

PD-NBE-072

# *Greater Cairo Wastewater Project*

## **Review Statement**

*April 1989*

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## ***Greater Cairo Wastewater Project Review Statement***

**Prepared for** Arab Republic of Egypt  
Ministry of Reconstruction, New Communities,  
Housing and Utilities  
  
Organization for the Execution of the  
Greater Cairo Wastewater Project

**By AMBRIC,** American British Consultants  
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John Taylor & Sons; London, England

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Moharram-Bakhoum (ACE)  
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# ARAB REPUBLIC OF EGYPT

Ministry of Reconstruction, New Communities,  
Housing and Utilities

Minister:  
Engineer Hassaballah el Kafrawi

Organization for the Execution of the  
Greater Cairo Wastewater Project (CWO)

Chairman:  
Engineer Salama A. Salem

General Organization for Sanitary Drainage (GOSD)

Chairman:  
General Engineer Farid Sweilem

## AMERICAN BRITISH CONSULTANTS (AMBRIC)

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Camp Dresser & McKee International  
John Taylor & Sons

### ASSOCIATE ENGINEERS

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Sabbour Associates

### SUB-CONSULTANTS

Haley and Aldrich  
C.C. Johnson & Malhotra  
Mott, Hay & Anderson Holdings  
Sheladia & Associates

## **Introduction**

AMBRIC submits this Review Statement to report on overall progress of the Greater Cairo Wastewater Project together with recommendations for future action and development. This document is submitted at 18-month intervals and at other times deemed necessary by the Consultant. The previous Review Statement was submitted in October 1987.

## **Progress**

Following the study, design, and tendering phases of the Greater Cairo Wastewater Project during the late 1970s and early 1980s, construction of the East Bank contracts started in 1984 and West Bank construction commenced in 1985. Significant progress continues on collector, conveyance, and pumping facilities that are among the largest in the world. Tunnelling achievements of the last 18 months have clearly demonstrated the effectiveness of the bentonite machine concept in the potentially hazardous ground conditions of Cairo, and with minimum amount of surface settlement and disruption to the public. The peak progress rate achieved of 168 meters per week on Contract 4 is considered a record for this size and type tunnel.

Schedules for completed, ongoing, and remaining contracts of Stage 1 facilities are presented in Exhibits 7 and 8. Photographs have been incorporated throughout the report to provide an indication of the magnitude and nature of the overall project.

The total expenditures to date for construction and consulting services are 169 million Egyptian Pounds, 253 million US Dollars, and 169 million Pounds Sterling. During the past 18 months, the expenditures have been 86 million Egyptian Pounds, 108 million US Dollars, and 32 million Pounds Sterling.

## **Required Actions**

During the years following the preparation of the Master Plan and the Design Inception Report, development in the Greater Cairo area accelerated. In many cases, this development exceeds or varies from those projections based on information available in the 1970s. Previous Review Statements have stressed the need to review and update these documents.

Based on the actual development that has taken place, and the inability to construct major facilities as staged in the projected schedules, it is now critical that urgent actions be taken to implement a review and update of the previously prepared wastewater development plan. Other actions are also required in order to achieve an orderly and effective commissioning of facilities as they are completed and placed into operation.

The following major issues require action:

- Review and reappraise Master Plan
- Study sludge disposal
- Provide for temporary discharge of wastewater
- Provide interim maintenance for completed facilities
- Study effluent disposal and reuse
- Extend West Bank sewerage through FAR procedures
- Continue operation, maintenance, and training services
- Provide sanitation services in unsewered areas
- Implement Gabal el Asfar treatment plant construction
- Implement branch tunnel construction.

The entire program for the provision of wastewater services to Cairo demands a high degree of coordination and liaison among CWO, GOSD, other government agencies, the foreign funding agencies, contractors, consultants, and other involved organizations. The required actions to be addressed by these entities necessitate that institutional and policy actions be formulated and implemented.

This Report emphasizes the need for proper sequencing and scheduling of the required actions through the use of exhibits that present the relationships of scheduling construction, non-construction requirements, decisions regarding sludge and effluent discharge, and Master Plan review and reappraisal. The constraints noted in these schedules must be accommodated by timely policy decisions in order to achieve an orderly commissioning of the major wastewater facilities now under construction.

# ***Background and Objectives***

**KEY:**

 SEWERED AREAS

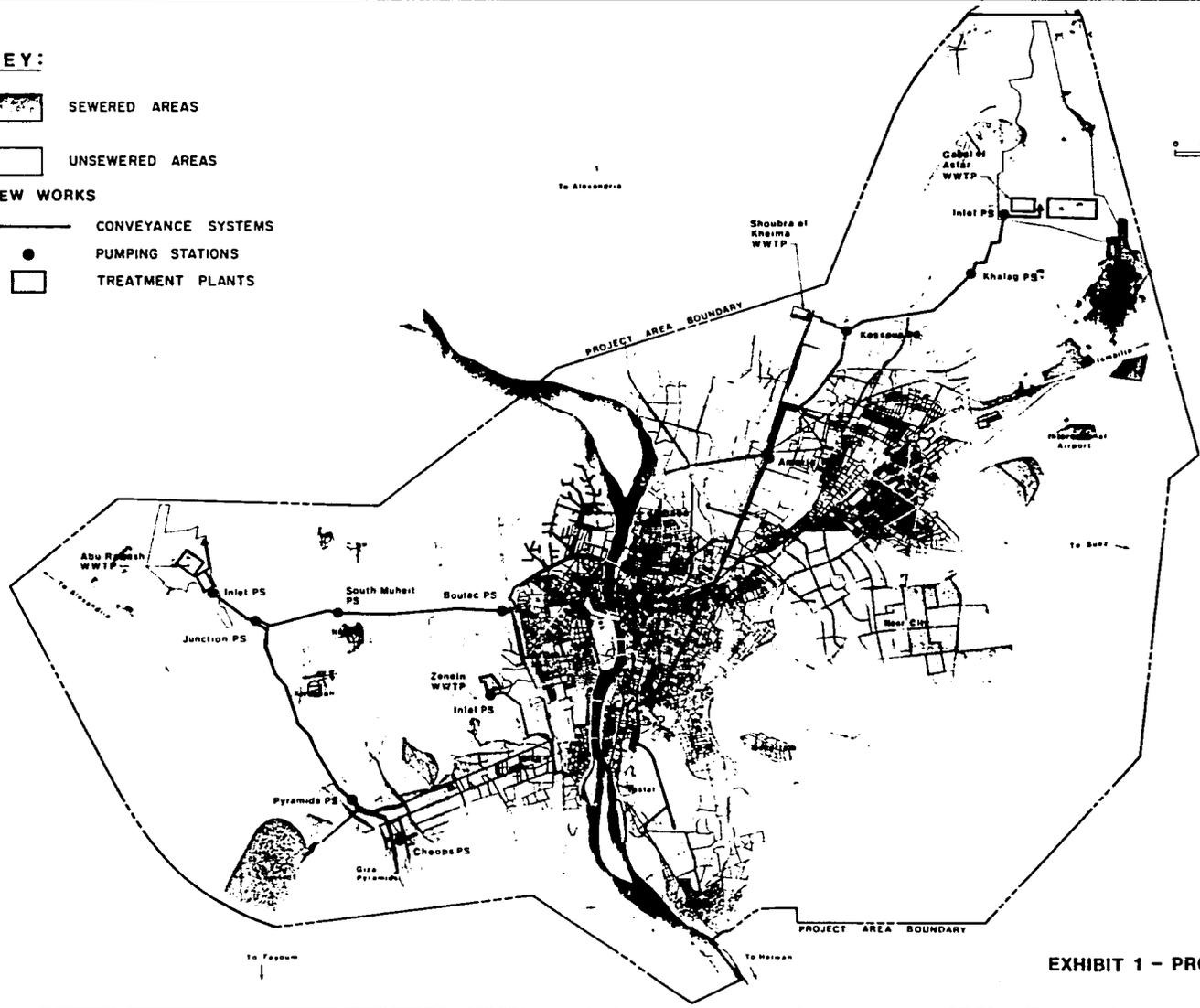
 UNSEWERED AREAS

**NEW WORKS**

 CONVEYANCE SYSTEMS

 PUMPING STATIONS

 TREATMENT PLANTS



**EXHIBIT 1 - PROJECT PLAN**

# 1. Background and Objectives

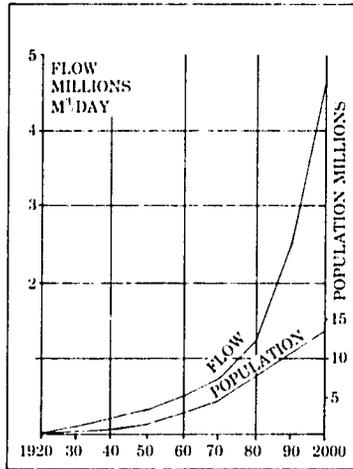
1.1

## Greater Cairo Wastewater Project

**T**he Greater Cairo Wastewater Project demonstrates the concern of the Egyptian Government in addressing environmental and health issues in Cairo, and the strong spirit of friendship and mutual objectives that exist among the Arab Republic of Egypt, the United Kingdom and the United States of America.

Through the United States Agency for International Development (USAID) and the Overseas Development Administration of the United Kingdom (ODA), financial assistance has been provided to support this massive wastewater project and to meet the growing sanitation needs of the capital area. The project covers an area of 875 square kilometers and its extent is shown in Exhibit 1. The projected population to be served and wastewater flows through the year 2000 are shown in Exhibit 2. The objectives of the project are to provide new wastewater collection facilities and to rehabilitate existing facilities in order to eliminate wastewater flooding and to provide reliable sewerage service. In addition treated wastewater effluent will be available from modern wastewater treatment plants for reuse and sludge will be available in reclamation projects.

EXHIBIT 2 - PROJECTED POPULATION AND FLOWS



1.2

## Cairo Wastewater Organization

**T**he Organization for the Execution of the Greater Cairo Wastewater Project (CWO), preceded by the General Organization for Sewerage and Sanitary Drainage (GOSSD), is the responsible agency for the project. CWO comes under the Ministry of Reconstruction, New Communities, Housing and Utilities and reports to and is governed by a number of committees set up by ministerial decree. Currently the CWO Chairman reports to a Board of Directors. Matters related to pre-qualification of contractors, tendering, and award of contracts are referred to a Higher Decision Committee at the Ministry. The organization responsible for the operation and maintenance of the improved

and new facilities executed by CWO is the General Organization for Sanitary Drainage (GOSD). Various activities of the project are directed to improving the management, operation and maintenance capabilities of GOSD.

1.3

## American and British Involvement

**I**n 1977, Taylor Binnie & Partners (TBP) in association with Dr. Abdel Warith, were appointed to undertake a study for the Greater Cairo Wastewater Master Plan with funding provided by the Arab Fund for Economic and Social Development. The study was completed and recommendations approved in 1978. However, the lack of further offshore funding precluded any prospect of early implementation of the project.

Recognizing the critical importance of the project to the people of Cairo and in responding to the United Nations goal for improved water and sanitation for health, the United States of America and the United Kingdom agreed to assist Egypt in moving the project forward. ODA provided a grant of fifty million pounds sterling toward engineering and construction costs, and USAID provided an approximately equal amount, a grant of one hundred million dollars, also for engineering services and construction costs. It was agreed that the initial funding would be used for urgently required rehabilitation works and for a review and update of the previously prepared Master Plan.

During the same period a group of UK companies prepared a funding

package to carry out design and construction work. Although the technical and construction elements of this offer were not taken up, a loan of PDS 100 million was arranged as part of a protocol for funding assistance and construction.

As the project has progressed and further needs have been identified, funding provisions have been increased. The initial USAID allocation was incorporated into the Cairo Sewerage I grant project and eventually totalled US\$129 million. Total planned funding for Cairo Sewerage II is US\$816 million of which US\$555 million has been authorized by the US Congress. The UK funding available from the loan has been increased to a total of PDS 185 million.

The UK and US funding for new construction has been allocated to the East and West Banks respectively. USAID provided the dollar funding for the rehabilitation construction efforts. The major study and design efforts that proceeded construction contract awards in 1984 and 1985 were performed by integrated teams of American and British engineers.

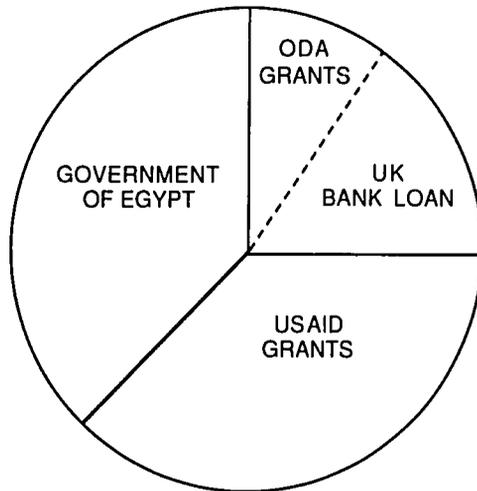
Current funding commitments are shown in Exhibit 3.

1.4

### *American British Consultants (AMBRIC)*

**W**hen foreign funding from the US and UK became available, a joint venture of Black & Veatch International (BVI) and Camp Dresser & McKee (CDM) was selected as the US consultants. It was agreed that Taylor Binnie & Partners should continue to be involved in the project and that the US and UK consulting engineers

### EXHIBIT 3 - SOURCES OF CURRENT FUNDING



This exhibit shows the make-up of the total funding currently committed to the Project using a common base of equivalent LE. The exchange rates adopted are US\$1.00 = LE 1.35 and PDS 1.00 = \$1.80. CWO uses these exchange rates for current budgeting advice to the GOE. The GOE portion includes only consulting and construction commitments, details of other local costs not being available to AMBRIC. This does not include USAID Grant funds of \$133 million that has been authorized but not obligated.

should work together in association. A consortium known as American British Consultants (AMBRIC) was formed. In April 1979 an agreement was made between GOSSD and AMBRIC appointing AMBRIC as the project's engineering consultants.

The scope of work was for management services, study review, services for rehabilitation and a rehabilitation training program. The agreement could be extended to include functional and detailed design of new work, services during construction, and services related to operation and maintenance. These additional tasks have been, and continue to be, provided under the authority of work orders and amendments prepared by AMBRIC for agreement by CWO and the funding agencies.

Most of the consultancy services have been provided in Cairo with the participation of local subconsultants, but portions of the design effort, involving a large number of specialist disciplines for short periods, have been executed in the home offices of the UK and US firms.

Early on in the project the principal subconsultants were Atco, Sanes and Tencon (EGYCON) as local engineering consultants; Mott Hay & Anderson for tunnelling work; Hunting Surveys for surveys and establishment of survey stations; and Haley and Aldrich for geo-technical work. EGYCON worked on the project until May 1987 when their services were terminated at the instruction of CWO. Local subconsultant services are now pro-

vided by Moharram-Bakhoum (ACE) and Sabbour Associates.

As a result of the termination of EGYCON several legal actions have been initiated. The latest of these was a writ of summons issued on 29 March 1989 against AMBRIC and its member firms by the individual firms that constituted EGYCON. The writ was issued from the Admiralty and Commercial Court Registry of the High Court of Justice in the UK. Previous legal actions have been filed in Egypt.



# ***Current Status***



## 2.1

### AMBRIC Services

The AMBRIC Agreement includes five basic phases of work: an inception report, rehabilitation work, training activities, study review, and design/construction services. Exhibit 4 shows the schedule of progress made on the phases and the general nature of the work in hand. The principal reports that have been prepared by AMBRIC are:

- Project Inception Report
- A considerable number of special reports concerning rehabilitation and training issues
- Interim Development Plan Report
- Design Inception Report
- Several subsoil investigation contracts and reports
- Functional design memoranda
- Contract strategy and management reports

- Tender documents (for 3 rehabilitation supply contracts and 24 construction contracts)
- Unsewered Areas Demonstration Project Report
- Interim Maintenance Requirements for Wastewater Pump Stations
- The Need for Policy Decisions Related to the Temporary Discharge of Wastewater
- Position Paper on the Reuse of Effluent from the Gabal el Asfar WWTP

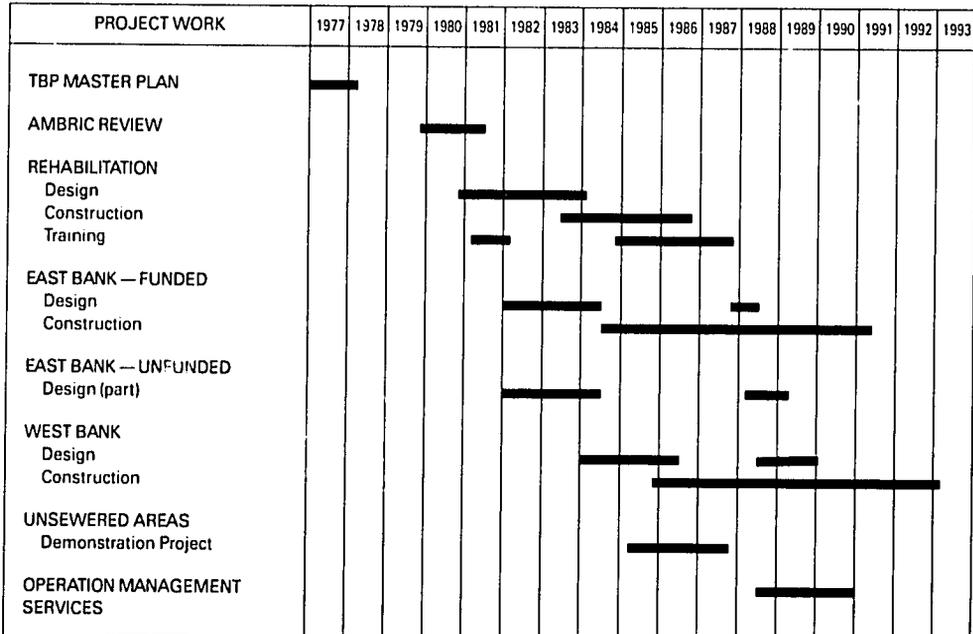
The Design Inception Report summarized the findings of the review and study phase and recommended projects to be implemented. This report was submitted in June 1981.

