cities and 53 0 percent for villages, for a total of 52.6 percent. Billed consumption is estimated to be 84 percent of total consumption in the base year. An aggressive program to increase billed consumption to 100 percent of total consumption should be undertaken. An assumed 1.5 percentage point increase per year has been included in the model, which increases the percentage of billed consumption to 91.6 percent of total consumption by 2001.

- Billed consumption increases directly with population served but also increases based on the assumption that the percentage of total consumption billed will increase by 1.5 percentage points per year (See cells BG 30 and GI 30 for factors.) This improvement is based on the estimation that total consumption in 1996 is 6 percentage points higher than billed consumption as a function of total production. In other words, it is estimated that 6 percent of production is metered but not billed (the difference between cells G 24 and G27). If the difference is found to be higher, cell G24 should be increased to reflect the difference. In Table 5-9, the percentage increase in billed consumption is larger than for population served, reflecting the improvement in billings for accounts currently metered but not billed.

- Billed Consumption Collected - The percentage of billed consumption collected has been reported at 81 5 percent of billings for the base year. Annual improvements of 2 0 percentage points per year for cities and 1.5 percentage points for villages (cells BG 38 and BI 38) are included in the model which results in 99.0 percent collections overall by 2006. In Table 5-9, the 42 percent increase in water cash receipts by 2001 and 89.8 percent by 2006 reflects all three influences discussed, that is, the increase in population served, the increase in percent of production billed, and the increase in the percentage of revenue collected.

5.3.4.2 Total Gross Revenue Requirements

Total O & M and Unit Cost - The budget for the base year, which is compiled in the budget spreadsheet, is linked to the financial model; so there is no budget data input required for the 10 year plan All O & M costs (BAB 1 and 2) are as reported by the authority except electricity cost which is estimated based on the experience of the Dutch consultants in Fayoum as shown in Table 5-1 and their supporting documents. Costs per unit of production used are 7 5 piastres per meter for cities, 8.5 for villages, and 1.2 for the maintenance centers. The logic in estimating electricity costs lies in the fact that the Ministry of Finance subsidizes major electricity costs but tries to force the governorates to live with the agreed budget on other cost elements. The level of O & M expenditures and changes are also summarized in Table 5-9.

Projections of expenditures are made for the 10 years by entering growth rates in columns BG through BI. A 5 percent increase in O & M expenditures is assumed in the Minia model. Higher rates of increase can be input to measure the impact of higher real increases in cost as capacity is increased, impact of inflation, or to test the impact of labor cost increases.

5.5.4.3 Non-Tariff Revenues

The authority currently has not identified any non-tariff revenues. Programs should be devised to generate cost recovery revenue for cost elements such as capacity costs, service installation costs, meter-on/meter-off costs, and so forth These revenues are included in the cash receipts section (lines 40-42) and deducted from Gross Revenue Requirements on line 93.

5.3.4.4. Total Revenue Requirements from Subsidies and Tariffs

The Revenue Requirements that must be funded from subsidies or tariffs (Net Revenue Requirements) are simply the Gross Revenue Requirements less non-tariff revenues. In a situation where there are no subsidies, all of the Net Revenue Requirements would be funded from tariffs. This will be the case when self-sufficiency is achieved. During the transition to self-sufficiency, the following logic has been incorporated into the model

- Tariff Revenue Increases - There are various reasons put forth within the governorates against tariff increases.

  - Affordability - This issue implies a subsidy for those who truly cannot afford to pay for water For small areas of poverty, the authority should probably absorb the cost of service, but if the need is widespread, it becomes a welfare problem which should not be the responsibility of the water authority.

- Poor Service - The quality of service has been constrained by budget restrictions, but should increase as the ability to spend more increases

- Non-tariff Revenues - It has been demonstrated in this report that revenues can be increased by approximately 90 percent (9.2 million LE per year by 2006) without tariff increases.

• The difficulty is that cost are projected to increase (at the modest rate of 5 percent per year) or 11.0 million LE over a ten year period. A 7 percent annual tariff increase is recommended if self-sufficiency is to be achieved in the 5 to 7 year target range. If all the other information and assumption hold, self-sufficiency would occur in the first quarter of 2003. Thereafter, tariff increases could be eliminated or the surpluses that would accrue could be used to remedy the long-constrained O & M spending, or to continue with self-sufficiency in capital spending.

• Subsidies - The current level of subsidies removes the incentive to make the improvements required for self-sufficiency. However, it takes time to implement major improvement programs and some level of subsidy will be required throughout the transition period. The need will be most acute in the early years before the improvement programs produce their maximum results The amount of subsidy is a residual that depends on the level of expenditures and the amount of revenue that is brought in from tariffs and other sources In the Minia example, the subsidy is drawn down from 7 0 million LE in 1996 (cell G 98) to 1.9 million LE by 2001 (cell AF 98), and is eliminated in the first quarter of 2003

• If expenditures were increased to meet real needs, the subsidy would probably increase even with substantial revenue increases Consequently, a formula is needed to allow increases in cost that improve operational performance. The recommended formula is that cost increases be allowed in proportion to revenue increases. In this way improvements can be undertaken coincident with a reducing subsidy program.

• If the subsidies are made in the form of loans, self-sufficiency would take 11 years (until 2007) for Minia using the recommended scenario of 5 percent O & M cost increases and 7 percent tariff increases, coupled with a 90 percent composite increase (6 6 percent per annum) in cash receipts stemming solely from increased sales and revenue collections.

• It must be borne in mind, however, that the authorities will be expected to also assume their own capital financing after O & M self-sufficiency Therefore, it might not be feasible to commit cash receipts to subsidy loan repayments without additional tariff increases

- Revenue Sensitivity Analysis - There are numerous sensitivity scenarios that might be applied to the above factors to observe the impact on revenues. Just five are calculated by simply changing the factors in the model.

The effects of variable changes on cash receipts or costs in Table 5-10 have the identical effect on subsidies For example, if labor costs were increased 5 percent above the recommended case (from 5% to 10%), subsidies would be increased by 2.7 million LE over the base case.

Numerous other elements of the financial model could be modified to strike an acceptable balance between cost increases, tariff increases, and subsidies

TABLE 5-10

SENSITIVITY OF VARIABLE CHANGES ON CASH RECEIPTS, COSTS, AND SUBSIDIES

(in millions of LE)

Variable Changed	Base Case	With Change	Effect on Cash Receipts or Costs
Effect on Cash Receipts			
Population Growth			
Change = -1 0%/Year	20 6	19 6	-1 0
Population Served			
Change = -0 5%/Year	20 6	20 0	-0 6
Percentage Billed Consumption			
Change = -0 5%/Year	20 6	20 2	-0 4
Tariff Increases			
Change -5 0%/Year	20 6	18 7	-1 9
Effect on Total Costs			
Labor Costs			
Change = +5 0%/Year	10 2	12 9	+2 7
Total O & M Costs			
Change = +5 0%/Year	22 2	28 1	+5 9

5.4 Chart of Accounts and Financial Reporting System

A chart of accounts is a basic financial tool which is generally regarded as a means of classifying costs, revenues, assets, and liabilities in the preparation of financial statements It is also typically used in the preparation of budgets and in linking comparisons of budgeted and actual numbers.

5.4.1 Introduction

A recommended budgeting system was described in the Section 5.2 of this chapter. Basically, it calls for a bottom-up identification of needs, expressed in terms of line item expenditures by location (village, markaz), by function (source of water, treatment, ...), by activity (operating a pump, repairing pipes, ..), and by organizational unit (department, budget unit). Each of these component elements has a unique designation or code so that all activity can be sorted and reported by location, function, department, and so forth. For the purpose of budgeting, all of these different designations can be identified with expected expenditures with very little computer power and with simple application software such as the Microsoft Excel spreadsheet or Access database programs.

There is a major difference in a budgeting system and an accounting system. The budgeting system identifies the expected expenditures by function, activity, area, and line item, but the accounting system must record every expenditure that takes place during the year by the same function, activity, area, and line item codes and accumulate the expenditures into an accounting system to meet internal and governmental reporting requirements. The new authorities have neither the budgeting system nor the accounting system in place; so there is a major development process that must be completed Both the budgeting and accounting systems are currently done manually on a cash basis. A phasing-in of the budgeting process is recommended, starting with a single computer spreadsheet program and growing over 4 or 5 years to a database system with computers in all major locations.

5.4.2 Financial Accounting and Reporting System Requirement

Both water authorities should develop plans to implement a financial reporting system as soon as practicable The authority will be required to produce an Income Statement in the first year of operation, perhaps even by quarters which can be done much more efficiently with a computerized system. A balance sheet cannot be accurately constructed until assets have been valued, and a means of including outstanding debt has been devised. Asset valuation is a tedious process with strict rules laid out by the Minister of Finance; it would take several months even if all the basic data were available. Also, the debt that is carried by the Egyptian government

on facilities constructed for Minia and Beni Suef is not supposed to be turned over to the authorities until they are self-sufficient in O & M, which is scheduled for 5 to 7 years.

The Balance Sheet is not a critical operational statement and, if necessary, can be based on estimated values until asset values and debt obligations are sorted out. Accurate revenue and expenditure accounting, however, is required immediately

The Government of Egypt has a standard Unified System of Accounts that is required for use by all of the new authorities. No special provisions are made for water or wastewater utilities in the Unified System of Accounts. Consequently, using the uniform system as it is designed, does not provide the functional classifications of assets for water and wastewater needed to make comparisons among utilities of assets by functional area: source of water, transmission, treatment, distribution, and general plant.

These same functional categories and subsets can also used to allocate capital costs in various cost-of-service analyses when the need arises. In the next 5 to 7 years, there is no need for this additional detailed information in Minia or Beni Suef for cost-of-service analysis; however, in the long-run, the information is very useful, and therefore should be captured at the time of transition so that the effort is not largely duplicated at a later date The Uniform System of Accounts also does not provide for expenditure and revenue reporting by the functional and departmental categories typically used in the water business, nor does it provide for extensive area and budget unit (cost center) cost roll-up

The difficulty is to dovetail a water utility chart of accounts with a new accounting system that has not yet been specified, while preserving the ability to meet GOE reporting requirements as specified in the Uniform System of Accounts. For the purposes of this assignment, we must assume that the new accounting system that will be recommended and installed in a year or two will have a database capability, that is, will be able to accumulate, sort, and report data by the budget codes for function, activity, location, department, and line code or any combination of them. Given this capability, the accounting system must also be able to classify all of the elements in a manner that will meet the GOE Unified System of Accounts.

Until the financial accounting and reporting system is selected, there is no way to specify the exact account numbers that should be used. An adaptation of the National Association of Regulatory Utility Commissioners (NARUC) is used here to illustrate the kind of account number structure that is needed to provide typical water utility financial information The system is presumed to have database capability and meet the GOE Unified System of Accounts standard; so account classifications unique to the water or wastewater business can be included and then rolled-up to meet both the water system and GOE standards. Table 5-11 identifies the kind of account structure that is typically required for plant asset reporting in the water business, and Table 5-12 identifies the account links with the Egyptian Unified System of Accounts Any good

accounting system can accumulate plant assets by the numbering system identified in Table 5-11, and with the cross-referencing identified in Table 5-12, the new accounting system can classify the assets according to the Unified System of Accounts.

The account structure for expenditures and revenues is more straightforward; so the expenditure and revenue accounts typically used in the water business are cross-referenced with the Unified System in single tables, Table 5-13 for expenditures and Table 5-14 for revenues. The Uniform System also breaks down expenditures into five departmental or functional categories; for example, labor costs for example: Production (531), Production Services (631), Marketing Services (731), Administrative & Financial (831), and Capital Operations (931). The recommended budgeting and accounting account structure will have an unlimited number of departments, budget units, functions, activities, and object codes that can easily be summarized to fall into these categories for GOE reporting.

