PD-AAX-624
55461

A.I.D. EVALUATION SUMMARY: PART I

A. REPORTING A.I.D. UNIT:

USAID/EGYPT
ES#: 88-2

B. WAS EVALUATION SCHEDULED CURRENT FY EVALUATION PLAN?
Yes__ Slipped x
Ad hoc__

C. EVALUATION TIMING:
Interim__ Final__
Ex Post__ Other x

D. ACTIVITY EVALUATED:

Cairo Sewerage I (263-0091)

E. ACTION DECISIONS APPROVED BY THE MISSION DIRECTOR:	OFFICER	COMPLETION DATE
1. Finalize agreement on Work Order 4-A which includes: a. Continue pump station and sewer cleaning operator training and maintenance programs, and b. Strengthen GOSD operations management.	M. Gould, DR/UAD	4/88
2. Collaborate with GOSD and Governorate of Cairo reduce sewer system abuse by public and private organizations, i.e. tanneries, hospitals, and bus depots causing chronic flooding.	S. Patton, DR/UAD M. Gould, DR/UAD H. Hasan, DR/UAD F. Zobrist, AD/DR	9/88
3. To facilitate solid waste removal and prevent abuse of the sewer system, the Cairo Governate will expand solid waste collection services currently proposed under the Special Account Financed Zabaleen Mechanization Project.	F. Zobrist, DR/UAD G. Huger, AD/IS	5/89

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

Technical Directorate	Program Development and Support Directorate	Deputy Director
S. Patton, DR/UAD	J. Laudato, PDS/P	G. Laudato, DD
M. Gould, DR/UAD	V. Molldrem, PDS/P	
H. Hasan, DR/UAD	J. Patterson, AD/PDS	
F. Zobrist, AD/DR		
G. Huger, AD/IS		

Approved: _____ 3/6/88
Marshall D. Brown, DIR

(CSIESUM)

H. ABSTRACT:

1. Background: During the 1970's, frequent system breakdowns caused serious, chronic sewerage flooding. In 1981, USAID and the Government of Egypt launched Cairo Sewerage I which provided $88 million for rehabilitation to upgrade the existing system and reduce flooding and ponding of sewage.

2. Purpose: To determine the impact of USAID rehabilitation investments, this study was to

- assess the extent to which the frequency and severity of sewage flooding has been reduced over the past five years in project areas,
- identify causes of continued flooding, and
- identify ways in which the quality of life of local residents has improved as a result of reduced flooding.

3. Findings and Conclusions:

a. The Flooding Situation in 1987. The survey found an 84 percent reduction in chronic flooding in the areas studied. These represent half of the neighborhoods where major USAID funded rehabilitation works were completed. During the initial 1981 survey, 67 chronically flooded areas were identified. Currently, only 11 exist, and another 12 areas have occasional, localized flooding. Cairo General Organization for Sanitary Drainage (C/GOSD) officials unanimously credit the reduction in flooding to the rehabilitation program. Similarly, utilities personnel report a 80-50 percent drop in complaints from neighborhood residents since completion of rehabilitation work. Field investigations showed that in none of these areas can continued flooding be attributed to pump station malfunction. A survey showed that flooding had been a serious problem for 84% of local residents and shop keepers located near chronically flooded areas.

b. Current Causes of Flooding. Increased population density, illegal housing, and potable water supply will continue to strain the existing sewer network and pumping stations until gravity mains are completed through work now being done by ODA and USAID. Other important causes include poor maintenance of house connections and upper floor downpipes and dumping of refuse and garbage in the sewers. Industries and institutions are the major culprits in several areas, abusing the sewerage system by using it to dispose of chemical and solid wastes.

c. Impact of Reduced Flooding on Neighborhood Quality of Life. Most respondents (76 percent) were aware of the project and cited problems which had been reduced or eliminated as a result of system repairs: The most frequently cited problems were foul odors, mosquitoes and flies, increase in diseases, and difficulty in walking or driving through the streets. Sewage had flooded the houses and shops of 52 percent of the respondents. Some residents had to move to the roof of their appartment buildings or relocate. Almost half the shop keepers interviewed had to close and suffered some losses from damaged inventory. As utilities personnel were unable to correct problems, residents had raised the level of the streets with rubble, used wooden planks as walkways, and built concrete barriers. Women had to keep their children inside and wash clothes soiled in the flooded streets. They noted that children frequently came down with eye infections, diarrhea, and rheumatism. Clearly, the program led to a major improvement in the living condition of people in these neighborhoods.

I. MISSION COMMENTS:

1. Continued Causes of Flooding. AMBRIC predesign reports determined that principal causes were that the system was inadequate to carry current volumes, collectors were overloaded, pipelines were leaking and broken, sediment and grit had reduced the capacity of collectors and pipes, and disposal of rubbish, waste oils and tannery wastes in the sewers blocked sewers. Under the project agreement, USAID supported the major rehabilitation projects in 16 neighborhoods and C/GOSD was to complete rehabilitation of the secondary system. Due to limited funding, C/GOSD did not complete this work. Thus small diameter, poorly installed, leaking pipelines are still a factor in continuing flooding.

2. Upgrading Maintenance and Operations. DR/UAD is planning an evaluation of Cairo Sewerage I Operation and Maintenance Interventions. This will complement Work Order 4-A and Amendment 34 to upgrade C/GOSD's management, operations and maintenance systems. This should prevent deterioration of rehabilitated pump stations and improve regular removal of grit from sewers.

3. Sewer System Abuse. This survey found that almost half the remaining chronically flooded areas are the result of solid waste disposal by public institutions and commercial establishments, i.e. a municipal bus garage, a hospital, bakeries, and tanneries. The tanneries are a particularly serious problem because the solids mixed with corrosive chemicals settle in the pipes affect the area's system. USAID will work with C/GOSD and the Governorate of Cairo to correct these long standing problems.

4. Solid Waste Collection Systems. Many neighborhoods, particularly low income areas, have no solid waste collection systems and consequently use the sewers. The Governor of Cairo has recently contracted with the Zeballeen to provide service to two high income areas. If the pilot project proves successful, this should be expanded to other areas.

5. This evaluation demonstrates that we can obtain information on impact and beneficiaries quickly, inexpensively, and accurately using Egyptian firms.

J. EVALUATION COSTS:

1. Evaluation Team Members; Name/Affiliation	Contract # OR TDY Days	Contract Cost OR TDY Cost	Source of Funds
Synda Elhamy Greiss, Environmental Quality International (EQI)	263-00FT-0-00-7255-00	LE14,620	FT800
Ali Hussein M. El Hakim, EQI			

2. Mission Staff Person Days NA 3. Grantee/Staff Person Days NA

K. ATTACHMENTS:

EGYPT: Evaluation of Cairo Sewerage I Rehabilitation, prepared by Environmental Quality International (EQI), December 1987.

(CSIESUM)

XD-AAX-624-A
55462

EVALUATION OF CAIRO SEWERAGE I REHABILITATION

Presented to

United States Agency for International Development

(USAID)

ENVIRONMENTAL QUALITY INTERNATIONAL
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February 1988

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I. INTRODUCTION

I. INTRODUCTION:

Cairo's rapidly growing urban population has severely taxed the city's ailing and outdated wastewater system. Frequent system breakdowns and bottlenecks have caused serious sewerage flooding. To rectify this situation, USAID and the Government of Egypt (GOE) launched Cairo Sewerage I in 1981. The project channelled $88 million into the construction and rehabilitation of pump stations, and the clearing of accumulated sediment and grit from the main collector sewers.

In October 1987, USAID requested Environmental Quality International (EQI) to verify impressionistic accounts of reduced flooding and quality of life improvements in rehabilitated areas. This report summarizes the findings and recommendations of EQI's field investigators.

II. OBJECTIVES

II. OBJECTIVES:

This study seaks to answer the following questions:

1. Is sewerage flooding currently less frequent and severe than it was in 1980/1981, in areas where sewer system improvements were undertaken by the project?

2. What evidence is there that any reduction in flooding in these areas is attributable to the project? For example, did elimination or reduction in flooding in specific localities coincide with completion of project-financed improvements to the sewer system?

3. To what extent has reduced flooding improved the quality of life for local residents? What do they see as the major benefits to less frequent and severe flooding? Are there any differences between men's and women's perceptions of these benefits?

4. Does flooding still occur in areas where project rehabilitation activities have been completed? If so, what is the frequency and severity of these incidents? What appear to be the major reasons for continued flooding?