During the years following the preparation of the original master plan and the design inception report, there has been a significant acceleration of development in the greater Cairo area. In many cases this development has exceeded or varied from the projections that

were developed from the information available in the 1970s. Previous review statements, particularly the report of October 1987, have recommended that these planning documents be reviewed and updated.

Based on the actual development that has taken place, and the inability to construct major facilities as staged in the projected schedules, it is now critical that urgent action be taken to review and update the previously prepared wastewater development plan. Recommendations to do this are presented in Section 4.

EXHIBIT 4 AMBRIC SERVICES — PROGRAM OF COMPLETED & CURRENT WORK



## Construction Phase

### 2.2.1 Rehabilitation

**A**s a part of the project, a US\$95 million and LE 38 million rehabilitation program was established to improve the performance and reliability of the existing system. More than 100 pump stations were retrofitted with new mechanical and electrical equipment, improved control systems, and improved operation and maintenance features. Six new pump stations and some 47 kms of sewers and force mains were constructed to increase capacity, to redirect discharges from surcharged sewers, and to replace existing pump stations and force mains that were in extremely poor condition.

The rehabilitation work was performed during the period 1982-1986 and is summarized in Exhibit 5. The Egyptian Pound component of the costs was provided by the Government of Egypt and the US Dollar component through USAID.

The pump station rehabilitation effort is a significant success. It pro-

vides greater capacity and reliability of pumping capability, and major reduction in the incidence of wastewater flooding in the streets of Cairo.

During the study period AMBRIC identified 107 areas where chronic wastewater flooding occurred and it was determined that these areas could be grouped into 59 separate project areas. Thirty-five (35) pre design reports were prepared on the basis that the detailed design would be undertaken by local consulting firms with general guidance from AMBRIC. AMBRIC prepared the detailed design for one such area as a model. This model was for Abu el Saoud, an area of great need, and the recommended works were built in 1984-85, providing a dramatic improvement in the area. Tender documents have been issued for several of these areas and two contracts have been awarded.

### 2.2.2 East Bank

#### Current Program

The current program for the execution of the East Bank contracts is shown in Exhibit 6 and in Exhibit 7. Where a contract has been awarded, the name of the contractor and

the awarded sum are given. Pound sterling sums are being funded by UK funding agencies and the GOE.

#### Tunnel Contracts

All three tunnelling contractors on Contracts 3, 4 and 12 have completed the structural primary (outer) lining of concrete segments. The only outstanding item of tunnelling work on the main spine tunnel is a 3 meter length at the interface of Contracts 1 and 3 at Ameria. The 3 meter length of tunnel is now being carried out under Contract 1 by the specialized technique of ground freezing.

The main tunnel drives of Contracts 3 and 4 were constructed with five and six meter diameter tunnelling machines utilizing bentonite slurry to maintain stability of the tunnel face and carry away the excavated material. A spirit of competition developed between the Contracts 3 and 4 contractors and tunnelling progress records were continually being pushed higher. It is believed that the peak progress rate of 168 meters per week on Contract 4 is a world record for this size and type of tunnel.

The tunnelling achievements of the last 18 months have clearly demonstrated the viability of the bentonite

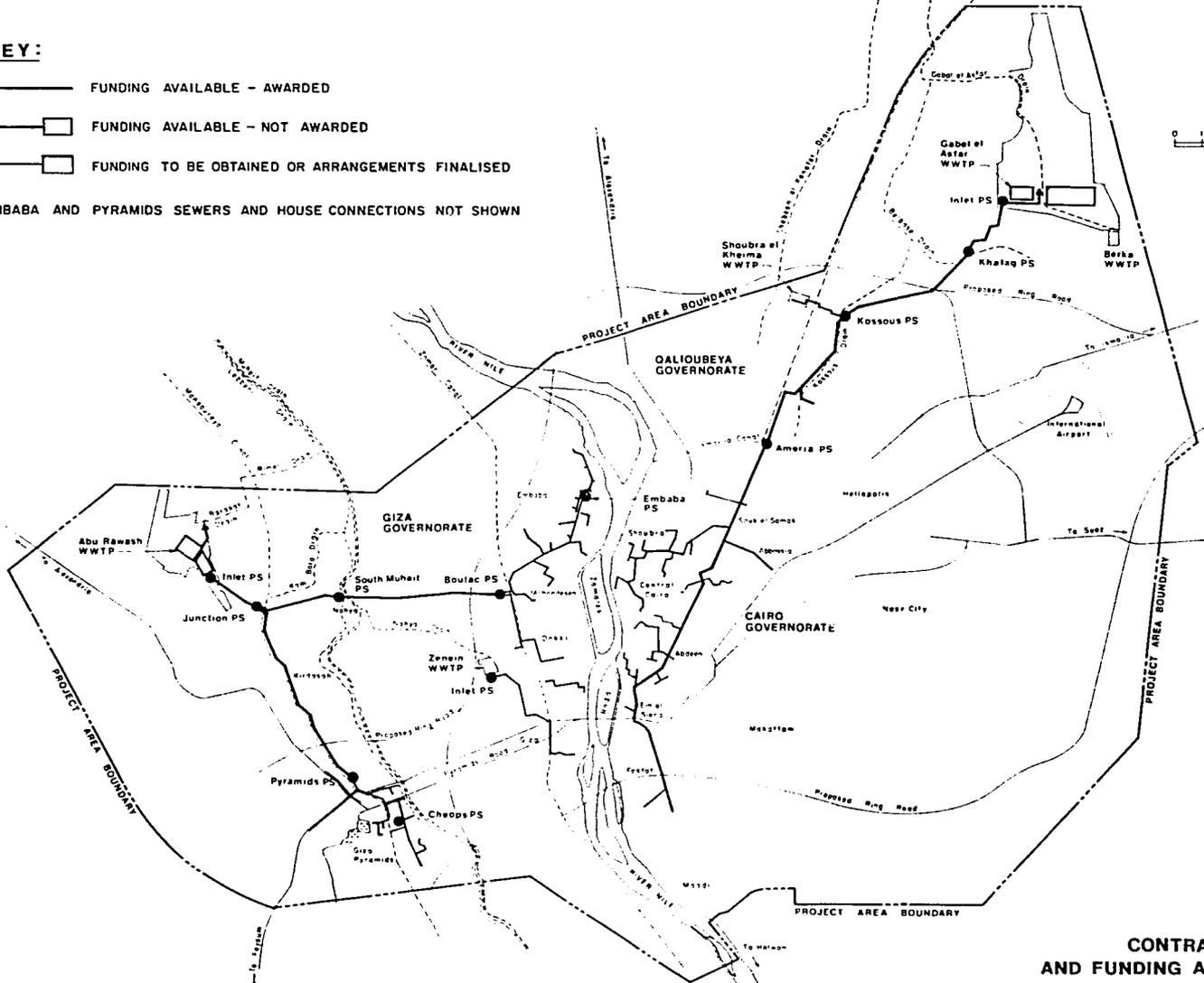
EXHIBIT 5 — SUMMARY OF REHABILITATION EFFORTS

CONTRACT NUMBER	CONTRACT DESCRIPTION	NUMBER OF STATIONS INVOLVED	CONTRACT AMOUNT (Millions)	
			LE	US\$
004	Procurement of Sewer Cleaning Equipment	N.A.	—	2.8
006	Procurement of Pump Station Equipment	N.A.	—	6.4
007	Improvements to Subsidiary Pump Stations Construction of New Subsidiary Pump Stations	56 6	22.3	52.7
009	Procurement of Ejector Station Equipment Improvements to Ejector Stations	N.A. 36	0.1	1.7
010	Improvements of Major Pump Stations	8	7.3	13.3
Various	Other Procurement and Construction	N.A.	8.3	18.1

**KEY:**

- FUNDING AVAILABLE - AWARDED
- FUNDING AVAILABLE - NOT AWARDED
- FUNDING TO BE OBTAINED OR ARRANGEMENTS FINALISED

EMBABA AND PYRAMIDS SEWERS AND HOUSE CONNECTIONS NOT SHOWN

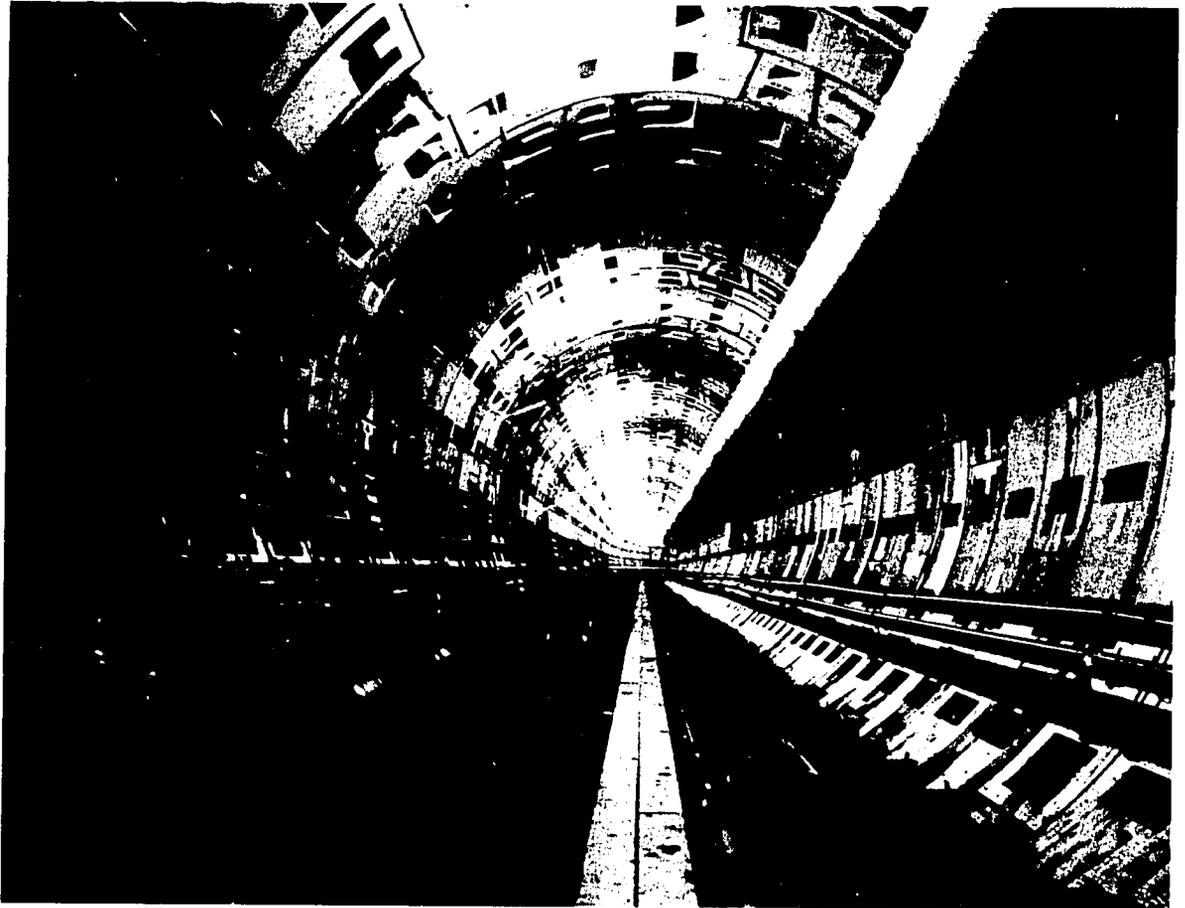


**EXHIBIT 6  
STATUS OF  
CONTRACT AWARDS  
AND FUNDING AVAILABILITY**

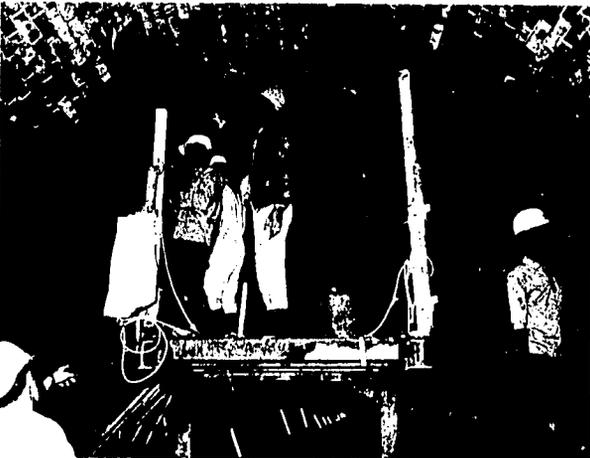
Contract No.	DESCRIPTION	CONTRACTOR	CONTRACT SUM		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
			LE × 10 <sup>6</sup>	Pounds × 10 <sup>6</sup>											
1	Ameria Pump Station — Civil	Christiani & Nielsen Misr Concrete	22.9	15.1		[Actual dates & program]									
2	Ameria Pump Station — M&E	General Electric Co.	1.3	10.9	[Estimated completion date — Late]										
3	Main Tunnel Ameria to Souk el Samak	Anglo-Egyptian Cairo Wastewater Consortium	59.4	39.1	[Estimated dates]										
4	Main Tunnel — Souk el Samak to Abdeen	Lilley International/Misr Engineering	53.7	33.7	[Estimated completion date — Late]										
	Priority Branch Tunnels				[Estimated completion date — Late]										
6	Culvert — Ameria to Urban Boundary	The Arab Contractors (Tarmac)	38.2	0.5	[Estimated completion date — Late]										
7	Culvert — Urban Boundary to Kossous	Moukhtar Ibrahim (Fairclough)	38.6	0.8	[Estimated completion date — Late]										
8	Culvert — Kossous to Gabal el Asfar	CRC Hassan Dora & Partners (Laing)	48.5	0.9	[Estimated completion date — Late]										
9	Pump Stations — Kossous & Khalag Force Mains to Shoubra el Kheima	Kier International	30.5	28.3	[Estimated completion date — Late]										
10A	Gabal el Asfar WWTP Essential Works				[Estimated completion date — Late]										
12	Main Tunnel — Abdeen to Ein el Siera	Anglo-Egyptian Cairo Wastewater Consortium	64.3	43.3	[Estimated completion date — Late]										
16	Gabal el Asfar WWTP Stg. 1.				[Estimated completion date — Late]										

 Actual dates & program  
 Estimated completion date — Late  
 Estimated dates

*Installing  
secondary lining  
in tunnel*

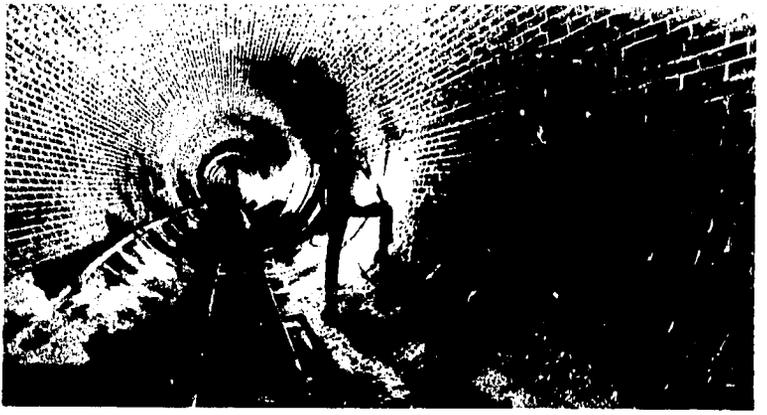


*Primary lining of tunnel*



*Pointing of secondary  
brickwork lining  
with epoxy mortar*

*Contract 3:  
brickwork lining*



*Contract 12:  
preparing gantry for  
installing brickwork*



*Contract 3:  
closing brickwork  
lining to soffit*

machine concept in the potentially very hazardous ground conditions of Cairo. It has also demonstrated that it is practicable to drive tunnels using this method accurately to line and level, and with the minimum amount of surface settlement and disruption to the public.

All tunnels are to be provided with an inner lining of local blue bricks pointed with corrosion resistant epoxy mortar. Of the 15 km of tunnel constructed under these three contracts, about 10 km has been so far provided with brick lining. The brickwork for the tunnels on Contract 12 has recently been completed.

#### *Contract 3 - Ameria to Souk el Samak*

Primary lining of the entire 5.5 km length and approximately 50 percent of the brickwork have been completed. As a result of brick shortages, CWO instructed in June 1988 that the outstanding brickwork should be deleted from the contract. A completion certificate was issued effective 6 July 1988.

In late 1987 the contractor completed remedial works to a 20-30 meter length of tunnel that had suffered some distortion of its circular shape. The remedial works comprised heavy reinforcement of the in-situ infill to the tunnel invert. The work was carried out under compressed air to improve the loading situation. Since the tunnel was depressurized, there has been no further distortion.

Completion of the outstanding 50 percent of the brickwork is the subject of a tender (Contract 3A) in which the contractors for Contracts 1, 3 and 4 have been invited to participate. Tenders were received on 16 April 1989, with completion of construction programmed for the end of 1989.

#### *Contract 4 - Souk el Samak to Abdeen*

As with Contract 3 the Contractor has been engaged since mid-1987 on the construction of the secondary brick lining. So far, approximately 50 percent has been completed. This slow rate of progress is the result of brick shortages. In March 1989 Contract 4 was made the main recipient of bricks and it is now anticipated that the contractor will complete the brickwork by the end of 1989.

Earlier in the contract the contractor encountered large boulders and this was ruled by AMBRIC to be an unforeseen circumstance. The contractor was awarded a 120 day extension of time. The brick supply shortages are resulting in further extensions of time being awarded to the contractor.

#### *Contract 12 - Abdeen to Ein el Siera*

The section of tunnel between Shafts 13 and 15 was successfully completed using the tunnelling machine of Contract 4 and tunnelling work was completed in October 1988. A further milestone was achieved in early March 1989 when brick supplies to Contract 12 were completed.