The criterion for determining how many department, activities, and so forth to set up is to require that the data accumulated for each element is really necessary to run and measure the performance of the utility. More data than is manageable or meaningful for decision making should be avoided

TABLE 5-11

WATER UTILITY PLANT ACCOUNTS

Account Number	Functional Category and Account Description
	Intangible Plant
301	Organization
302	Franchises and Consents
303	Miscellaneous Intangible Plant
	Source of Supply Plant
310	Land and Land Rights
311	Structures and Improvements
312	Collecting and Impounding Reservoirs
313	Lake, River and Other Intakes
314	Wells and Springs
315	Infiltration Galleries and Tunnels
316	Supply Mains
317	Other Water Source Plant
	Pumping Plant
320	Land and Land Rights
321	Structures and Improvements
322	Boiler Plant Equipment
323	Other Power Production Equipment
324	Steam Pumping Equipment
325	Electric Pumping Equipment
326	Diesel Pumping Equipment
327	Hydraulic Pumping Equipment
328	Other Pumping Equipment
	Water Treatment Plant
330	Land and Land Rights
331	Structures and Improvements
332	Water Treatment Equipment
	Transmission and Distribution Plant
340	Land and Land Rights
341	Structures and Improvements
342	Distribution Reservoirs and Standpipes
343	Transmission and Distribution Mains
344	Fire Mains
345	Services
346	Meters
347	Meter Installations
348	Hydrants
349	Other Transmission and Distribution Plant
	General Plant
389	Land and Land Rights
390	Structures and Improvements
391	Office Furniture and Equipment
392	Transportation Equipment
393	Stores Equipment
394	Tools, Shop and Garage Equipment
395	Laboratory Equipment
396	Power Operated Equipment
397	Communication Equipment
398	Miscellaneous Equipment
399	Other Tangible Property

Source Uniform System of Accounts for Class A Water Utilities, NARUC, Washington, D C

TABLE 5-12

WATER SYSTEMS
CROSS-REFERENCE OF PLANT ACCOUNTS BETWEEN NARUC AND THE UNIFIED SYSTEM OF ACCOUNTS

Uniform Number	NARUC Number	Functional Category and Account Description
111		Land
	310	Source of Supply Land
	320	Pumping Land
	330	Treatment Land
	340	Transmission & Distribution Land
	389	General Land
112		Buildings
	311	Source of Supply Structures
	321	Pumping Structures
	331	Treatment Structures
	341	Transmission & Distribution Structures
	390	General Structures
113		Machinery
	313	River Intakes
	314	Wells
	316	Supply Mains
	323	Power Production Equipment
	325	Electric Pumping Equipment
	326	Diesel Pumping Equipment
	332	Water Treatment Equipment
	342	Distribution Reservoirs
	343	Transmission and Distribution Mains
	345	Services
	346	Meters
	347	Meter Installations
	348	Hydrants
114		Means of Transport
	392	Transportation Equipment
	396	Power Operated Equipment
115		Loose Tools and Meters
	393	Stores Equipment
	394	Tools, Shop and Garage Equipment
116		Furniture
	391	Office Furniture and Equipment
	395	Laboratory Equipment
	397	Communications Equipment
	398	Miscellaneous Equipment

TABLE 5-13

CROSS-REFERENCE OF EXPENDITURE ACCOUNTS BETWEEN NARUC & THE UNIFIED SYSTEM OF ACCOUNTS

Uniform Number	NARUC Number	Account Description
310		Wages
	601	Salaries
	603	Incentive Compensation
	605	Advances for Conditions
	607	Performance and COL Salary Adjustments
	608	Pensions and Insurance
	609	Other Salary Expense
320		Materials for Production
321	610	Purchased Water
	615	Materials for Operations
	660	Supplies
322	620	Fuel and Oil
	622	Oil and Grease
	625	Electricity
	627	Gasoline
	629	Solar Fuel
	630	Oil
323	640	Small Capital, Spare Parts
327	650	Lighting
	652	Water
330		Service Inputs
331	670	Building and Equipment Maintenance
334	675	Publication, Advertising, Printing
335	680	Communications Expense
336	681	Hiring Equipment & Means of Transport
	685	Training
338	695	Miscellaneous Services
	686	Insurance (except personnel & inputs)
	350	Transfer Payments
351	687	Commodity Duties
353	688	Rent of Land and Buildings
366	690	Bad Debts

TABLE 5-14

CROSS-REFERENCE OF INCOME ACCOUNTS BETWEEN NARUC & THE UNIFIED SYSTEM OF ACCOUNTS

Uniform Number	NARUC Number	Account Description
410		Revenue of Current Activity
	460	Unmetered Water Revenue
	461	Metered Water Revenue - Residential
	462	Metered Water Revenue - Multi-family
	463	Metered Water Revenue - Commercial
	464	Metered Water Revenue - Industrial
	465	Metered Water Revenue - Public Authorities
	470	Fire Protection Revenue
	472	Rents from Water Properties
	474	Other Water Revenues

5.4.3 Wastewater System Accounts

In the Section 5.2 of this chapter, a recommended account structure was identified for wastewater operations The structure is the same as for water, but the functions and activities are different to reflect the wastewater situation. The expenditure accounts are the same for both water and wastewater. The asset categories and revenues are different and are provided in Tables 5-15, 5-16, and 5-17 which are equivalent to Tables 5-11, 5-12, and 5-14 for the water system.

TABLE 5-15

WASTEWATER UTILITY PLANT ACCOUNTS

Account Number	Functional Category and Account Description
	Intangible Plant
301	Organization
302	Franchises and Consents
303	Miscellaneous Intangible Plant
	Collection Plant
350	Land and Land Rights
351	Structures and Improvements
352	Collection Sewers- Force
352 1	Collection Sewers Gravity
352 2	Special Collecting Structures
353	Services to Customers
354	Flow Measuring Devices
355	Flow Measuring Installation
356	Other Collection Plant Facilities
	Pumping Plant
360	Land and Land Rights
361	Structures and Improvements
362	Receiving Wells
363	Electric Pumping Equipment
364	Diesel Pumping Equipment
365	Other Pumping Equipment
	Treatment and Disposal Plant
370	Land and Land Rights
370 1	Oxidation Lagoon Land and Land Rights
370 2	Other Land and Land Rights
371	Structures and Improvements
372	Treatment and Disposal Equipment
373	Plant Sewers
374	Outfall Sewer Lines
375	Other Treatment and Disposal Plant Equipment
	General Plant
389	Land and Land Rights
390	Structures and Improvements
391	Office Furniture and Equipment
392	Transportation Equipment
393	Stores Equipment
394	Tools, Shop and Garage Equipment
395	Laboratory Equipment
396	Power Operated Equipment
397	Communication Equipment
398	Miscellaneous Equipment
399	Other Tangible Property

Source Uniform System of Accounts for Class A Sewer Utilities, NARUC, Washington, D C

TABLE 5-16

WASTEWATER SYSTEMS
CROSS-REFERENCE OF PLANT ACCOUNTS BETWEEN NARUC AND THE UNIFIED SYSTEM OF ACCOUNTS

Uniform Number	NARUC Number	Functional Category and Account Description
111		Land
	350	Source of Supply Land
	360	Pumping Land
	370	Treatment and Disposal Land
	389	General Land
112		Buildings
	351	Collection Structures
	361	Pumping Structures
	371	Treatment and Disposal Structures
	390	General Structures
113		Machinery
	352	Collection Sewers
	353	Services to Customers
	354	Flow Measuring Devices
	356	Other Collection Plant
	362	Receiving Wells
	363	Electric Pumping Equipment
	364	Diesel Pumping Equipment
	365	Other Pumping Equipment
	372	Treatment and Disposal Equipment
	373	Plant Sewers
	374	Outfall Sewers
114		Means of Transport
	392	Transportation Equipment
	396	Power Operated Equipment
115		Loose Tools and Meters
	393	Stores Equipment
	394	Tools, Shop and Garage Equipment
116		Furniture
	391	Office Furniture and Equipment
	395	Laboratory Equipment
	397	Communications Equipment
	399	Other Tangible Property

TABLE 5-17

WASTEWATER SYSTEM
CROSS-REFERENCE OF INCOME ACCOUNTS BETWEEN
NARUC & THE UNIFIED SYSTEM OF ACCOUNTS

Uniform Number	NARUC Number	Account Description
410		Revenue of Current Activity
	460	Service Charges - Metered
	461	Metered Service Charge Residential
	462	Metered Service Charge Multi-family
	463	Metered Service Charge Commercial
	464	Metered Service Charge Industrial
	465	Metered Service Charge Public Authorities
	470	Flat Rate Service Charge
	472	Rents from Water Properties
	474	Other Sewer Revenues

A copy of the Government of Egypt standard Uniform System of Accounts is provided in Annex 4-1 along with the budgeting/accounting structure that is recommended in this chapter. The specific account numbers used in this section (adopted from NARUC) will probably be different from the actual numbers that will be used in the financial accounting and reporting system that is installed. The account numbers can be any sequence; it is the numbering concept that is important.

Chapter 6
OPERATIONS AND MAINTENANCE

6.1 Introduction

The Governorates of Minia and Beni Suef contain existing maintenance centers and workshops that will be incorporated into the new Water and Wastewater Authorities A strategic maintenance pro; ram is required to provide effective and cost-efficient strategies for organizing and managing these facilities in the short and long-term.

This chapter presents the development of a strategic management program for the new Minia and Beni Suef Water and Wastewater Authorities. The strategy and objectives for development were:

- Perform an assets register of all maintenance facilities presented in Annexes 6.1, 6.2 and 6.3;
- Investigate the existing maintenance systems, including information from workshops held with authority and government personnel;
- Analyze the existing maintenance systems;
- Prepare a strategic maintenance plan in partnership with the Minia and Beni Suef Water and Wastewater Authorities; and
- Prepare an action plan for implementation of the strategic maintenance plan.

6.2 Existing Maintenance Systems

In the Minia and Beni Suef Governorates, the maintenance centers and workshops are operated by their respective Village Council, City, or Marakez, and the maintenance organizations are consistent at the Village Council, City and Marakez levels Village Council maintenance centers supply maintenance to Village Council facilities as well as maintenance support of water and wastewater facilities in villages designated as satellite to the Village Council. Marakez maintenance centers supply maintenance to Marakaz facilities as well as maintenance support of water and wastewater facilities in village Councils and villages. City maintenance centers and workshops are dedicated to their respective city water and wastewater facilities

To illustrate the maintenance organization types:

- A typical Marakez maintenance center organization structure is shown in figure 6.1;
- The Minia water maintenance center and workshop organization structure is shown in figure 6 2;
- The Beni Suef water maintenance center and workshop organization structure is shown in figure 6.3; and
- The Minia and Beni Suef wastewater maintenance center and workshop organization structure is shown in figure 6.4.

The responsibilities and tasks of the existing maintenance centers and workshops are provided in Table 6.1 Maintenance center and workshop operation, maintenance and spare part costs are the responsibility of the respective Village Center, City or Marakez.

6.3 Analysis of Existing Maintenance Systems

6.3.1 Organization and Staffing

Presently, maintenance organizations serving the Government are fairly independent Planning, coordination and control of maintenance activities are completely decentralized This decentralized approach with little overall coordination has resulted in non-standardized equipment, lack of inventories, inefficient purchasing and delayed or improper maintenance.

Vehicle and equipment repairs are performed at unqualified Village Council, Marakez and City maintenance centers and workshops

There is a lack of skilled technicians and labor on maintenance teams. A large number of technical school graduates are employed at the centers and workshops, however, the majority are assigned to administrative and clerical work The lack of skills affects the quality and effectiveness of preventive maintenance and repair.

Job descriptions indicating qualification, experience and responsibilities for each job are not available

There has been a concerted effort to have trained personnel, and continuous training is necessary for staff at all levels, including management, technical, and on-the-job. Training needs assessments and training plans need to be prepared at all levels

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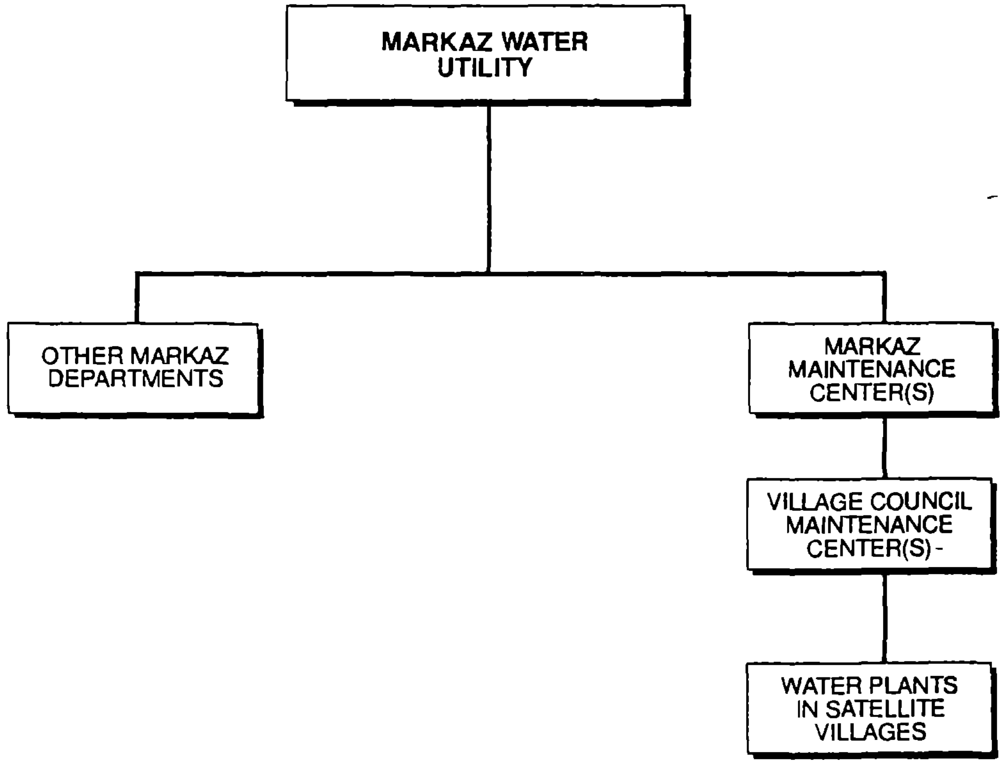