III. RESEARCH DESIGN

i. Baseline Analysis and Sample Selection:

The EQI Team reviewed the seven AMBRIC Summary Pre-design Reports of 1980/81. AMBRIC had conducted an extensive investigation of 35 neighborhoods in Cairo to identify major deficiencies within the system and to make recommendations for its upgrading. Among the causes of flooding discovered:

1. A substantial portion of the existing sewerage system was inadequate to convey daily flows.

2. Surcharged collectors prevented the free discharge of wastewater from the secondary system.

3. Pipeline subsidience resulted in poor ground conditions and several incidents of flooding.

4. Sediment and grit had significantly reduced the carrying capacity of the collectors.

5. Abuse of the sewerage system by the disposal of rubbish, waste oils and lubricants, tannery wastes, and construction rubble is common and creates blockages.

EQI used this information as the baseline against which to measure improvements in the selected neighborhoods. The following criteria were used in sample selection:

- areas with severe flooding in 1980/81,
- areas with significant rehabilitation work, and upgrading of subsidiary pumping stations,
- areas with alleged improvement in the flooding situation and in the quality of life of the residents.

Using these criteria, and following the advice of the AMBRIC Consultants, EQI picked the following neighborhoods to survey:

1. El Mounira (Tahrir/Talaat Harb)
2. Abou Heriera/Sakiet Mekki
3. Nozha/Shorafa (El Sakakini)
4. Kalet El Kabsh (Baghala)
5. Geziret Badran
6. Al Awkaf City
7. Abou El Seoud
8. Zolfakar

ii. Data Collection Method:

EQI used the following methods to collect data:

a. Analysis of flooding records: AMBRIC Pre-design Summary Report on each of the eight sample areas were reviewed to locate flooding areas. Moreover, all reports available on the condition of pump stations prior to rehabilitation were obtained. This information was used as the baseline data against which improvements were assessed. Unfortunately, administrative records were not available. Utilities departments keep records for one year only. Records of previous years are stored in central offices.

b. Physical Observations: EQI toured sample areas to investigate the conditions of pump stations and the incidence of flooding. It also tried to ascertain improvements in the quality of life of the inhabitants.

c. Interviews:

   - Unstructured open-ended conversational interviews were conducted with former and current C/GOSD and CWO Officials. Officials were most reluctant to be interviewed.

   - Twenty six informal interviews were carried out with local informal and formal community leaders in each of the neighborhoods.

- Structured open-ended interviews were administered to a total of 324 residents on a purposive non-random sample basis. Criteria of sample selection included: ground floor occupancy, male and female participation, and individuals most susceptible to flooding problems. The sample included a cross-section of shop-owners, garage owners, street vendors and street cleaners.

- Twenty sewer cleaners and repairmen were interviewed to ascertain the frequency and severity of flooding. They were also asked to compare the current level of complaints to that preceding the rehabilitation program.

iii. Data-gathering Techniques:

These included field notes, group interviews and unstructured individual interviews.

iv. Data Analysis:

EQI analyzed the data qualitatively and quantatively and formulated answers to the key research questions posed in Section II.

IV. FINDINGS

PART 1: THE FLOODING SITUATION IN 1987

The field investigation of the eight flooding-prone neighborhoods shows a marked decrease in the frequency and severity of this problem. This conclusion is fully supported by the opinions of utilities personnel, local residents, community leaders, and C/GOSD officials.

Of the 67 chronic[1] flooding areas identified by the AMBRIC Report of 1980/81, only 11 remain which are chronic (See Table 1) and a further 12 areas still suffer from periodic or localized flooding. (Refer to the Appendix for location of flooding areas in 1981 and 1987).

TABLE 1

NO. OF FLOODED AREAS OBSERVED IN 8 DISTRICTS UNDERSTUDY IN SEPTEMBER- OCTOBER 1987

Name of Neighborhood	No. of Flooding Areas in 1981	No. of Flooding Areas in 1987	Comments
1. El Mounira (Tahrir/Talaat Harb)	10	6	2 chronic areas
2. Abou Heriera/Sakiet Mekki	14	5	2 chronic areas
3. Nozah/Sharafa (El Sakakini)	13	3	not chronic
4. Kalet El Kabsh (Baghala)	6	3	All 3 flooded are chronic
5. Geziret Badran	3	1	1 chronic not in original area.
6. Al Awkaf City	10	1	Not chronic
7. Abou EL Secud	10	3	1 chronic - Tanneries (industrial waste disposal in the system
8. Zolfakar	1	1	Not chronic
Total	67	23	11 chronic areas

Source: AMBRIC - Pre-design Reports, General Summary of Drainage Areas and Proposals 1981

[1] Chronic flooding refers to a situation where sewage overflows the system causing pondage over the ground, in an extended area which never dries up. This situation is recurrent.

Neighborhood Survey:

1. El Mounira/Tahrir and Ommal Cities:
   This neighborhood is located in the district of Embaba. It covers an area of approximately 165 hectares.[1] Its population was 71,600 in 1981 and is expected to reach 165,200 by the year 2000.

   El Mounira is a low-income, previously agricultural neighborhood. Ommal City was constructed by the government to house workers. The growing housing shortage has prompted the residents to illegally raise their buildings to three and four storeys.

   Gardens and empty spaces between housing units have also been built up. This new construction and over-population have placed excessive pressure on the existing sewerage capacity. This causes continuous flooding of the streets and houses below or at street level. The disposal of household rubbish into sewer manholes, poor maintenance of house connections and damaged down pipes cause flooding too.

   In 1981, 10 chronic flooding areas were reported. After the rehabilitation of the two pumping stations in 1984, only 6 flooding areas remain and only 4 of these are chronic. In Abou Ouf Street, the continuous dumping of earth and stones has turned the ground floor flats into basement flats about one meter below street level. Many people are said to have abandoned their shops and flats.

2. Abou Heriera/Sakkiet Mekki:
   This is an over-populated, low-income area in Giza. It covers an area of 146 hectares. Its population of 105,900 in 1981 estimated reach 218,200 in the year 2000.

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[1] 1 Hectare = 10,000 m^2
1 Acre = 4,200 m^2

In 1980, it had 14 flooded areas. After the rehabilitation of its pumping stations in January 1984, only 5 flooded areas remain. Two of these are chronic.

A municipal bus garage located at the end of the market street in Sakiet Mekki disposes of its mazots, waste oils and lubricants into the sewerage system. Three bakeries on the same street similarly abuse the sewers. The houses and shops along this long street are now below street level and continously flooded. The street has been raised by the dumping of earth and stones. Residents complained to no avail.

The second chronic area is located in Abou Heriera. The problem there is caused by solid waste discharge from the Om El Masreen Hospital. The situation is better in the other four areas identified. Several streets have been paved and others remain to be done.

3. Noza/Shorafa (El Sakakini):
This area is located in the Daher District over 44 hectares. The population in 1981 was estimated at 35,000 but expected to drop to 28,900 in the year 2000.

This projection has proved inaccurate. The 1987 population is actually larger than that of 1981. Multi-storey apartment houses have replaced villas, increasing the pressure on the sewerage network.

Nevertheless, since the rehabilitation of two pumping stations in November 1984, the number of flooded areas has decreased from 13 in 1980 to 3 currently. None of these are chronic. Community residents are happy with the improvements in wastewater disposal. Shop-owners, say that wastewater used to flood their shops and that they had to raise their door-steps to prevent the inflow of sewage. Many of the streets have been repaved in the last six months.

Presently, there is flooding in Abou Khoulda Street previously unidentified by AMBRIC. Residents and a shop-keeper say that the street has been flooding for over a decade. New construction is apparently to blame for system overload.

4. Kalet El Kabsh:
This area is located in the Sayeda Zeinab District of Cairo over an area of 51 hectares. The 1980 population of 87,000 was expected to fall to 53,600 by the year 2000. Again, that projection did not materialize and the 1987 population exceeds that of 1980.

Kalet El Kabsh is about 10 meters higher than Sayeda Zeinab. Wastewater flows downwards through a pipe into the Salama Street sewer. Illegal connections cause continuous flooding. The sewerage system in this neighborhood was meant to serve 200 houses sixty years ago. Today, over 500 buildings use the same facilities. Nevertheless, the number of flooded areas has decreased from 6 in 1981 to 3 in 1987. This improvement is attributed to the rehabilitation of the pumping station in July 1986.

5. Geziret Badran:
This area is located in the Rod El Farag District. It covers an area of 44 hectares and had a population of 69,900 in 1980. This is expected to increase to 72,400 in the year 2000.

After the rehabilitation of the pumping station in July 1986, the number of flooded areas decreased from 3 in 1980 to 1 in 1987. This chronic area was not originally identified as such by AMBRIC.

The area is relatively clean. The few remaining flooding incidents are caused by the leakage of potable water pipes in Kota Street.

6. El Awkaf City:

El Awkaf City is located in the Embaba and Dokki Districts. It covers an area of 150 hectares. The population of 53,400 in 1980 is expected to reach 103,700 by the year 2000.

El Awkaf City is a relatively new area. Its sewerage system is 25 years old. Flooded areas have decreased from 10 in 1980 to 1 in 1987. The pumping station was rehabilitated in February 1985.