The contractor is on schedule for completion in August 1989, although he is presently encountering difficulties with construction of subsidiary sewers laid in trench. These short lengths of sewer, required to connect sewer networks into the tunnel, are being constructed in silty ground with a high water table. In addition, the contractor has encountered buried structures, services and other obstructions. The problems are further complicated by the fact that the works are being constructed in busy thoroughfares in the city center.

#### **Pump Station Contracts**

##### *Contracts 1 and 2 - Ameria Pump Stations*

The works at Ameria comprise the Tunnel pump station and the Collector pump station (screw type), together with electrical power and control switchgear building, standby power generator station, workshop and administration and amenity buildings.

A major landmark on Contract 1 was achieved in May 1988 when the Tunnel pump station caisson finally "landed." Other significant items of progress include the recent completion of the concrete "plug" forming the base slab of the pump station and the "landing" of the drywell caisson on the "plug." With the completion of these works the contractor has just entered a phase when the construction work on the Tunnel pump station will be relatively conventional and straightforward and steady progress should be maintained. The delays that have occurred on Contract 1 mean that this is a critical contract so far as commissioning of the Phase 1 contracts is concerned.

Although the Tunnel pump station is of primary importance to the Phase 1 project, the Collector pump station will be of great assistance in dealing with sewage flows ahead of the contract completion date. The Collector pump station has recently been handed over to the Contract 2 contractor for pre-commissioning trials prior to commissioning later in 1989. The Tunnel pump station switchgear building and the Collector pump station substation will also be commissioned at this time.

The standby generator station will be substantially completed by the middle of 1989. Other buildings are virtually complete.

Work has commenced using ground freezing to complete the interconnection between the distribution chamber and the Tunnel pump station. This technique will also be

used to complete the 3 meter connection with the completed Contract 3 tunnel upstream of the distribution chamber.

#### *Contract 9 - Kossous and Khalag Pump Stations*

Under this contract screw type pump stations are provided at Kossous and Khalag to lift sewage from low level to high level in the culvert conveyance system from Ameria to Gabal el Asfar WWTP. At Kossous there is also a pump station to transfer some flows to the Shoubra el Kheima WWTP. There were long delays to the commencement of the contract and the order to commence was given in October 1987. There is a three year construction period making this a critical contract so far as commissioning of Phase 1 contracts is concerned.

Forty percent of the contract civil works has been completed. Manufacture and factory testing of mechanical and electrical equipment is 80 percent complete and many major items of equipment have been delivered to site.

#### **Culvert Contracts**

##### *Contracts 6, 7 and 8 - Ameria to Gabal el Asfar*

To the north of Ameria the culverts of the conveyance system to Gabal el Asfar are being constructed under three contracts. Of a total length of 15 km, about 13.8 km (92 percent) of the concrete structure has been completed and about 6 km of blue brick lining has been installed. On Contract 6 one of the two barrels has been substantially completed for its entire length, including brick lining. Only pointing with epoxy mortar remains to be carried out.

All three contracts have been affected by shortages of blue bricks and deliveries continue to be less than requirements.

Contract 8 has been affected by difficulties in obtaining access to parts of the site. Extensions of time totalling 380 days have been granted,

principally as a result of these difficulties. Extra works on Contract 6 resulted in an extension of time of 229 days being granted.

#### **Treatment Plant Contracts**

##### *Contract 10A - Gabal el Asfar WWTP - Essential Works*

In October 1987 AMBRIC received authority to redocument some of the earlier work prepared for the Gabal el Asfar WWTP. The Essential Works comprise the inlet pump station, screening and grit removal facilities and by-pass arrangements to the Gabal el Asfar drain. Tender documents were produced for the tendering of a single contract with an Egyptian civil contractor and a UK mechanical and electrical subcontractor.

Tender documents were issued to five UK mechanical and electrical subcontractors for pricing in June 1988. However, following issue of the tender invitation for Contract 16 in July 1988, the tender return date for Contract 10A mechanical and electrical works has been postponed indefinitely.

The works comprising Contract 10A are also included in Contract 16. Hence Contract 10A may be cancelled if there is a satisfactory outcome to the tender for Contract 16 (see below). However, if delays occur to the award of Contract 16, the tenders for Contract 10A may be called in.

##### *Contract 16 - Gabal el Asfar - Phase 1*

On 31 July 1988 CWO invited tenders for Contract 16. The invitation to tender required mechanical and electrical contractors within the European Economic Community to form joint ventures with one of a select list of five Egyptian civil contractors. The description of works contained work already included in Contract 10A and also contained a requirement for sludge treatment

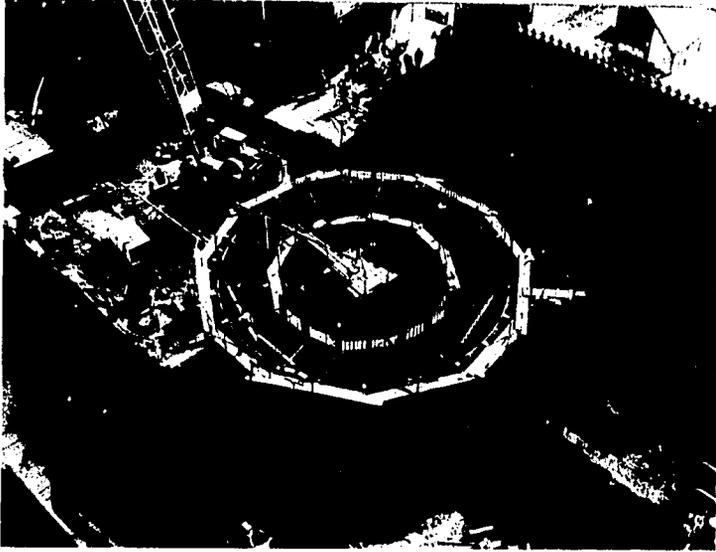
by digestion and mechanical dewatering. A further requirement of the invitation to tender was that the tender should include a proposal to fund the offshore costs.

Since tender documents specific to Contract 16 had not been prepared previously, the tender documents were based upon those previously issued for Contracts 10A, 10 and 11. These were issued to interested companies in September 1988 and addenda were issued during the subsequent months to update the existing documents and to include performance specifications for those works which had not previously been designed.

After three postponements, tenders were received on 15 March 1989. Six tenders were opened and the technical packages were forwarded to AMBRIC for preliminary analysis.

Preliminary technical analysis revealed that the majority of the tenderers had submitted very detailed and technically competent bids. Based upon advice from AMBRIC, CWO decided to bring forward the date for opening of the financial packages and these packages were opened in public on 13 April 1989. Detailed analysis of the tenders has now commenced. Preliminary analysis of the financial offers, which were in a variety of currencies, revealed that the tenders for AMBRIC's design are in a narrow range and close to AMBRIC's estimates. Although one tenderer offered a 23 percent reduction in price for his alternative design, the reduction offered by other tenderers was moderate, in the range 3-13 percent. Tender analysis will reveal whether the savings offered for the alternative designs are offset by increases in operating costs.

Four of the six tenders included proposals to fund the work.

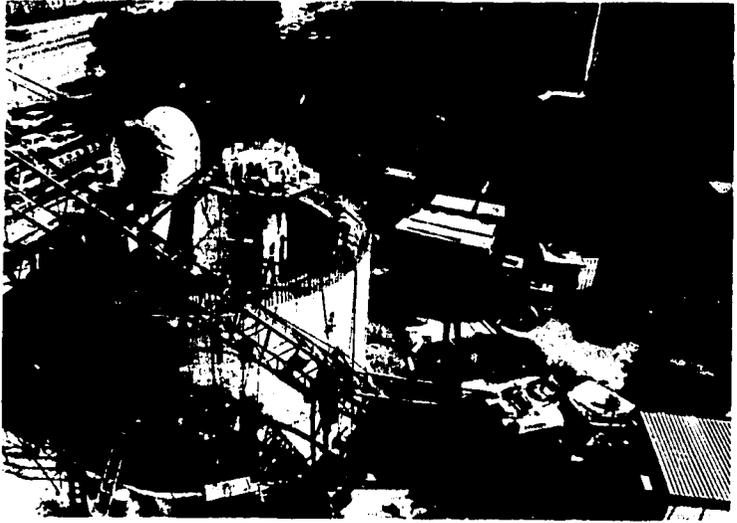


*Before  
(1986)*

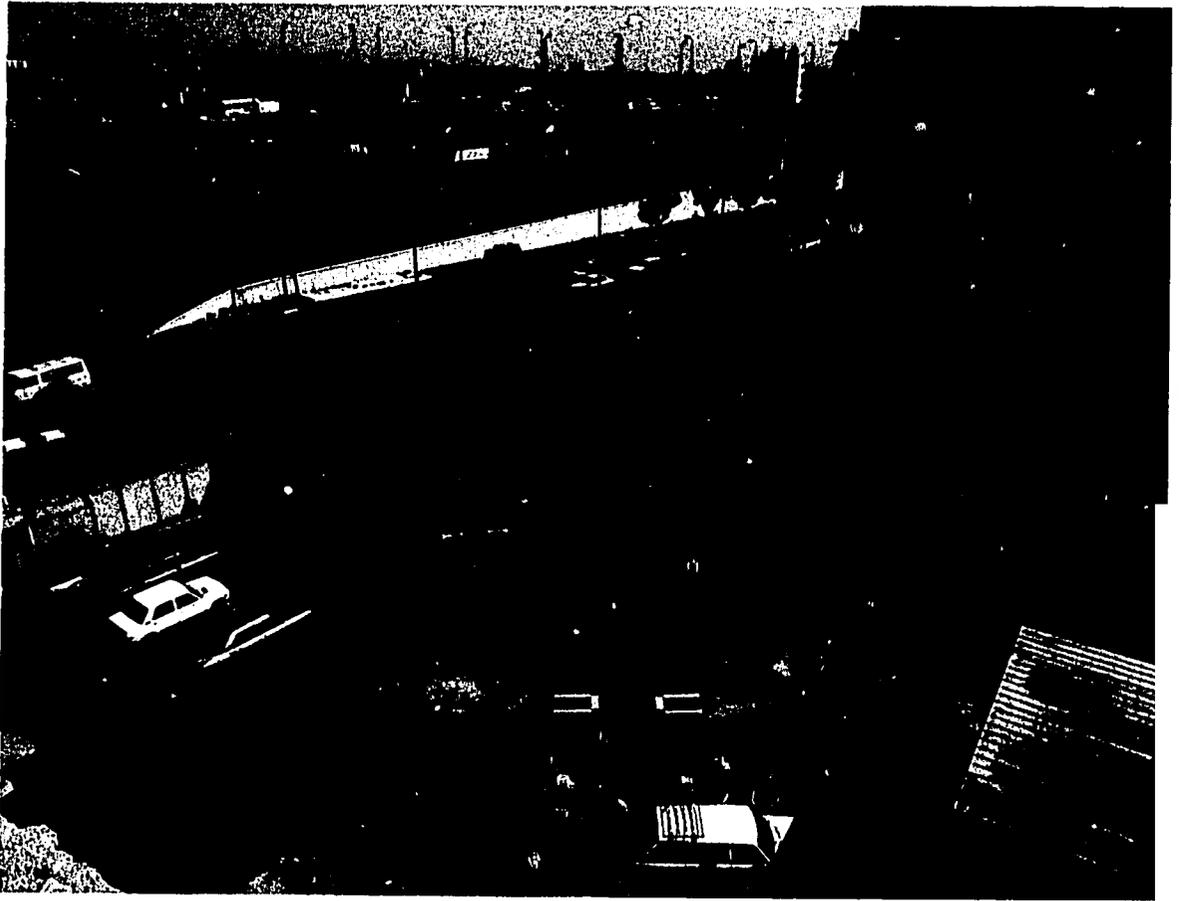


*After  
(1989)*

*Contract 4: Shaft 11 — Port Said Street*



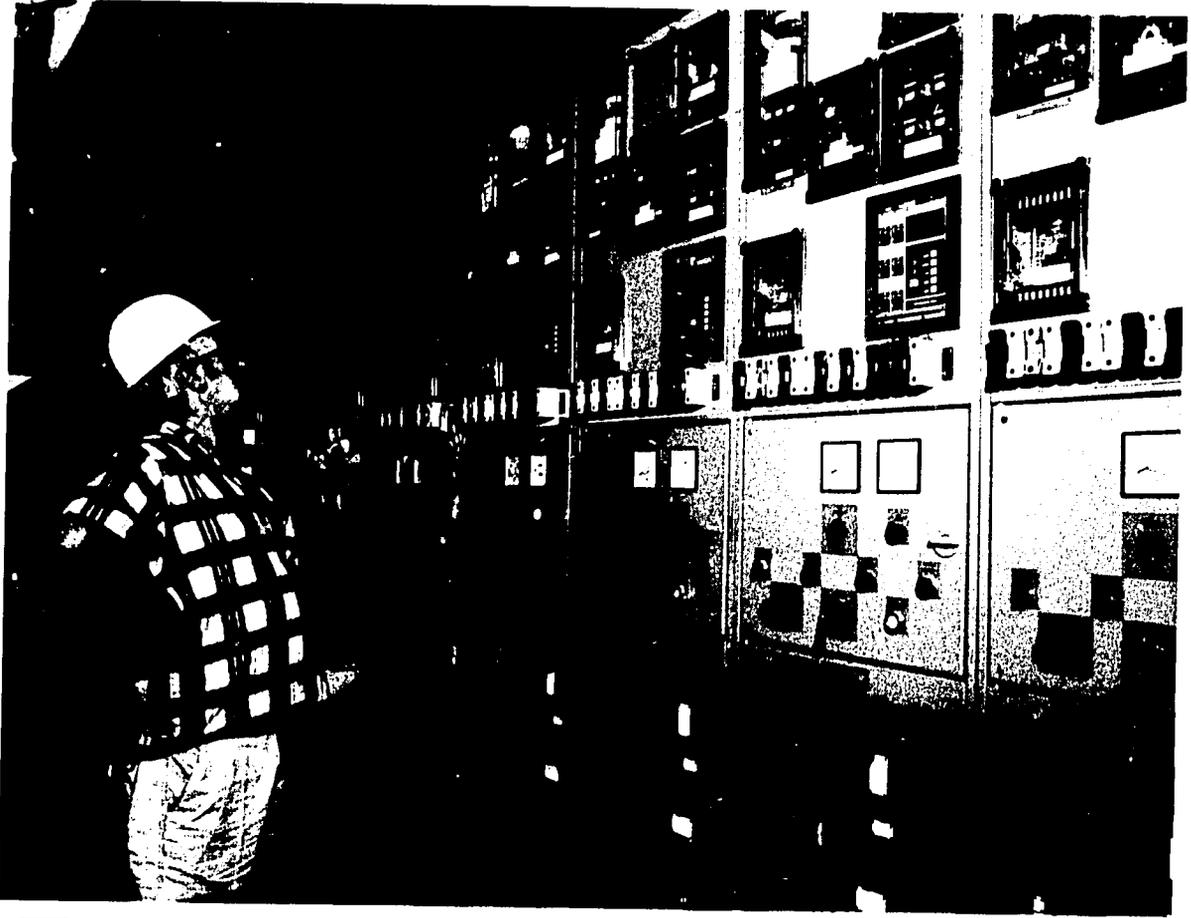
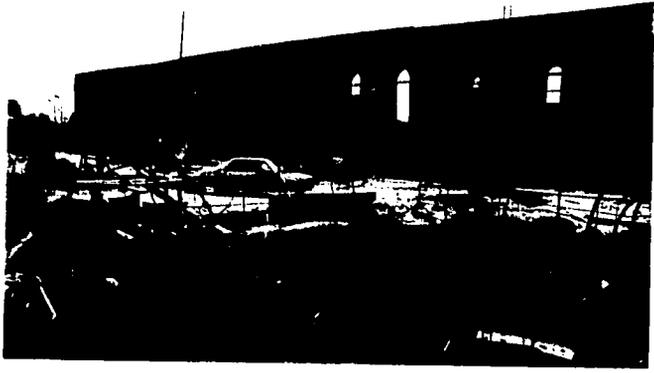
*Before  
(Late 1985)*



*After  
(1989)*

*Contract 4: Shaft 7 — Ramses Street*

*Contract 12:  
Shaft 19 with  
ancient aquaduct  
in background*



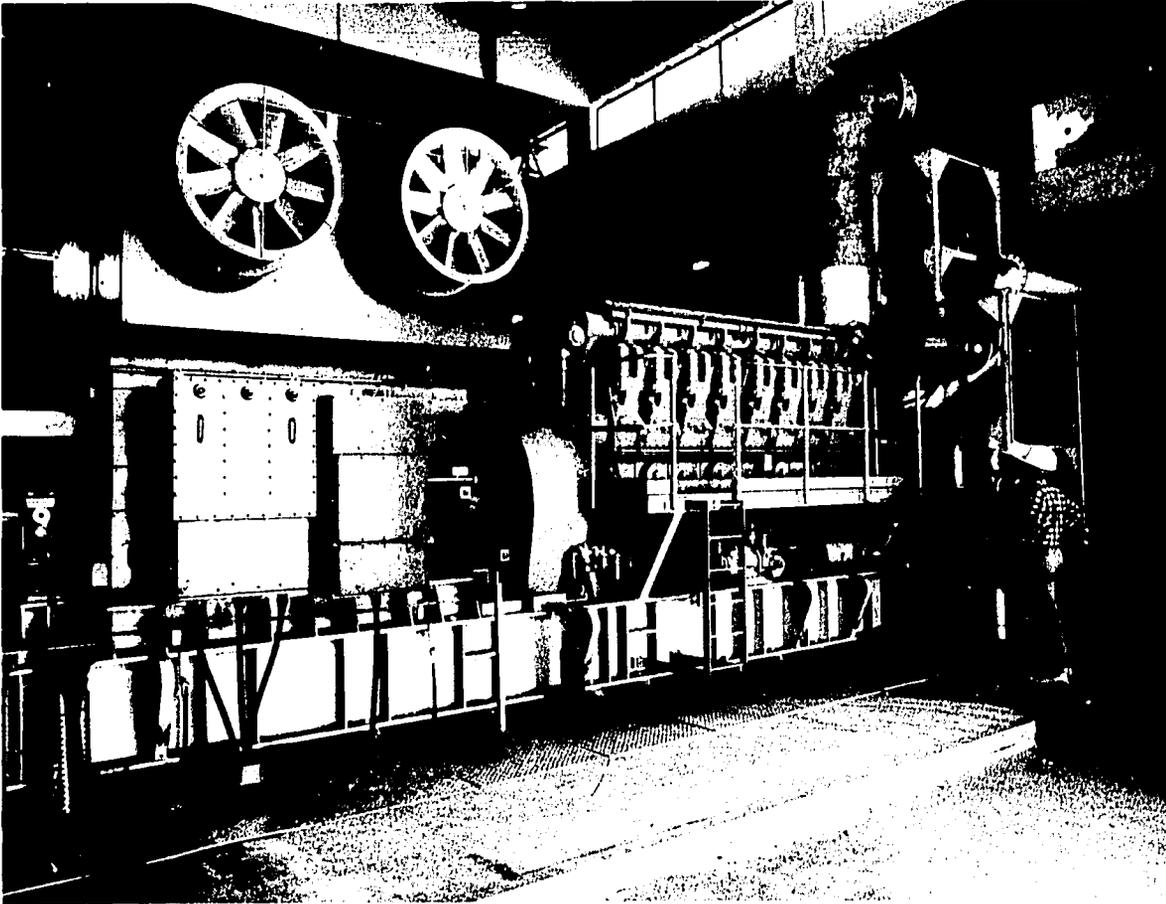
*Contract 2:  
Control room for  
standby generators*

*Contract 23:  
Zenein*





*Computer training of  
GOSD staff*



*Contract 2  
Ameria Pump Station  
standby generators*



*Meeting to discuss  
utility interface  
problems with  
Egyptian authorities*

### **Priority Branch Tunnels** **Contracts 5, 13 and 14**

Priority branch tunnels comprise those parts of Contracts 5, 13 and 14 that are considered by CWO to be the most urgent. These tunnels are known as Boulac, Kitchener, Sakakini, Central and Ibn Tulun branches and all connect into the main spine tunnel being constructed under Contracts 3, 4 and 12. When constructed, these branch tunnels will permit many of the existing pump stations to be abandoned, thereby eliminating operation and maintenance requirements for those stations and improving flow conditions in the sewers.