Figure 6-1

ORGANIZATION OF EXISTING WATER MAINTENANCE SYSTEM AT THE MARAKEZ GOVERNORATES OF MINIA AND BENI SUEF

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

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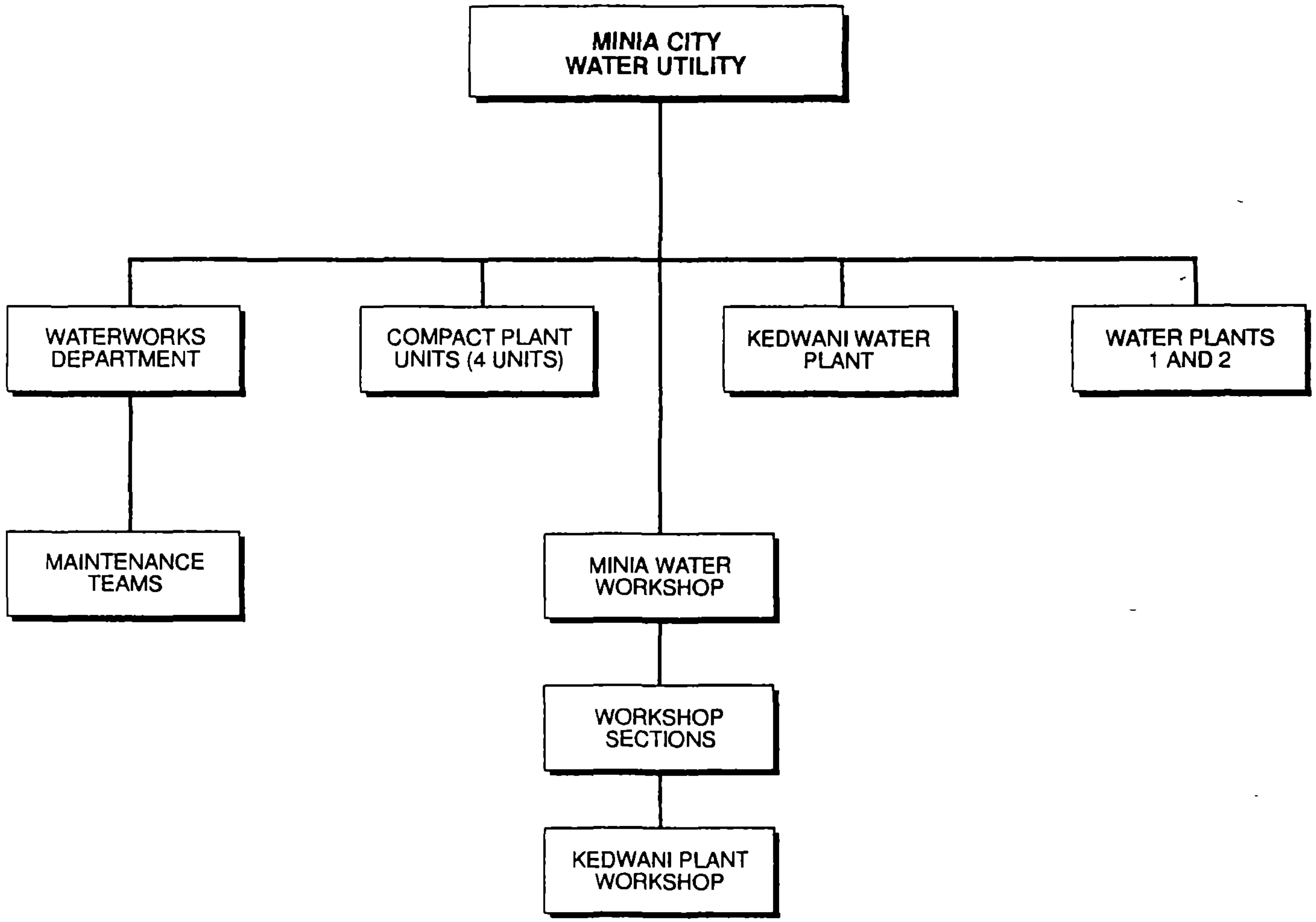

Figure 6-2

ORGANIZATION OF EXISTING WATER MAINTENANCE SYSTEM
CITY OF MINIA

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

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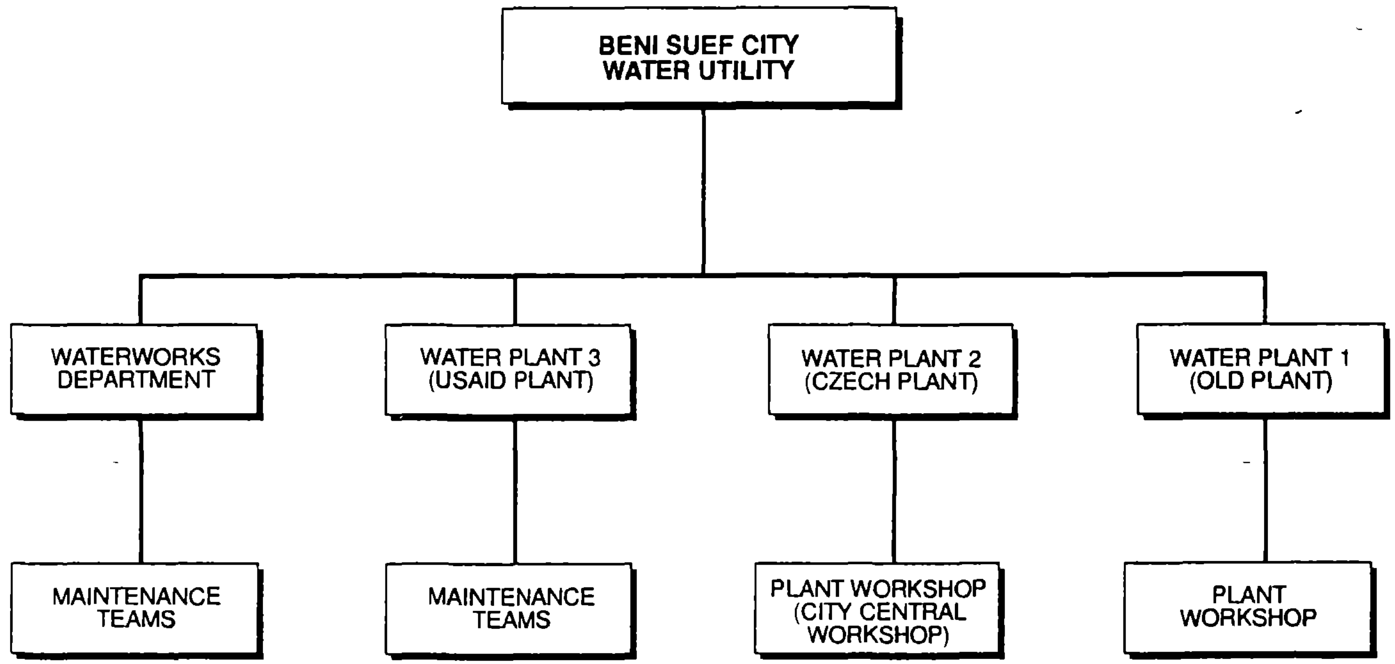

Figure 6-3

ORGANIZATION OF EXISTING WATER MAINTENANCE SYSTEM CITY OF BENI SUEF

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

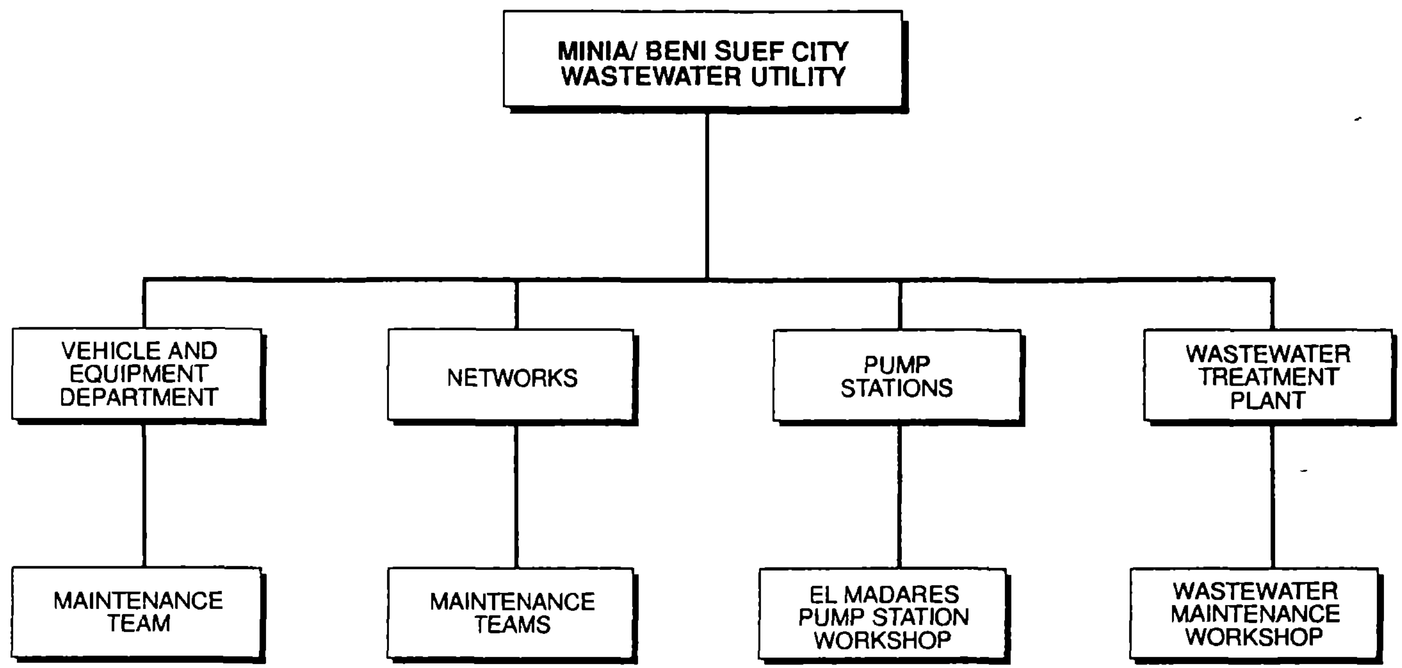

Figure 6-4

ORGANIZATION OF EXISTING WASTEWATER MAINTENANCE SYSTEM
CITIES OF MINIA AND BENI SUEF

Table 6-1
Responsibilities of Existing Maintenance Centers or Workshops

Maintenance Center or Workshop	Administrative Unit	Responsibilities
1 Village Council water maintenance center	Village Council	1 Operates and maintains water plants at the village council and satellite water plants and water distribution networks 2 Performs PM, simple and running repairs for plants equipment
2 Markaz water maintenance center	Markaz Council	1. Operates and maintains the markaz water plant and the water distribution networks 2. Technically supervises maintenance activities for water plants at village council and satellite villages 3 Performs medium and major repairs for plants equipment in cooperation with private sector workshops
3 Water treatment plant workshops at cities	City Council, Water Utility Department	1 Perform all levels of PM for plant equipment. 2 Perform all levels of repair for plant equipment 3 Major repairs are performed in cooperation with outside specialized workshops
4 Maintenance teams for water distribution networks	City Council, Water Utility Department	1 Perform PM for networks 2 Repair or replace demolished small parts of pipes and connections 3 Major replacements are performed by contractors
5 Wastewater plants workshops	City Council, Wastewater Utility Department	1 Perform all levels of PM for plant equipment 2 Perform all levels of repair for plant equipment 3 Major repairs are performed in cooperation with outside specialized workshops
6 Maintenance teams for Wastewater collection networks	City Council, Wastewater Utility Department	1 Perform all PM to collection networks 2 Repair or replace blocked and broken pipes, wells, valves, etc 3 Major repairs and replacements are performed by contractors

6.3.2 Maintenance Facilities

Except for the newly constructed U S. water plants, all maintenance centers and workshops were constructed in earlier years. The centers and workshops need to be rehabilitated and upgraded.