Residents say that the problems of street flooding are almost over now. Flooding still occurs occasionally because of the abuse of the sewerage system and delays in routine cleaning of the manholes.

7. Abou El Seoud:

Abou El Seoud is located in Masr El Qadima District. It covers an area of 46 hectares and had a population of 41,200 in 1980. Its projected population in the year 2000 is 52,100.

Abou El Seoud is an old area housing the major Cairo tanneries. Its sewerage system is about 60 years old. The entire sewerage network including the pumping station was rehabilitated in October 1984. In 1980, 10 areas suffered from flooding. In 1987, we observed only 3 such areas.

The remaining problems are caused by the tanneries which dispose of their wastes in the sewers. These wastes lead to more frequent blockages and subsequent flooding.

8. Zolfakar:

Zolfakar is located in the Sahel District. It has an area of 59 hectares and had a population of 55,300 in 1980. The projection for the year 2000 is 137,800. Zolfakar has one pumping station which was rehabilitated in December 1984. The sewerage system is 60 years old.

There was one serious flooding area in 1981 which is still the main complaint today. The problem, however, is no longer chronic. Residents say that the occasional flooding that still occurs is manageable and caused by household abuse and lack of maintenance.

Assessment of Utilities Personnel:

In-depth interviews with officials of the Utility Departments in the eight neighborhoods reveal a consensus on the decrease in the incidence and severity of flooding since the rehabilitation project. This is reflected in a marked decline in the number of reported complaints by neighborhood residents.

Prior to rehabilitation, officials in Sakakini, for example, received 20-25 complaints daily. Currently, only 4-5 complaints are received. The number of complaints in Kalet El Kabsh has dropped from an average of 80-90 per day to 40-45 per day. Likewise in El Ommal cities complaints dropped from 90-95 to 30-35 daily.

Reduced flooding has alleviated the pressure on sewer cleaners. Sewer cleaners who were interviewed reported that prior to rehabilitation they could not respond to all the complaints received. Manual cleaning of the sewers was a very difficult task because water levels were too high. During emergency situations, more strenuous working hours were common. One sewer cleaner stated that his cleaning crew was sometimes called in the middle of the night to handle incidences of severe flooding. Apart from the remaining chronic flooding areas, they are now well able to handle routine breakdowns and blockages.

Assessment of C/GOSD Officials:

C/GOSD officials unanimously credit the tremendous improvement in the flooding situation in the eight neighborhoods to the rehabilitation program. Part 2 describes the impact of the rehabilitation project on the sewerage systems of the eight neighborhoods.

TABLE 2

DESCRIPTION OF NEIGHBORHOODS

Name of Area	No. of Pumping Stations	Approx. Area in Hectares	Average Age of Sewerage System	Pop in 1981	Pop. Projection in year 2000	No. of Flooding Areas in 1981	No. of Flooding Areas in 1987
1. El Mounira (Tahrir/ Taleat Harb)	2	165	20	71,600	165,200	10	6
2. Abou Heriera/ Sakiet Mekki	1	146	20/25	105,900	218,200	14	5
3. Nozha/Sharafa (El Sakakini)	1	44	60	35,500	28,900	13	3
4. Kalet El Kabsh (Baghala)	1	51	60	87,000	53,600	6	3
5. Geziret Badran	1	44	60	69,900	72,400	3	1
6. Al Awkaf City	1	150	25	53,400	103,700	10	1
7. Abou Seoud*	1	46	60	41,200	52,100	10	3
8. Zolfakar	1	59	60	55,300	137,800	1	1

PART 2: THE IMPACT OF REHABILITATION

By the 1970's, the aging and over-extended Cairo sewerage System could no longer satisfy the demands of a rapidly growing urban population. Back-up and overflow of sewage became endemic because of severe inadequencies in the sewerage system. To rectify this serious problem, USAID and the GOE initiated the $129 million Cairo Sewerage I Project. An agreement was reached between USAID and GOSD concerning the implementation of the rehabilitation projects. USAID investments were to be used in more complex projects requiring major capital works while GOSD and CWO would undertake small and moderately sized projects. GOSD, however, only partially completed the rehabilitation projects previously agreed upon. Delays occured because of shortage of funds as reported by GOSD officials.

The Anglo-American consortium AMBRIC supervised an $88 million project to rehabilitate and expand the capacity of the secondary sewerage system. The project succeeded in:

- o renovating 55 pumping stations and 39 ejector stations,
- o constructing 6 new pumping stations,
- o installing 20 kilometers of force mains and gravity sewers,
- o clearing sewers of accumulated sludge and grit,
- o providing sewer cleaning equipment and training crews in its use,
- o training C/GOSD technicians in the operation and maintenance of pump stations, sewage treatment plants and power sewer cleaning equipment.

EQI was asked to determine how much rehabilitation had contributed to reduced flooding in each of the eight sample neighborhoods.

Increased System Efficiency:

The rehabilitation project has improved the functioning of the system through:

a. Greater reliability of the pumps:
Prior to rehabilitation the overloaded, manually-operated pumping units were prone to breakdowns. There was a lack in both spare parts and regular maintenance. According to the operators and technicians interviewed, operation is now fully automated. Hence perfomance is regulated and efficient.

Water levels are controlled. Failures or breakdowns are easily detected because all flow measurement devices are in working order. Repairs are now carried out promptly. The automatic operation of the pumping stations has decreased sedimentation in the gravity mains. The mains are emptied more frequently, allowing greater wastewater flow and consequently less sedimentation.

b. Larger discharge volumes:
The volume of sewage pumped by the rehabilitated stations has increased considerably in all areas. The undersized pumps were replaced with units of greater capacity.

Table 3 compares the current daily discharge to the estimated discharge[1] prior to rehabilitation. In many instances, discharge volume increased two, three and, in Old Awkaf, almost fourfold. This, in turn, has increased the flow of wastewater and minimized flooding in most neighborhoods

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[1] Estimated pre-rehabilitation discharge figures obtained from AMBRIC report on "Condition of Pump Stations in 1981."

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TABLE 3

COMPARISON OF ACTUAL DAILY DISCHARGE OF PUMPING UNITS BEFORE AND AFTER REHABILITATION

PUMPING UNITS	DAILY DISCHARGE cu. meters per day		Percentage Increase / Decrease
	Before Rehabilitation " estimated "	After Rehabilitation	
Zolfaker	2880	7620	264
Geziret Badran	4032	8650	214
New Talaat Harb	5184	11050	213
Abou Hariera	6912	12065	175
New El - Tahrir	8064	14529	180
New Awkaf +	11520	50112	435
Old Awkaf	5760	20160	350
		operation has not started	
El - Baghala	5760	5760	0
Abou El Seoud	8524	14386	169
Shourafa *	2304	2277	-1.17
Nozha *	7200	10238.9	142

N.B.: + Notice big difference in New Awkaf Station as Old Awkaf is not operating till now and its discharge is transfered to New Awkaf P.S.

* Shourafa & Nozha Pumping Stations serve one Area.

c. Improved Training of Sewerage Personnel:

A total of six hundred C/GOSD personnel went through one of the five training programs as part of the rehabilitation program. C/GOSD officials assert that trained personnel enhance the efficiency of pumping operations considerably. A summary of these training programs is presented in Table 4.

TABLE 4

TRAINING PROGRAMS

TRAINING PROGRAM PRESENTED	GOSD PERSONNEL ATTENDING					TOTAL
	ENGINEERS	SUPERVISORS	MECHANICS	ELECTRICIANS	OPERATIONS	
TITLE : Pump Station O & M Training	8	14	181	43	24	270
TITLE : Electrical Short Course Training for Pump Control Panel Rewiring	8	5	0	7	0	20
TITLE : Ejector Station O & M Training	0	8	71	0	67	146
TITLE : Technical Training Course for Pump Station Electricians (trainee data as of 11/12/86, this training is still on-going)	16	16	0	25	0	57
TITLE : Technical Training Course for Submersible Pump Repair (trainee data as of 8/12/86, this training is still on-going)	16	18	51	1	4 (a) 1 (b)	88
TOTAL						581

a. Assistant mechanics
b. Laborer

PART III: IMPROVED QUALITY OF LIFE

The years preceding the rehabilitation of the sewerage systems brought extreme hardship to the population. The following section discusses in some detail the experiences and problems encountered by residents and community leaders interviewed in the eight sample neighborhoods. For the overwhelming majority, memories of problems associated with sewerage flooding were still very vivid. The majority of respondents (84%) confirmed that sewerage flooding was a chronic problem that persisted for several years prior to rehabilitation efforts. Moreover, it was not confined only to the streets but extended inside their homes or shops. That was the experience of 52% of the residents. Inevitably pondages of sewerage water filled the streets and hardly had time to dry up before sewerage overflow filled up the area once more. According to 35% of our sample, sewerage ponds during those years never dried up.

