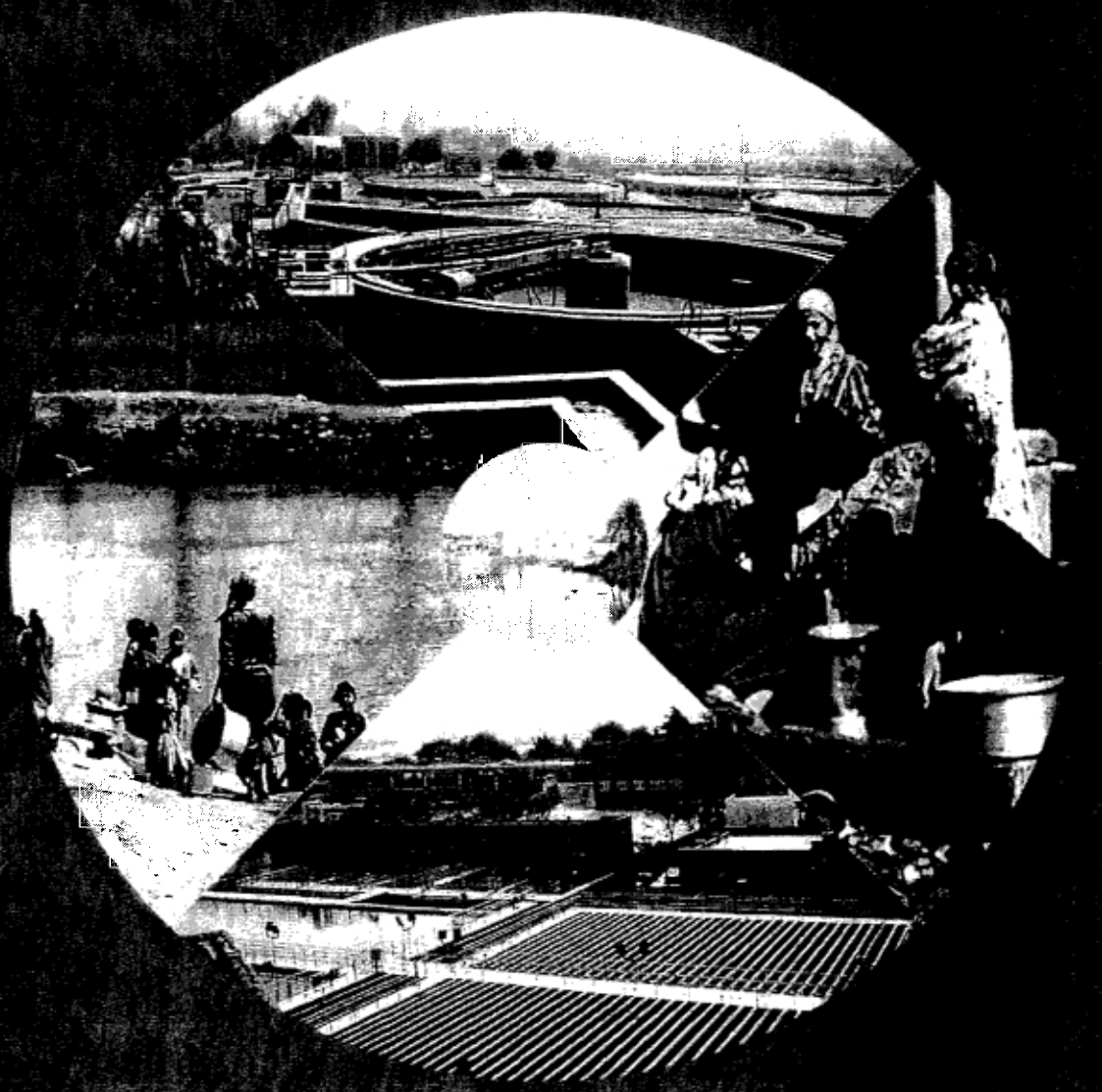
VOLUME I OF V

EXECUTIVE SUMMARY

USAID

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

MISSION TO CAIRO, EGYPT



BENI SUEF GOVERNORATE

STRATEGIC MASTER PLAN

MIDDLE EGYPT WATER AND WASTEWATER
MASTER PLANNING PROJECT
PROJECT NO. 263-0270
UNDER CONTRACT NO. 263-C-00-99-00008-00
WITH UNITED STATES AGENCY FOR INTERNATIONAL
DEVELOPMENT MISSION TO CAIRO, EGYPT

HARZA Environmental Services, Inc.
in association with:
Camp Dresser & McKee International Inc.
Environmental Quality International
ECG Engineering Consultants Group S.A.

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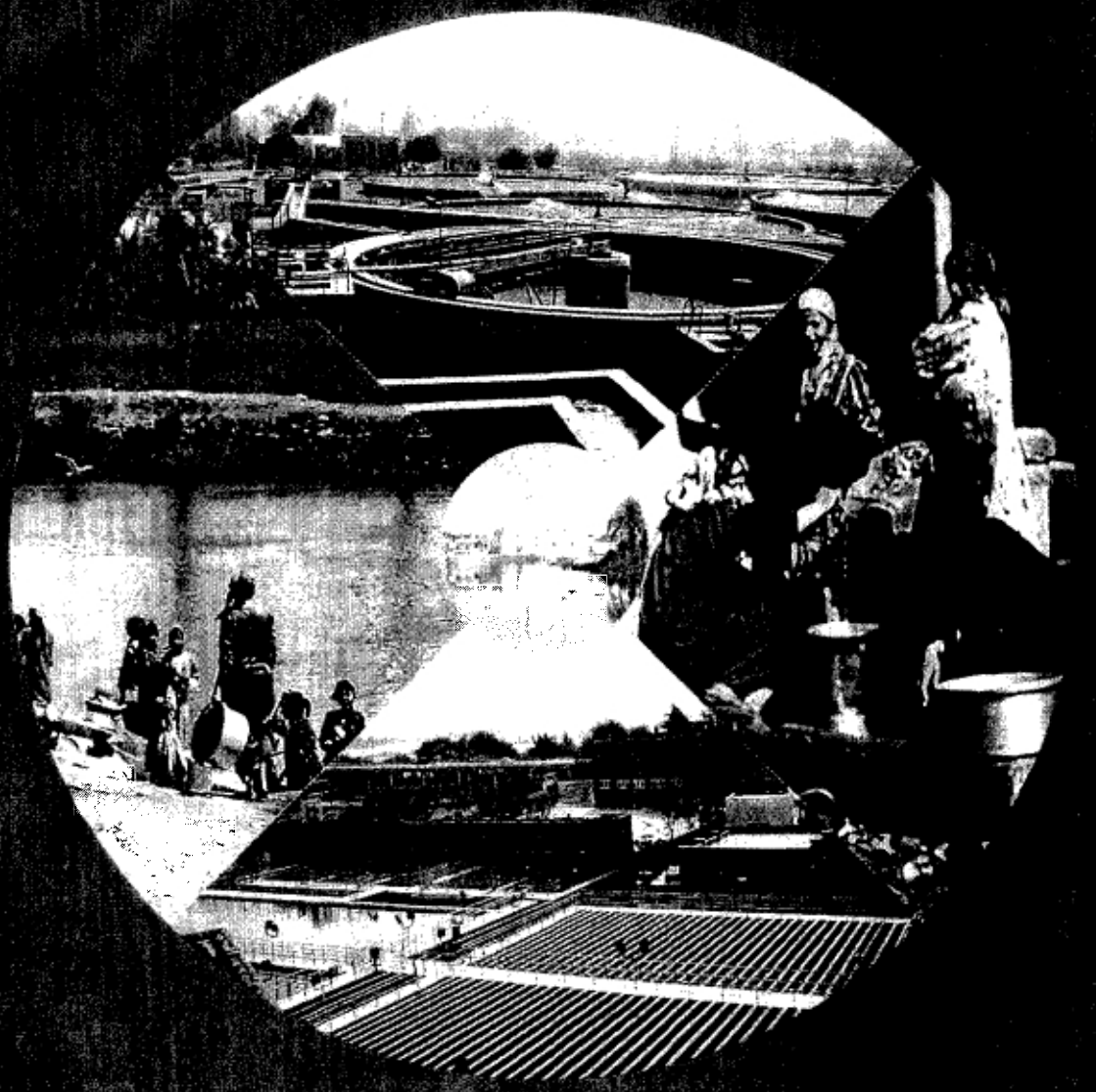

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ACRONYMS

BOD	Biochemical Oxygen Demand
DWF	Dry Weather Flow
EHP	Environmental Health Project (support organization for assistance to USAID)
EI	Environmental and Infrastructure (USAID Directorate, formerly DR)
FINNIDA	Finnish International Development Agency
FY	Fiscal Year
GOE	Governorate of Egypt
IDC	Institutional Development Contract
IEE	Initial Environmental Evaluation
LE	Egyptian Pound
MHUNC	Ministry of Housing, Utilities and New Communities
MOH	Ministry of Health
MWRI	Ministry of Water Resources and Irrigation
NGO	Non-Governmental Organization
NOPWASD	National Organization for Potable Water and Sanitary Drainage
O&M	Operation and Maintenance
PCD	Provincial Cities Development (Project)
PVO	Private Voluntary Organization
TSS	Total Dissolved Solids
UFW	Unaccounted-for-Water
UNICEF	United Nations "Children's Fund"
US	United States
USAID	United States Agency for International Development
VEC	Village Executive Council (Legally responsible for village affairs)

ACRONYMS (Continued)

WASH	Water and Sanitation for Health (Predecessor organization to EHP)
WHO	World Health Organization
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

DEFINITIONS

Canal	Canal or ditch bringing irrigation water from the Nile (*terah*)
Drain	Canal or ditch that drains irrigation water from the fields (*masraf*)
Ezbah	A settlement within a village
Km	Kilometer
lcd	Liters per capita per day
lps	Liters per second
Markaz	The principal political sub-division of a governorate
m^3	Cubic meters
m^3/day	Cubic meters per day

VOLUME I
EXECUTIVE SUMMARY
BENI SUEF GOVERNORATE

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Executive Summary
Beni Suef Governorate

INTRODUCTION

BACKGROUND

Over the past 15 years, the Middle Egypt Governorates (Fayoum, Beni Suef and Minia) have received major support from the United States Agency for International Development (USAID), other donors and the Government of Egypt for improvements to their water and wastewater systems.