Not all water and wastewater treatment plants have maintenance workshops.

Preventive maintenance and repair levels and responsibilities are not defined.

Village council maintenance centers and the two new water treatment plants have maintenance programs and schedules Maintenance programs and schedules are required for the remaining maintenance centers and workshops.

Petty cash is allocated to maintenance centers and workshops. However, the allocations have remained constant while materials and spare part prices have increased substantially during the last years. This conditions have resulted in inadequate petty cash (i.e.,a village council maintenance center is allocated L.E. 200 to purchase urgent needs).

With the exception of the recently constructed U.S. Water Plants. Some operation and maintenance manuals and spare parts catalogs are available but are kept in locked sideboards. The information is not organized into libraries.

6.3.3 Supplies and Inventory Control System

Maintenance centers and workshops have some spare parts, however, increases in spare part prices and maintenance budgets not keeping up with inflation has resulted in shortages of spare parts Due to the difficulties in replacing spares used, there is a tendency to not use consumable spares hence, there is a large stock of supplies of old unused consumables.

In warehouses, except for the two new water treatment plants, custody is recorded on custody books (118) following the governmental storing system. All books are kept manually.

Since maintenance centers are independent, supplies are procured individually at different levels. Independence results in duplicate procurement administration, non-standardized equipment procured, and less cost-effective procurement than collective, bulk purchasing could achieve.

6.4 Proposed Strategic Maintenance Program

6.4.1 Maintenance Organization

On forming the new Water and Wastewater Authorities, an integrated maintenance system should be developed. The integrated system should ensure the following:

- Planning, Management, Budgeting and Control of maintenance activities would be performed at the authorities' headquarters.

- Operation of water wastewater plants and distribution collection systems would be the responsibility of the Authority branches at cities and marakez.

- Preventive Maintenance (PM) and repairs should be performed at different levels depending on the qualifications of maintenance centers and workshops.

- A computerized Procurement and Inventory Control System of maintenance supplies should be implemented at the Authorities headquarters. Cardex systems should be implemented at village councils, marakez and cities, as a preliminary step before introducing computers.

To ensure better performance of Water and Wastewater facilities, cost savings and productivity, the following deficiencies need to be addressed promptly:

- The creation of a maintenance department at the authority's headquarters responsible for planning and monitoring maintenance activities is needed Maintenance activities will include: procurement of maintenance supplies; development of a computerized inventory control system, and planning of maintenance staff training needs using Authority's resources or through outside training centers.

- The creation of a qualified central workshop at the authority's headquarters for conducting major repairs, and assisting in the performance of annual preventive maintenance to all vehicles and equipment.

- The creation of a central warehouse for shipping and handling of maintenance supplies. The central warehouse responsibilities will be to supply the central workshop and maintenance centers and/or workshops at the marakez and cities levels. Delivery schedules will be prepared by the maintenance department.

- Water and wastewater plants should be provided with adequate workshops to perform preventive maintenance and medium repairs

- The rehabilitation of the existing maintenance centers and workshops to meet current and future needs. Many water and wastewater plants will come on line during the next two years.

- The establishment of properly organized library centers - containing operation and maintenance reference materials - should be available to all engineers and technicians of the different administrative levels.

- Water meter maintenance workshops should be implemented at all administrative levels Major repairs and meter calibration would be performed at the proposed central workshop.

6.4.2 Maintenance Management

Maintenance management is defined as a series of activities carried out to ensure that equipment, systems, and facilities are able to perform as intended. Maintenance activities are divided into two categories: preventive and corrective.

Preventive Maintenance (PM) incorporates actions that are performed on a regular and scheduled basis These actions consist of inspection and/or maintenance tasks. Corrective maintenance (CM) incorporates actions that are taken to either repair or restore equipment or structures to standard operating conditions.

Effective PM will ensure·

1) keeping vehicles, equipment and structures in good and safe operating conditions;

2) avoid sudden defects;

3) increase the lifetime of vehicles,equipment and structure; and;

4) reduce overall operation and maintenance costs

6.4.2.1 Major Repairs

Outside contractors can perform frequent maintenance tasks requiring specialized skills or equipment that are not available to the central workshops. The cost may be less if contractors rather than the utility undertake the work

When it is decided to use outside contractors to do certain maintenance tasks, three types of contracts can be considered

1) service contracts, generally used for work involving both PM and CM tasks;

2) contracts issued after competitive bidding; and

3) contracts that require specifications and requests for proposal (RFP) to be developed for particular jobs.

6.4.3 Maintenance Management Information Systems

Maintenance Management Information Systems (MMIS) gather and report the information necessary to control the maintenance effort. They also track costs and allow management to make decisions regarding replacement, and upgrading of equipment. A satisfactory level of maintenance can not be achieved without accurate information.

The most important information that needs to be recorded relates to the equipment used to process and treat water and waste water, as well as pipe lines, valves, wells and miscellaneous flow devices that make up the distribution and collection systems.

Recording such information serves two purposes·

1) to maintain data on hardware (equipment and structures) specifications; and

2) to keep a written (or recorded) history of maintenance activities

If the necessary data are not available or incomplete, the first task for implementing maintenance programs is to gather the data.

6.4.3.1 Distribution and Collection System Inventory

Maps, with suitable scales on a grid system, should be used to record the location of water and wastewater pipelines, valves, and miscellaneous flow devices.

6.4.4 Work-Order Systems

Work-Order Systems keep track of the maintenance work activities Work-order systems must be tailored to effectively support maintenance activities.

One of the prime requisites for an effective maintenance management program is a work-order system covering all maintenance work undertaken For example, tracking PM work is virtually impossible without work orders In addition, work orders provide the data required to build the history segment of the equipment file

The flow chart displayed on Figure 6-5 indicates how the requests for CM work are originated, work orders prepared and completed, and maintenance work fed back to O&M files This approach enables operations to receive the same information as the maintenance departments

6.4.5 Maintenance Management System (MMS) Control

Maintenance Management Systems (MMS) maintain the integrity of the information system.

Monitoring MMS performance serves four functions:

1) to ensure that the work is carried in a timely manner;

2) to ensure that no work is unaccounted for;

3) to provide the data needed to track maintenance costs; and

4) to provide a means of assessing maintenance group performance.

The examples of typical monitoring reports, cited here, are designed to satisfy the four purposes of a monitoring system described above. The most important of these reports is likely to be that which ensures that all work is accounted for.

The Figure 6-6, which combines all data on work orders written during the month, is an example of this type of report. This form lists all jobs that were started but not completed, as well as work that remains undone from previous periods

Cost reports are considerably more difficult to develop and prepare for manual systems. Even for small water systems with relatively few work orders, the effort to assemble and analyze the data on maintenance utility costs may be extensive. Figure 6-7 shows one such report While this report does not analyze individual jobs, it does measure the cost of maintenance from month to month.

6.4.6 Inventory Management

Inventory management keeps a balance between stocking the right type and amount of spare parts to undertake repairs, and controlling the cost of an extensive inventory.

An effective inventory system will ensure that the parts, materials and tools necessary to minimize downtime and service interruption for the utilities' equipment and structures are readily available; and that the cost of maintaining these supplies is as low as possible.

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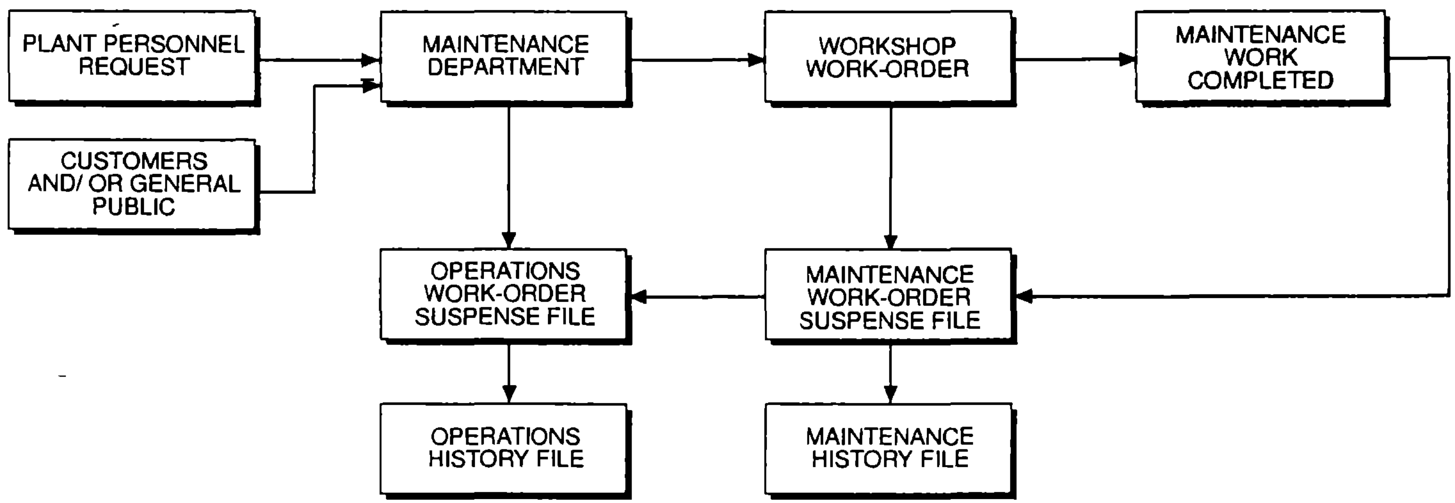

Figure 6-5

CORRECTIVE MAINTENANCE WORK ORDERS TRACKING SYSTEM

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

Work-Order Summary

Month:____________________ Maintenance Depot:____________________

CM	PM	
		Number of work orders outstanding from last month.
		Number of work orders started this month.
		From E/M.
		From operations.
		Number of work orders originating this month but not completed.

Work Order Number	Date Opened	Reason for Delay	Expected Completion Date
Number 1 priority work orders not completed this month.			
Number 3 priority work orders not completed from previous months.			

Figure 6-6

WORK ORDER SUMMARY

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

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Monthly Cost Summary			
Month:________________ Maintenance Office:________________			
Number of work orders completed			
	PM	**CM**	**Total**
Total labor cost:			
Total materials cost:			
Total other cost:			
Total cost:			
Average cost per work order:			
Other Comments:			

Figure 6-.

MONTHLY MAINTENANCE COST SUMMARY

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

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For the new Water and Wastewater Authorities in both governorates, where utilities are spread over the entire governorate, regional warehouses with multiple storerooms are needed despite the additional cost of maintaining them. For village council warehouses, a single storeroom is adequate.

The central warehouse will purchase, store and distribute supply materials to the regional warehouses at Cities/Markaz The regional warehouses will re-stock supply materials and provide petty cash for operation of village council and plant warehouses. Figure 6-8 illustrates the proposed store system.

6.4.6.1 Maintenance Requirements

An inventory system that will serve all maintenance functions, needs to differentiate between equipment downtime and service interruptions In particular, these differences will affect the method and cost of maintaining adequate spare parts and supplies.

6.4.6.1.1 Equipment Maintenance

Maintaining equipment to minimize downtime does not mean having enough supplies on hand to restore every piece of equipment to immediate service. Such an approach is too costly. However, an assessment of each operating system is needed according to the following factors:

- Availability of stand-by equipment
- Criticality of equipment to primary plants operations.
- Frequency of spare parts.

The factors above relate more to CM than to PM work. Since PM is conducted regularly and requirements for parts and supplies are known, the inventory should be designed to ensure that the required parts and supplies are always available when needed.

6.4.6.1.2 Water Distribution and Wastewater Collection Systems

For managers of distribution and collection systems, reducing interruption time is vital Necessary parts and supplies to restore service to the public must be available when the need arises

6.4.6.1.3 Water Meters and Fire Hydrants

These are special cases for the distribution maintenance sections Obviously, fire hydrants should be operational all of the time; thus spare units must be available when needed Maintaining an adequate supply of replacement parts for water meters, in case of failure, is also important from a revenue standpoint.