The residents cited a range of problems associated with sewerage flooding in their streets. Table 5 details their perceptions of the most severe problems experienced then. Foremost, among those mentioned were the emittance of foul odours, the spread of flies and mosquitoes, the contraction of diseases, the disruption of transportation and general mobility in their streets.

For the shopkeepers, it meant closing down their shops. In fact almost half of those interviewed said they were forced to close down their businesses. Several carpenters interviewed said that furniture manufactured for customers was damaged by wastewater that flooded their shops. One of them said his estimated financial losses were around LE 2000.

For the women, it was the inability of their children to play in the streets, and the diseases easily contracted in an unhealthy environment. Diseases frequently mentioned were eye infections, diarrheal fever and rheumatism. The women also complained that their chores at home increased. Their children came home from school with soiled clothes.

TABLE 5

PROBLEMS OF SEWERAGE FLOODING

Category	Foul Order		Spread of Flies & Mosquitoes		Difficulty of Transport & Walking		Spread of Diseases		Close Down Shops		Streets Unsafe For Children		Potable Water Cuts		Potable Water Pollution		Difficulty in Toilet Use		Time Wasted	
	No.	%	No.	%	No.	%	No	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Males	75	92	60	74	62	76	33	40	6	7	16	19	3	3	5	6	2	2	1	1
Females	113	92	105	86	91	74	51	41	3	2	33	27	2	0.8	1	0.8	3	2	4	3
Shopkeepers	107	88	97	80	94	77	57	47	57	47	11	9	4	3	2	1	-	-	1	0.8
Total	295	83	262	80	247	76	141	43	66	20	60	18	9	2	8	2	5	1	6	1

In general, less perceived problems were the possible pollution of potable water supply, water service interruption forcibly imposed to to reduce wastwater flow into sewers, or the actual time wasted in clearing the flooded homes. Our findings indicated that women, whose role is looking after the well being of their children, were more aware of the health hazards caused by sewerage flooding.

A few other problems were mentioned by the community leaders. Wastewater overflow was the cause of two fatal accidents. An elderly invalid woman drowned when the room where she lay was filled with sewerage. A 3 year old child reportedly fell into an exposed manhole and drowned.

Conflicts among neighbors were also cited. In attempting to clear sewerage from one apartment, it was only possible if it was swept and allowed to flow out in another direction. This was often toward the house next door ! Arguments and quarrels about where to dispose of wastewater ensued.

The severity of flooding necessitated taking certain measures to resolve at least those problems that directly affected the residents. A vast majority of the residents (95%) routinely reported incidence of flooding to the Utility Centers in their neighborhood. Sewer cleaners, when sent to resolve the problem, often demanded payments to do the job. On numerous occasions, it was only a matter of a few hours before the sewers started overflowing once more. Since flooding was a chronic problem, the residents knew that reporting to the authorities often proved useless. It also meant searching for other solutions.

The second more practical alternative was to fill the flooded areas with debris, earth and stone and to raise the levels of manholes in the streets. While this may have temporarily stopped flooding in the street, it often transferred the problem right into the home where ground-floor levels sank to as much as 150 cm. The researchers observed one street in the district of Mounira El Gedida where unfortunately flooding is still a chronic problem. Layer after layer of debris has raised the street level to unrecognizable limits. The houses visited along the street showed evidence of recent flooding.

Toilets were permanently blocked to prevent overflow inside the bathroom. In another house, the owner raised the toilet by 150 cm. One had to climb five steps to reach it. When asked why a big rock was placed on top of the lid covering the inspection chamber in his house, one resident said: "I am forced to put as much weight on the lid as possible. When flooding occurs, the lid bursts open and enormous quantities of wastewater drench my house."

To make walking in the flooded streets and into their homes possible, the residents placed stepping stones or wooden planks. Those living on streets which have pavements, raised these higher and surrounded the entrances to their houses or shops with concrete barriers.

In one of the neighborhoods where flooding was extensive, residents became desperate. None of the above-mentioned solutions even brought temporarily relief from flooding. The community leaders interviewed in Abou El Seoud where Cairo's tanneries are located revealed that the residents organized a demonstration to draw the attention of the authorities to the appalling conditions in their area. Pressuring the authorities to initiate rehabilitation of the sewerage system was the only practical solution in sight and it worked.

The community leaders stated that they also handled many complaints, channeling these to the responsible authorities. But according to them, the authorities could only pay them lip service. In El Sakakini, families living on the ground-floor had to be temporarily accommodated on the roof tops of their apartments buildings. It was impossible to remain in their homes during bouts of excessive sewerage flooding.

The residents, having suffered the problems of sewerage flooding, could easily recognize benefits gained from investment in rehabilitation. Two hundred and forty-seven of the total number of interviewees recognized the benefits gained from elimination or reduction of flooding in their neighborhoods. As mentioned earlier, incidence of flooding was reduced but not eliminated. Therefore, it follows that a substantial number of the residents mentioned the occurence of flooding in 1987. However, since frequency and severity

have also decreased, the majority admit the benefits of improved environmental conditions and the possibility of living a normal life.

The findings revealed that differences in the perceptions of benefits are determined by the assigned roles of the three categories of respondents in the sample (see Tables 6 and 7). The shopkeepers' main concern was doing business for even a modest profit. The benefits of reduced flooding were perceived in terms of the free flow of traffic and the pedestrians in their streets that enabled them to carry on with their economic activities. On the other hand, the mothers whose primary role is care of their families perceived benefits in terms of a healthier environment free from flies and mosquitoes. Their children could safely play in the streets without getting their clothes soiled and wet. Some statements made were:

> "We can live a normal life, the nightmares of sewerage flooding in our street can now be forgotten."
>
> "I had to lock up the children inside the house and they were miserable. Now they are free to play with their friends."
>
> "The foul odours made nauseated me; I lost my appetite and felt sick."
>
> "We all got sick, my son contracted a skin infection. He was forced to stand in wastewater when flooding was very severe."

The male residents perceived the benefits of reduced flooding in a generally cleaner environment that decreased health hazards and incidence of contagious diseases. Like the other two categories of respondents improved conditions enabled them to live normal lives.

Similar responses were expressed by the community leaders. In El Awkaf City, a member of the Local Popular Council stated that the resolution of sewerage flooding problems allowed them to turn their attention to the beautification of their community.

The overwhelming majority of residents (76%) were aware of the sewerage rehabilitation efforts in their communities. On this issue, the female respondents showed the least awareness as compared to the male residents and the shopkeepers (see Table 8).

Undoubtedly, the findings revealed that the residents had suffered serious problems because of sewerage flooding in their neighborhoods. The rehabilitation efforts certainly brought relief and improvement to the quality of their lives.

TABLE 6

RESPONDENTS PERCEPTIONS OF MOST IMPORTANT BENEFITS AFTER REHABILITATION

Category	Clean St. and Normal Life		Cleanliness From Flies and Mosquitoes		Diseases Reduced		Children Safety in Streets	
	No.	%	No.	%	No.	%	No.	%
Males	52	64	49	60	22	27	13	16
Females	68	55	71	58	26	21	29	23
Shopkeepers	79	70	70	57	42	43	23	19
Total	199	61	190	58	90	27	65	20

TABLE 7

BENEFITS OF REHABILITATION

Category	Yes		No		Total
	Number	Percentage		Percentage	
	65	80	16	19	81
Females	88	72	34	27	122
Shopkeepers	94	77	27	22	121
Total	247	76	77	23	324

TABLE 8

KNOWLEDGE OF SEWERAGE REHABILITATION PROJECT IN NEIGHBORHOOD

Category	Yes		No		Total
	Number	Percentage	Number	Percentage	
Males	75	92	6	7	81
Females	86	70	36	29	122
Shopkeepers	94	77	27	22	121
Total	247	76	77	23	324

PART 4: REMAINING PROBLEMS

The sewerage flooding problem in Cairo has by no means been completely eradicated. In the neighborhoods surveyed, several problem areas still persist. Saklet Mekki, Kalet El Kabsh, El Mounira and Abou Seoud still experience various degrees of flooding. In none of these areas can continuing flooding be attributed to pump station malfunction. Our field investigations and interviews with residents and officials reveal the following main reasons for remaining problems:

- Over population and the expansion of illegal housing strain existing pumping facilities. Officials complain that new unauthorized buildings plug into the existing sewerage network and overwhelm it. El Mounira El Gedida stations were replaced since rehabilitation.

- The expansion of the Cairo potable water supply also taxes existing sewerage capacity. The Embaba and Rod El Farag potable water station alone pump an additional one million m^3 of water into the system.

- Poor maintenance of house connections and down pipes from the upper storeys of housing.