USAID has had a long-term commitment to Middle Egypt involving numerous initiatives, including:

- Assessments;
- Training;
- Master planning;
- Capital investment programs (both in treatment and other facilities); and
- Institutional strengthening in support of Presidential Degree No. 281.

USAID desired to take these initiatives to the next level by incorporating the villages and the entire governorates into this program and to assist the recently formed Economic General Authorities for Water and Sanitation (ECAWS) in further developing their institution by providing:

- Additional planning and planning tools;
- Management tools; and
- Capital investment in water/wastewater as well as support facilities.

These new initiatives are intended to complement and build upon the other donor efforts and not duplicate their efforts.

As noted above, USAID launched in 1999 its next series of projects within Middle Egypt. The focus of this work was a two-part initiative:

- Governorate wide master planning:
  - Capital investment in known, higher priority projects;
  - Development of long-term strategic water/wastewater plan using "dynamic" planning tools;
  - Establishment of a first stage implementation plan; and
- Long-term institutional strengthening.

To perform the first initiative, USAID selected the Harza Environmental Services team. The Harza Team was comprised of:

- Harza Environmental Services, Inc. (Harza);
- Camp Dresser & McKee International, Inc. (CDM);
- Environmental Quality International (EQI); and
- Engineering Consultants Group (ECG).

This team provided the combined talent of two of America's leading international water/wastewater planning firms and two of Egypt's foremost consulting engineering firms.

SCOPE

The overall project scope consisted of two primary work activities:

- Immediate capital investment program (High Priority Projects); and
- Master planning (Long-Term Strategic Plan).

In many respects, these two work activities could be considered as two separate and independent projects with independent timelines. The immediate capital investment program was on a fast-track schedule using previously identified potential high priority projects as a starting point. The master planning project followed a more rigorous, structured approach, resulting in a long-term strategic water/wastewater plan as well as a first stage investment plan.

The purpose of the Capital Investment portion of the project was to quickly implement high priority water and wastewater projects in the governorate. Through the USAID Environmental Health Program (EHP), a survey was performed in the governorate. The results of the survey indicated the need for an immediate capital investment program, and the program's immediacy dictated its inclusion into the scope of work.

Because of the nature of the projects, USAID wanted the projects defined and pre-engineered within six months so that design and construction could proceed as quickly as possible. USAID allocated funding for the construction of high priority projects in the three governorates, and for the construction of the first stage investment program projects identified during water and wastewater master plan development.

The second and main activity of the overall project, and the focus of this report, was the master planning component. The purpose of this component was to develop new, coherent water and wastewater master plans based upon sound engineering, financial and environmental principals and concepts. These long-term strategic master plans were to address the water and wastewater needs of the governorate over the next 20 years (through 2022).

The main considerations in the preparation of the master plans included:

- Improve water resource, water facility, wastewater facility, and re-use planning, both in terms of plan content and the process by which it is performed;
- Provide for greater water conservation, efficiency of use, and re-use;
- Identify immediate public health improvements in service deficient areas;
- Develop effective capital programs for the immediate, short and long-term;
- Strategize short and long-term improvements using environmental, financial, service, and operation and maintenance cost considerations;
- Extend past planning activities to include villages, not just cities;
- Assess a wide range of service options, ranging from individual solutions to village/city solutions, to perhaps regional solutions. All service options to use appropriate technology;
- Develop solutions that are implementable, viable, cost efficient, and reflective of implementation constraints, such as land availability, socio-economics, economic resources and environmental considerations.
- Extract the higher priority components from the long-term plan and develop a First Stage Investment Program;
- Develop with, and build upon, the successes of other donor community efforts to eliminate duplication and maximize benefits; and

- Prepare the master plan using hydraulic models of the major water distribution and wastewater collection systems.

The development of the master plan followed a rigorous, proven approach, which includes the following scope:

- Define and assess current water and wastewater service, conditions and facilities;
- Define implementation constraints;
- Establish basic planning parameters, including service area, populations, water demands, and wastewater generation;
- Evaluate conditions in existing water and wastewater systems at all levels of service and identify immediate and future needs;
- Prepare basis of design;
- Identify, screen and evaluate service area options;
- Select the preferred plan;
- Identify options for private participation, ownership and/or operation;
- Extract the higher priority components to develop the first stage projects; and
- Prepare an implementation plan for the first stage projects.

REPORT LAYOUT

This report culminates the master planning activities for the Beni Suef Economic and General Authority for Water and Sanitation (BEGAWS). The report has been organized into multiple volumes to facilitate its presentation, including:

- Volume 1 – Executive Summary (this volume of the report);
- Volume 2 – Existing Conditions;
- Volume 3 – Strategic Master Plan, Water Supply Systems;
- Volume 4 – Strategic Master Plan, Wastewater Systems;
- Volume 5 – First Stage Investment Program;
- Map Annex Base Maps;
- Map Annex Strategic Master Plan, Water Supply Systems, and
- Map Annex Strategic Master Plan, Wastewater Systems.

In addition to these volumes, several separate reports were generated as outcomes of specific related work activities. These separate reports include:

- Middle Egypt Water and Wastewater Planning Project Inception Report,
- Middle Egypt Water and Wastewater Planning Project, Beni Suef Governorate High Priority Projects Report, (2 Volumes);
- Middle Egypt Water and Wastewater Planning Project, Beni Suef Governorate High Priority Projects Report, Administration/O&M Support Facilities;
- Middle Egypt In-Situ Wastewater Treatment Study;
- Lake Qarun Water Quality Management Feasibility Study; and
- Middle Egypt Water and Wastewater Planning Project, Beni Suef Governorate First Stage Investment Program Environmental Assessments.

EXISTING CONDITIONS

PHYSICAL CHARACTERISTICS

The Governorate of Beni Suef covers a land area of approximately 7,169 km^2 along both sides of the Nile River. The majority of this area is comprised of desert and other unproductive uses. The fertile lands comprise only about 15% of the total land area, with the majority of irrigated lands on the west side of the river. This area varies in width from approximately 13 to 26 km and runs 85 km from north to south along the river. Land use within the area is predominantly agricultural.

On both sides of the river, the topography generally slopes downward toward the river. In the irrigated areas, the top surface consists of a layer of silt that is underlain by a gravel bed. The gravel bed contains groundwater that is confined by a lower rock layer. The rock layer becomes exposed on either side of the river, delineating the boundaries of the valley.

The Governorate lies in the extreme arid belt of Egypt. In this area, the summers are very hot and winters cool. The mean daily temperature varies from 29 degrees C in the summer to 13 degrees C in the winter. Annual rainfall across the area totals a meager 8.5 mm and occurs primarily during the winter months.

To provide water for irrigation and surface drainage, the area contains an extensive series of irrigation and drainage canals. The main irrigation canals, running south to north, are the Bahr Yousseff on the west edge of the populated area and the Ibrahemiya along the eastern edge of the west bank of the Nile River. The drainage canals remove unutilized irrigation water from the fields, help keep the groundwater table from rising to too high of levels and are the receptor for most of the wastewater treatment plant and industrial effluents. The main drain in the Governorate is the Mohit Drain. The Ministry of Public Works and Water Resources (MPWWR) controls the entire irrigation and drainage canal system.

The Nile River and the two main irrigation canals and their main branches comprise the three surface water sources acceptable for potable water use. Currently, there is more than enough capacity within these sources to meet the potable water needs of the Governorate. In addition to available surface water supplies, there is a sufficient quantity of groundwater between the Bahr Youseff and Nile River. However, water quality of the groundwater is quite variable and further hydrogeological studies are warranted to support short-term needs and perhaps define a role in the long-term plan for some of the more isolated rural areas.

POLITICAL BOUNDARIES

The Governorate is administratively divided into seven marakez containing seven cities, 220 villages and 686 hamlets. The marakez include:

- El Wasta;
- Nasser;
- Beni Suef;
- Ihnasya;
- Biba;
- Sumusta; and
- Al Fashn.

Beni Suef City is the largest urban center within the Governorate and it serves as headquarters of BEGAWS.

SOCIO-ECONOMIC CONDITIONS

According to the 1996 census, the total population of the Governorate was approximately 1,860,000, which represents about 3.1% of Egypt's total population. The distribution by marakez is presented in Table ES-1. Approximately 75% of the population live in the rural areas and the remaining 25% in urban areas. The average household size was estimated to be 5.2 persons/household in 1996. Over the past 30 years, growth rates within the urban areas have been declining to about 1.9%/year in 1996. On the other hand, the rural growth rates have been increasing to about 2.75%/year in 1996.

TABLE ES-1
1996 POPULATION DISTRIBUTION
BENI SUEF GOVERNORATE

Marakaz	Population		
	Urban	Rural	Total
El Wasta	30,874	261,905	292,779
Nasser	70,534	154,455	224,989
Beni Suef	172,032	243,000	415,032
Ihnasya	31,486	194,923	226,409
Biba	49,409	220,241	269,650
Sumusta	30,715	129,542	160,257
Al Fashn	52,587	218,274	270,861
Total	**437,637**	**1,422,340**	**1,859,977**

While reliable data on Egyptian per capita income does not exist, related factors were reviewed to provide a reasonable indication of income levels. The gross domestic product per capita for Beni Suef Governorate is among the lowest in Egypt. Overall, 86% of households within the Governorate has reported earnings below the poverty line. Based on a survey conducted under the master planning activities, over 70% of the respondents reported a total monthly household income of less than LE 300.