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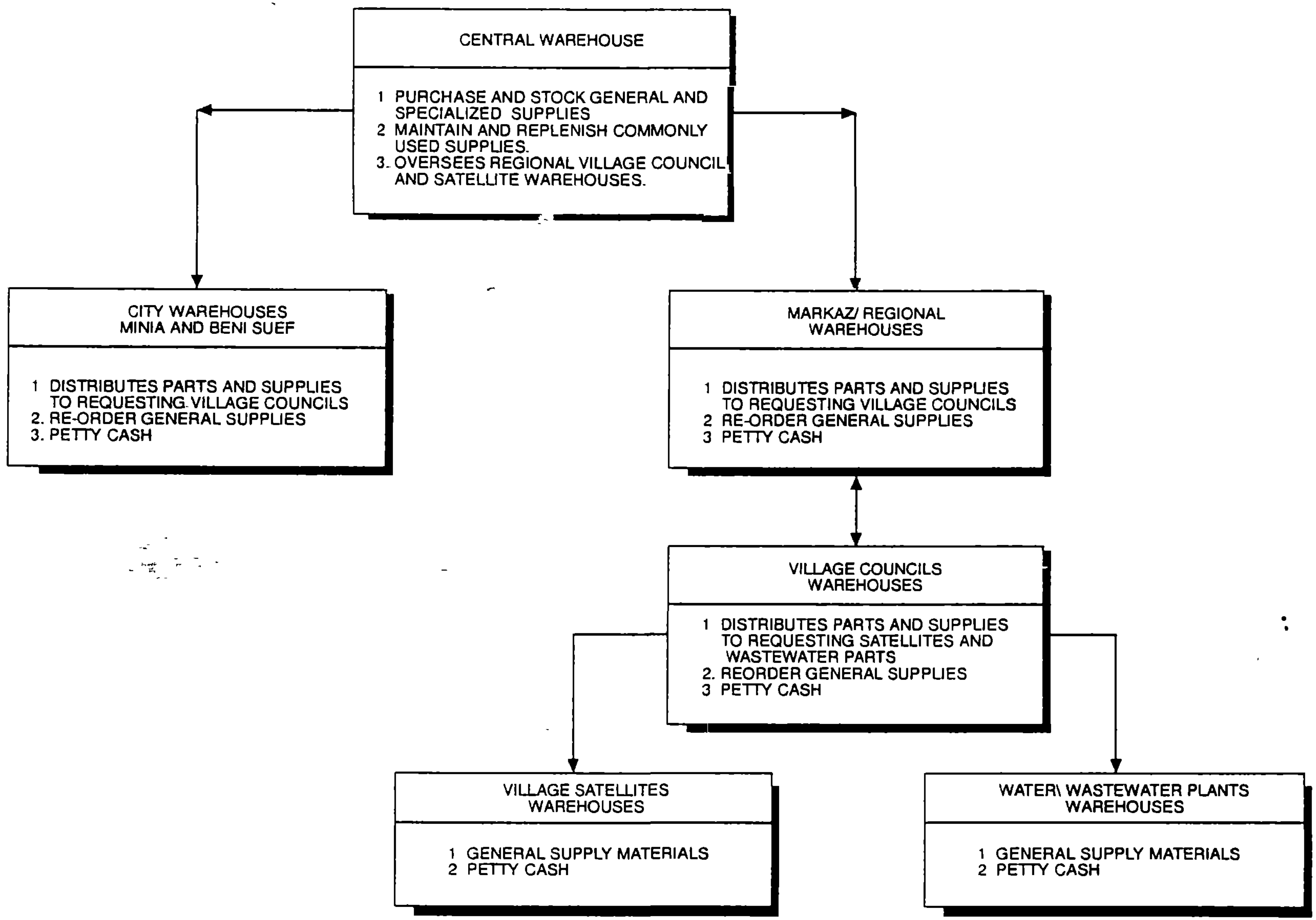

Figure 6-8

PROPOSED STORE SYSTEM

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

6.4.6.1.4 Buildings and Grounds (B&G)

A minimum inventory of materials and supplies should be maintained Items relating to safety and security need to be available when needed They are as important to the utilities as those supplies required for reliable operations of utilities.

6.4.6.1.5 Petty Cash

As mentioned above, it is not necessary to keep all needed spare parts and supplies on stock. Petty cash should be allocated to each maintenance center, workshop or team to purchase urgently needed spare parts and supplies. Recommend minimum petty cash allocations could be:

- L E 1000 for village council maintenance centers
- L E 2500 for cities and Markez workshops
- L.E. 3500 for water and wastewater treatment plants
- L.E. 5000 for the central workshop

6.4.6.2 Determining Quantities in Inventory

Deciding the quantities needed to properly and effectively maintain the utilities' equipment and structures is a time-consuming and sometimes difficult task. It requires evaluating basic maintenance requirements, assessing the use of equipment and structures, and knowing the availability of parts and supplies.

The actual quantities stocked will be affected by the following factors:

- Long lead times;
- Obsolete equipment;
- Local availability;
- Stockroom space;
- Use of contractors; and
- Equipment or structure life

Inventory cost is the final item that needs to be addressed when establishing quantities. Some maintenance managers tend to stock as many spare parts or supplies as possible to avoid delays in maintenance work However, this will result in an unmanageable stockroom. To avoid the problems of delay and overstocking, petty cash should be allocated to the different sub-regional warehouses and village council warehouses for the purchase of urgently needed spare parts and supplies that are not available in stores

6.4.6.3 Storage Room Location

The new Water and Wastewater Authorities in both governorates could use centralized warehouses as well as regional and small satellite storerooms. The regional (at Marakez) and satellite (at village councils and plants) will save travel time. One advantage to this decentralized approach is that the regional and satellite storerooms will be operated using inexpensive manual inventory techniques, and still maintain proper control over stock movement.

6.4.7 Inventory Information System

Inventory Information Systems (IIS) are used to control and operate inventory systems. IIS check the amount of stock that can be accounted for versus stock that is actually present or has been used.

An effective and efficient inventory system depends on a smooth flow of information through the system and the different storerooms.

6.4.7.1 Purchase Requisition

Preparing a purchase requisition is the first step to obtaining spare parts and supplies. The Purchase Department of the new Water and Wastewater Authority in each governorate is separate from the Maintenance Department. Cooperation between the two departments is very important Upon receipt of the requisition, the Purchase Department will prepare purchase orders, having first determined the suppliers through competitive procedures. The only real requirements are that the items in inventory are available when needed and that system control mechanisms are in place.

The Maintenance Department is responsible for preparing purchase requisitions, and can assist the Purchase Department by preparing them carefully. The Maintenance Department Manager should ensure that a realistic date is set for the delivery of items.

6.4.7.2 Documentation

Because the new Water and Wastewater Authorities' assets are considered public property, Authorities have to follow GOE warehousing regulations and documents. Inventory custody should be kept in formal custody books; and other formal forms should be used. However, other systems, either manual (cardex system) or automated (computerized system), need to be introduced besides the GOE formal system.

It is recommended that a cardex inventory information system be used initially, then, once it is perfected integrated computer data base systems could be introduced.

6.5 Recommended Strategic Maintenance System for Minia and Beni Suef Water & Wastewater Authorities

The proposed strategic maintenance system for Minia and Beni Suef Water and Wastewater Authorities should adopt a combination of a centralized and decentralized approach

The creation of regional branches at marakez/cities would ensure decentralization, while the creation of a maintenance department, a central workshop, and a central warehouse at the authorities headquarters would help centralization. Figures 6-9 and 6-10 illustrate the proposed maintenance organization through the authorities hierarchies. The tables 6-2, 6-3, 6-4, 6-5 indicate PM & CM responsibilities and maintenance levels The tables are the result of the training workshops held in Minia and Beni Suef Governorates.

6.5.1 Maintenance Department

The Maintenance Department would be formed under the Deputy Chairman for Technical Affairs. The Maintenance Department Manager/Director will be responsible for:

- Obtaining accurate data on vehicles, equipment, water and wastewater networks, and maintaining and updating data on different inventories.
- Planning and controlling all PM and CM activities for all maintenance facilities in the Authority.
- Planning and following up on requisitions and procurement of spare parts and other supplies needed for the maintenance of vehicles, equipment and structures.
- Cooperating closely with the Purchase Department on the procurement of spare parts and other supplies for maintenance.
- Introducing modern maintenance and inventory control systems and tools (Manual and/or automated) and following up on implementing these systems
- Planning and supervising the upgrading of existing maintenance facilities and the formation of marakez and central workshops.
- Planning and supervising the upgrading of regional and village council storerooms, and forming the central warehouse
- Reporting to the Deputy Chairman for Technical Affairs on all PM and CM activities, and on the spare parts and other supplies inventory

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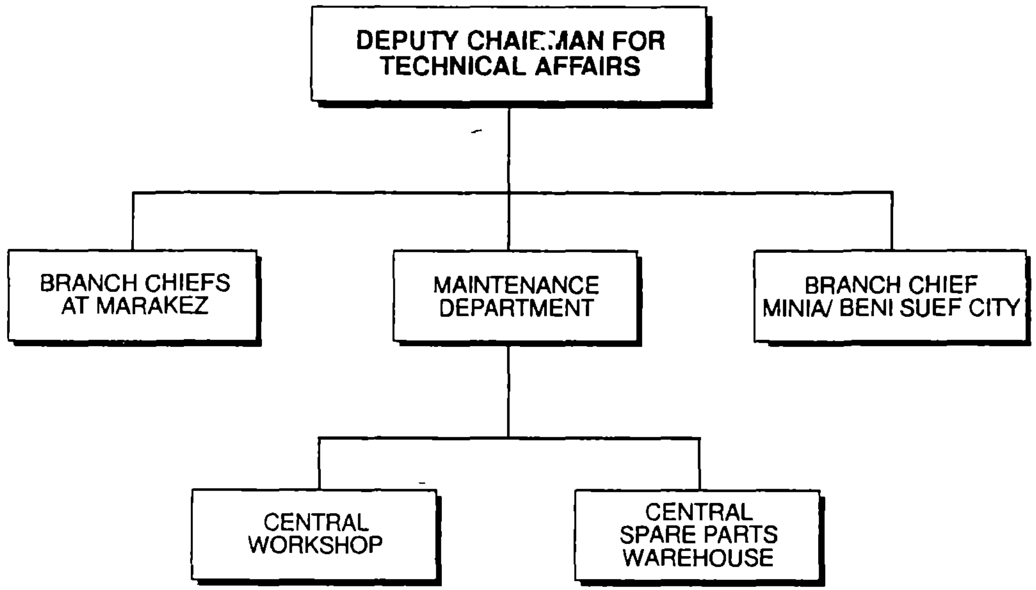

Figure 6-9

MAINTENANCE DEPARTMENT
CENTRAL WORKSHOP AND CENTRAL SPARE PARTS WAREHOUSE

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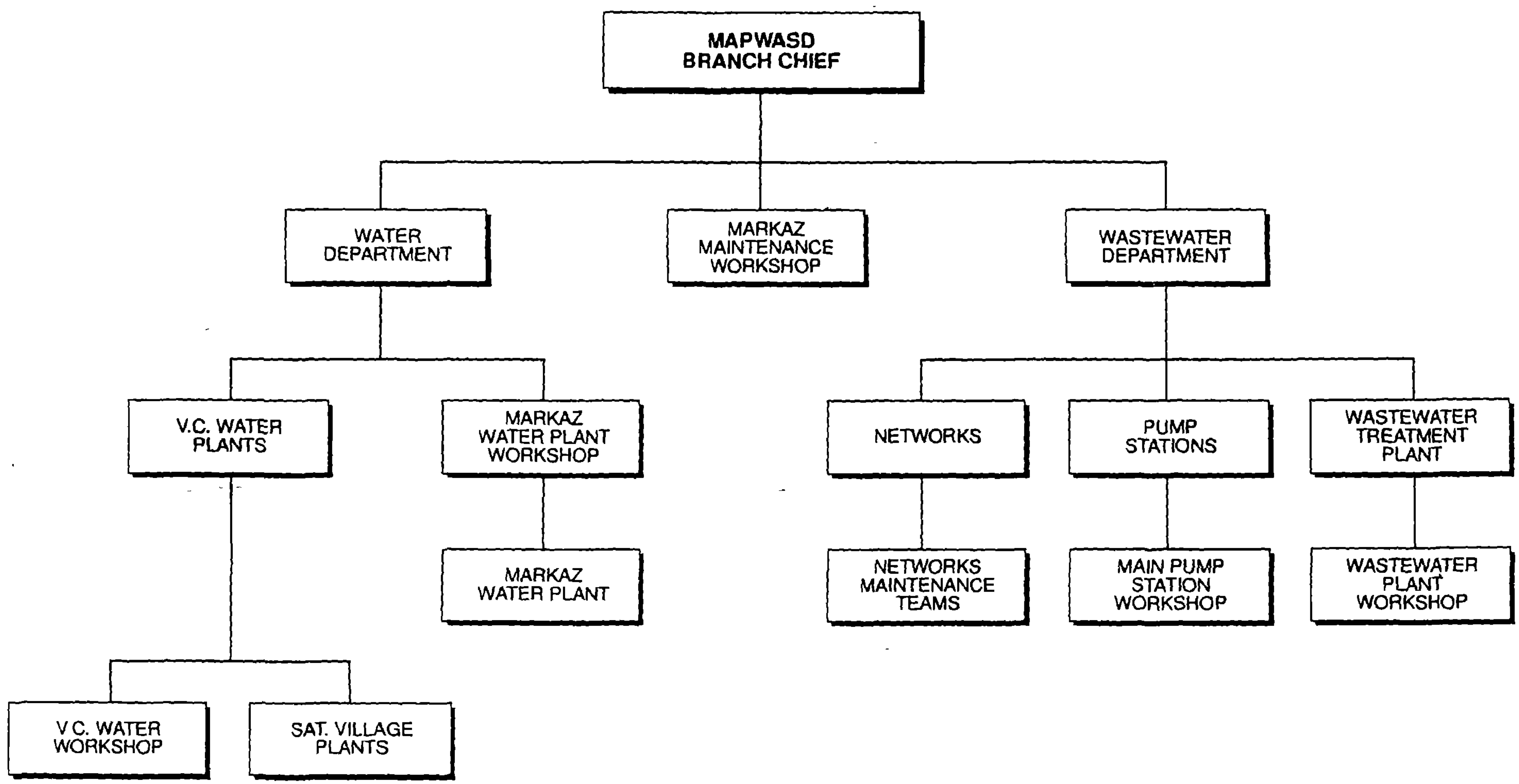