- Abuse of sewerage: Residents, officials, and sewer cleaners alike blamed the illegal discharge of garbage and solid waste into the sewerage for some of the remaining problems. Examples of abuse include:

  a. the disposal of mazots, waste oils and lubricants by a bus station into the Saklet Mekki Sewerage.
  b. hospital solid waste blocking Abou Heriera Sewerage.
  c. tanneries wastes including lime and acid discharged into Abou El Seoud Sewerage.

TABLE 9

CAUSES OF SEWERAGE FLOODING IN NEIGHBORHOODS IN 1987
AS INDICATED BY RESPONDENTS STILL EXPERIENCING
INCIDENCE OF FLOODING

Category	Damaged Pipes	Sewer Abuse	Failure of Pump Stations	Total
Males	12	20	2	34
Females	16	38	3	57
Shopkeepers	19	35	2	56
Total	47	93	7	147

V. CONCLUSION AND RECOMMENDATIONS

CONCLUSION:

This study conclusively shows that sewerage flooding in the surveyed neighborhoods is much less frequent and severe than it was prior to the rehabilitation project. Fewer areas suffer chronic flooding, and recurrent problems are more manageable.

Residents, utilities personnel and government officials credit the rehabilitation of the pumping stations with this improvement. The amelioration of the flooding problem has, moreover, visibly improved the quality of life in the surveyed neighborhoods. Reduced health hazards, cleaner streets, and a safer environment for children are among the major improvements.

Flooding problems, however, still persist in some neighborhoods. They are often caused by abuse of the sewerage network, poor maintenance of house connections, damaged down pipes, etc.

More fundamentally, new housing to accommodate a rapidly growing population strains the existing sewerage network. The rehabilitation of pumps and regular cleaning of sewers is only a temporary palliative. In the long-term, only the expansion of the Greater Cairo Sewerage Network provides a viable solution.

RECOMMENDATIONS:

1. Complete work on Greater Cairo Sewerage Network.

2. Upgrade solid waste collection systems particularly in low-income neighborhoods. The governorate of Cairo could speed up its solid waste management program. A media campaign to educate the public can go hand in hand with this effort.

3. Regular maintenance of external housing down drains to decrease the uncontrolled flow of wastewater into the streets.

4. Tighter governmental control over the various public institutions and industrial establishments such as hospitals, public garages,

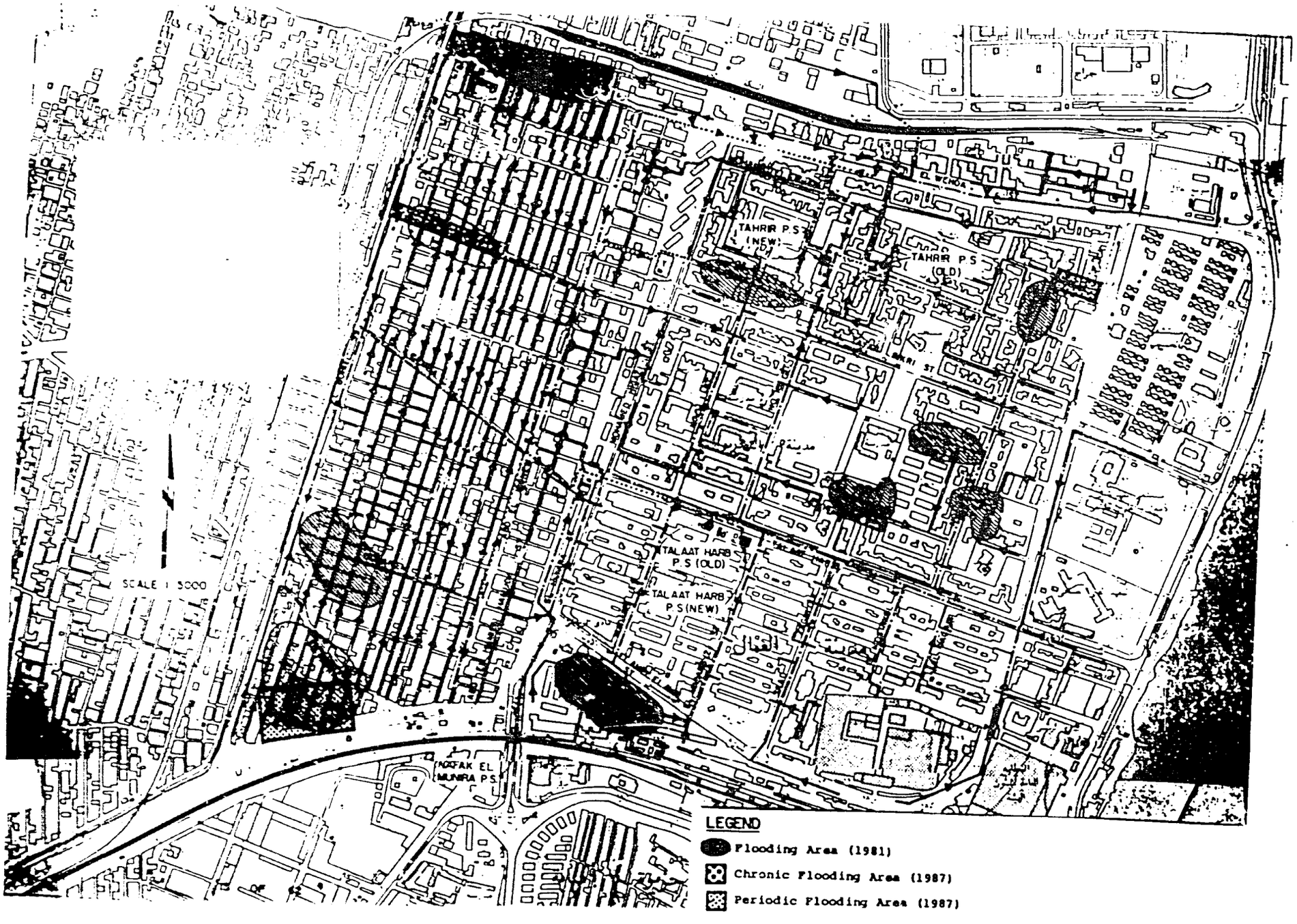
and tanneries which are discharging wastewater into the sewerage system with little or no pre-treatment.

5. Regular cleaning of street inspection chambers to guarantee the free-flow of sewerage water and prevent blockages.

6. Periodic and regular maintenance of pumping stations and other equipment to prevent unnecessary failures and breakdowns.