From the 1996 census data, it was reported that 91% of the average annual household expenditures went towards essential items (such as food, clothing, housing, transportation, etc.) and only 9% went towards non-essential items (such as entertainment, tobacco products, etc.). Furthermore, rural households and higher income urban ones are paying significantly less than the 2% expected annual expenditure for water/wastewater services. Lower income urban households are paying close to or greater than the expected 2% per year. From the master planning survey, about 30% of the respondents connected to the main potable water network reported paying less than LE 10 monthly, while most of the rest paying under LE 30. Users of available wastewater services, which are only about 8% of the buildings in the Governorate, pay similar charges as for potable water. The survey also showed that a little over 70% of the respondents indicated a willingness to pay more for improved water and wastewater services. It was not clear however how much additional they would be willing to pay for these services.

Finally, relative to health, the Governorate has reported lower rates of most water-related diseases than Egypt as a whole. Recent incident rates for the three diseases that are most likely to be related to drinking water quality and sanitation are summarized in Table ES-2. From this data, only polio and urinary schistosomiasis are reported to be higher than elsewhere in Egypt.

TABLE ES-2
1998 DISEASE INCIDENCE RATE
BENI SUEF GOVERNORATE

Markaz	1998 Incidence Rate Per 100,000 People		
	Typhoid	Viral Hepatitis	Gastroenteritis
El Wasta	6.1	12.0	8.2
Nasser	**16.4**	19.5	3.6
Beni Suef	10.1	19.8	24.1
Ihnasya	11.9	**20.8**	9.7
Biba	11.9	**21.6**	4.5
Sumusta	9.4	3.7	4.4
Al Fashn	0.7	10.3	7.0
Average Rate-Governorate	9.3	16.1	10.3
Average Rate-Egypt	16.3	20.7	Not Available

Note: Bold denotes where Governorate average exceeds national average.

WATER SYSTEMS

Urban Water Systems

Beni Suef's existing water system can generally be characterized as a series of local community systems with some interconnections that are beginning to form a semi-regional system between some of the marakez. The source of water supply comes from a mixture of surface and groundwater sources. The majority of water, approximately 76% of the total, comes from one of the three primary surface supplies previously described. Groundwater sources account for the remaining 24% of the total production.

The current extent and level of water service provided throughout the Governorate's urban water systems are summarized in Table ES-3. In addition to these major urban water systems, there are an extensive number of small water systems serving rural villages. The source of these water supplies is predominantly the branch irrigation canals or groundwater. These systems are normally only operated a portion of the day (6-16 hours) and about a third of the customers have piped water connections. Very few of the groundwater supplies (approximately 15%) that have been tested are in full compliance with current Government of Egypt standards.

As noted above, the Governorate currently has 11 main operating water treatment plants, 48 compact water treatment units and 200 production wells. NOPWASD has also proposed construction of two additional plants in the Governorate. In addition to the public water supplies, private wells are also used in some of the rural villages. Information on these main water treatment plants and their current condition are summarized in Table ES-4. As can be seen from Table ES-4, seven of the plants (64%) are in poor condition and require major rehabilitation or replacement.

The remaining aspects of the urban water systems consist of finished water storage and water transmission/distribution networks. Available finished water storage facilities, consisting of a combination of ground and elevated tanks, are summarized in Table ES-5. In general, the available storage volumes are not adequate to meet current system needs. A summary audit of the existing urban water transmission/distribution systems is given in Table ES-6. The extent and noted problems, as determined by hydraulic modeling of the pipe networks, is summarized in Table ES-7.

TABLE ES-3
CURRENT EXTENT AND LEVEL OF URBAN WATER SERVICE
BENI SUEF GOVERNORATE

Description	Markaz						
	El Wasta	Nasser	Beni Suef	Ihnasya	Biba	Sumusta	Al Fashn
Area Within City (hectares)	129	229	713	200	167	134	254
Current Area Served (hectares)	61	124	670	120	100	83	135
Current City Population Served	30,320	40,702	177,035	19,280	38,702	18,381	44,057
Adjacent Villages/Ezbets Served	3	11	6	5	21	8	16
Current Village Population	31,039	6,951	33,518	5,525	44,719	4,651	106,492
Water Connections:							
Residential	8,744	7,518	34,118	4,000	6,264	3,606	7,923
Commercial	150	189	1,944	150	345	191	596
Industrial	0	21	5	0	51	0	15
Institutional	97	61	813	102	105	106	143
Total	8,991	7,789	36,880	4,252	6,765	3,903	8,677
Number of Public Taps	6	10	5	23	9	0	6
Availability of Water:							
Hours/Day	24	24	24	24	24	24	24
Accessible to Population (%)	97.3	96.5	99.8	99.2	93.8	64.5	92.4
Average Day Consumption (m^3/d):							
City	4,049	7,086	35,929	3,933	3,973	2,536	6,087
Villages	3,104	282	4,852	650	8,966	168	7,436
Total	7,152	7,369	40,781	4,583	12,939	2,705	13,523
City Per Capita Consumption (LCD)	123	94	195	117	75	77	108
City Peak Consumption (m^3/d):							
Maximum Month	4,656	8,149	41,318	4,523	4,967	2,917	7,000
Maximum Day	6,073	10,630	53,893	5,899	5,960	3,804	9,131
Peak Hour	9,109	15,944	80,840	8,849	8,940	5,707	13,696
Amount Water Billed (%)	43	34	54	34	47	42	41
Metering Survey Results:							
Operating Accurately (%)	28	16	39	24	14	27	21
Operating Inaccurately (%)	48	49	30	54	68	70	63
Broken Meters (%)	24	35	31	22	18	3	16
Average Meter Inaccuracy (%)	-0.3	3.7	-8.0	-1.4	-5.0	-5.0	2.0
Unaccounted-For-Water (%)	57	66	46	66	46	58	59

TABLE ES-4
EXISTING/PROPOSED MAJOR WATER TREATMENT PLANTS
BENI SUEF GOVERNORATE

Location	Plant Name	Raw Water Source	Capacity (l/s)	Average Day Production (l/s)	Finished Water Quality [1]	General Condition
El Wasta	El Wasta WTP	Nile River	35	30	NA [2]	Very old and at end of its useful life, does not contain all desired process equipment.
Nasser	Nasser WTP	Ibrahemiya	30	22	NA	Poor condition and nearing end of its useful life.
	Ishmant WTP	Nile River	600-1,200	-	NA	Proposed NOPWASD Plant.
Beni Suef	Old British WTP	Nile River	210	148	NA	Very poor condition, questionable if can be rehabilitated.
	Czech WTP	Nile River	200	189	In Compliance	Poor condition, except for some of the concrete structures.
	U.S. WTP	Nile River	300	253	In Compliance	Very good condition, some minor equipment problems.
	Tal Al-Narouz WTP	Nile River	20	9	NA	NA
	NOPWASD WTP	Nile River	500-1,000	-	NA	Proposed NOPWASD Plant.
Ihnasya	Masret Nassum WTP	Bahr Youseff	200	200	NA	Quite new and in very good condition.
Biba	Old WTP	Ibrahemiya	60	87	NA	Very old and at end of its useful life, does not contain all desired process equipment.
	New WTP	Nile River	200	100	NA	Fairly new and in very good condition.
Al Fashn	Old WTP	Ibrahemyia	60	28	NA	Very old and nearing the end of its useful life.
	New WTP	Nile River	200	141	In Compliance	Quite new and in very good condition.

(1) In compliance with Government of Egypt standards
(2) NA – Not Available.

TABLE ES-5
EXISTING FINISHED WATER STORAGE FACILITY SUMMARY
BENI SUEF GOVERNORATE

City	Location	Type	Capacity (m^3)	Head (mt)
El Wasta	City WTP	Ground	200	-
	City WTP	Elevated	150	36
Nasser	City WTP	Ground	400	-
	Each CU Site	Ground	200	-
	System	Elevated	150	34
Beni Suef	British WTP	Ground	2,800	-
	Czech WTP	Ground	4,000	-
	US WTP	Ground	8,000	-
	System	Elevated	3@4,000	51
Ihnasya	City WTP	Ground	4,700	-
	Each CU Site	Ground	200	-
	System	Elevated	300	21
Biba	Old WTP	Ground	2,260	-
	New WTP	Ground	4,700	-
	2@ CU Sites	Ground	400 (Total)	-
	Old WTP	Elevated	500	39
Sumusta	3@ CU Sites	Ground	3@200	-
	Northern System	Elevated	400	40
	Southern System	Elevated	200	36
Al Fashn	Old WTP	Ground	250	-
	New WTP	Ground	4,700	-
	CU Site	Ground	200	-
	WTP Compound	Elevated	185	38

TABLE ES-6
EXISTING URBAN WATER TRANSMISSION/DISTRIBUTION SYSTEM SUMMARY
BENI SUEF GOVERNORATE

City	Piping Network		Noted Problems
	Diameter (mm)	Length (m)	
El Wasta	100	23,890	With the exception of the areas around Ezbet Seleem and Ezbet Dwedar, the system is generally adequate to meet current average day to maximum day water demands. However, the system is incapable of meeting peak hour demands for all areas.
	150	6,920	
	200	1,970	
	300	2,180	
	Total	**34,960**	
Nasser	100	25,730	System is adequate to meet current average and maximum day demands, except for area south of Bosh Canal and northwestern section of city. System cannot maintain adequate pressure under peak hour demands.
	150	6,100	
	200	3,560	
	250	1,820	
	Total	**37,210**	
Beni Suef	100	32,300	Overall, the Beni Suef distribution system is adequate to convey water to its customers to meet maximum day water demands at pressures above the recommended minimum standard in all areas of the City. However, the system is inadequate to meet the peak hour demand.
	150	32,300	
	300	28,280	
	500	56,570	
	Total	**149,450**	