Figure 6-10

OPERATION AND MAINTENANCE ORGANIZATION
MARKAZ CITY

INSTITUTIONAL SUPPORT ASSISTANCE FOR 1996
Provincial Cities, Egypt

MONTGOMERY - HARZA

Table 6-2
Maintenance Levels and Responsibilities
for Vehicles and Mechanical Equipment Department

Maintenance Level	Operator	V.C. Workshop Pump Station Workshop	Markaz Workshop W.W. Treatment Workshop	Central Workshop
1. Preventive Maintenance				
Daily	√	-	-	-
Weekly	√	-	-	-
Monthly	√	√	√	√
Bi-Annual	-	√	√	√
Annual	-	-	-	-
2. Corrective Maintenance (Repairs)				
Simple	-	√	-	-
Running	-	-	√	-
Medium	-	-	√	-
Major	-	-	-	√

Notes: Output from workshops 1&2.

Table 6-3
Maintenance Levels and Distribution Responsibilities for Water Distribution Department

Type of Work	Period	Responsibility
Preventive Maintenance		
1 Clean valve well, shut and open valves	Bi-monthly	Network technician
2 Washing and disinfecting water tanks	Monthly	Plant plumber
3 Wash and clear water network	Quarterly	Markaz/City maintenance team
4 Replace defective valves	As needed	Markaz/City maintenance team
Corrective Maintenance (Repairs)		
1. Replace leaking consumer connections	As needed	Village maintenance plumber
2. Replace demolished connections or pipes	As needed	Markaz/City maintenance team
3. Major pipe replacements	As needed or at the end of its lifetime	Contractors

Note: Output from Workshops 1 & 2.

Table 6-4
Maintenance Levels and Responsibilities for Waste Water Collection Department

Type of Work	Period	Responsibility
<u>Gravity of Work</u>		
Preventive Maintenance		
1. Disinfecting collection wells.	Bi-monthly	Network technician
2 Clear W.W. collection pipes.	Monthly	Network maintenance teams
3. Annual clearing of network.	Annual	Network maintenance teams
Corrective Maintenance (Repairs)		
1. Repair damage in broken pipes.	As needed	Markaz/city workshop
2. Repair damage in valve wells	As needed	Markaz/city workshop
3. Raise well cover levels	Prior to paving streets	Contractors
4. Major pipe replacements.	As needed or by the end of its lifetime	Contractors
<u>Force Mains Pipes</u>		
Preventive Maintenance		
1. Check and maintain air release valves.	Quarterly	Maintenance technician
Corrective Maintenance (Repairs)		
1. Repair of replace valves	As needed	Markaz/city maintenance teams
2. Repair damage in broken pipes	As needed	Markaz/city maintenance teams
3. Major pipe replacements.	As needed or at the end of its lifetime	Contractors

Note· Output from Workshops 1 & 2.

Table 6-5
Maintenance Levels and Responsibilities for Meter Department

Repair Level	Type of Work	Responsibility
1. Running repairs	Repair leaking meter connections	Village workshop
2. Running repairs	Disassemble, clean and re-erect water meter	Village workshop
3. Running repairs	Replace defective meters	Village workshop
4. Medium repairs	Disassemble and change defective gears and reassemble water meters	Central workshop
5. Major repairs	Overhaul and calibrate water meters	Central workshop

Note: Output from workshops 1 & 2.

6.5.1.2 Central Workshop

The proposed central workshop would be responsible for:

- Performing annual preventive maintenance for vehicles and equipment
- Carrying out medium and major repairs for vehicles and equipment.
- Reporting monthly to the Maintenance Department Manager on all maintenance activities performed by the Central Workshop; and on consumed spare parts and materials.

6.5.1.3 Central Warehouse

It is recommended that the Central Warehouse be located close to the Central Workshop. The Central Warehouse would consist of several storerooms of an adequate size. A suitable fenced and partly covered yard would also be required for storing heavy parts and large weather-resistant materials.

The central warehouse will be responsible for:

1) Preparing procurement requisitions for spare parts and other supplies needed for maintenance

2) Cooperating with the Procurement Department on following up procurement procedures.

3) Distributing spare parts and other supplies among regional and satellite stores according to the Maintenance Department Manager's plans

4) Instructing suppliers on items that should be delivered directly to regional and satellite store, in cooperation with the Procurement Department This may save transportation costs

5) Maintaining and updating custody books and forms in accordance with GOE warehousing regulations as well as the inventory control system adopted.

6) Reporting on a monthly basis to the Maintenance Department Manager on the inventory status A copy of the monthly report would be submitted to the Central Workshop Manager

6.5.2 Strategic Maintenance and Supplies System

Corrective Maintenance (CM) and supplies management follows the combination of a centralized and decentralized system described above Figure 6-11 is a flow diagram describing the strategic maintenance system.

The strategic maintenance system was presented to the participants of training workshops 1 and 2 held in Minia and Beni Suef governorates. All participants approved the proposed strategic maintenance system.

6.6 Action Plan for Implementing the Strategic Maintenance System

To implement the strategic maintenance system for both governorates, intensive technical assistance is needed. Short and long term actions and tasks are to be undertaken.

The following list describes these actions and tasks.

6.6.1 Short Term Actions

1) Perfect all data obtained on assets at both governorates.

2) Rehabilitate and upgrade the existing maintenance centers at village councils, marakez and plants workshops.

3) Assess needed shop equip and tools.

4) Assess training needs and develop training programs and schedules.

5) Establish the Central Maintenance Department.

6) Improve and upgrade maintenance performance and systems developed during the LD II Project at village councils and marakez.

7) Replicate the maintenance system developed at the new water treatment plants (USAID projects) in all water and wastewater treatment plants.

8) Establish maintenance libraries at Water and Wastewater Authority headquarters and at marakez workshop and water wastewater plants.

9) Follow up on, supervise, and improve maintenance performance in existing workshops and maintenance centers (Continuous activity)

6.6.2 Long Term Actions

1) Construct and equip the Central Workshop

2) Construct and equip the Central Warehouse

3) Procure needed shop equipment and tools both locally and from abroad.

4) Introduce a cardex inventory control system at the Central Warehouse, and at the regional and satellite stores.

5) Introduce computerized inventory control system at the Central Warehouse and, insofar as this is possible, at marakez and plant storerooms.

6) Assist in developing maintenance systems at the new wastewater treatment plants which are currently under construction.

7) Implement and supervise training programs. Training will include:

   - Water and wastewater plant management for engineers.

   - Maintenance management for maintenance engineers

   - Trouble shooting and repairs for different vehicles and equipment for engineers and technicians

   - OJT for PM teams

   - Skills upgrading for operators and maintenance personnel Training will be a continuous activity through the whole duration of any future technical assistance project.

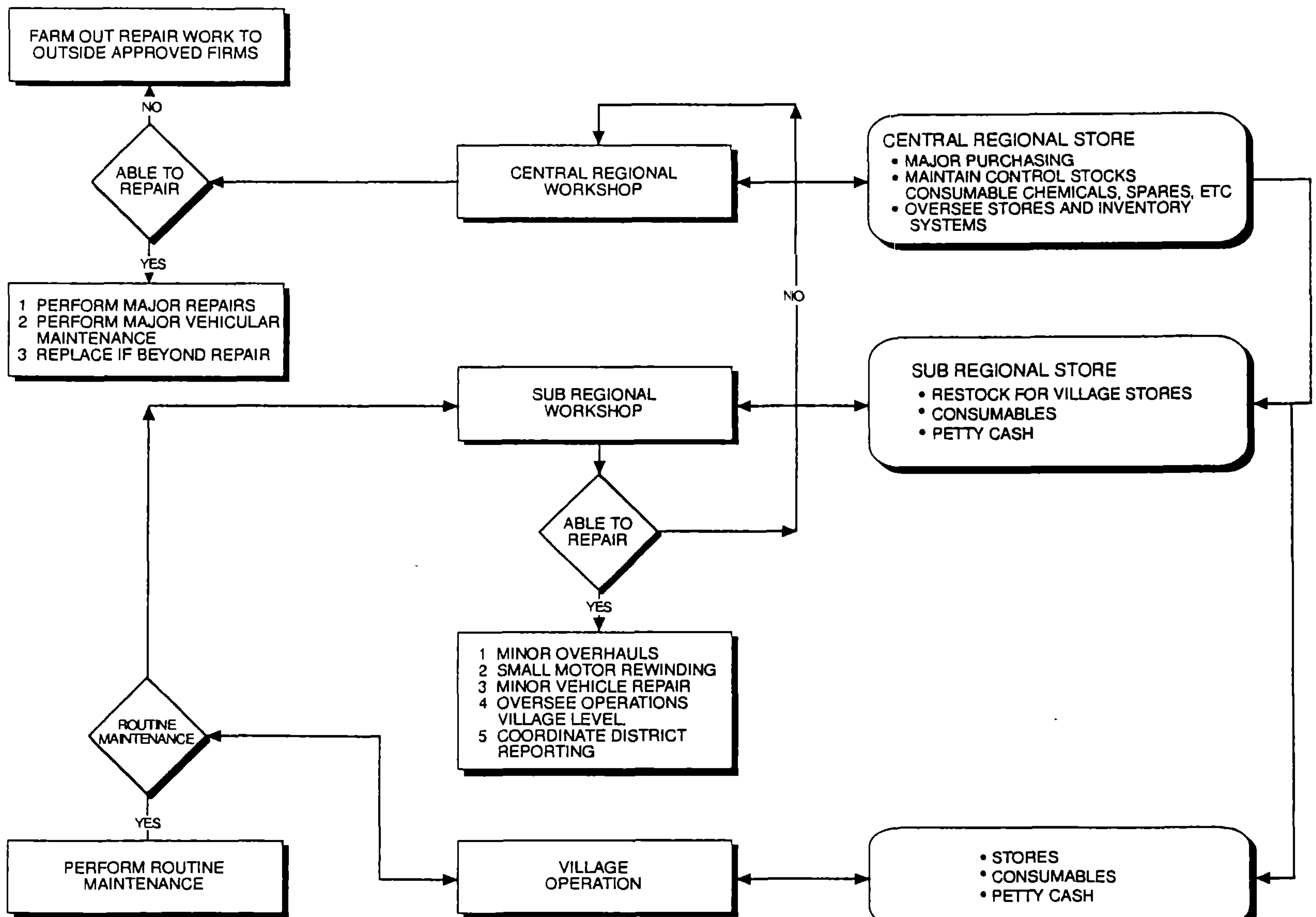

Figure 6-11

PROPOSED STRATEGIC MAINTENANCE SYSTEM

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Chapter 7
RECOMMENDED ACTION PLAN

Under the project scope of work, refined action plans, based on the previous EHP Activity Report No. 11 prepared in September 1995, for the transformation of the Authorities to achieve financial and operational autonomy are to be provided.

The approach in generating these refined was based on an in-depth review of the previously prepared EHP action plans. This review was undertaken based on the results of the project activities undertaken during this phase of the project.

As a first step in refining the action plans to achieve financial and operational autonomy the basic premises for the action plan prepared under the EHP report were reviewed in light of the findings under this phase of the project.

It is the consensus of the Montgomery HARZA Team that the EHP report accurately established:

- The purpose and goals of the program;
- Activity areas;
- Purpose for transformation; and
- General plan of actions including indicators for success.