Tender documents were issued to the two tunnelling contractors already working on the project. The tenders were required to be split into individual sections and groups of sections so that the extent to which available sterling funding may be used could be considered. Bids were returned and opened in August 1988 and AMBRIC's evaluation report was submitted in November 1988.

Both bids were qualified both contractually and technically and there were omissions from both bids. The evaluation report did not recommend award of the work, but proposed that CWO commence to negotiate with both contractors with a view to withdrawal of onerous qualifications, achieving more responsive bids and converting sterling cost to local currency wherever possible.

Negotiations with both contractors commenced in January 1989. CWO instructed that negotiations should be limited to the bids for the Boulac (North and South) branch tunnel. By March 1989, AMBRIC submitted an interim update report to CWO. This report advised CWO that most of the contractors' qualifications had been resolved, and that the bid prices had increased significantly.

Although discussions with the contractors are still continuing to resolve all outstanding matters, the indications are that an award of this work will take place in the not too distant future. In view of the increased bid prices and the limited sterling funds remaining, efforts are still being made to minimize the sterling element of the bids.

#### *General*

Exhibit 7 shows the currently envisaged construction programs. The ability to convey wastewater to the ultimate discharge point at the Gabal el Asfar drain is dependent upon completing the main spine tunnel and culverts together with Contracts 1, 2 and 9 and the Priority Works of Contract 16 (or Contract 10A). There is provision to transfer up to 350,000 cmd to Shoubra el Kheima WWTP from Kossous.

The ability to use this facility and to commission the tunnel system requires commissioning of the Tunnel pump station at Ameria and the screw and transfer pump stations at Kossous. The Tunnel pump station is on the critical path. Overflows into the Kossous drain at the urban boundary are possible when the Collector pump station is commissioned. Commissioning of this station will improve conditions in the existing collectors feeding Ameria.

Much thought has already been given to the requirements of the commissioning stage, including interim discharges and the need for interim maintenance until works are commissioned. Sections 2.3.2, 2.3.3, 4.3 and 4.4 of this report should be referred to for further details.

Other significant works are being carried out by GOSD on the East Bank. The Berka and Shoubra el Kheima WWTP's are both major works, each with a capacity of 600,000 cmd. These two treatment

plants, together with the Gabal el Asfar WWTP, all discharge into the same drainage system. Continued coordination with the Ministry of Irrigation is necessary to ensure that the drains will have adequate capacity for the anticipated flows. Discharge of wastewater to the drain system is a suitable short-term expedient, but reuse of the effluent is the long-term objective. Section 4.5 of this report outlines proposals for further studies. The other by-product of the treatment plants will be sludge. The quantities involved are huge and to date no master plan for sludge disposal has been determined. The urgent need for a sludge study is discussed in Sections 2.3.1 and 4.2.

#### *Brick Delivery*

The project required the delivery of about 33 million bricks to provide corrosion resistant linings to tunnels, culverts and associated structures. Contracts 3, 4, 6, 7, 8 and 12 are the main recipients on the East Bank and Contracts 21 and 25 on the West Bank. Relatively small quantities are also required on Contracts 1, 22 and 26.

By the end of 1987 about 7.5 million bricks had been delivered (about 22 percent of the total requirement) and monthly deliveries had peaked in December 1987. However, in early 1988 serious concern arose about the quality of bricks and independent testing by CWO, the contractors and AMBRIC revealed that testing previously carried out at some factories had become unreliable. As a result, by April 1988 brick deliveries had virtually ceased. A protocol between CWO and the Mining and Refractories Industry Company (MARIC) was signed in May 1988 which laid down revised procedures for testing and approval of bricks. By July 1988 supplies had recommenced, and backlog stock.

piles at the factories were being cleared; by September 1988 brick deliveries were averaging between 800,000 and 900,000 per month. This rate of delivery continued to the end of 1988 by which time about 15 million bricks had been delivered (about 45 percent of the total requirements).

A second protocol between CWO and MARIC was signed in September 1988. This protocol set a new price for bricks and set out a schedule of monthly deliveries to be achieved. It also established that, for the first time, AMBRIC would determine to which contracts available supplies of bricks would be distributed. As a result, deliveries to Contract 12 were completed at the end of February 1989 and all contractors now have firm programs for supply of bricks on which to base their programs to complete their contracts. This action is believed to have considerably mitigated the delays and additional costs being incurred to the Project.

At the beginning of 1989 there was a significant increase in deliveries of bricks as a result of two additional factories (Siegwert and Nasr Phosphate) commencing production. Deliveries reached nearly 1.8 million in March 1989. Overall, by the end of March over 19 million bricks had been delivered (about 57 percent of the total requirements).

The upturn in brick deliveries in the first three months of 1989 is of major importance and is a significant achievement. However, it must be pointed out that brick deliveries are still consistently less than the production schedules agreed upon in September 1988. Further ways are being sought to improve production. To this end, a brick production expert from the UK is presently visiting Egypt to provide technical advice to the brick factories.

The September 1988 protocol required that brick deliveries should be completed by September 1989. Present indications are that there will be slippage until late 1989 or early 1990.

Fortunately, the failure of the brick manufacturers to supply sufficient bricks in the time required is unlikely to materially affect the commissioning program. The works at Ameria, Kossous, Khalag, Gabal el Asfar and Abu Rawash are the main constraints on the critical path for commissioning the overall systems.

#### 2.2.3

### *West Bank*

#### *Current Program*

The current program for the execution of the West Bank contracts is shown in Exhibit 6 and in Exhibit 8. Where a contract has been awarded, the name of the contractor and the awarded amount are given. The contracts, with the exception of the FAR program, are in US dollars and are funded from a grant from USAID.

#### *Components*

The goals of the West Bank projects are to augment existing facilities, extend service into newly developed and previously unsewered but developed areas, and provide wastewater conveyance from developed areas to treatment facilities. System components include: a series of collector sewers, cast-in-place culverts, seven pump stations ranging in capacity from 240,000 to 832,000 cmd, a rehabilitated treatment plant at Zenein, and a primary treatment plant at Abu Rawash with a capacity of 400,000 cmd.

The West Bank project also includes the construction of secondary and lateral sewers, and the connections to homes and commercial buildings within presently unsewered areas in Embaba and in the Pyramids area of Giza.

### *Collector and Culvert Contracts*

#### *Contract 20A - Embaba Collectors*

Previous efforts to proceed with construction of Contract 20 works were unsuccessful. The first contractor awarded the work contended that it would not be possible to execute the works without causing extensive damage to property in the vicinity of the works. Negotiations were successfully completed for the contractor to withdraw from the contract. The project was subsequently restructured as Contract 20A to include major collectors of some 21 km in length, and tenders for the revised works were received on 12 December 1988. AMBRIC has completed its report on the review of tenders and recommended that a contract be awarded at the low bid of US\$114.91 million.

The award recommendation has been approved by CWO and USAID and it is anticipated that a contract starting date of June 1989 can be achieved.

#### *Contract 21 - Northeast Culverts*

Substantial completion of Section 1 (Boulac to South Muheit pump station) was effected on 30 April 1988, some three months behind the originally scheduled completion date. The only remaining work includes brick lining and construction of various access chambers. Brick lining for Section 1 is now complete.

Work continues at a steady rate on the excavation and concreting of the culverts for Section 2 (South Muheit to Junction to Abu Rawash pump stations) which is now more than 81 percent complete. The brick work on section 2 is 21 percent complete.

#### *Contract 23 - Giza Relief System*

A substantial completion certificate was issued on 14 June 1988 for the two stage pump stations at the inlet to the Zenein WWTP.

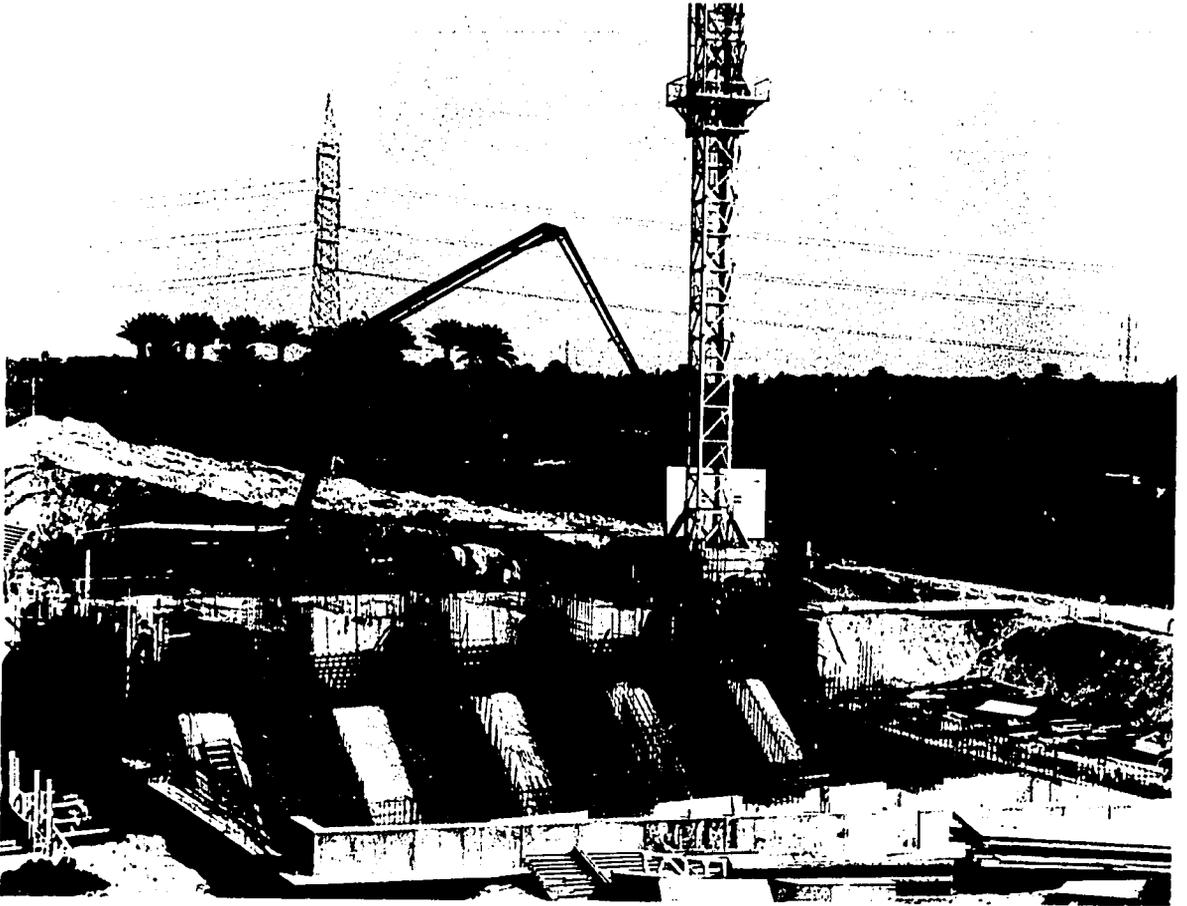
Contract No.	DESCRIPTION	CONTRACTOR	CONTRACT SUM		1985	1986	1987	1988	1989	1990	1991	1992	1993
			LE × 10 <sup>6</sup>	Dollars × 10 <sup>6</sup>									
20A	Embaba Sewers & Collectors								████████████████████				
21	Culverts—Boulac to Abu Rawash	Fru-Con		31.3		████████████████████			████████████████████				
22	Pump Stations	Fru-Con		43.6		████████████████████			████████████████████				
23	Zenein Pump Station	Sadelmi NY			████████████████████								
23A	Collector and Giza Relief System			14.4					████████████████████				
24A	Embaba Sewers and House Connections—FARA 24A...T								████████████████████			████████████████████	
25	Pyramids Culvert	Fuller/Wallace		28.7		████████████████████			████████████████████				
26	Pyramids Pump Station	Fru-Con		9.5			████████████████████		████████████████████				
27A	Pyramids Sewers & House Connections—FARA 27A...Q							████████████████████	████████████████████				
27	Pyramids Collector—FARA 27 N & S								████████████████████			████████████████████	
28	Cheops Pump Station								████████████████████				
29	Abu Rawash WWTP								████████████████████				
30	Abu Rawash Effluent Disposal								████████████████████				
31	Zenein WWTP Rehabilitation	Sadelmi NY	5.0	69.8		████████████████████			████████████████████				

 Actual dates & program  
 Estimated completion date—Late  
 Estimated dates

EXHIBIT B—SUMMARY OF WEST BANK CONTRACTS



*Soils investigation for  
Sphinx Emergency  
Sewerage Project  
FAR Program*

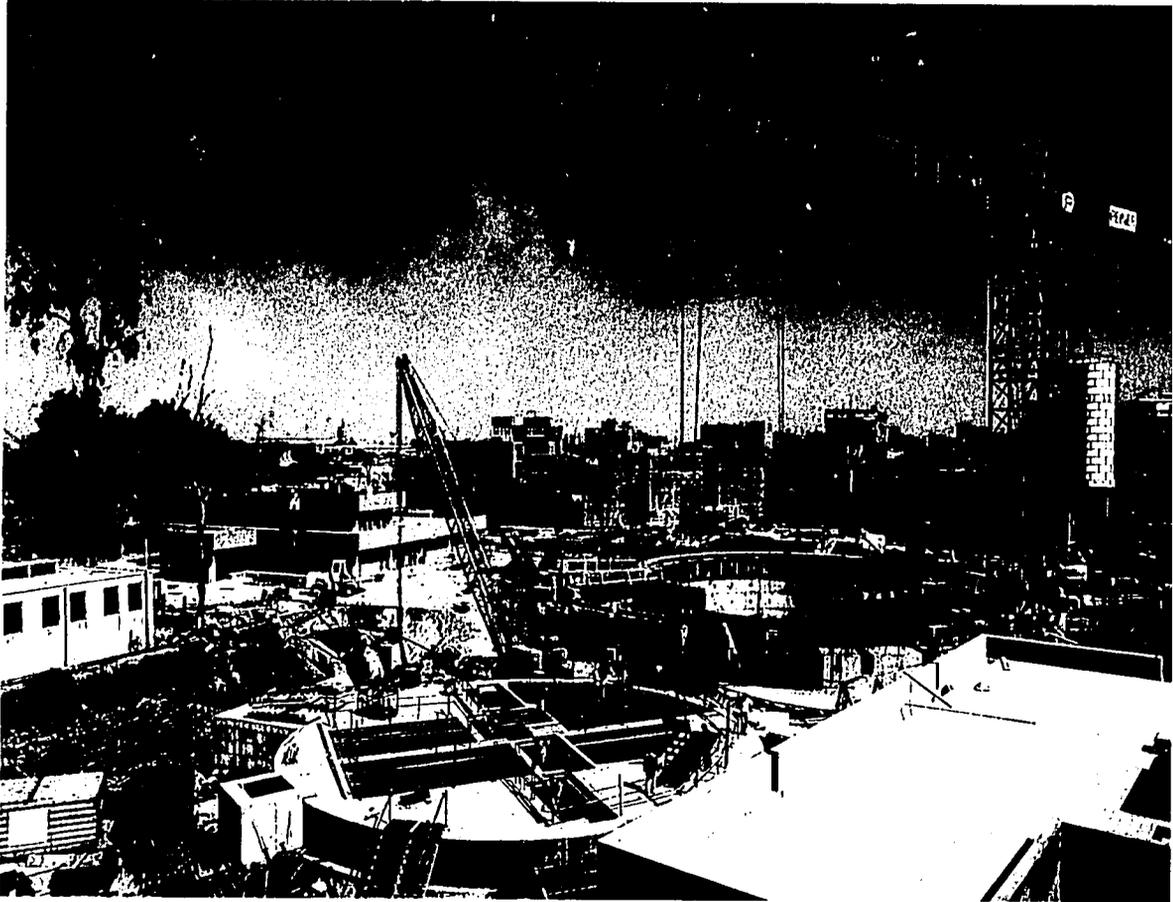


*Contract 22:  
Abu Rawash Pump Station  
construction of troughs  
for screw pumps*