TABLE ES-6 (Continued)
EXISTING URBAN WATER TRANSMISSION/DISTRIBUTION SYSTEM SUMMARY
BENI SUEF GOVERNORATE

City	Piping Network		Noted Problems
	Diameter (mm)	Length (m)	
Ihnasya	100	10,360	Overall system is not adequate to even maintain acceptable system pressures under average day demand conditions.
	125	2,150	
	150	10,460	
	200	1,470	
	225	1,900	
	250	1,660	
	300	1,290	
	400	5,400	
	600	2,750	
	660	190	
	Total	**37,730**	
Biba	100	25,822	System is generally adequate to maintain adequate pressures under the various demand conditions. Except is the northwestern region of the city, where low pressures under peak hour demand conditions occur.
	150	3,648	
	200	2,907	
	250	508	
	300	1,277	
	Total	**34,162**	
Sumusta	100	39,820	System appears adequate to maintain acceptable pressure under the various demand conditions. Pressures tend to be lower in southwestern region of city.
	150	4,170	
	200	3,110	
	250	8,890	
	Total	**55,990**	
Al Fashn	100	27,170	System is adequate to maintain adequate pressure under average and maximum day demands. Low pressures occur under peak hour demand conditions.
	150	3,190	
	200	570	
	250	21,770	
	300	2,180	
	810	1,360	
	Total	**56,240**	

TABLE ES-7
EXISTING CONDITIONS HYDRAULIC MODELING SUMMARY
BENI SUEF GOVERNORATE

System	Description	Average Day	Maximum Day	Peak Hour
Beni Suef	System Demand (L/S)	590	885	1328
	Operating Capacity of Pumps Online (L/S)	703	942	1331
	Water Supplied From Water Sources (L/S)	590	885	1192
	Water Supplied by Elevated Tanks (L/S)	Tanks Closed	Simulations	136
	Pressure Range (m)	44 – 55	31 – 53	9 - 54
El Wasta	System Demand (L/S)	104	156	233
	Operating Capacity of Pumps online (L/S)	145	200	200
	Water Supplied From Water Sources (L/S)	104	156	233
	Water Supplied by Elevated Tanks (L/S)	Assume Tank	Closed	
	Pressure Range (m)	35 – 48	22 - 47	0 - 39

TABLE ES-7 (Continued)
EXISTING CONDITIONS HYDRAULIC MODELING SUMMARY
BENI SUEF GOVERNORATE

System	Description	Average Day	Maximum Day	Peak Hour
Nassar	System Demand (L/S)	107	160	240
	Operating Capacity of Pumps online (L/S)	125	180	245
	Water Supplied From Water Sources (L/S)	107	160	240
	Water Supplied by Elevated Tanks (L/S)	Tank Closed		
	Pressure Range (m)	41 - 49	29 - 45	9 - 42
Ihnasya	System Demand (L/S)	66	99	149
	Operating Capacity of Pumps online (L/S)*	65	100	145
	Water Supplied From Water Sources (L/S)	67	100	149
	Water Supplied by Elevated Tanks (L/S)	Tank Closed		
	Pressure Range (m)	20 - 37	0 - 30	0 - 26
	* 35 L/S is supplied from Massarit Nassan WTP			
Sumusta	System Demand (l/s)	39	59	88
	Operating Capacity of Pumps Online (l/s)	60	60	60
	Water Supplied From Water Sources (l/s)	39	59	51
	Water Supplied by Elevated Tanks (l/s)	Tanks were	closed	37
	Pressure Range (m)	57 - 59	25 – 52	30 - 40
Biba	System Demand (L/S)	187	281	421
	Operating Capacity of Pumps Online (L/S)	180	290	440
	Water Supplied From Water Sources (L/S)	187	280	412
	Water Supplied by Elevated Tanks (L/S)	Tanks Closed		
	Pressure Range (m)	34 - 50	18 - 46	7 – 49
Al Fashn	System Demand (l/s)	196	294	441
	Operating Capacity of Pumps Online (l/s)	220	330	440
	Water Supplied From Water Sources (l/s)	196	294	441
	Water Supplied by Elevated Tanks (l/s)	Tank closed		
	Pressure Range (m)	41 - 57	23 - 48	0 - 22

Village Water Systems

Water Sources

Table ES-8 presents known rural water sources in the Governorate, the source of raw water, capacity, hours of operation, and estimated volume of water produced.

TABLE ES-8
BENI SUEF GOVERNORATE WATER SOURCES[1]

Town or Village	Type of Source[2]	Raw Water Source	Rated Capacity (l/s)	Hours of Operation per Day	Water Production[3] (m^3/d)
AL FASHN DISTRICT					
Beni Saleh	W	Groundwater	15	14	756
Gizeret El Wakelia	W	Groundwater	25	5	450
Iqfahas	CU	Irrigation Canal	30	14	1,512
Al Kunayyisah	W	Groundwater	25	8	720
Dilhanis	W	Groundwater	25	4	360
Beni Manayn	CU	Irrigation Canal	30	12	1,296
Bushra	W	Groundwater	12	6	259
Al Fant	W	Groundwater	12	0	-
Talat	CU	Irrigation Canal	30	10	1,080
	W	Groundwater	25	4	360
Talaa	W	Groundwater	12	5	216
Saft Al Khirsah	W	Groundwater	25	5	450
BENI SUEF DISTRICT					
Ibshana	W	Groundwater	25	8	720
Ihnasia El Khadra	W	Groundwater	25	8	720
Bani Affan	W	Groundwater	25	8	720
Dmoshia	W	Groundwater	25	8	720
Barrout	W	Groundwater	25	10	900
Manchat Asem	CU	Irrigation Canal	30	20	2,160
Ahwa	W	Groundwater	35	10	1,260
Beleefea	W	Groundwater	35	10	1,260
Sherif	W	Groundwater	25	10	900
Nazlet Abo Slem	CU	Nile River	30	10	1,080
El Koum El Ahmar	W	Groundwater	25	2	180
Ryaad	CU	Irrigation Canal	30	10	1,080
Tazment Sharkia	W	Groundwater	0	0	-
Bani Harraum	CU	Irrigation Canal	30	10	1,080
El Dowia	CU	Nile River	30	10	1,080
El Halabia	W	Groundwater	12	10	432
BIBA DISTRICT					
Gizeret Biba	CU	Nile River	30	16	1,728
Kafr Nasser	W	Groundwater	35	2	252
Tarshoub	W	Groundwater	25	22	1,980
Zawyat an-Nawyah	W	Groundwater	35	20	2,520
Saft Rasheen	W	Groundwater	25	14	1,260
Suds el-Umarah	W	Groundwater	25	10	900
Al Fuqqai	W	Groundwater	25	10	900
Harbshant	W	Groundwater	25	10	900
Beni Awad	W	Groundwater	35	10	1,260
El Baranqah	CU	Irrigation Canal	30	10	1,080
	W	Groundwater	25	10	900
	W	Groundwater	35	0	-
EL WASTA DISTRICT					
Zawyat El Masloub	W	Groundwater	25	5	450
Abu Seer Al Malaq	CU	Irrigation Canal	30	24	2,592
	CU	Irrigation Canal	30	24	2,592
Ilfast	CU	Irrigation Canal	30	14	1,512
Ibweet	CU	Irrigation Canal	30	14	1,512

TABLE ES-8 (Continued)
BENI SUEF GOVERNORATE WATER SOURCES[1]

Town or Village	Type of Source[2]	Raw Water Source	Rated Capacity (l/s)	Hours of Operation per Day	Water Production[3] (m^3/d)
Itwaab	W	Groundwater	25	10	900
Ifwah	W	Groundwater	25	10	900
Al Maymoun	CU	Nile River	30	16	1,728
	W	Groundwater	25	10	900
	W	Groundwater	25	10	900
Maydoum	CU	Irrigation Canal	30	20	2,160
	CU	Irrigation Canal	30	20	2,160
	W	Groundwater	25	5	450
Al Houmah	W	Groundwater	25	10	900
Saft El Sharkia	W	Groundwater	25	15	1,350
Kowm el Arous	W	Groundwater	25	16	1,440
Ad-Diyaabiyyah	W	Groundwater	12	10	432
Koum Idreegah	W	Groundwater	25	0	-
IHNASYA DISTRICT					
Barawah al-Waqf	CU	Irrigation Canal	30	14	1,512
	W	Groundwater	12	0	-
Manchat Al Hajj	W	Groundwater	12	5	216
Deir Barawah	W	Groundwater	25	10	900
Manchat Tahir	W	Groundwater	25	5	450
Miyahnah	W	Groundwater	25	5	450
Al Awawhan	CU	Irrigation Canal	30	14	1,512
Kalaha	W	Groundwater	12	3	130
Manchat El Bidinee	CU	Irrigation Canal	30	21	2,268
	CU	Irrigation Canal	30	21	2,268
Nena	W	Groundwater	25	5	450
Manhara	W	Groundwater	12	2	86
Massarat Nassan	S	Irrigation Canal	200	24	17,280
NASSER DISTRICT					
Ishmant	W	Groundwater	35	10	1,260
Kafr El Gizera	CU	Irrigation Canal	30	10	1,080
Bani Ady	CU	Irrigation Canal	30	12	1,296
	W	Groundwater	12	5	216
El Ryad	W	Groundwater	12	10	432
Dalaas	W	Groundwater	35	10	1,260
SUMUSTA DISTRICT					
Bedehl	W	Groundwater	25	10	900
Beni Halah	W	Groundwater	25	5	450
DASHTOOT	CU	Irrigation Canal	30	10	1,080
	W	Groundwater	35	5	630
Koum El Noor	W	Groundwater	12	5	216
Al Shantour	W	Groundwater	25	5	450
Beni Mohamed Rasheed	W	Groundwater	12	5	216
Izbet Al Shantour	W	Groundwater	25	10	900
Koftan El Garbia	W	Groundwater	12	5	216
Mazoorah	W	Groundwater	25	10	900
	CU	Irrigation Canal	30	10	1,080

TABLE ES-8 (Continued)
BENI SUEF GOVERNORATE WATER SOURCES[1]

Town or Village	Type of Source[2]	Raw Water Source	Rated Capacity (l/s)	Hours of Operation per Day	Water Production[3] (m^3/d)
TEL EL NAROUZ DISTRICT					
Al Hibah	CU	Nile River	30	14	1,512
El Al Allamah	CU	Nile River	30	14	1,512
	CU	Nile River	30	14	1,512
	CU	Nile River	30	0	-
Sannur	CU	Nile River	30	14	1,512
Tel El Narouz	CU	Nile River	30	24	2,592
	S	Nile River	20	24	1,728
El Gizeret El Sharkia	CU	Nile River	30	10	1,080
Gayada El Sharkia	CU	Nile River	30	10	1,080
Gizeret Abo Saleh	CU	Nile River	30	12	1,296

Notes
1. Information obtained during preliminary survey.
2. S = Surface Water Treatment Plant; CU = Compact Unit; W = Well.
3. Water Production based on rated capacity and hours of operation per day.