Complete information regarding these items can be found in Annex 7, EHP Activity Report No. 11, Action Plan, Institutional Development for Water and Wastewater Utilities in the Governorates of Fayoum, Beni Suef and Menya.

What the team has done is to amplify the activities required as a result of the findings of this phase of the project. The approach followed presents with activities required to accomplish autonomy at the end of each section of the report. This information was then summarized and input into the time line critical path method chart included as Figure 7-1.

It is not the intent of this schedule to indicate in complete detail every activity which will be required to achieve financial and operational autonomy for the authorities. Rather, it is meant to begin to form a baseline activity plan which is indicative of the number and complexity of the tasks facing the authorities in their transformation to autonomy.

There is a tendency for organizations to downplay the complexity of the tasks associated with periods of transition. The difficulties that occur during these periods of re-organization should not be underestimated. Effective management is required to recognize both the strengths and weaknesses of the organization and take the necessary steps to insure that the transition takes place in a timely manner

There will be difficult decisions facing the new authorities in Minia and Beni Suef Decisions taken must be based on sound information and in some cases must consider the social and economic issues facing the Country as a whole.

The recommended plan of action is meant to be a guide and should be reviewed and updated as required. It was prepared using a computer program for project management called Microsoft Project A copy of the file can be found on the computer disks included in Volume II of the report document.

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Task Name

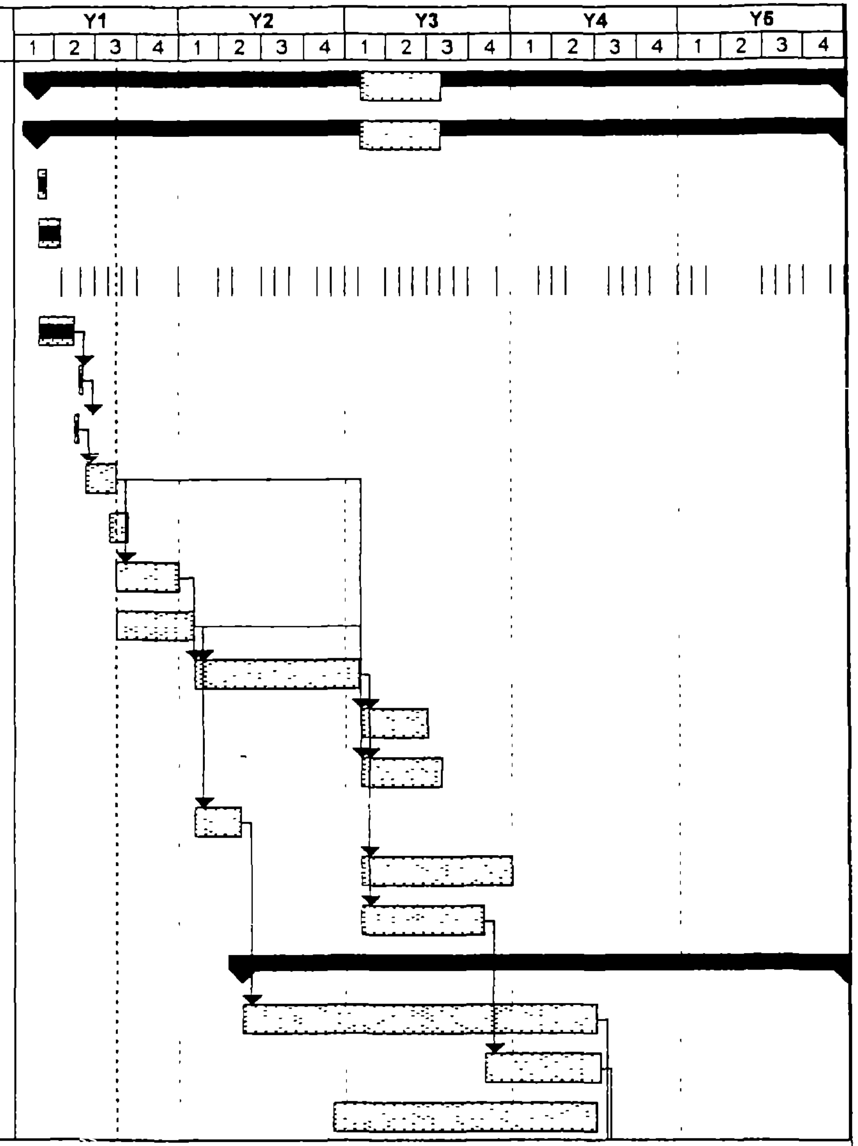
Actions Required for Transformation

Organizational Development

- Appoint Authority Chairman
- Nominate Board & Issue necesssary decrees
- **Hold regular Board Meetings**
- Prepare Organization Chart Including Job Desc .ptions for Key Posts
- Comments from COAC
- Review organization chart with Chairman for final Approval
- Get Approval of Board for Organization Chart
- Identify & establish offices for the use of the Authority
- Develop organization chart for total organization
- Review existing personnel to determine who is a full time employee
- Undertake a Personnel Needs Assessment
- Compare number of staff with requirements of the Authority
- Board establishes policy regarding surplus staff, training, manpower gaps
- Transfer personnel who are full time to the Authority under GOE Conditions
- Appoint Authority Personnel (Link with Manpower Planning Study)
- Establish personnel policies including conditions of service

Manpower Training

- Undertake a training needs assessment (Manpower Planning Study)
- Develop a certification program
- Develop in house training capabilities



Task | Summary | Rolled Up Progress
Progress | Rolled Up Task
Milestone | Rolled Up Milestone

ORGANIZATIONAL DEVELOPMENT
(Sheet 1 of 2)

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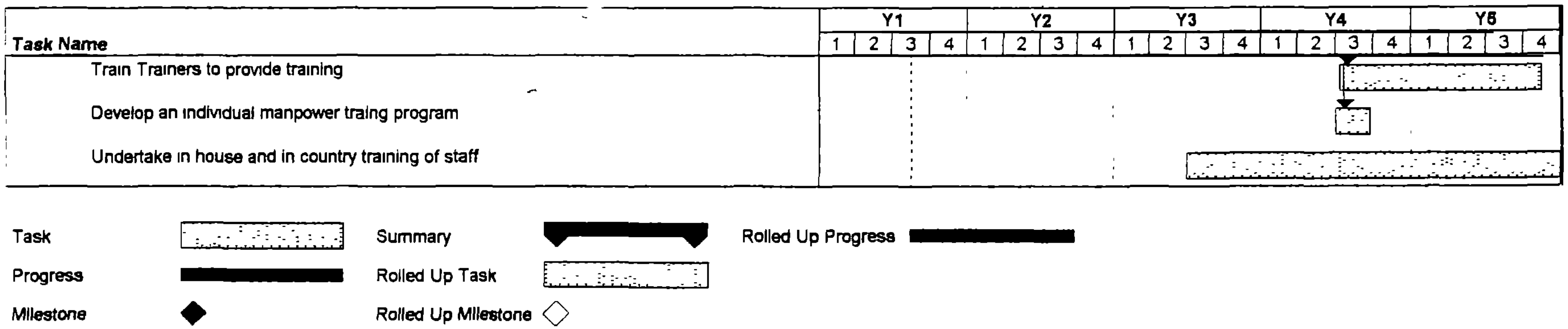

ORGANIZATIONAL DEVELOPMENT
(Sheet 2 of 2)

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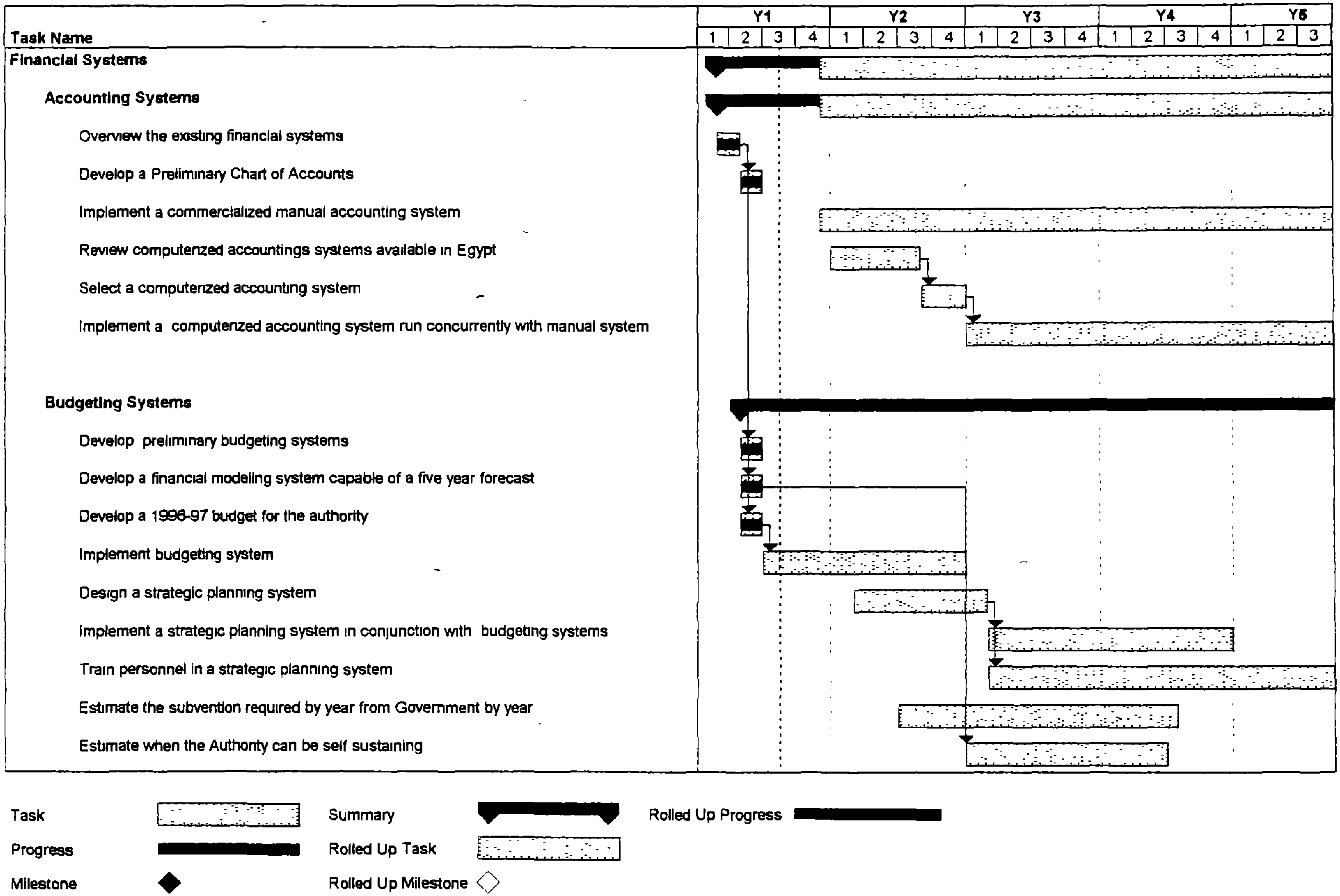