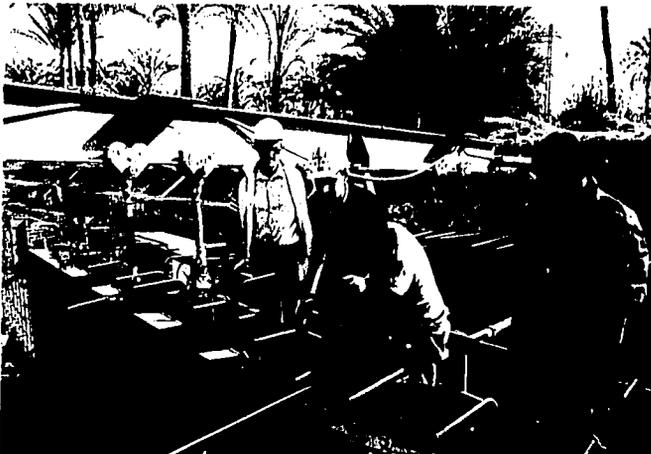


*Contract 25:  
culvert under  
construction*

*Contract 22:  
drive units  
for screw pumps*

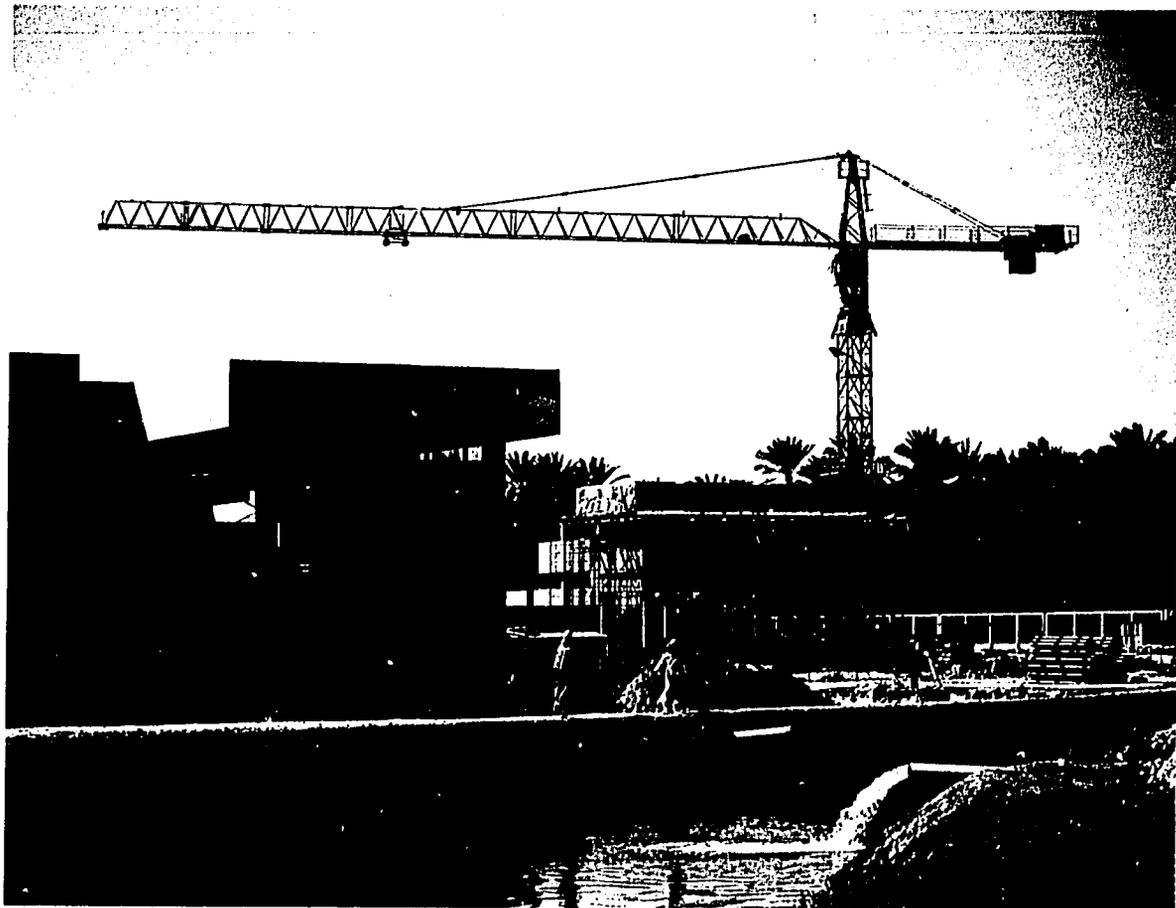


*Contract 1:  
Ameria tunnel  
distribution chamber  
and pump station*



*Inspection prior to  
pouring of concrete  
(typical)*

*Contract 31:  
Zenein pipe work*

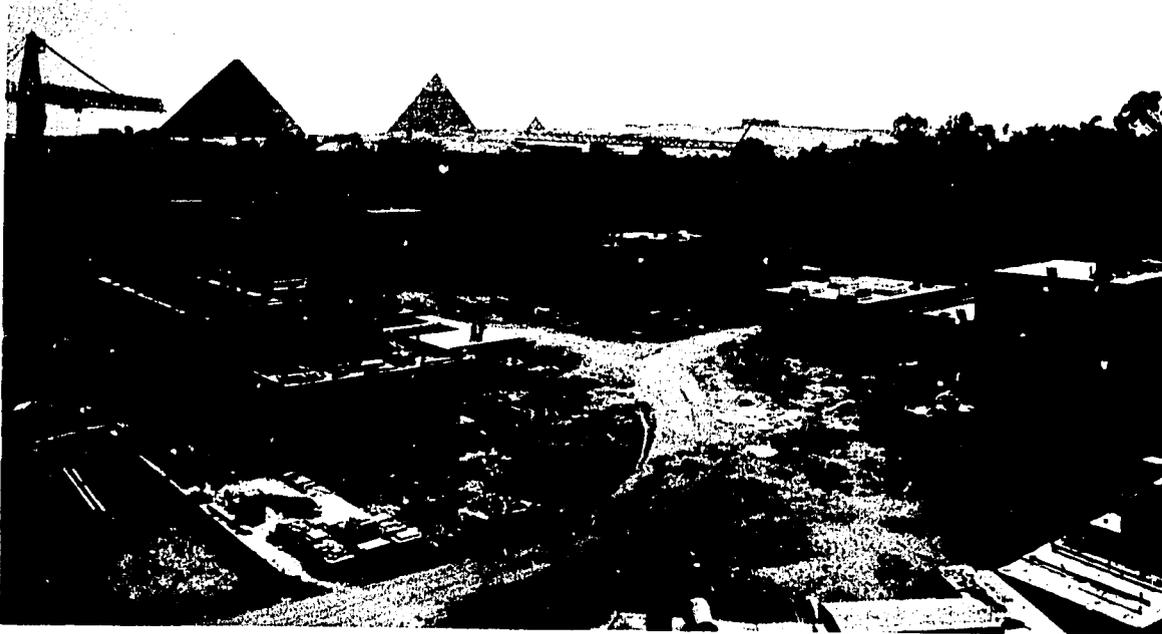


*Contract 22:  
Junction Pump Station*



*Contract 31:  
Zenein  
modification and  
extension of  
grit chambers*

*Quality control  
inspection*



*Contract 26:  
Pyramids Pump Station*



*Contract 22:  
Boulac Pump Station*

### **Contract 23A - Collector**

The main collector work, on which work was stopped, is still in abeyance. Following negotiations, an agreement has been reached with the contractor to delete the collector works from Contract 23. After a committee had been formed by the Minister to review this agreement and as a condition of its acceptance, it was required that the collector portion of Contract 23, subtitled C23A, be put out to tender to preselected Egyptian contractors and successfully let. This was carried out over January and February and tenders were received on 6 March 1989. These tenders are presently being evaluated by AMBRIC and a recommendation will be given to CWO and USAID by mid May 1989.

### **Contract 25 - Pyramids Culvert**

The contractor continues to maintain a steady rate of progress constructing the culvert. Approximately 60 percent of the culvert has now been concreted. Continuation of this rate of progress will enable the contractor to complete the culvert concrete work on schedule. Last November the contractor, because of the blue brick shortage, was instructed to suspend installing blue brick for three months. This suspension has now been lifted and the contractor is mobilizing to start this portion of the work. This delay in starting installation of the blue brick lining is expected to result in a delay of completion of the contract as a whole and a resulting claim from the contractor.

### **Contract 27A - Pyramids Sewers and Force Main**

The contractor has been proceeding steadily with the submittals for the house connection laterals, materials approval and purchase, and the delivery of these items. Work is proceeding on the installation of precast manholes and the gravity sewer pipe work, as well as the weld-

ed steel force main. The temporary pump station caisson has been sunk and the top slab and valve chamber concreted.

### **Pump Station Contracts**

#### **Contracts 22 and 26 - Pump Stations**

Work is continuing steadily on all six pump stations under these contracts. A substantial completion certificate was issued for the Embaba pump station on 26 May 1988 and the contractor is presently addressing the items required to enable the substantial completion certificates to be issued for the pump stations at Boulac and South Muheit. Progress is still on schedule to finish within the contract completion dates for Junction pump station (74 percent complete), Abu Rawash pump station (68 percent complete) and Pyramids pump station (58 percent complete).

A claim for extension of time without costs has been agreed for the completion dates of Boulac and South Muheit. This was a part of an integral package of settlement of claims by the contractor on these contracts and Contract 21 which cover delayed site access, dewatering, epoxy mortar and grade 60/40 rebar substitution.

### **Treatment Plant Contracts**

#### **Contract 31 - Zenein WWTP Rehabilitation**

Work is continuing at a steady rate on all phases of the contract. The pretreatment facility is in full use with diverted flows from the treatment works passing through it and the Nahya drain culverts to the Nahya drain which has been dredged to improve its hydraulic capacity.

Rehabilitation work continues on Modules 1, 2 and 3, the compressor building, operations building, workshop, and generator building on both the civil and mechanical

sites. New work continues on the construction of the switchgear building, return activated sludge pump station, intake chambers, the electrical substations at Zenein and Abu Rawash, underground pipe work in the yard and modifications to the existing sludge pipelines between Zenein and Abu Rawash.

#### **Abu Rawash WWTP and Emergency Drains**

Tenders are scheduled to be received from prequalified US contractors on 7 June 1989 for two of the three modules of the first stage primary treatment facilities at Abu Rawash. This stage also includes sludge thickening facilities to accommodate the sludge to be pumped from the rehabilitated Zenein wastewater treatment plant.

Preliminary studies have been initiated to determine required improvements to existing drains and relevant structures to accommodate Abu Rawash discharges during emergency conditions. The current development program provides for reuse of the treated effluent from the Abu Rawash plant. The funding for the primary treatment facilities and the required drain and related improvements will be provided from US grants available through USAID for the Cairo Sewerage Project. The cost is estimated to be US\$90 million.

### **FAR Program**

Amendment 42 to the Agreement between CWO and AMBRIC for consulting services related to Work Order 3C was executed by CWO and AMBRIC and was approved by ODA and USAID in early June 1988. The scope of work of this amendment included the design and contract document preparation for sewers and house connections in the unsewered areas of Embaba and Pyramids in the Giza Governorate. It also in-

cluded the collectors and Cheops pump station design in the Pyramids area. A priority project area in the Sphinx Villages was identified as urgent and sewer designs and contract documents were to be prepared immediately. This is called the Sphinx Emergency Program. The construction cost for these sewers and house connections is financed by USAID and the Government of Egypt (GOE). USAID provides 79 percent of the construction cost through Fixed Account Reimbursement Agreements (FARA), a form of financial assistance whereby USAID provides funds to CWO in Egyptian Pounds for completed stages of work as certified by AMBRIC.

Staff was mobilized in July 1988. Subcontracts with Egyptian firms were executed for geotechnical investigations, and ground and aerial survey work. Two design teams were formed, one each for the Embaba and the Pyramids areas. Local engineers, from AMBRIC's subconsultant, were mobilized to assist in design, liaison, utility detection and cost estimating.

The Embaba project area, which covers approximately 600 hectares (refer to Exhibit 9), is divided into twenty (20) subprojects (Contracts 24A-24T). The construction cost of each subproject is estimated to be within the USAID required FARA ceiling of LE 10 million each.

The total construction cost of the Embaba contracts is estimated at LE 173 million. The design duration for these contracts is projected through the end of April 1990 (pending approval of a request to extend Amendment 42). Contract documents for Contract 24A were prepared and issued to tender by prequalified Egyptian private and public sector contractors on 9 February 1989. Construction of these contracts is projected to be completed in the last quarter of 1992.

The Pyramids project area, which covers approximately 1200 hectares (refer to Exhibit 9), is divided into fourteen (14) FARA subprojects (Contracts 27A-27N). The total construction cost of these contracts is estimated at LE 106 million.

Contracts 27A, B and C form the Sphinx Emergency Program. Contract 27A is under construction by a public sector contractor and Contracts 27B and C documents were issued to potential tenders on 31 January and 7 March 1989 respectively. The design duration for these contracts is projected through end of April 1990 (pending approval of the request to extend Amendment 42).

In addition, the scope of work of the Pyramids Area Project includes the design and contract document preparation for Cheops pump station (C28) and main collectors (C27). These two contracts will be tendered by prequalified American contractors. The C28 design is under way and the documents are scheduled to be issued to tenderers on 1 August 1989. Contract 27 design is being undertaken in Cairo and documents are scheduled to be issued on 1 September 1989. Contract 28 construction cost is estimated at \$8 million and C27 construction cost is estimated at \$65 million. Both contracts will be 100 percent financed by USAID.

The General Conditions of Contract (Volume 1 of 3) for the FARA contracts (24A-24T and 27A-27N) are in Arabic with an English translation. All the construction contracts will be between CWO and the contractors and will be in Arabic. Although Arabic is the "ruling language," all correspondence during construction will be in English.

Amendment 42 staff have recently completed an investigation of locally available construction material (i.e. vitrified clay pipe with flexible joint, PVC, reinforced concrete pipe with PVC liner, precast manholes, manhole rungs and covers) and will

be monitoring availability and quality of material as the program progresses. Amendment 42 staff will also closely monitor the ability of local contractors to successfully complete the large amounts of work under the FAR program.

An agreement has been made between CWO and GOSD to temporarily discharge wastewater collected from the Embaba project area of Contracts 24A, B, C and D (approximately 100 hectares) to the existing Awkaf pump station. The agreement also allowed the discharge of wastewater from the Pyramids project area (100 hectares) of Contracts 27A, B, C and D to GOSD pump station No. 4. This will continue until the West Bank conveyance and treatment system is operational.

In accordance with the requirements of the Work Plan, AMBRIC staff have recently completed a review of the Amendment 42 budget and schedule and has identified the need to extend the design duration through the end of April 1990. A request for additional cost and time will be forwarded to CWO and USAID for their approval shortly. In addition, if funds are available, AMBRIC may be requested to increase the scope of work to cover additional unsewered areas in the vicinity of the Zenein treatment plant.





## 2.3

# Follow-on Studies and Projects

### 2.3.1

#### Sludge Disposal

**A** study into sludge treatment and disposal has been proposed for some years and in November 1987 a draft Amendment 32 was submitted to CWO updating the original Amendment submitted in May 1987. The Amendment provided for a sludge study to determine how best to handle the processing and ultimate disposal of wastewater treatment residuals (sludge, grit and screenings) from both East and West Bank wastewater treatment plants. The Amendment allowed for functional design of the West Bank facilities. This submission did not result in an instruction to proceed.

In July 1988 tenders were invited for Contract 16 - Gabal el Asfar WWTP Phase 1. Participating companies were required to submit tenders for sludge digestion and mechanical dewatering facilities in addition to the works as already designed. During subsequent discussions with CWO it was agreed that companies tendering for Contract 16 would be required to submit two alternative tenders for sludge treatment. The first alternative is based upon 100 percent sludge digestion and mechanical dewatering. The second alternative is based upon 50 percent sludge digestion and mechanical dewatering and 50 percent sludge drying beds. Contract 16 tenders were received in March 1989 and are being evaluated (see Section 2.2.2).

The decision by CWO to invite tenders for sludge digestion and mechanical dewatering created an additional need for early resolution of the sludge study amendment. In February 1989 a revised draft Amendment 32 was agreed with USAID. This revised draft excludes functional design but included provision to permit extension of services for functional design preparation. In April 1989 a further draft version was prepared including functional design of sludge facilities for Gabal el Asfar. Discussions are continuing with ODA and the need for an early outcome to these discussions is presented in Section 4.2 of this report.

### 2.3.2

#### Temporary Discharges

Study of the anticipated commissioning schedules shown in Exhibits 7 and 8 shows that the new facilities—pump stations, tunnels, culverts and treatment plants—will not be finished and available for use in a perfect time frame. AMBRIC has recently submitted two reports to CWO on the issues that arise as a result of this fact. The first report considers the problem of what should be done with wastewater between the time when flow first enters the culverts, tunnels and pump stations and the time when the treatment plants are commissioned.

It is assumed that there will be inevitable pressures to put into use those works that have been completed, particularly if this diverts wastewater away from the urban area. If treatment plants are not available, the wastewater must be disposed of temporarily. The alternative solution of delaying the construction contracts is not recommended by AMBRIC. Two policy decisions are necessary and these relate to the quality of wastewater which may be temporarily discharged and the location of these discharges.