Village Level of Service

A representative 15% of villages not connected to a markaz city's water or wastewater system were surveyed. Table ES-9 describes the estimated level of water service for each village included in the survey within the Governorate.

TABLE ES-9
ESTIMATED LEVELS OF SERVICE FOR SURVEYED VILLAGES
BENI SUEF GOVERNORATE

Village	Estimated Percentage of Customers Served by Water Connections (*1996 National Census Governorate Average*)	Number of Public Stand Spots	Community Source Water[1]	Hours of Availability per Day
Bani Adi	32%	3	HP	24
Dalaas	32%	1	HP	24
El Zaytoun	32%	1	HP	20
El Ryad	32%	0	HP	20
Tansa El Malaq	32%	0	HP	24
Quom El Arous	32%	2	HP	24
Quom Idrega	32%	1	HP	6
Kafr Ibjij	32%	2	HP	18
Bani Hayder	32%	1	HP	24
Bahnas	32%	1	HP	16
Al Maymoun	32%	2	HP,ST	24
Baha	32%	7	HP	24
Shinary	32%	4	HP,ST	12
Kafr Minsabah	32%	1	HP,ST	16
El Gamahoud	32%	2	HP,ST	16
El Gafadoun	32%	1	HP,ST	20

TABLE ES-9 (Continued)
ESTIMATED LEVELS OF SERVICE FOR SURVEYED VILLAGES
BENI SUEF GOVERNORATE

Village	Estimated Percentage of Customers Served by Water Connections (*1996 National Census Governorate Average*)	Number of Public Stand Spots	Community Source Water[1]	Hours of Availability per Day
Dilhanis	32%	1	HP,ST	16
Beni Menein	32%	2	HP,ST	20
Nazlet Khalaf	32%	1	HP	12
Barawah El Waqf	32%	3	HP	24
El Bahsamon	32%	4	HP,ST	12
Manchat Taher	32%	3	HP	12
Gayada El Sharkia	32%	1	ST	24
Gabal El Nour	32%	2	N	8
Mohammed Radwan	32%	0	ND	ND
Bani Khalil	32%	0	N	24

1 HP- Handpump, ST- Community Stand Pipe, N- Neighbor, ND- No Data

Village System's Water Quality and Quantity

The Ministry of Health takes samples from each well and sends the results directly to the Prime Minister. Available information indicates that this monthly test in enforced. However, the Authority is required to take samples daily to ensure quality, which is seldom done that frequently. Throughout the governorate, 52 wells were analyzed for water quality. Seven of these wells met all Egyptian water quality standards, while 45 failed to meet at least one standard. All wells analyzed had an acceptable iron concentration of less than 1 mg/l, while exactly half of the wells analyzed had an acceptable manganese level.

Only five wells did not meet standards for the physical properties of turbidity and total dissolved solids (TDS). Thirty-two wells failed to meet at least one of the chemical parameters, while 33 wells failed to meet standards for bacteria, total coliform, or both.

These results are summarized in Table ES-10.

TABLE ES-10
SUMMARY OF WELL WATER QUALITY TESTING RESULTS
BENI SUEF GOVERNORATE

Description of wells	Number of Wells
Total number of wells tested	52
Wells that passed all standards	7
Wells that passed iron & manganese standards	26
Wells that passed physical standards	47
Wells that passed chemical standards	20
Wells that passed bacteriological	20
Wells that failed only in physical	0
Wells that failed only in iron & manganese	2
Wells that failed only in chemical	3
Wells that failed only in bacteriological	8
Wells that failed in both physical and chemical	1
Wells that failed in both physical and bacteriological	1
Wells that failed in physical, chemical and Iron & Manganese	3

TABLE ES-10 (Continued)
SUMMARY OF WELL WATER QUALITY TESTING RESULTS
BENI SUEF GOVERNORATE

Description of wells	Number of Wells
Wells that failed in both chemical and iron & manganese	7
Wells that failed in both chemical and bacteriological	8
Wells that failed in bacteriological, chemical, iron & manganese	1
Wells that failed in both bacteriological and iron & manganese	1

WASTEWATER SYSTEMS

General

Wastewater collection and treatment within the Governorate is currently limited to Beni Suef City. NOPWASD has underway projects to construct wastewater collection, pumping and treatment systems in the other marakaz capital cities, including:

- El Wasta;
- Nasser;
- Ihnasya;
- Biba;
- Sumusta; and
- Al Fashn.

Some of these urban systems are nearing completion and others are still in the early construction or planning stages. Wastewater collection and treatment in the villages is essentially non-existent. As a result, disposal options practiced include direct disposal of untreated wastewater into drains, septic tanks and cesspools, soak pits and infiltration wells.

Beni Suef City

As previously indicated the Governorate's only operating wastewater system is located in Beni Suef City. The current extent and level of service provided by this system are summarized in Table ES-11.

TABLE ES-11
CURRENT EXTENT AND LEVEL OF URBAN WASTEWATER SERVICE
BENI SUEF GOVERNORATE

Description	Value
Area Within City (hectares)	713
Current Area Served (hectares)	563
Current City Population Served	137,878
Total Wastewater Connections	14,046
Number of Zones	8
Number of Pumping Stations	8
Average Day Wastewater Flow (m^3/d):	
Residential	28,990
Commercial	177
Industrial	236
Institutional	29
Total	29,462
Average Day Per Capita Generation (LCD)	214

TABLE ES-11 (Continued)
CURRENT EXTENT AND LEVEL OF URBAN WASTEWATER SERVICE
BENI SUEF GOVERNORATE

Description	Value
Estimated Infiltration/Inflow (m^3/d)	4,493
Generation Variation (m^3/d):	
Minimum Day	23,587
Maximum Day	36,634
Peak Hour	48,125
Wastewater Average Strength (mg/l):	
BOD	221
TSS	265

Information on the existing wastewater treatment plant, as well as those currently under construction within the Governorate, is presented in Table ES-12. The operating plant in Beni Suef City appears to be suffering from hydraulic design problems and overloading. It is generally in poor condition and requires extensive rehabilitation or replacement.

The existing wastewater collection system in Beni Suef City is comprised of nine zones, eight of which are currently in operation. The original wastewater collection system was constructed in 1958. Today, the gravity collection system consists of nearly 109 km of 175-700 mm sewers. The vast majority of the system is constructed in sizes below 300 mm and used vitrified clay or PVC pipe. Each zone contains a pump station that is generally connected to a manifold force main system that ultimately discharges to the Beni Suef City Wastewater Treatment Plant. The force main system consists of nearly 17 km of 250-600 mm ductile or cast iron pipeline. Information on the existing pumping stations and overall condition of the collection/pumping system is summarized in Table ES-13.

TABLE ES-12
OPERATING/UNDER CONSTRUCTION WASTEWATER TREATMENT PLANTS
BENI SUEF GOVERNORATE

Plant Name	Location	Design Capacity (m^3/d)	Treatment Process
El Wasta WWTP	5 km SW of Maydum	20,000	Trickling Filter
Nasser WWTP	Desert NW of City	20,000	Stabilization Pond
Beni Suef City	4 km SW in El Sahara	26,000	Trickling Filter
New Beni Suef City	In City	13,000	Activated Sludge
Ihnasya	2.5 km SW of City	10,000	Oxidation Ditch
Biba	2 km W of Biba	20,000	Trickling Filter
Sumusta	1.5 km SW of City	10,000	Oxidation Ditch
Al Fashn	0.8 km N of Saft El Nour	20,000	Trickling Filter

TABLE ES-13
EXISTING WASTEWATER COLLECTION/PUMPING SYSTEM SUMMARY
BENI SUEF GOVERNORATE

Area	Pumping Stations				Overall Condition	
	Name	Capacity (l/s)		Current Condition	Collection System	Pumping Station/ Force Main System
		Firm	In Operation			
Zone No. 1	Mold El Naby	160	80	Good to fair, piping is old.	Zone has adequate capacity, however low velocities occur.	Adequate capacity exists, but system hydraulics lead to inefficiencies.
Zone No. 2	Al Nokh	120	120	Generally good to fair.	Peak flows high than current operating capacity.	While incoming flows are less than pumping capacity, hydraulic problems negatively impact capacity of system.
Zone No. 3	Al Madaris	230	200	Generally good, pumps vibrate.	Zone has adequate capacity, however low velocities occur.	Capacity of pumping system adequate, however some surcharging occurs.
Zone No. 4	Al Ghamrawy	120	60	Generally fair, pumps vibrate.	Zone has adequate capacity, however low velocities occur.	Capacity is adequate to handle incoming flows.
Zone No. 5	Ahmed Orabi	120	120	Generally good to fair.	Incoming peak flows exceed capacity of zone, only southern end surcharges.	Incoming flows exceed pumping capacity, plus system hydraulics lead to inefficiencies.
Zone No. 6	Bolbel	105	35	Generally good.	Zone has adequate capacity, however low velocities occur.	Capacity is adequate to handle incoming flows.
Zone No. 8	El Gazirah	180	60	Generally good.	Zone has adequate capacity, however low velocities occur.	Capacity is adequate to handle incoming flows.
Zone No. 9	El Tahrir	60	40	Under construction.	Zone has adequate capacity, however low velocities occur.	Adequate capacity exists, but system hydraulics lead to inefficiencies.