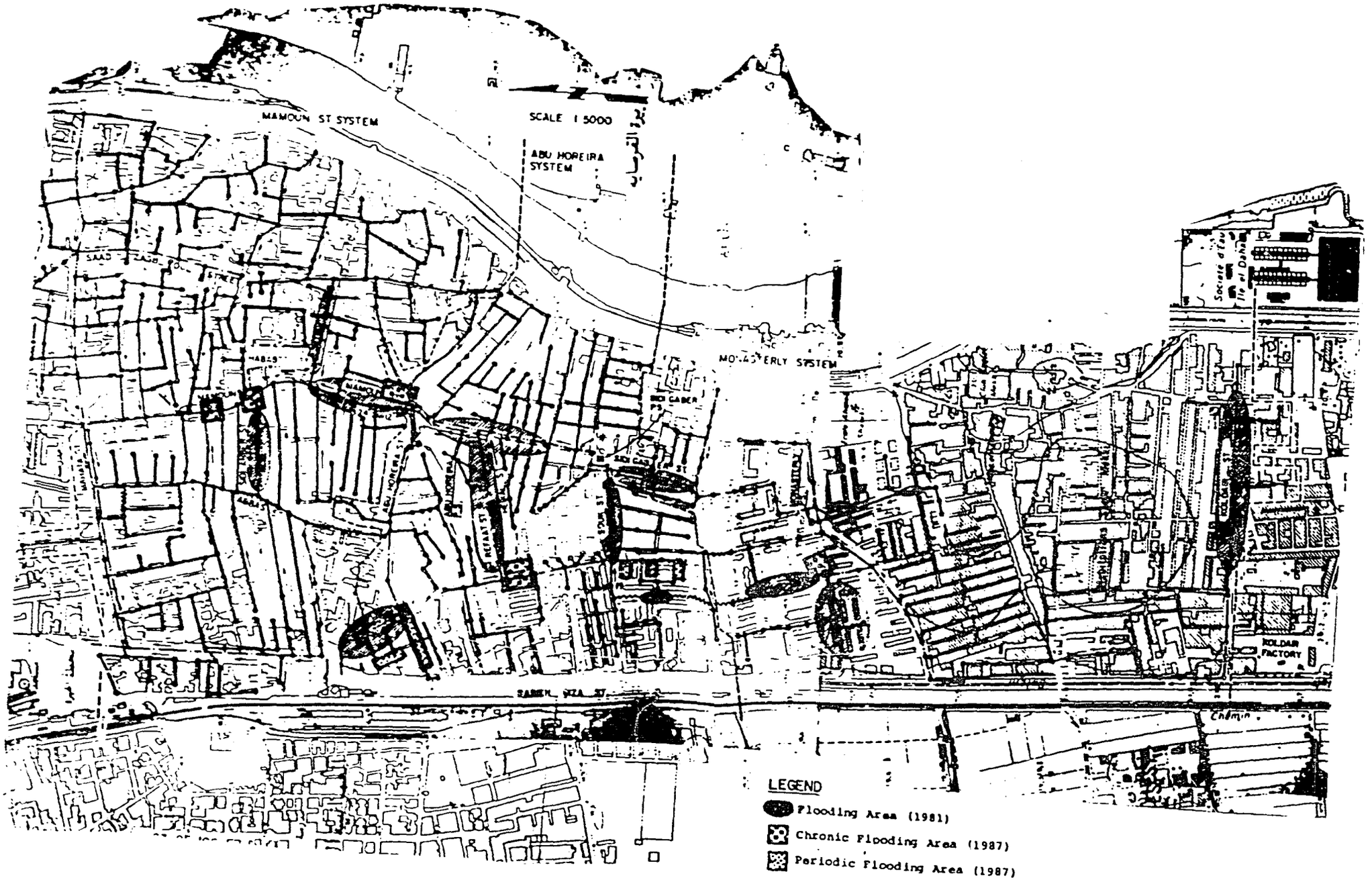
APPENDIX

MAPS OF EIGHT NEIGHBORHOODS IDENTIFYING THE FLOODING AREAS IN 1981 AND 1987



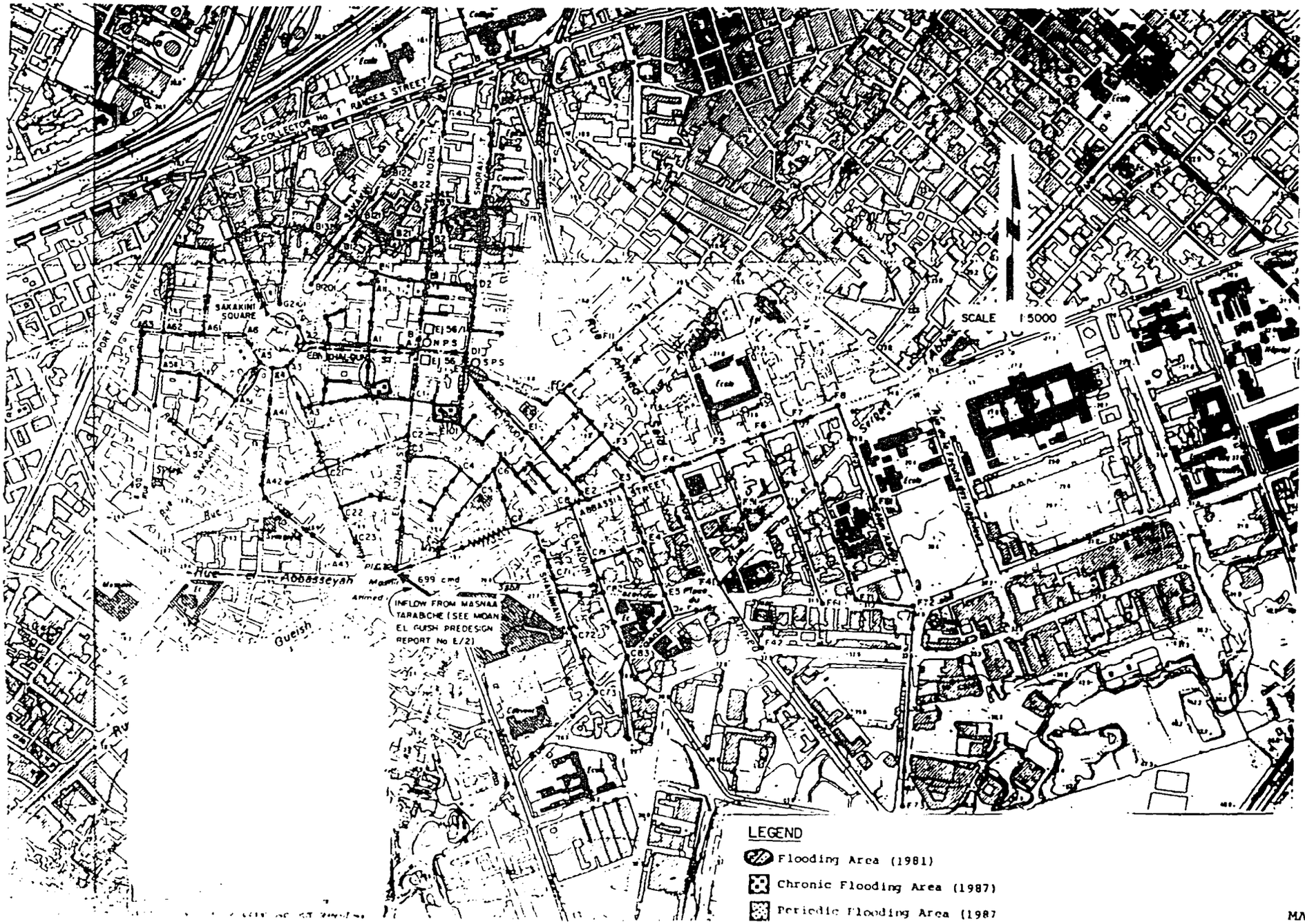
MAP 1

EL MOUNIRA EAST



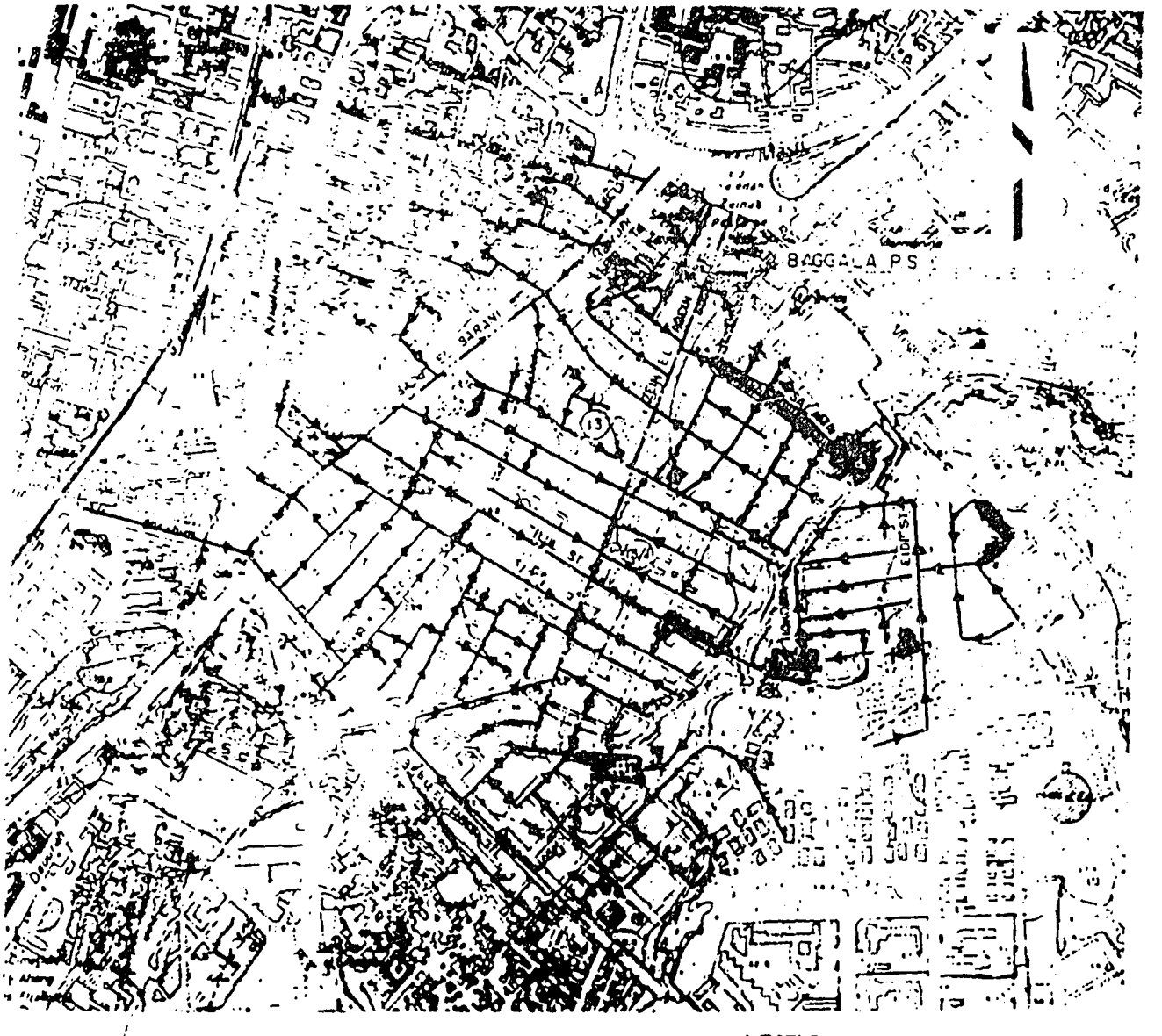
MAP 2

ABOU HOREIRA/SAKIET MEK



MAP 3

NOZHA/SHORAFA (EL SAKAKINI)