FINANCE

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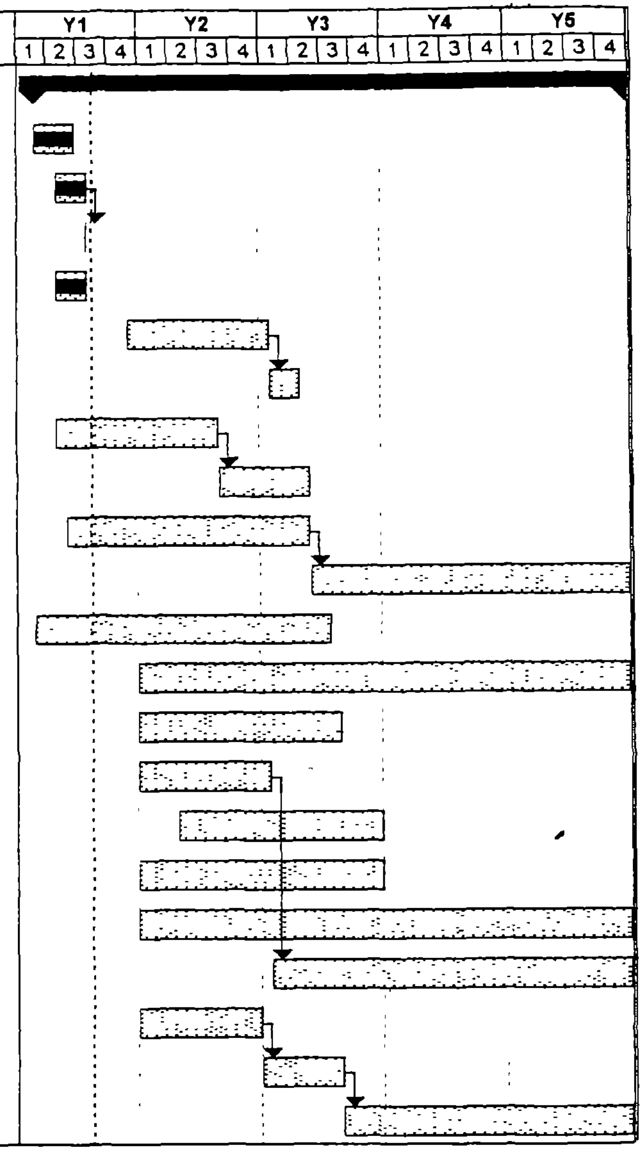
Task Name
Operation & Maintenance
Overview existing maintenance systems
Develop a Strategic Maintenance Program (SMP)
Hold training sessions for SMP
Develop, for the short term, immediate action plan for repairs as required
Overview maintenance facilities shared by various governmental units
Establish procedures for the use of shared maintenance facilities
Review electrical & mechanical lists
List recurring maintenance needs
Arrange supply and purchase of recurring maintenance needs
Implement routine maintenance practices based on available funds, equipment and manpower
Replicate US maintenance system in major installations
Improve and upgrade maintenance performance at the village & marakez level, as required
Assess equipment & workshop needs include new workshops required and rehabilitation of existing workshops
Assess stores requirements including existing facilities and new facilities
Develop material handling systems
Rehabilitate and upgrade existing workshops
Supervise and train personnel in existing workshops and maintenance centers
Construct and equip maintenance and store facilities, as required.
Overview computerized O & M systems available in Egypt & in Arabic (include stores, inventory & purchasing systems)
Select O & M system
Implement O & M system & train personnel in the selected O & M system



Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

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OPERATIONS AND DEVELOPMENT

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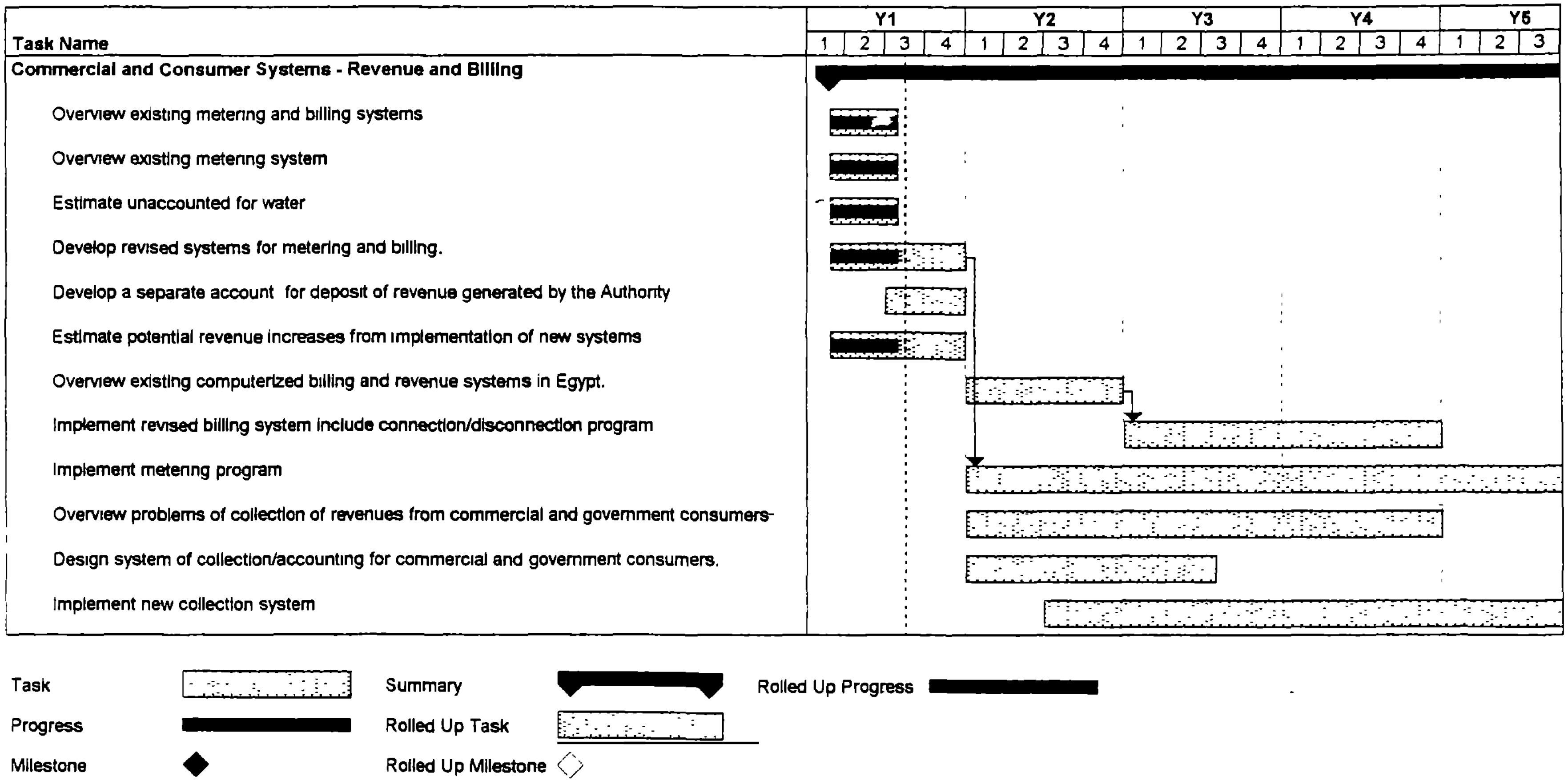

REVENUE AND BILLING COMMERCIAL SYSTEMS

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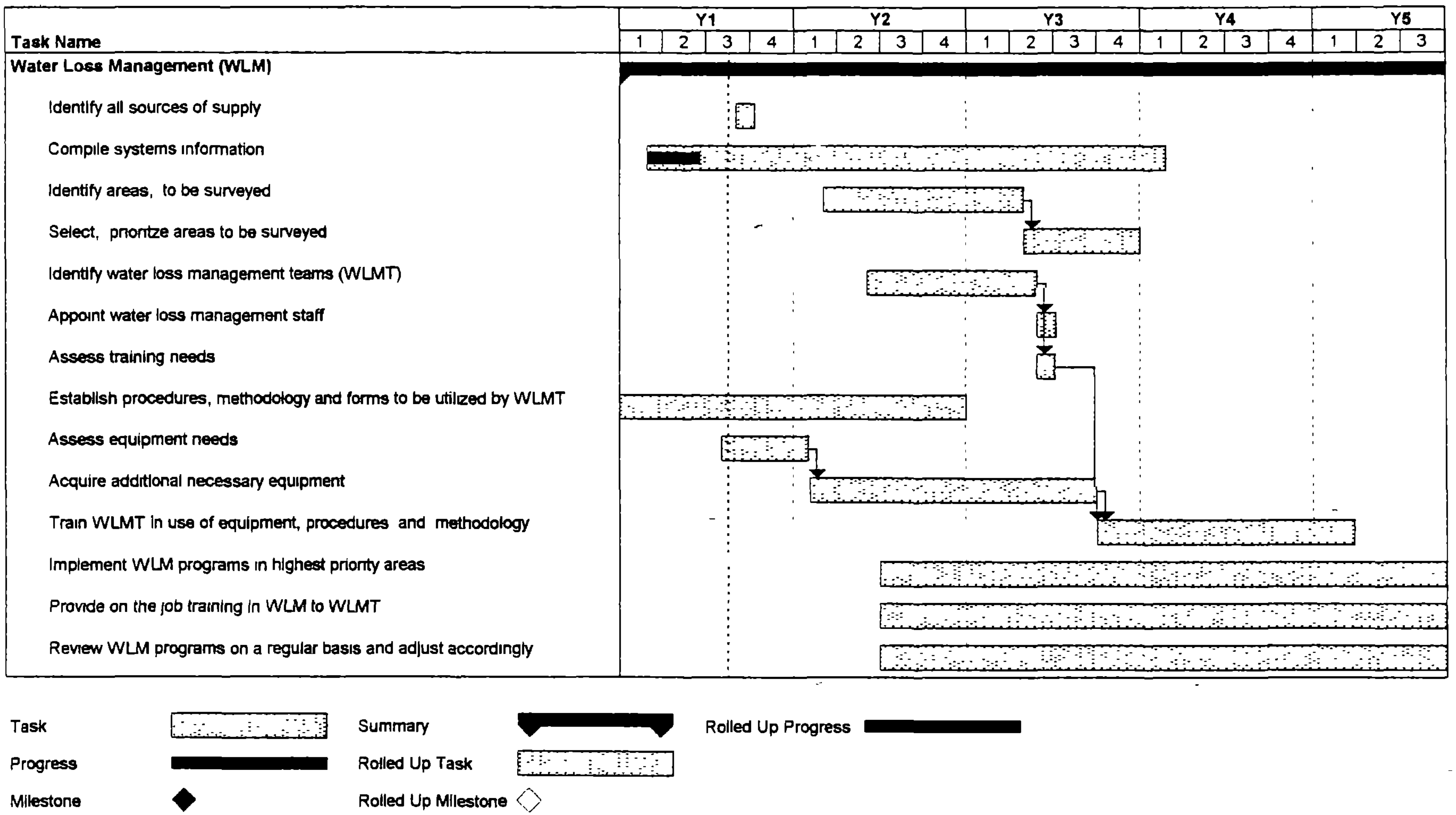

WATER LOSS MANAGEMENT

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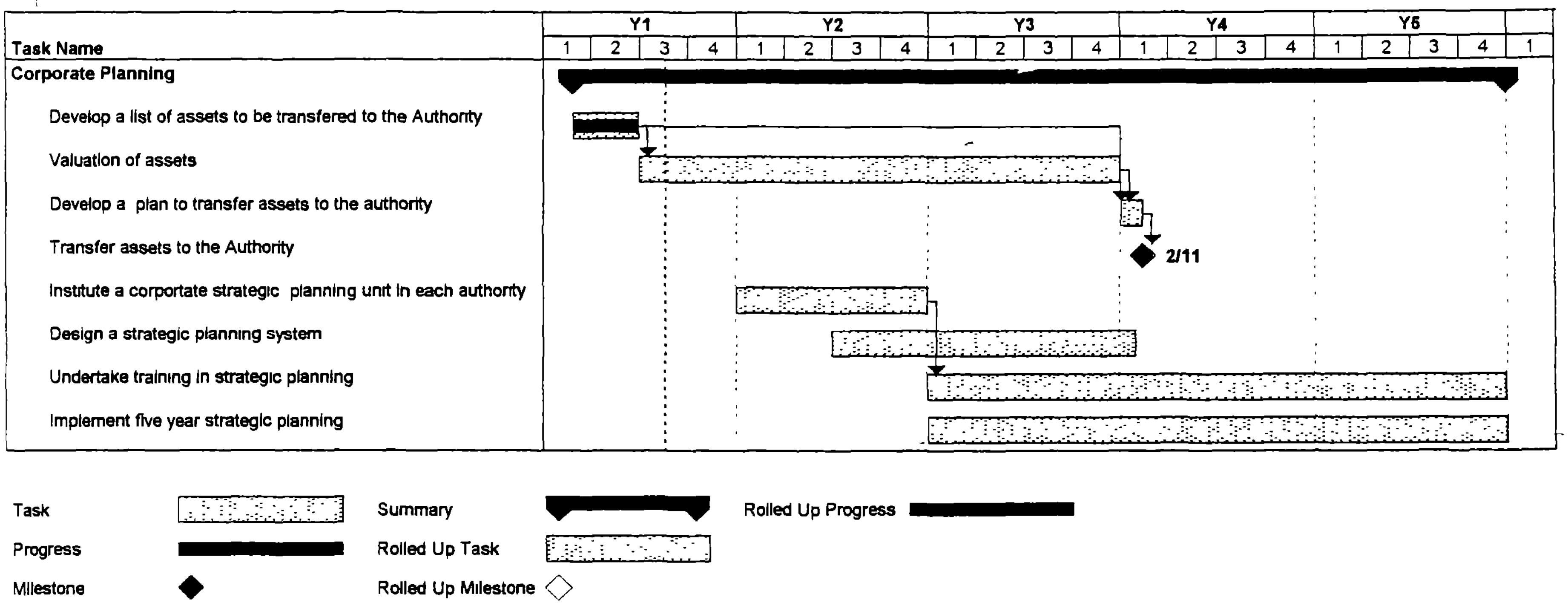

CORPORATE PLANNING

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