OPERATION AND MAINTENANCE CAPABILITIES

To determine the existing operation & maintenance (O&M) capabilities of BEGAWS, the Harza Team developed evaluation criteria, conducted site visits and interviews with BEGAWS management and O&M staff and inventoried existing O&M support facilities. Based on this assessment of the existing O&M situation, the following conclusions were drawn relative to the O&M capabilities of BEGAWS:

- The Authority is lacking certain staffing skills necessary for the proper operation and maintenance of its facilities, which require development of an appropriate staffing plan and compensation and training programs;
- To maintain adequate budgets to cover the proper O&M of its facilities, the Authority needs to establish a revenue stream that meets the needs of the system;
- Additional staff training is necessary throughout all levels of the O&M staff;
- Limited O&M manuals exist and these are needed for all of the Authority's facilities;
- To effectively carry out their duties over this vast Governorate, a good transportation system needs to be maintained by the Authority;
- The Authority currently has no written policies and procedures, which are a necessity for an efficiently run utility;
- While treatment chemicals seem to be made available as needed, other required consumables and spare parts are in short supply, which hampers the effectiveness of the operation;
- Improvements to the current records system would be beneficial to the overall operation;
- An information management system does not currently exist, which limits the effectiveness of the management of the Authority;
- Limited tools and equipment are available which in turn limits the ability of the staff to properly support the operation and upkeep of the Authority's facilities; and
- A fully functioning telecommunication system will be a must for the effective operation of the Authority's widespread water and wastewater facilities.

FINANCIAL CONDITION

The Authority is currently organized in accordance with the format that was originally suggested when the Economic General Authority for Water and Sanitation were formed in 1996, with three large groups reporting to the Office of the Chairman. The Authority's current staffing level is approximately 3,650, with the majority of staff associated with the Governorate's water system. This mix in staff assignments between water and wastewater will have to change in the upcoming years as NOPWASD's new wastewater treatment plants come on line and are turned over to the Authority. Other adjustments to the organization are anticipated based on the on-going activities of USAID's Institutional Strengthening Contractor. The Bureau of Financial Affairs in the Department of Finance and Administration Affairs currently handles BEGAWS's financial affairs.

BEGAWS has implemented a new accounting system that is based on the Egyptian Uniform System of Accounts for Economic General Authorities. This system uses four broad categories of accounts. These accounts are neither broken down by cost centers nor are they broken down by the individual water and wastewater services provided. As a result, while this accounting system conforms to Egyptian standards, it is inadequate for use as the basis for proper utility management. Therefore some improvements will be required for the system to effectively support the BEGAWS operation.

The Authority's commercial practices and systems are very similar to those employed by the Governorate prior to BEGAWS being established. While the billing and collection system appears straightforward and typical of most utility systems in Egypt, it does exhibit some significant problems. The end result is in low billings (estimated 30% of the billings based on

accurate metering) and payment (reported collection levels of 65-70% over the past several years) for services rendered.

Based on available information for fiscal year 1999/2000, the existing financial condition for BEGAWS is summarized in Table ES-14. As this table indicates, FY 1999/2000 is anticipated to produce a deficit of approximately LE 11.3 million, which translates to about 52% of its operational budget. Just to breakeven, it is projected that the water tariff would need to be increased by 100% and the wastewater tariff by 240% of the breakeven water tariff, yielding a total water and wastewater tariff increase of approximately 350%. As it is also indicated in Table ES-14, if no improvements in operating efficiencies or tariffs occur, this deficit would increase to over LE 18.6 million in the next five years.

TABLE ES-14
EXISTING FINANCIAL CONDITION (FY1999/2000)
BENI SUEF GOVERNORATE

System Statistics	Units	Actual 1997/98	Actual 1998/99	Budget 1999/2000
Annual Volume of Water Produced	M^3/Yr	56,534,610	59,885,709	120,689,000
Unaccounted For Water	%	45.0%	45.0%	45.0%
Annual Volume of Water Supply Billed	M^3/Yr	31,094,036	32,937,284	66,379,000
Value of Water Billed	LE/Yr.	5,907,867	6,205,263	12,612,000
Percentage of WS Billings Collected	%	65.0%	70.0%	70.0%
Annual Volume of Wastewater Handled	M^3/Yr	10,950,000	12,775,000	14,600,000
WW Surcharge Level on Water Bills	%	35%	35%	35%
WS-WW SYSTEM ANNUAL O&M COST				
Wages	LE/Yr.	9,082,000	11,207,000	12,500,000
Electricity	LE/Yr.	3,775,000	3,786,000	4,829,000
All Other Costs	LE/Yr.	2,091,000	3,452,000	4,508,000
Total Yearly O&M Cost	LE/Yr.	14,948,000	18,445,000	21,837,000
Level Of Cost Savings From Previous Yr.	%	-	-	-
Total Yearly O&M Cost w/ Savings + Inflation	LE/Yr.	14,948,000	18,445,000	21,837,000
COST ALLOCATIONS AND UNIT COSTS				
Per Cent of Total O&M Cost Allocated to WS	%	67%	67%	67%
Per Cent of Total O&M Cost Allocated to WW	%	33%	33%	33%
Amount of O&M Cost Allocated to WS	LE/Yr.	10,015,160	12,358,150	14,630,790
Amount of O&M Cost Allocated to WW	LE/Yr.	4,932,840	6,086,850	7,206,210
Cost of Water per M^3 of Production	LE/M^3	0.177	0.206	0.121
Cost of Water per M^3 of Billed	LE/M^3	0.322	0.375	0.220
Cost of Wastewater per M^3 Handled/Billed	LE/M^3	0.450	0.476	0.494
REVENUES				
Water Supply Service				
Amount of WS Billings at Current Tariff	LE/Yr.	5,907,867	6,205,263	12,612,000
Tariff Increases In Year	%	0%	0%	0%
Amount of Billings With Tariff Increase	LE/Yr.	5,907,867	6,205,263	12,612,000
Percentage of WS Billings Collected	%	65.00%	70.00%	70.00%
WS Billings Collected = WS Tariff Revenue	LE/Yr.	3,840,114	4,343,684	8,828,400
WS Tariff Yield Per M^3 Billed	LE/M^3	0.124	0.132	0.133
Other Miscellaneous Non Tariff Revenues	LE/Yr.	348,000	954,000	1,000,000
Total Authority WS Revenue in Year	LE/Yr.	4,188,114	5,297,684	9,828,400
Gross WS Revenue Yield Per M^3 Billed	LE/M^3	0.135	0.161	0.148
Wastewater Service				
Surcharge Level on WS Charge	%	35%	35%	35%
WS Volume Billed For Sewered Customers	M^3	10,950,000	12,775,000	14,600,000
WS Billings for Sewered Customers	LE/Yr.	2,080,500	2,406,763	2,773,998

TABLE ES-14 (Continued)
EXISTING FINANCIAL CONDITION (FY1999/2000)
BENI SUEF GOVERNORATE

System Statistics	Units	Actual 1997/98	Actual 1998/99	Budget 1999/2000
Equivalent Amount of WW Billed	LE/Yr.	728,175	842,367	970,899
Surcharge Collected	LE/Yr.	473,314	589,657	679,629
Equivalent WW Revenue Yield Per M^3 Handled	LE/M^3	0.043	0.046	0.047
ANNUAL CASH SURPLUS or (DEFICIT)	LE/Yr.	(10,286,573)	(12,557,659)	(11,328,971)
Deficit As % Of Total O&M Cost	LE/Yr.	69%	68%	52%
Estimated Portion of Deficit Due to WS Operations	LE	5,827,046	7,060,466	4,802,390
Estimated Portion of Deficit Due to WW Operations	LE	4,459,526	5,497,193	6,526,581
WS Break Even Tarrif Yld. Per M^3 Billed	LE/M^3	0.48	0.49	0.29
Equiv. WW Tariff Per M^3 of WW Billed	LE/M^3	0.69	0.68	0.71
WW Surcharge Level For Break Even	%	145%	138%	240%

WATER SYSTEM MASTER PLAN

PLANNING CONSIDERATIONS AND CRITERIA

Planning Considerations

Systems were master planned to provide sufficient quantities of water:

- Meeting quality standards; and
- Meeting the year 2022 demands of the cities and villages.

The following general planning considerations have been integrated into the water master plan.

- Master planning would hold to the urban development limits provided by the GOE;
- Agricultural lands will be conserved for current use;
- New cities or reclaimed land/new developments will be developed with all infrastructure included;
- Future population distribution will follow existing characteristics;
- Existing rights of way (ROWs) can be used for new pipelines, or new ROWs can be obtained;
- Land is readily available for the construction of treatment plants and other facilities; and
- Any plants or systems that are under construction, that were designed or funded by others, will be completed by the respective GOE donor or funding agency.

Urban Service Area Criteria

The following urban service area criteria are used for developing urban and regional water service options:

- The use of available water sources to meet future demands is optimized.
- The use of existing transmission and distribution piping is maximized.
- Provide source supply at least equal to maximum day demand
- Segregate the urban system from the regional system to avoid transporting regional water demands through the urban distribution network.