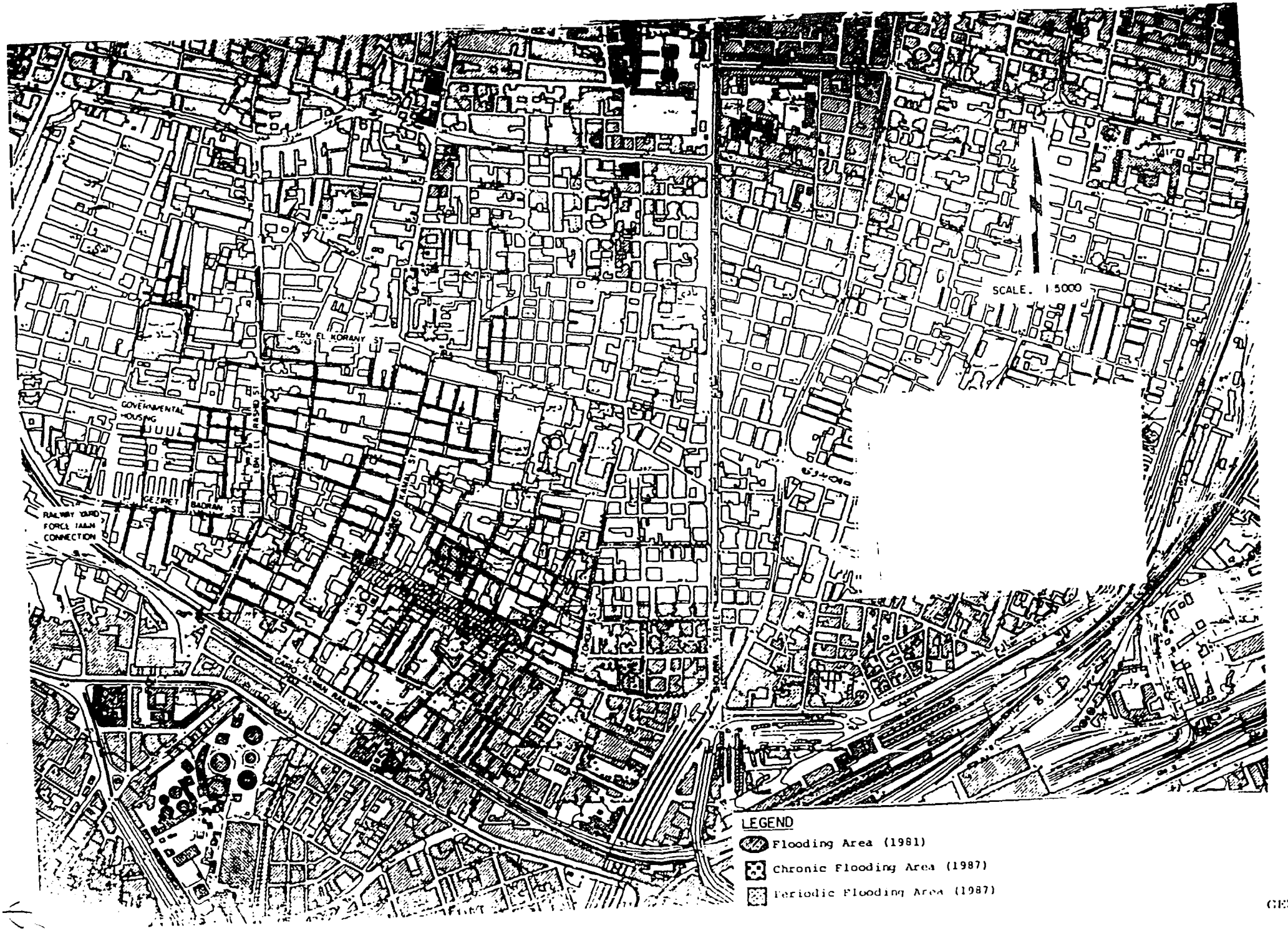


LEGEND

Flooding Area (1981)

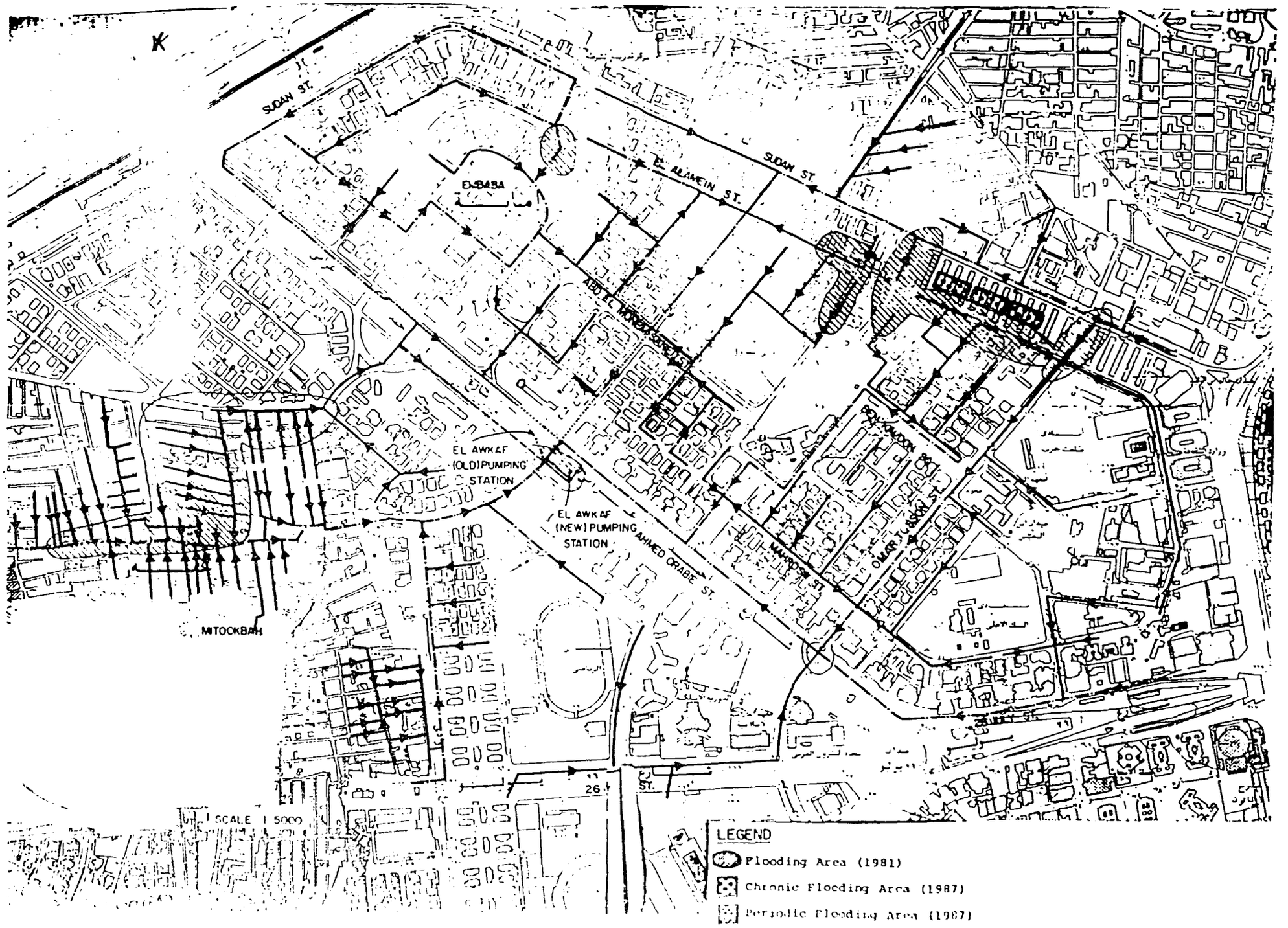
Chronic Flooding Area (1987)

Periodic Flooding Area (1987)


SCALE. 1:5000
EBN EL KORANY ST
GOVERNMENTAL HOUSING
GEZIRET
BADRAN ST
RAILWAY YARD FORCE MAIN CONNECTION
CAIRO ASWAN RAILWAY
LEGEND
Flooding Area (1981)
Chronic Flooding Area (1987)
Periodic Flooding Area (1987)