#### West Bank

On the West Bank, interim discharges are possible at Boulac, South Muheit, Junction and Abu Rawash pump stations. However, based on AMBRIC's study and preliminary hydraulic analyses, it is recommended that the North Giza flows from Embaba be temporarily released to the Lebbeni drain system at South Muheit and the Pyramids area flows be temporarily released to the Kombara/Lebbeni drain system at Junction.

AMBRIC has considered the necessity and feasibility of treating West Bank wastewater flows to primary or secondary levels before temporary discharge to the drain system. The fact that contractors will be using the new wastewater network to dispose of groundwater from their excavations means that the concentration of pollutants in the wastewater will be relatively low because of the resultant dilution. Wastewater with a lower quality than that expected from the Abu Rawash WWTP will be discharged outside the urban boundary for a relatively short period. Therefore it has been concluded that the construction of temporary treatment facilities cannot be justified.

#### East Bank

On the East Bank, temporary discharges are possible into the Kossous drain at the urban boundary, at Kossous pump station where provision is being made to allow flow transfer to the Shoubra el Kheima WWTP and at Gabal el Asfar using the essential inlet works and bypass to the Gabal el Asfar drain.

Early commissioning of the Collector pump station at Ameria with discharge into the Kossous drain has the benefit of improving the flow situation in the existing collector sewers. Such a temporary discharge into the Kossous drain should not adversely affect the quality of waters

in the drains. A further benefit will be that the wastewater will be discharged at the urban boundary.

At Gabal el Asfar it is essential that the inlet pump station and WWTP bypass be constructed as soon as possible under Contract 10A or 16. This will allow the entire Phase I project to be commissioned and operated. Dredging and improvement of the Gabal el Asfar drain will be necessary. This is being planned and will be executed by the Ministry of Irrigation.

### 2.3.3

#### *Interim Maintenance*

As part of the theme of "a look toward commissioning," the second report addressed the issue of interim maintenance.

The construction of most pump stations and a large portion of the conveyance system will be completed prior to the associated treatment facilities and/or collector sewers. These facilities will be "owned" by CWO. The completed facilities could logically be turned over to GOSD by CWO or retained by CWO until commissioning. In either case, interim maintenance of the facilities' would be required to ensure the facilities' physical condition so that when commissioned they will operate as intended.

The assessment report was prepared to:

- Define the issues pertinent to interim maintenance
- Identify the periods for which interim maintenance will be required
- Present alternative methods to provide interim maintenance with associated cost estimates

- Recommend an implementation plan for the required interim maintenance program

The report provided detailed discussions of issues and schedules, work to date pertinent to interim maintenance, strategies for providing interim maintenance, and recommended actions.

The recommended strategy for the interim maintenance program is one in which all of the involved governmental organizations have a role, and is based on the following:

- CWO is recommended as the organization to administer and fund the program
- AMBRIC is recommended as the organization to act as CWO's project manager and generally monitor the program
- USAID and ODA should be requested by CWO to consider extending their funding to cover the program
- GOSD should have "observer status" in the program and nominate a cadre of supervisors and operators to prepare GOSD to operate the commissioned system
- An Egyptian specialized technical service firm, or association of firms, is recommended as the organizational unit to provide the "hands on" interim maintenance services.

The services should be provided by a single organization (or association of firms) for all facilities on the West Bank. Interim maintenance of East Bank facilities will be provided by contractors currently involved on the project. The actions required to implement an interim maintenance program are presented in Section 4.4.

### 2.3.4

#### *Effluent Disposal and Reuse*

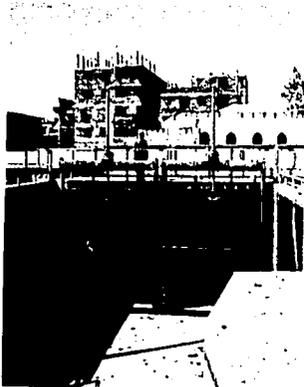
On the West Bank, studies and designs are being undertaken to ensure that effluent from the Abu Rawash WWTP can be satisfactorily disposed of to the drains. There are presently no specific proposals for reuse of effluent from the West Bank treatment plants.

On the East Bank there are understood to be studies and designs relating to the reuse of effluent from Berka WWTP.

For the Gabal el Asfar WWTP a position paper relating to wastewater reuse and disposal was submitted to CWO by AMBRIC in December 1987. This position paper considered direct reuse on Cairo's Ring Road and Green Belt and reuse on desert reclamation areas. It also considered indirect reuse resulting from discharge to irrigation canals or drains. The paper concluded that effluent reuse schemes are technically feasible, but that further studies are needed to determine the optimum use for the effluent and the economic viability of irrigation reuse. The paper also concluded that drain capacity needed to be increased, irrespective of the reuse scheme ultimately adopted.

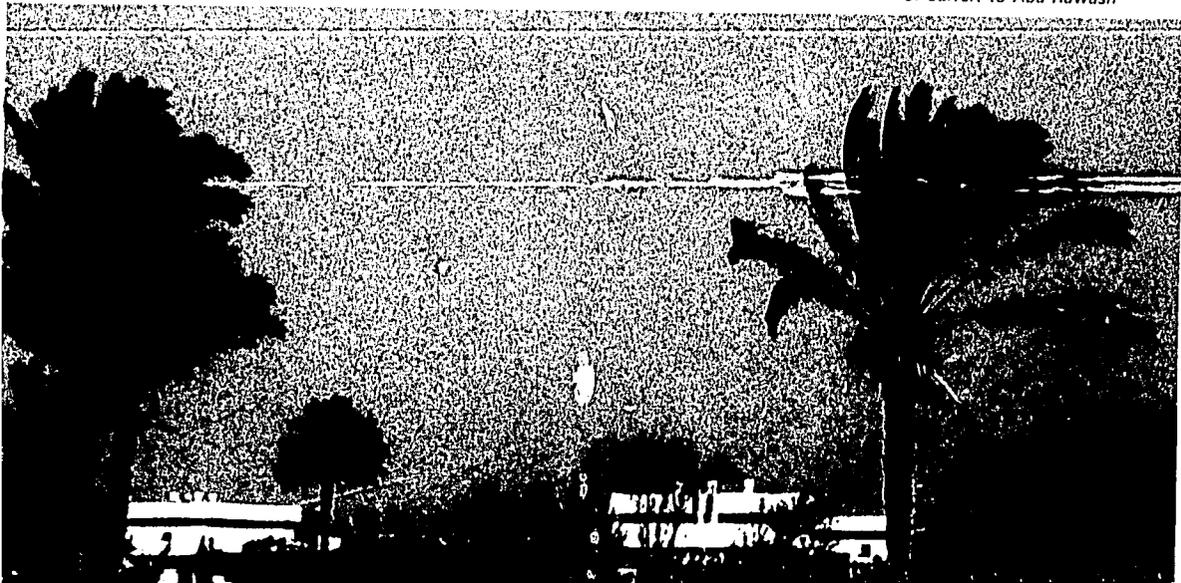
In August 1988 CWO requested ODA to fund further studies into effluent reuse for the Gabal el Asfar WWTP and in March 1989 ODA invited proposals from six UK companies, including Taylor Binnie & Partners, to undertake a prefeasibility study. These proposals were submitted to ODA in April 1989.

Following submission by AMBRIC of the December 1987 Position Paper, CWO and AMBRIC commenced discussions with the Ministry of Irrigation to determine the works necessary to upgrade the drains downstream of Gabal el Asfar WWTP. The Ministry of Irrigation has now completed its studies

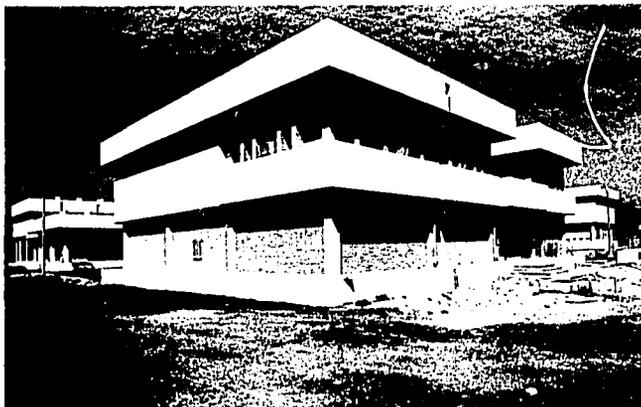


*Sluice gates at  
isolation chamber  
(typical)*

*Typical scene along route  
of culvert to Abu Rawash*



*General view of  
buildings at  
pump stations*



*Contract 31:  
substation to  
electricity authority*



and has made proposals to CWO for the upgrading of drains for a distance of 40 km downstream of Gabal el Asfar.

Discussions have also been held between CWO, GOSD, AMBRIC and the Ministry of Irrigation to ensure that the Kossous drain downstream of Ameria has adequate capacity to permit satisfactory temporary discharges at the urban boundary.

Future actions with regard to effluent disposal and reuse are discussed in Section 4.5 of this report.

### 2.3.5

#### *Operation Management Services*

In March 1988, Work Order 4A (WO4A) was approved and signed by CWO and AMBRIC to provide the framework and foundation for a broad program of institutional strengthening of GOSD. The starting date for the project was 1 June 1988.

The WO4A project is to produce a System Management Plan, a System Operations Plan, and a Comprehensive Training Plan for GOSD. Since the project is to service the needs of GOSD, while the contractual relationship is with CWO, it was decided to form an Executive Steering Committee to monitor and guide project activities. The Steering Committee is composed of representatives of GOSD, CWO, and AMBRIC with participation by the funding agencies.

After nine months of effort, major elements of the work have been completed and significant sections of the System Management Plan, the System Operations Plan, and the Comprehensive Training Plan have been prepared.

A complete inventory of GOSD operation and management resources has been completed and most of the

information entered into a computer data base. A Preliminary Operational Needs Assessment Report has been completed in draft form that reviews the GOSD operation and maintenance organization, identifies O&M problems, states the needs, recommends solutions and cites the benefits to be achieved.

Four major future notices have been prepared to service GOSD needs in pump station O&M, computerization, collection system O&M and twinning. Three of the notices have been approved by the Executive Steering Committee. Notice No. 1 for Pump Station O&M services was recently signed and will soon start and continue for a period of 18 months.

More than 16,000 trainee hours have been provided in O&M procedures, computer processes and applications, management and instructor training. Visiting specialists have come to Cairo to provide special expertise in computer systems and archiving, safety, and design of a Training Center at Zenein. A significant amount of specialized equipment has been purchased including computers, audio visual equipment, laboratory equipment, safety equipment, and tools. All of the equipment purchased will become the property of GOSD.

A preliminary report on the GOSD organization has been prepared. It analyzes the existing organizational structure and makes recommendations for improvements to that structure. The report, in English and Arabic, has been reviewed with GOSD for implementation and will be included as part of the System Management Plan. It draws conclusions and makes specific recommendations regarding span of control, management training, the development of policies and procedures, the need for equipment, supplies and spare parts and computerization of the management system. The changes proposed in the report may

take considerable time and, in some cases, government approval for implementation, but the proposed organization will provide a better and more efficient structure for control and management. The report recommends computerization of portions of the GOSD management systems, including personnel, payroll, purchasing, stores and accounts.

In 1979, a comprehensive financial and management report was prepared by BVI-ATK Associates for six Egyptian cities, including Cairo. AMBRIC is reviewing and updating those recommendations. The updated report has been completed and will be included as part of the System Management Plan. It also contains recommended management systems for the expanded wastewater system.

The Comprehensive Training Plan will define GOSD's training and operator development needs through the year 2001. The Plan includes schedules for training related to the planned startup of newly constructed or rehabilitated treatment plants, pump stations and collections system facilities. It also includes course outlines, schedules for planning, target training groups, training resources, including institutional and equipment requirements, and coordination through a local university.

A notice has been prepared and approved by the Executive Steering Committee for a twinning relationship with an American sewerage agency. Consideration would also be given to such an arrangement with a British agency if sterling funding were available. The program will provide for exchange of executives, consultation, training and professional development. Other work is anticipated in areas such as safety management, industrial waste

monitoring and control, computerization of GOSD, and management training.

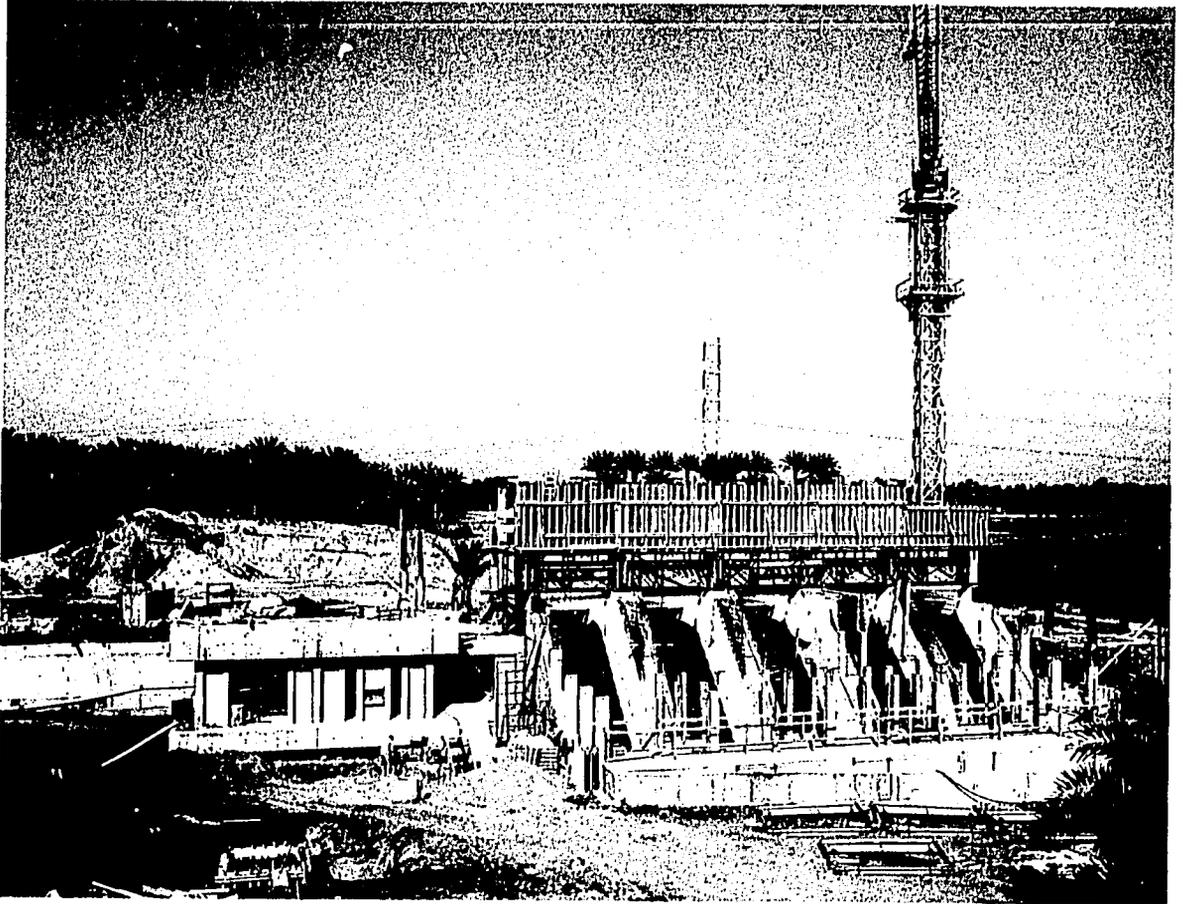
### 2.3.6

#### *Unsewered Areas*

Following the preparation of the Master Plan in 1978 it was recognized that there was a need for a more detailed appraisal of conditions in the unsewered areas in order that recommendations for improvements could be made. More than three million people live in unsewered areas shown on Exhibit 1. In 1982 USAID funded a Water and Sanitation for Health (WASH) study to define areas where further practical investigations should be conducted and to provide information to form the basis for a project to demonstrate feasible methods to collect, treat and dispose of wastewaters from these areas. While recognizing that the only feasible long term solution would be a waterborne sewage system, the WASH study acknowledged the urgent needs of the unsewered areas.

The final report of the Unsewered Areas Demonstration Project was completed and was formally submitted to CWO and USAID in October 1987. The report summarized the activities of the project and stated conclusions and recommendations. Of particular importance was the inclusion of a plan designed to move the successful demonstration projects forward into an implementation program. Development of a responsive, efficient executing organization, in conjunction with a phased implementation program, was cited as a key activity. Other recommendations included emphasis on private sector participation, establishment of operational costs and a payment scheme, and a list of target priority areas in greater Cairo.

*Training of  
Egyptian O&M  
staff (GOSD)*



*Contract 22:  
Abu Rawash Pump Station*



*Reviewing  
construction  
drawings*

*Confirmation of  
construction  
procedures*



*Contract 25:  
culvert construction*



*Contract 31:  
installation of  
inlet piping*

# Funding



## 3. Funding

### 3.1 Funding Contracted

**E**xhibit 3 shows the relative proportions of PDS, US\$ and LE funding commitments to the Project using a common base of Equivalent LE. Funding commitments to AMBRIC's consultancy and CWO's construction contracts are presently as follows:

ODA Grants	PDS	59.06 million
UK Bank Loans	PDS	131.07 million
USAID Grants*	US\$	401.07 million
	LE	4.76 million
Government of Egypt	LE	484.56 million
	PDS	20.08 million

\* The total USAID Grant authorized to date is \$684 million

In addition, approximately US\$ 5 million has been committed to design of the Abu Rawash WWTP through CDM.

Exhibits 10, 11, and 12 show how these amounts are allocated to consultancy and construction and also how the construction amounts are allocated to East Bank, West Bank and Rehabilitation Contracts.

### 3.2 Expenditures to Date

**T**he work has consumed a considerable portion of the committed funds. As AMBRIC does not have access to full details of costs for items other than construction and consultancy work, this Section addresses only those two aspects.