Urban System Planning Criteria

In addition to service area criteria, other planning criteria are used in water delivery system development in urban service areas:

- Wells and compact units are not considered long-term sources
- The equalization storage in the storage tanks is used to supplement the peak hour water demands
- Provide a total storage equal to one-day consumption with 45% for elevated storage and 55% for ground storage.
- Route pipelines along existing right-of-ways.
- Characteristics of the growth of urban areas including population density, percent of development and urban growth patterns are considered to be the same during the planning period.
- Make selection whether to separate villages from urban network systems based on the considerations of cost-effectiveness, hydraulic efficiency, operation & maintenance and future system improvements.

Regional Service Area and Planning Criteria

The following are the criteria used in planning regional service areas:

- Optimize the use of available water sources to meet future demands
- Maximize the use of existing transmission and distribution piping
- Limit the pumping head at the treated water pumping stations to no more than 65 meters
- Size the transmission main based on the maximum day demand and a head loss gradient of no greater than 2 meters per km.
- Provide the capacity of water production to at least equal to the maximum day demand
- Segregate the urban system from the regional system to avoid transporting village water demands through the urban distribution network.
- Identify districts not covered by a WTP due to WTP capacity or hydraulic efficiency limitations and develop as a service area with new source(s).

POPULATION AND WATER DEMAND PROJECTIONS

Population projections based on available data have been prepared for the urban and rural population in the governorate. Table ES-15 summarizes this information.

TABLE ES-15
POPULATION PROJECTIONS
BENI SUEF GOVERNORATE

Year	Urban Population	Rural Population	Total Population
Current (1999)	467,668	1,523,467	1,991,135
2007	551,355	1,838,571	2,389,926
2012	605,548	2,072,921	2,678,469
2022	715,205	2,650,104	3,365,309

Based on population projections water demand projections have been developed for the urban and rural populations. These projections are summarized in Table ES-16.

TABLE ES-16
WATER DEMAND PROJECTIONS
BENI SUEF GOVERNORATE

Markaz	Average Day Demand (lps)			Maximum Day Demand (lps)			Peak Hour Demand (lps)		
	2007	2012	2022	2007	2012	2022	2007	2012	2022
Urban Areas									
Beni Suef City	627	667	823	941	1,000	1,235	1,411	1,500	1,852
Sumusta	79	85	106	118	127	159	177	190	239
El Fashn	135	145	182	202	217	273	304	326	410
Biba	127	136	171	190	204	257	285	306	385
Nasser	181	194	244	272	291	366	407	437	549
El Wasta	79	85	107	119	128	160	178	191	240
Ihnasya	81	87	109	121	130	163	182	195	245
Total	**1309**	**1399**	**1742**	**1963**	**2,097**	**2,613**	**2,944**	**3,145**	**3,920**
Rural Areas									
Beni Suef	202	239	368	303	359	553	454	538	829
Sumusta	110	128	193	164	191	290	247	287	435
El Fashn	178	220	321	267	330	482	401	495	723
Biba	174	213	312	261	319	468	392	478	702
Nasser	133	161	239	200	241	358	300	362	538
El Wasta	224	273	402	336	409	602	504	613	904
Ihnasya	155	190	280	233	285	420	350	428	630
Total	**1176**	**1424**	**2115**	**1764**	**2134**	**3173**	**2648**	**3201**	**4761**

OVERALL MASTER PLANNING METHODOLOGY

The characteristics of urban water systems differ from those of regional water systems. Thus, the overall methodology for long-term master planning is based on the assumption that the planning of urban systems is different from the planning of regional systems.

The resulting bases for the overall planning methodology are:

- The different characteristics of systems and planning requirements require that master planning of urban systems be separated from Source/Main Transmission system master planning;
- Master planning of urban systems need to start first to determine the urban system service area, villages to be included or excluded, and the service requirements needed from sources other than those dedicated to the urban system; and
- Master planning of village water supplies need to be included in the Source/Main Transmission system master planning.

PLANNING APPROACH

Water districts were developed using existing water service areas as a base and keeping the same network system in the same district. These districts were used as planning units to facilitate the establishment of new water service areas.

Information regarding water treatment plants under construction and design was obtained from NOPWASD. Those plants under design or construction were projected to be completed, along with their transmission mains, by 2012. Those plants having the capability for an additional expansion were projected to have their expansion constructed and ready for operation by 2022.

Existing water treatment plant capacities are assumed to remain the same over the planning period. Wells and compact units that have water quality meeting standards can be used as short-term supply and as backup should they remain in service beyond 2022.

With the locations, capacity and schedule of availability of all water sources identified, demands for each water district over the planning period were calculated. Available water service area options for the Governorate were then developed based on the 2022 supplies and demands and in accordance with service area criteria. These available options were then reduced to those that are viable and the viable options then screened to identify the preferred option for the selected plan. Next, options using the viable service area options and existing and currently planned facilities were developed and compared to one another. Another screening was performed to determine which option was the preferred option. Finally, the preferred option was developed further, with the required facilities identified and costs estimated.

The Nile River divides the governorate into two distinct parts with no convenient way to transport water across the river. Both the west and the east sides of the Nile River were master planned and the viable options identified independently.

AVAILABLE SERVICE AREA OPTIONS

Service areas ranging from one encompassing the entire governorate to separate service areas for individual city or village were possible. The size and shape of the Governorate, among other factors, dictates the cost-effectiveness of the different service areas. The available service areas are:

- Regional, the size of the region varied as follows:
  - Covering the entire Governorate;
  - Covering more than one markaz;
  - Covering an entire markaz; and
  - Covering parts of a markaz or marakez.
- Neighboring city/village level; and
- Individual city/village level (local).

These service area options were screened using several factors to determine the viable options. The resulting viable options became regional systems covering an entire markaz or part(s) of a markaz or marakez.

SELECTED PLAN - WATER

Recommended Service Areas

The Beni Suef Governorate recommended regional water service areas are shown in Map Annex Map BW-052. The recommended urban service areas of the Markaz cities are shown in Map Annex Map BW-001 to BW-007.

Recommended Facilities

Recommended Location of Major Facilities

The locations of Beni Suef Governorate recommended regional water major facilities are shown in Map Annex Map BW-052. Major facilities located include larger diameter pipelines (with sizes), and treatment facilities.

Those plants noted as GOE funded have 2022 capacities shown that match GOE planned build-out capacity.

The recommended urban water facilities of the Markaz Cities are shown in Map Annex Map BW-034 to BW-039a. Facilities located include pipelines (with sizes), and location of storage facilities.

Implementation

Project Development/Planning Section

It should be a top priority to develop a fully functioning project development/planning section inside the Authority. The importance of this group cannot be over stated. As with any master plan, factors affecting the facilities recommended in the plan are not static, and the plan needs to be reviewed and updated on a regular basis to allow changes to be made in the base master plan.

Recommended Implementation Plan

The following schedule is a recommended implementation plan for construction of major water facilities.

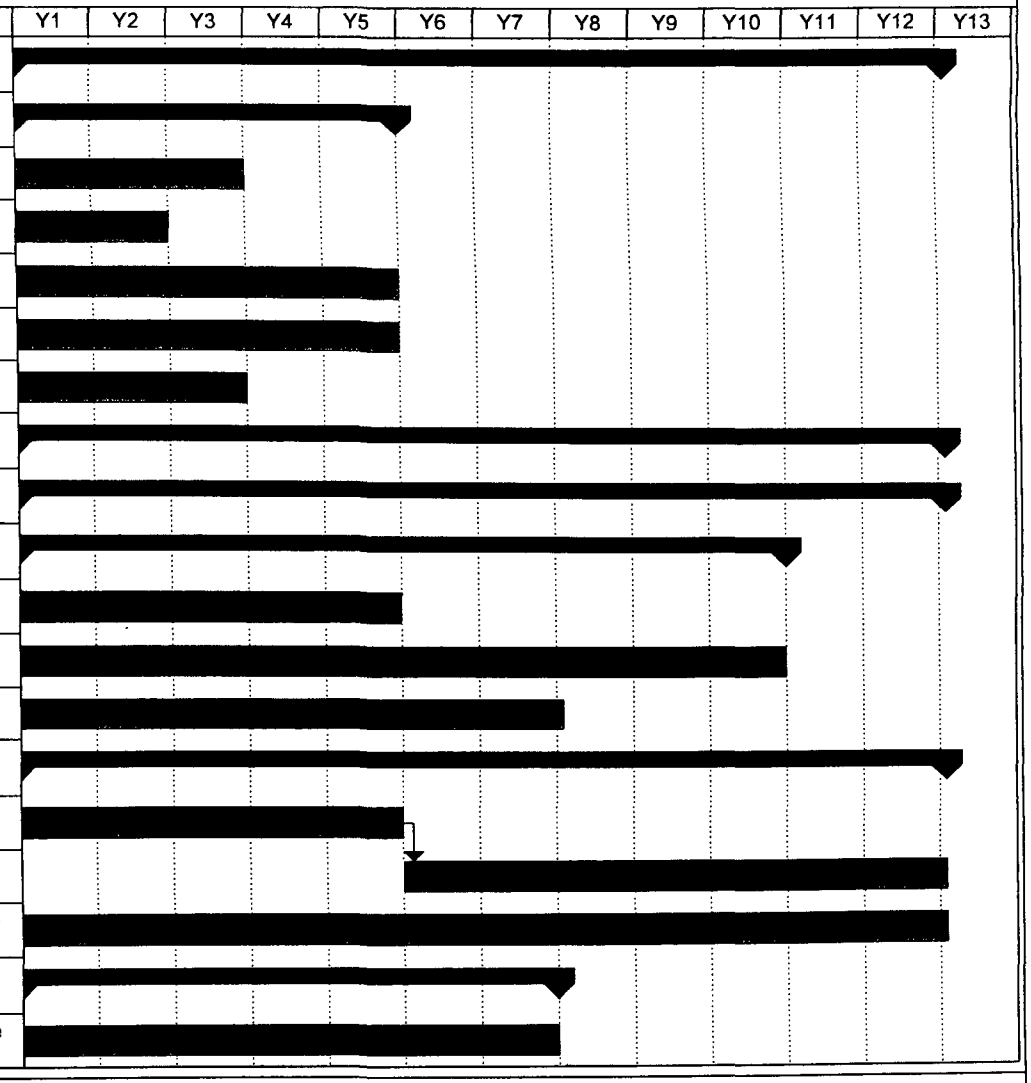
Capital Cost Estimates

The capital costs for completion of the recommended facilities in the selected plan are provided, by service area, in Table ES-17. Costs are in year 2000 US dollars. Where US contractor costs are given, local costs in US dollars, for the same quality of construction, can be estimated by multiplying the US contractor costs by 0.65.