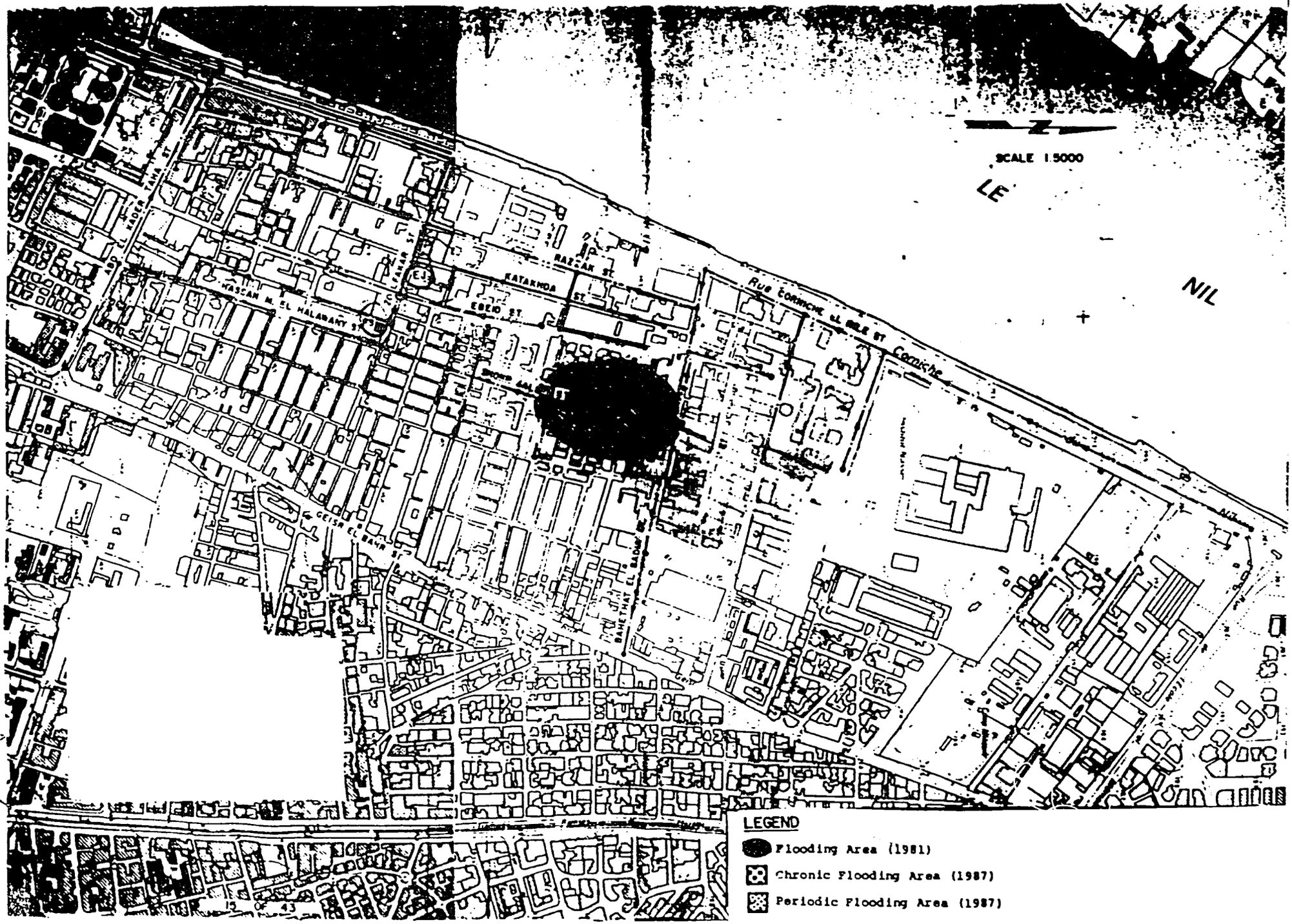
MAP

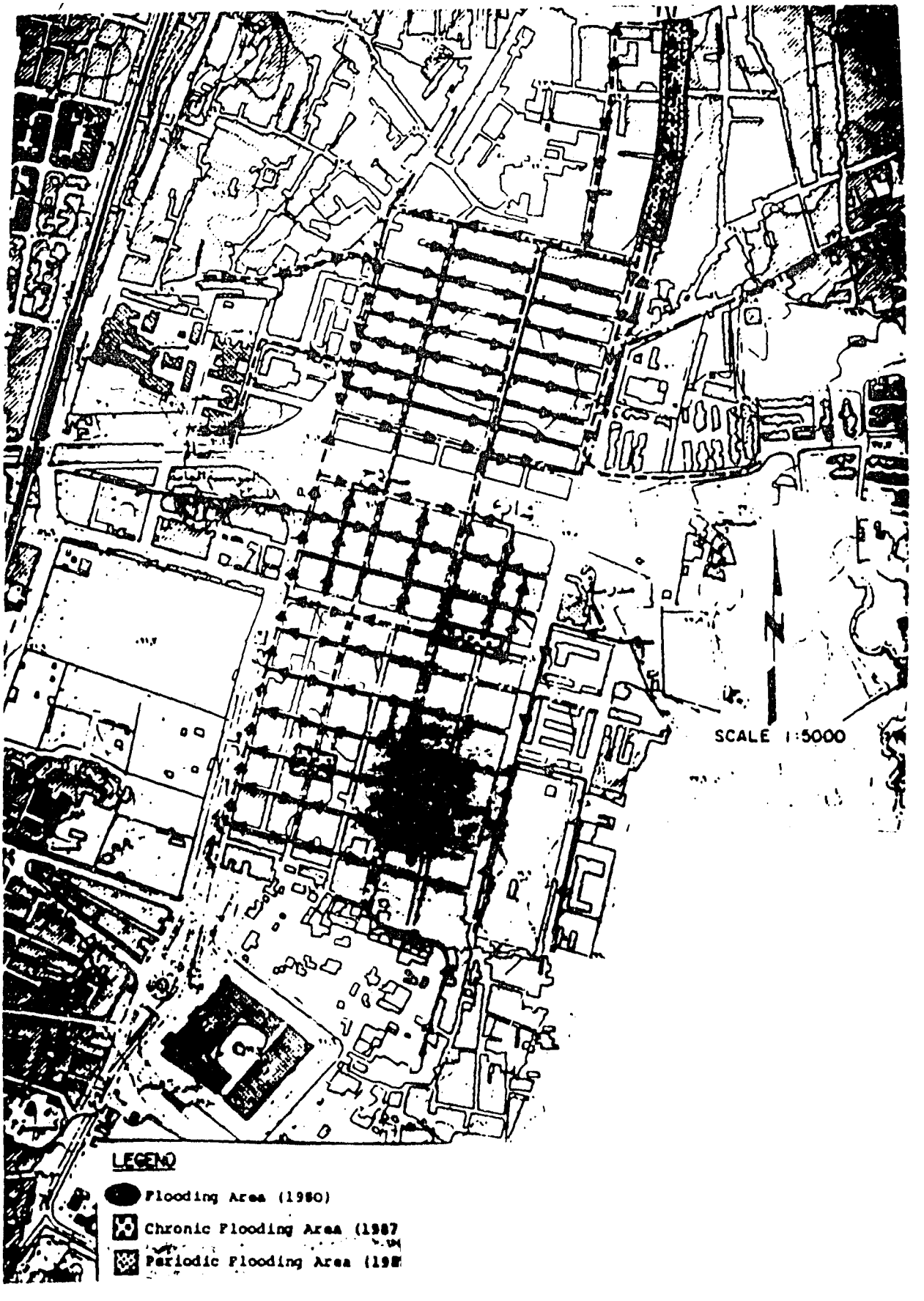
GEZIRET


SUDAN ST.
SUDAN ST.
EL ALAMEIN ST.
ELSABBA
ABD EL MONEM SOUDAN ST.
EL AWKAF (OLD) PUMPING STATION
EL AWKAF (NEW) PUMPING STATION
AHMED ORABIE ST.
MAHDI ST.
OMAR TAHER ST.
MITOOKBAH
26 ST.
SCALE 1:5000
LEGEND
Flooding Area (1981)
Chronic Flooding Area (1987)
Periodic Flooding Area (1987)

MAI

AL AWKA


SCALE 1:5000
LE
NIL
RAZKAK ST.
KATAKHDA
EBEID ST.
HASSAN M. EL HALABANY ST.
Rue Corniche
Corniche
GEISR EL BAHR ST.
BANETHAT EL BADR
LEGEND
Flooding Area (1981)
Chronic Flooding Area (1987)
Periodic Flooding Area (1987)


SCALE 1:5000
LEGEND
Flooding Area (1980)
Chronic Flooding Area (1987
Periodic Flooding Area (198