EXHIBIT 10—CONSTRUCTION CONTRACT COSTS (Amounts in millions)

CURRENCY	SOURCE	TOTAL COMMITTED COST	CERTIFIED TO END MARCH 1989	% CERTIFIED	PAYMENTS MADE	PAYMENTS OVERDUE
<b>East Bank Contracts</b>						
PDS	ODA	25.26	25.19	99.74	25.19	0.00
PDS	Loan	131.07	100.51	76.68	99.57	0.42
PDS	CWO	20.08	19.21	95.70	19.11	0.14
LE	CWO	381.15	303.58	79.65	275.93	16.73
<b>West Bank Contracts</b>						
US \$	USAID	253.45	132.38	52.23	132.38	0.00
LE	CWO	5.00	1.31	26.24	0.94	0.17
<b>FARA Contracts</b>						
LE	USAID	3.76				
LE	CWO	1.00				
<b>Rehabilitation Contracts</b>						
US \$	USAID	65.94	65.71	99.65	65.42	0.29
LE	CWO	29.22	28.88	98.85	28.68	0.20
<b>TOTALS</b>						
PDS		176.41	144.91	82.15	143.87	1.04
US \$		319.39	198.09	62.02	197.80	0.29
LE		420.13	333.78	79.45	305.55	28.23

The current status of construction costs certified and payments received by contractors as of the end of March 1989 are set out in Exhibit 10. Exhibit 11 shows the proportion of monies certified for the two major aspects of the Project. In a general sense this indicates the progress made to date on the awarded contracts but the overall situation is not truly represented because the details of contracts not awarded are not included.

The amounts of LE overdue to East Bank contractors have reduced in recent months, but the problem still remains serious. However, the position has improved compared with that of a year ago.

Particular problems are that CWO has deducted amounts from the Engineer's Certificates in respect of interest charges on late payments and custom dues. These amounts are significant and much attention has been paid by AMBRIC to trying to resolve the problem.

It appears now that CWO is prepared to pay the interest, at least in part, and to pay the customs amounts on production of the proper documentation by the contractors.

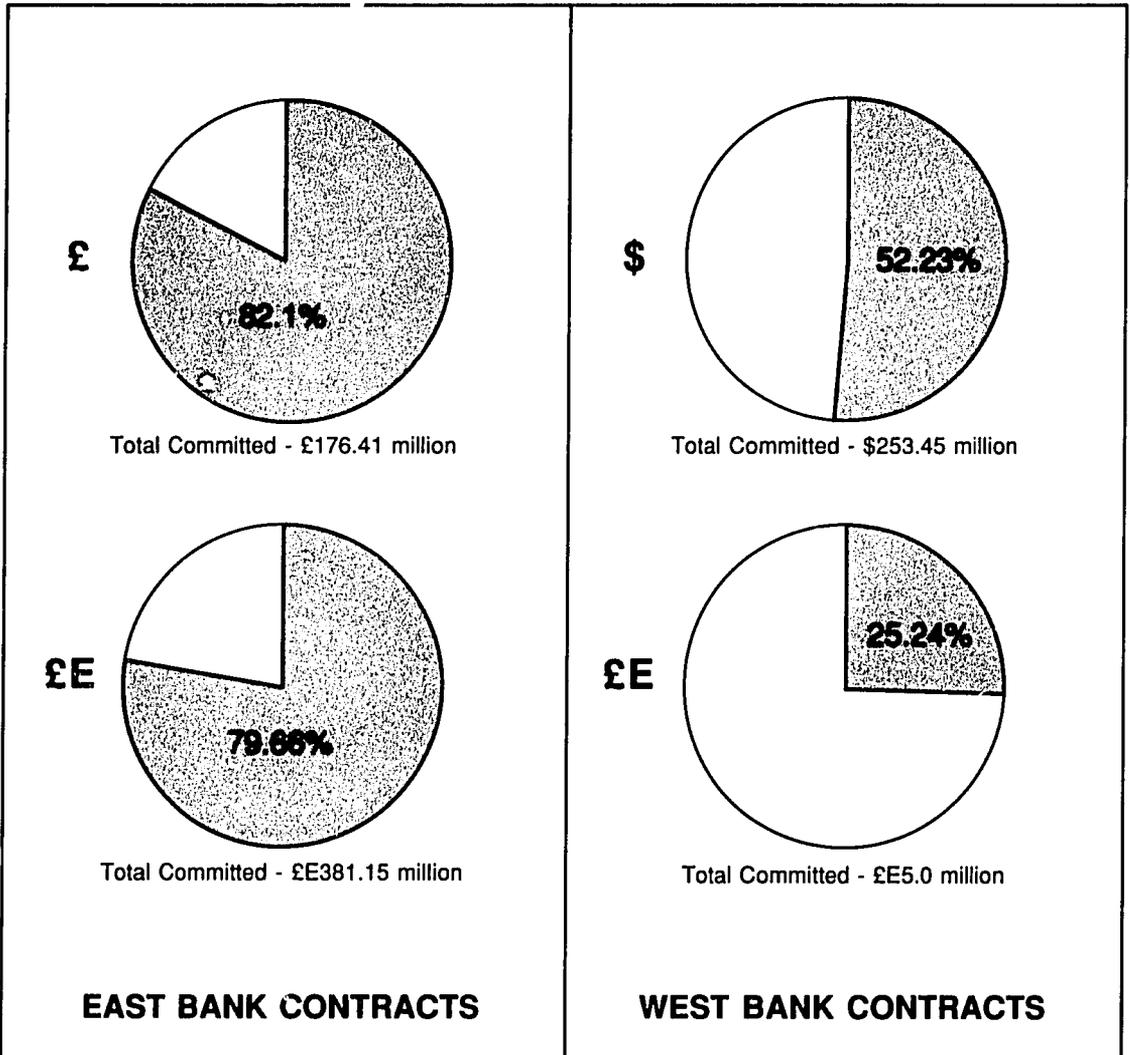
The status as of the end of March 1989 for consultancy costs invoiced since 1979 and payments received are given in Exhibit 12. The US\$ and the LE payments to AMBRIC are made through CWO; the PDS costs are paid directly by ODA to the TBP part of AMBRIC; CDM are paid direct from USAID. Exhibit 12 includes costs for all work which has commenced or has been approved to proceed. Overdue US\$ amounts reflect disallowances by CWO.

Of the LE 5.81 million overdue to AMBRIC, LE 4.95 million is the balance claimed by EGYCON for work carried out by EGYCON before its services were terminated. Payments to EGYCON are currently frozen by CWO pending the results of investigations by the audit authorities and the Attorney General. Nevertheless, a considerable LE sum is overdue to AMBRIC's own account. The agreement for consulting services provides for a revolving fund against which local costs have to be drawn. The revolving fund should be kept topped up to provide four months working cover. However, late payments continually deplete this fund and on occasion AMBRIC has been close to being unable to proceed due to lack of funds. For this reason, it has been proposed that the revolving fund be set at six months expenditure and an amendment on this basis awaits approval. The fund is currently set at LE 2.5 million but AMBRIC has submitted a request to CWO that this be increased to LE 2.65 million to take into account the increase in the present levels of expenditure.

EXHIBIT 12 — CONSULTANCY COSTS (Amounts in millions)

CURRENCY	SOURCE	TOTAL COMMITTED COST	INVOICED TO END MARCH 1989	% INVOICED	PAYMENTS MADE	PAYMENTS OVERDUE
PDS	ODA	33.80	25.55	75.60	25.30	0.00
US \$	USAID	86.68	58.86	67.40	56.33	0.18
LE	CWO	69.19	52.17	75.40	45.75	5.81

**EXHIBIT 11 CONSTRUCTION COSTS EXPENDED**



 EXPENDITURE TO DATE

## *Commitments to Budgets*

**T**o overcome the difficulties and risks caused by late Egyptian Pound payments to contractors it is necessary that timely and adequate budgets are made available to CWO. This involves forward budget planning using up-to-date forecasts based on the best predictions of contractors' payments.

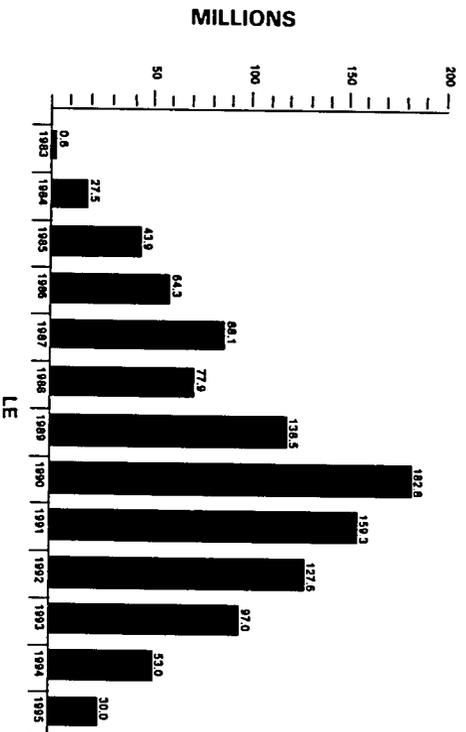
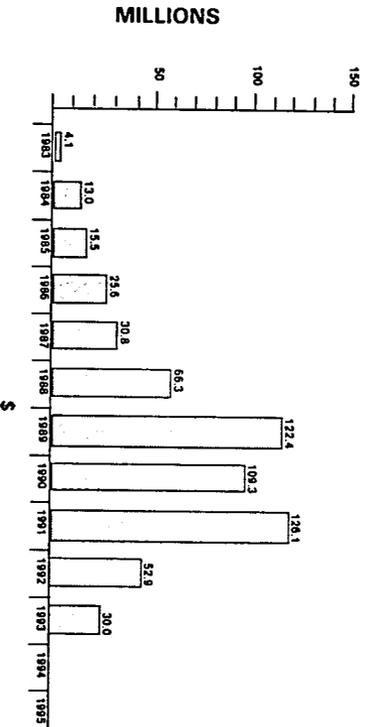
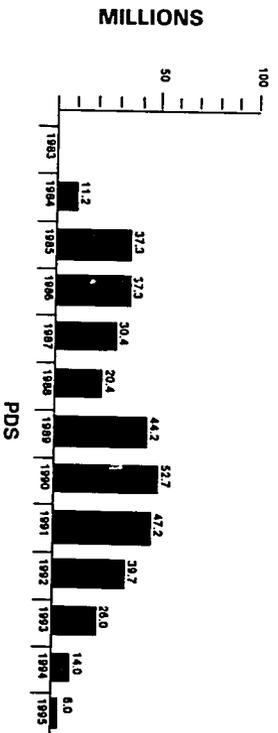
Budget commitments should also recognize those contracts which have not been awarded. Among these there is an urgent need to award the contracts which will enable the conveyance systems to discharge at drains to WWTPs. This involves Contract 16 (or 10A) at Gabal el Asfar on the East Bank and Contracts 29 and 30 at Abu Rawash on the West Bank.

From the records of payments certified to date and the best current estimates of future requirements, charts have been prepared summarizing the cash flows from funding sources for construction contracts. This is shown as Exhibit 13.

It takes into account on-going contracts and those which are funded but not awarded as identified in Exhibit 14. The charts show each of the three currencies (as provided by funding agencies) separately. The foreign funding for Contract 16 (Gabal el Asfar WWTP) has been included in the sterling chart although funding is expected from another EEC country. The Abu Rawash WWTP is a non-AMBRIC project, but its costs are included to present a complete picture.

It is to be hoped that, with the detailed information used to prepare such charts, the flow of LE funds can be improved over the remaining period of the construction programs.

# EXHIBIT 13- CONSTRUCTION COST EXPENDITURES



199

## Funding Requirements

**N**umerous funding needs have been identified in this Review Statement. Cost estimates are available for some of these needs but other aspects still have to progress to the study and design phases when preliminary cost estimates can be prepared. Exhibit 14 lists the work for which known costs or cost estimates are currently available.

Estimates are not currently available for implementation or construction of:

- Sludge treatment and ultimate disposal

- East Bank branch tunnels (other than the immediate priority branch tunnels)
- Complete facility operation management contract work
- Effluent disposal and reuse
- Interim maintenance (mainly West Bank)
- Additional FARA works
- Unsewered areas (other than FARA)
- Completion of documents for branch tunnels and subsequent supervision
- Development of implementation program for unsewered areas
- Master plan review
- Operations and maintenance safety program
- Operations management extension for additional training
- Services during commissioning and handover

Several amendments to AMBRIC's services are currently planned but no estimates of costs are currently available. These are:

- An immediate extension of FARA works design
- Contract 16 tender evaluation (Report 4)
- Contract 16 construction supervision
- Priority branch tunnels supervision

EXHIBIT 14 - KNOWN FUTURE FUNDING REQUIREMENTS (All amounts in millions)

DESCRIPTION	P DS	US \$	LE
<b>Current Construction - Costs Remaining:</b>			
Rehabilitation contracts	-	0.2	0.3
East Bank contracts	31.5	-	77.6
West Bank contracts	-	121.1	3.7
FARA c ontracts	-	1.6	1.0
<b>Funded But Not Awarded :</b>			
Priority branch tunnels	70.0	-	110.0
Gabal el Asfar WWTP (C16)	120.0	-	490.0
FARA contracts	-	89.7	57.2
C20A, C23A extra funds	-	68.3	17.0
Abu Rawash WWTP (C29)	-	90.0	-
<b>Consultancy:</b>			
AMBRIC: On-going work	8.2	23.8	17.0
Amendments under preparation	1.6	17.8	8.8
Work Orders under preparation	-	8.4	1.9
Other: Work Orders in hand (O&M)	-	3.8	0.7
CDM (Abu Rawash WWTP)	-	4.0	-

Note: The US\$ portion of FARA contracts is paid via CWO in LE.

# ***Recommended Actions***



## 4. Recommended Actions

4.1

### *Master Plan Update*

**T**he development plan for the staged expansion of the Cairo Wastewater facilities presented in the 1978 Master Plan was reassessed and confirmed during the AMBRIC Review/Study Phase (1980), and has served as the basis for the design and construction currently underway. The AMBRIC studies resulted in a recommended Stage 1 program that would accommodate projected flows through the early 1990s. The plan also called for Stage 2 work to follow on immediately after Stage 1.

The following statement was included in the AMBRIC Design Inception Report of June 1981: "The 1978 Wastewater Master Plan formed the starting point of the present study. It is axiomatic that all long term development plans require periodic review and reappraisal to take account of changing circumstances. This is particularly important in the case of a rapidly developing and expanding city such as Cairo."

There are many indications that population growth in certain areas has significantly exceeded the projections developed over a decade ago. It was predicted that the population would be ten million in 1990, and 13.6 million by the year 2000. Some demographers now contend that the population forecast for the year 2000 may well be reached early in the 1990s.

The Design Inception Report presented a staged construction program that scheduled major facilities for both the East and West Banks to be commissioned by the end of 1985. The schedules for on-going work shown in Exhibits 7 and 8 note that many of these facilities will now be available only in 1992.

It is now critical that an updated development plan be prepared to accommodate and adjust the staging of wastewater conveyance, pumping, and treatment facilities for Stage 2 as required by the current situation. The studies for this review and update of the Master Plan must also include a review of the urgency and priorities for execution of the unfunded Stage 1 contracts on the East Bank.

The very significant development that has taken place during the past decade has also included major water supply treatment and distribution improvements. Master plan studies for water were prepared in the late 1970s in parallel with the master plan studies for wastewater. The need for a water master plan review and reappraisal has been recognized and addressed by the General Organization for Greater Cairo Water Supply. Certain aspects of the water master plan were updated in 1986, and a major review and update for water on the East Bank will be finalized in 1989. No less should be done for wastewater.

Required CWO actions:

- Authorize AMBRIC to proceed with the drafting of an amendment that provides additional personnel and budget for the required master plan review and update.

Required AMBRIC actions:

- Prepare the required draft amendment taking into consideration information available from the rehabilitation efforts, geotechnical investigations, aerial photography and mapping, land use studies, and on-

going construction activities. Coordinate the preparation and review of the draft amendment with CWO, USAID and ODA.

4.2

### *Sludge Disposal*

**T**he long-standing and urgent need for a sludge study was discussed in Section 2.3.1. AMBRIC has prepared a draft Amendment 32 which requires final discussion and approval by all parties. The actions required by the involved parties to enable Amendment 32 to proceed include:

Required CWO action:

- Review and approve Amendment 32

Required AMBRIC action:

- Finalize amendment following discussions with ODA and USAID about the scope of work and the relative magnitude of UK/US inputs
- Submit amendment to CWO for approval

Required USAID/ODA actions:

- Agree on scope of work and relative magnitude of UK/US inputs

It is suggested that the occasion of the Liaison Committee Meeting in May 1989 is an appropriate time for all parties to meet and agree on the final content of Amendment 32, if agreement cannot be achieved beforehand.

## Temporary Discharges

The inevitable pressures to commission completed sections of the project in advance of commissioning of the whole of the project are discussed in Section 2.3.2. Early commissioning of sections of the project will require interim discharges of wastewater and this matter was the subject of a recent AMBRIC report to CWO. The report is intended to provide information needed to assist CWO with policy decisions.

### Required CWO actions:

- Make policy decisions for the West Bank:
  - Delay construction or discharge temporarily
  - Set discharge standards if temporary discharges are decided upon
  - Agree and implement the necessary actions to ensure that sufficient chlorine supplies are available to disinfect treated wastewaters
- Make rapid policy decisions for the Ameria Collector pump station on the East Bank:
  - Agree that it is necessary to commission the Ameria CPS by mid-summer 1989 to alleviate pressures on the existing system
  - Acquire the necessary permits from all of the necessary authorities to discharge flow to the Kossous drain at the urban boundary
  - Agree with the Ministry of Irrigation to dredge and clean the Kossous drain north from the urban boundary. This will ensure compliance with the design profiles and enable the discharged flows to enter the drain
- Agree and prepare the necessary requirements to operate the CPS including staffing, training and handing over procedures
- Make policy decisions for the complete Phase 1 East Bank system, including the essential priority works at Gabal el Asfar WWTP:
  - Award Contract 10A or 16. In either case AMBRIC recommends that the essential priority works be built first. This will enable the full East Bank project to be used in advance of full treatment being available
  - Agree with the Ministry of Irrigation that the Gabal el Asfar and Belbeis drains should be dredged and improved in accordance with their recent study. Arrange the necessary funding
  - Determine if the Shoubra el Kheima WWTP will be ready to receive wastewater flows from Kossous pump station by February 1991
  - Determine if power supplies will be available to Khalag pump station and Gabal el Asfar by early 1991
  - Agree and implement the necessary actions to ensure that sufficient chlorine supplies are available to disinfect treated wastewaters

### Required AMBRIC actions:

- Assist CWO with finalizing policy decisions with regard to interim discharges
- Continue liaison with CWO and Ministry of Irrigation with regard to drain upgrading

## Interim Maintenance

The recommended program for interim maintenance discussed in Section 2.3.3 would require certain actions by the involved parties including CWO and AMBRIC and the funding agencies.

### Required CWO actions:

- Implement an interim maintenance program, make policy decisions regarding operating conditions, determine funding sources, formulate a policy for taking over of facilities, check the availability of equipment insurance, and then prepare and let a service contract for interim maintenance services

### Required AMBRIC actions:

- Keep apprised of CWO's activities and act to prompt CWO to take the recommended actions. As directed by CWO prepare the necessary tender documents, and then monitor the activities

## *Effluent Disposal and Re-use*

**A**lthough Section 4.3 deals with the actions necessary to dispose of wastewater before treatment plants are commissioned, it is also necessary to ensure that treated wastewater can be satisfactorily dealt with after treatment plants are commissioned. Section 2.3.4 discusses the status of efforts to date.

The primary concern for all wastewater treatment plants, regardless of whether the wastewater will be re-used or not, is that there should be adequate capacity in the drains to accept the anticipated discharges. Since the drain system is the responsibility of the Ministry of Irrigation, it is of primary importance that action is taken to permit inter-Ministry transfer of funds for execution of the necessary works by the Ministry of Irrigation. In addition, the following actions are necessary with regard to effluent disposal:

### Required AMBRIC actions:

- Continue liaison with CWO and the Ministry of Irrigation, keeping both apprised of the project program and the consequent timing and amounts of discharge to the drains.

### Required CWO actions:

- Monitor progress on drain upgrading works by regular meetings with the Ministry of Irrigation.

Treated wastewater is a valuable resource and if opportunities exist for wastewater re-use to take place efficiently, economically and at low risk to public health, then these should be studied further. The volumes of treated wastewater that will eventually become available from wastewater treatment plants are huge and can assist with the government of Egypt's drive to make efficient use of water resources.

AMBRIC's position paper on the re-use of treated wastewater from the Gabal el Asfar WWTP concluded that there was a need for further studies to determine the optimum use for the effluents and the economic viability of irrigation re-use. ODA will shortly fund a pre-feasibility study into re-use of effluent from Gabal el Asfar WWTP.

### Required Consultant action:

- Undertake pre-feasibility study for ODA and submit recommendations for further action
- If the pre-feasibility study conclusions are favorable, prepare terms of reference for a detailed feasibility study

## *FAR Program*

**T**he need to extend the design duration of Amendment 42 was discussed in Section 2.3.5 and it was noted that an amendment to provide additional time and budget was being prepared. In addition it was noted that if additional funding became available to provide sewerage to additional unsewered areas, AMBRIC may be requested to increase the scope of work of Amendment 42. The actions required by the involved parties to implement these modifications include:

### Required CWO actions:

- Review and approve the request for extension of the design period
- Initiate discussions with USAID regarding the possible funding to provide sewerage to additional unsewered areas

### Required AMBRIC actions:

- Finalize amendment to provide for extension of design period
- When directed by CWO, draft documents related to extension of AMBRIC services for additional FARA packages; provide management and coordination of this effort among CWO, USAID and AMBRIC

## Operation Management Services

**T**he Management, Operations and Training Plans that are being developed through Work Order 4A should be implemented through appropriate follow-up action by CWO, GOSD and AMBRIC. The plans have recommended changes on the organizational structure for GOSD management and technical operations to improve the institutional efficiency of the agency. Specific operational needs have been identified and solutions recommended that will provide for improved operation and maintenance of the pump stations, treatment plants and the collection system. Future notices should be prepared, approved, funded and initiated to solve GOSD's management, training and operational needs. Specific actions required include the following:

### Required CWO actions:

- Review, approve new work orders that develop from Work Order 4A notices
- Approve nominated staff and budgets for AMBRIC and others to implement Work Order 4A programs
- Participate actively in the Executive Steering Committee in the guidance of AMBRIC O&M activities

### Required GOSD actions:

- Modify internal management systems and structures in accordance with the System Management Plan
- Implement recommended solutions contained in the GOSD Needs Assessment Report
- Pursue funding for required future notices
- Maintain training programs within GOSD through AMBRIC activities for technical O&M skill improvement

### Required AMBRIC actions:

- Develop an overall plan for the operation and maintenance of the existing system and the newly constructed facilities
- Prepare Notice No. 3 for collection system services
- Prepare a notice for a comprehensive safety program for GOSD
- Train GOSD staff in new management procedures
- Assist GOSD in procurement of needed equipment and spare parts

4.8

## Unsewered Areas

**U**SAID has indicated an active interest in initiating an implementation program. A problem exists in identifying the appropriate agency of the Egyptian government to operate and manage the recommended program. CWO and GOSD have indicated their continued interest in identifying a suitable sponsoring agency. Once identified, the scope of the initial program can be decided, the extent of public or private participation can be agreed upon, organizational development can commence and funding commitments can be secured. Promoting these goals will require effective and strenuous efforts.

The actions required for implementation of the recommended plan include:

- Select an agency to operate and maintain the program
- Enact enabling legislation
- Confirm funding
- Mobilize and organize the agency
- Develop implementation procedures
- Establish credit institutions
- Prepare designs and documents
- Tender and construct
- Coordinate and assist

It is recommended that assistance of a qualified consultant be arranged in guiding the program through the various phases of implementation.

4.9

## Gabal el Asfar WWTP

**T**he ability to fully commission all of the East Bank conveyances and pumping facilities is dependent upon construction of pumping and the by-pass channel facilities at Gabal el Asfar WWTP. These works are included in both Contracts 10A and 16.

Contract 16 tenders have been received and are being evaluated. Contract 10A tenders have been indefinitely postponed. Four of the Contract 16 tenders provide funding and it seems probable that Contract 16 will be awarded. Award of Contract 16 should be pursued as a matter of urgency. However, should delays to the award of Contract 16 develop, there are two alternatives. Firstly, tenders for Contract 10A may be called in or alternatively consideration may be given to the proposal by G.E.C. (submitted as part of their Contract 16 tender) for construction of the Priority Works as a variation order to Contract 9. Funding for either of these two alternatives could be from the UK loan.

Concerning the provision of engineering services during construction of Gabal el Asfar WWTP, there is provision of services for Contract 10A in funds already approved by ODA. These funds would be insuffi-

cient for services during construction for the considerably larger amount of work included in Contract 16. Therefore, new sources of funding must be found to permit AMBRIC to provide engineering services during the construction of Contract 16.

**Required CWO actions:**

- Take all necessary actions to permit the earliest possible award of Contract 16 to ensure completion of the priority works and the earliest possible commissioning of the East Bank scheme
- Approve the amendment covering Contract 16 tender evaluations
- Consider calling in Contract 10A tenders in the event that there are delays to the award of Contract 16
- Seek funding for construction supervision

**Required AMBRIC actions:**

- Complete evaluation of Contract 16 tenders as quickly as possible
- Assist CWO with any negotiations that may be necessary with Contract 16 tenderers
- Assist CWO as required to allow the earliest possible award of Contract 16 or issue of variation order to Contract 9

**Required ODA actions:**

- Approve amendment covering Contract 16 tender evaluation

4.10

## ***Branch Tunnels***

**F**ollowing receipt of tenders for priority branch tunnels and shafts, CWO has determined that only Boulac North and South tun-

nels should be considered further. Negotiations with tenderers are at an advanced stage and award of the work is expected soon.

Funding for the construction of the Boulac North and South branch tunnels is available from the UK bank loan but funding for engineering services during the construction of this work has yet to be arranged.

Funds are not yet available for construction of the other priority branch tunnels and the tunnel work included in Contracts 5, 13, 14 and 15.

**Required CWO actions:**

- Take all necessary action to award the Boulac North and South branch tunnels
- Request funding from ODA for engineering services during construction
- Review and approve AMBRIC proposals for services during construction
- Review AMBRIC proposals for construction of all remaining tunnel work

**Required AMBRIC actions:**

- Finalize outstanding matters with the two tenderers for Boulac North and South branch tunnels
- Submit final recommendations to CWO
- Assist CWO as required to award the work
- Develop staffing and financial proposals for services during construction for submittal to CWO and ODA
- Develop proposals for construction of all remaining tunnel work

**Required ODA actions:**

- Allocate funds for engineering services during construction of Boulac North and South branch tunnels
- Review and approve AMBRIC proposals for services during construction

4.11

## ***Program Management and Coordination***

**T**he entire program for the provision of wastewater services to Cairo demands a high degree of coordination and liaison among CWO, GOSD, other government agencies, the foreign funding agencies, contractors, AMBRIC, and many other organizations. The previous sub-sections on recommended actions have discussed major issues to be addressed by these groups and the institutional and policy actions that must be formulated and implemented.

The required actions for the key parties involved (CWO, GOSD, AMBRIC, and the funding agencies) have been presented in detail for ten major issues in Sections 4.1 through 4.10. A summary of required actions is presented in Exhibit 15.

The need for proper sequencing and scheduling of the required actions can be appreciated by reviewing Exhibit 15 in conjunction with Exhibits 16 and 17. These exhibits show the relationship of scheduling construction, non-construction requirements, decisions regarding sludge and effluent discharge, and master plan review and reappraisal. The constraints noted in these schedules must be accommodated by timely policy decisions in order to achieve an orderly commissioning of the major wastewater facilities now under construction.

In addition to the issues identified above, early action must be taken in handling issues such as:

- The future adequacy of chlorine supplies for wastewater disinfection
- The provision of adequate power supply to pumping and treatment facilities
- The provision of water supply
- The provision of adequate support services including transportation of staff, and staff facilities
- Commissioning the works
- Developing a strong operation and maintenance program to see that the facilities are properly operated

The master plan review and update would be a suitable mechanism for study and preparation of recommendations for these issues.

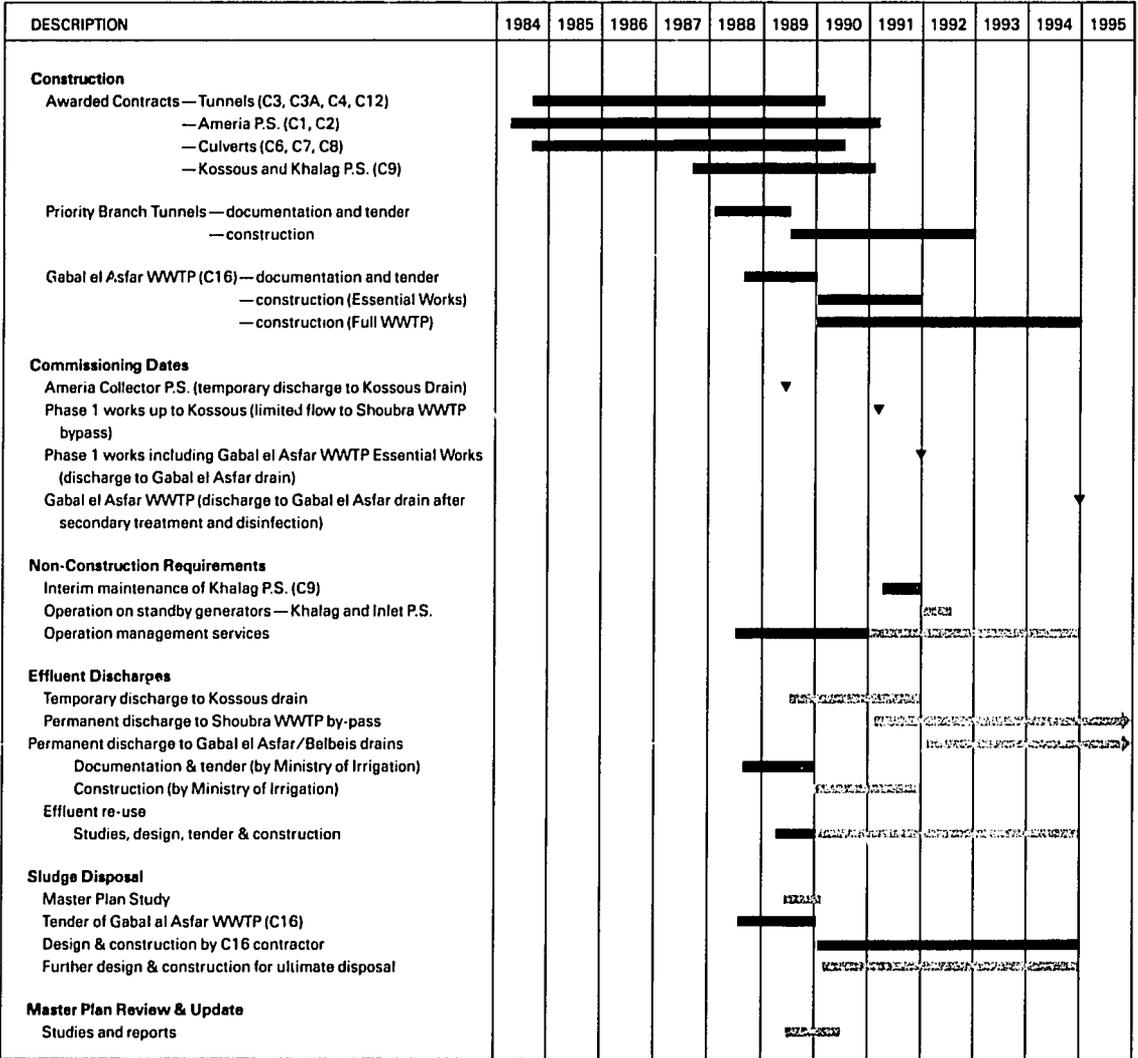


**EXHIBIT 15 — SUMMARY OF REQUIRED ACTIONS**

MAJOR ISSUES	REQUIRED ACTIONS					
	GOE/CWO POLICY DECISION OR ACTION	DRAFT AMENDMENT <sup>(a)</sup> BY AMBRIC	REVIEW & APPROVAL OF AMENDMENT BY CWO	MONITOR ON-GOING ACTIVITIES	AMBRIC/ CONSULTANT PREPARES STUDY/ DOCUMENT AS DIRECTED	DECISIONS FROM FUNDING AGENCIES
1. Need for master plan review and reappraisal (See 4.1)	•	•	•			•
2. Need for sludge disposal studies (See 4.2)	•	• A32	•			•
3. Provisions for interim discharge of wastewaters (See 4.3)	•			•	•	•
4. Provision of interim maintenance for completed facilities (See 4.4)	•				•	•
5. Study of effluent disposal and reuse (See 4.5)	•			•	•	•
6. Extension of sewerage thru FAR procedures (See 4.6)	•	• A42(R)	•			•
7. Continuation of operation, maintenance, and training services (See 4.7)	•	•	•			•
8. Provision of sanitation services in unsewered areas (See 4.8)	•			•	•	•
9. Implementation of Gabel el Asfar WWTP construction (See 4.9)	•	•	•		•	•
10. Implementation of branch tunnel construction (See 4.10)	•	•	•		•	•

(a) Includes amendments, work orders, and notices

**EXHIBIT 16 — PROGRAM OF ONGOING AND FUTURE WORK (EAST BANK)**



- [Solid bar] On-going work
- [Dashed bar] Instructions required
- [Dotted bar] To be initiated
- ▼ Commissioning dates

**EXHIBIT 17 — PROGRAM OF ONGOING AND FUTURE WORK (WEST BANK)**

DESCRIPTION	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	
<b>Construction</b>													
Awarded Contracts — Culverts (C21, C25)		[On-going work]											
— Pump Stations (C22, C23, C26)		[On-going work]											
— Zenein Rehabilitation (C31)				[On-going work]									
<b>Embaba Sewers &amp; Collectors (C20A)</b>													
— documentation and tender				[On-going work]									
— construction						[On-going work]							
<b>Giza Relief Collector (C23A)</b>													
— documentation and tender													
— construction						[On-going work]							
<b>Sewers and House Connections (C24 A-T, C27 A-N)</b>													
— documentation and tender					[On-going work]								
— construction							[On-going work]						
<b>Pyramids Collectors &amp; Cheops Pump Station (C27, C28)</b>													
— documentation and tender													
— construction							[On-going work]						
<b>Abu Rawash WWTP and Effluent Disposal (C29, C30)</b>													
— documentation and tender													
— construction							[On-going work]						
<b>Commissioning Dates</b>													
Boulac and South Maheir P.S., Zenein WWTP													
Zenein Preliminary Treatment Facilities													
Junction and Pyramids P.S.													
Embaba P.S.													
Zenein P.S.													
Cheops P.S.													
Abu Rawash P.S.													
Abu Rawash WWTP													
<b>Non-Construction Requirements</b>													
Maintenance Contracts for Pump Stations													
Operation Services of Zenein WWTP													
Operation Management Services													
Engineering Design — FARA													
<b>Effluent Discharges</b>													
Temporary discharges to Lebberri Drain													
— Study, design, tender & construction													
Permanent discharges to Abu Rawash WWTP													
— Study, design, tender & construction													
<b>Sludge Disposal</b>													
Master Plan Study													
Design and construction													
<b>Master Plan Review &amp; Update</b>													
Studies and reports													

- [On-going work]
- [Instructions required]
- [To be initiated]
- ▼ Commissioning dates