Harza Engineering Company

Beni Suef Major Water Projects Implementation Plan

ID	Task Name
1	**Implementation Plan Beni Suef Major Projects**
2	**Undertake Studies**
3	Full AM/FM Mapping System(GIS)
4	Calibrate and improve Hydraulic Models
5	Full I/I Sewerage Collection Study on all existing systems.
6	Undertake leak detection and repair program throughout Governorate
7	Hydrogeologic Studies
8	**Projects**
9	**Urban**
10	**Beni Suef City**
11	Upgrade of Existing US Treatment Plant
12	Construct New NOPWASD WTP to serive Beni Suef City
13	Implement of improvements to the distrubtion system including lines and storage
14	**El Wasta City/Nasser City**
15	Complete the NOPWASD WTP Under Construction
16	Expand the NOPWASD WTP
17	Implement of improvements to the distrubtion system including lines and storage
18	**Ihnasya/Sumusta/Biba/Al Fashn City**
19	Implement of improvements to the distrubtion system including lines and storage



Beni Suef Major Water Projects

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary

ID	Task Name	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13
20														
21	**Regional**													
22	**West Side of the Nile River**													
23	**Al Fashn, Sumusta and Biba Markez Service Area**													
24	Construct New Water Treatment Plant to serve the Sumusta Service Area Nile River in Biba Markez													
25	Expand The Al Fashn WTP to 800 l/Sec													
26	Build major Transmission lines as required for Option 2													
27	**Ibnasya, Nasser, El Wasta Service Area**													
28	Construct the NOPWASD proposed 1,200 l/sec Nasser WTP on Nile River													
29	Expand the Masarat Naasan WTP on the Bahr Youssef Canal to 400 l/sec													
30	Construct a new 600 l/sec WTP on the Bahr Youssef to serve Southern Ihnasya.													
31	Implement major transmission lines as defined in option 2													
32	**Beni Suef Service Area**													
33	Construct the NOPWASD proposed 1,200 l/sec Nasser WTP on Nile River													
34	Construct transmission mains as per option 1.													
35	**East Side of the Nile River**													
36	**Nasser Service Area East of Nile**													
37	Construct New Slow Sand Filtration Plant on Nile River													
38	Build Transmission Mains as required													

Beni Suef Major Water Projects

Task — Summary — Rolled Up Progress

Split — Rolled Up Task — External Tasks

Progress — Rolled Up Split — Project Summary

Milestone — Rolled Up Milestone

ID	Task Name	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13
39	**Beni Suef Service Area East of Nile**													
40	Construct New Slow Sand Filtration Plant on Nile River to service District 20													
41	Build Transmission Mains as required													
42	**Biba Service Area East of Nile**													
43	Construct New Slow Sand Filtration Plant on Nile River to service District 18													
44	Build Transmission Mains as required													
45	**Al Fashn Service Area East of Nile**													
46	Construct New Slow Sand Filtration Plant on Nile River to service District 5													
47	Build Transmission Mains as required													

Beni Suef Major Water Projects

Task		Summary		Rolled Up Progress	
Split		Rolled Up Task		External Tasks	
Progress		Rolled Up Split		Project Summary	
Milestone		Rolled Up Milestone			

TABLE ES-17
WATER STRATEGIC MASTER PLAN SELECTED PLAN
SUMMARY OF ESTIMATED TOTAL CONSTRUCTION COSTS (MILLION US$)
BENI SUEF GOVERNORATE

Service Area	WTP[1]	Transmission Main[1]	Storage Costs			Distribution Piping		Background Piping[1,2]	House Connections		Public Taps[3]	Total
			Regional[1]	Village[1]	Urban[1]	Village[1]	Urban[1]		Village[3]	Urban[3]		
Al Fashn	37.4	17.4	14.8	5.2	3.5	40.8	3.9	1.3	3.9	2.0	1.1	131.3
Beni Suef	59.9	31.1	14.5	5.1	11.2	43.5	2.9	2.5	4.2	8.1	1.1	184.1
Biba	14.0	7.2	7.6	2.6	4.2	39.3	4.5	0.9	3.8	1.8	1.0	86.9
El Wasta/Nasser	43.1	47.7	23.5	8.2	8.4	68.0	8.6	2.9	6.5	3.2	1.8	222.0
Ihnasya	41.2	35.0	22.7	7.9	2.8	50.9	5.3	3.3	4.9	0.9	1.3	176.3
Sumusta	34.2	31.8	16.3	5.7	2.1	27.7	3.4	2.0	2.7	0.8	0.7	127.4
Beni Suef East of Nile	3.0	3.2	1.9	0.7	0.0	4.8	0.0	0.0	0.5	0.0	0.1	14.1
Al Fashn East of Nile	1.5	1.0	1.1	0.4	0.0	2.6	0.0	0.0	0.2	0.0	0.1	6.8
Nasser East of Nile	1.5	0.4	0.9	0.3	0.0	2.5	0.0	0.0	0.2	0.0	0.1	5.9
Biba East of Nile	1.5	2.2	0.8	0.3	0.0	2.3	0.0	0.0	0.2	0.0	0.1	7.3
Total	**237.3**	**177.0**	**104.1**	**36.4**	**32.3**	**282.3**	**28.5**	**12.9**	**27.2**	**16.8**	**7.5**	**962.2**

Notes:
1. U.S. Contractor Construction Costs
2. Background piping is local piping described in *Master Plan Strategy for Local Piping*
3. Local Construction Costs

All estimated costs include 20% contingency and 15% engineering.

Operation and Maintenance Cost Estimates

The 2022 annual operation and maintenance costs (year 2000 US dollars) for the selected plan are provided in Table ES-18.

TABLE ES-18
WATER STRATEGIC MASTER PLAN SELECTED PLAN
ESTIMATED 2022 ANNUAL O&M COSTS
BENI SUEF GOVERNORATE

Service Area	Estimated 2022 Annual O&M Costs (Million US$)
Al Fashn	1.9
Beni Suef	4.4
Biba	1.3
El Wasta/Nasser	3.3
Ihnasya	2.3
Sumusta	1.7
Beni Suef East of Nile	0.1
Al Fashion East of Nile	0.1
Nasser East of Nile	0.1
Biba East of Nile	0.1
Total	**15.3**

Estimated Land Acquisition Costs

A summary of estimated land acquisition requirements and costs for 2022 by markaz are given in Table ES-19. Land acquisition costs are based on an estimated average cost of L.E. 60,000 (US$ 17,400 per feddan).

TABLE VI-19
WATER STRATEGIC MASTER PLAN SELECTED PLAN
SUMMARY OF ESTIMATED LAND ACQUISITION AND COSTS
BENI SUEF GOVERNORATE

Markaz	Estimated Land Acquisition Required (Feddans)	Estimated Land Acquisition Cost (Thousand US$)
El Wasta	0.0	0
Nasser	0.0	0
Beni Suef	1.3	23
Ihnasya	4.9	85
Sumusta	6.6	115
Biba	0.0	0
Al Fashn	3.5	61
Total	**16.3**	**284**

Recommended Further Studies with Estimated Costs, by Priority:

Study Name	Estimated Costs in US$
GIS AM/FM Mapping Program	5,000,000
Strategic Master Plan Management Training Program	1,000,000
Hydrogeological Study	2,000,000
Transmission Main Leak Detection Assistance	1,000,000
Urban Distribution System Leak Detection	1,000,000
Field Verification and Model Calibration Program	1,500,000
Water Treatment Plant Waste Stream and Sludge Management Study, as part of the wastewater Sludge Management Study	500,000

Additional Facilities

Additional facilities are required to complete the master plan:

- In villages there will always be unconnected population who cannot afford water connections. Public taps will be a necessity for the projected unconnected population (existing public taps are not of sufficient quantity to be a consideration, and virtually all existing public taps are in poor condition);
- Distribution system piping (including required elevation storage) and house connections for the projected connected population in villages to receive new distribution systems;
- Distribution system piping (including additional required elevation storage) and house connections for projected additional connected population in villages with existing distribution systems; and
- Distribution system piping elevated storage and house connections for projected additional connected population in cities.

Recommended Additional Authority Programs

- Transmission Main Leak Detection/Repair Programs;
- Urban Distribution System Leak Detection/Repair Programs;
- Operation and Maintenance Improvement Programs;
- House Connection Financing Programs;
- Public Tap Construction Programs;
- Demand Management Program;
- Water Use Conservation Education Program;
- Source Protection Programs;
- Safety Program;
- Customer Registry Program;
- Commercialization Program;
- Tariff Structure Program; and
- Financial Control Program.

WASTEWATER SYSTEM MASTER PLAN

PLANNING CONSIDERATIONS AND CRITERIA

Planning Considerations

Systems are master planned to provide appropriate wastewater services to cities and villages based on 2022 projected demands and levels of service. The following general planning considerations have been integrated into the wastewater master plan.

- Master planning would hold to the urban development limits provided by the GOE;
- Agricultural lands will be conserved for current use;
- New cities or reclaimed land/new developments will be developed with all infrastructure included;
- Future population distribution will follow existing characteristics;
- Existing rights of way (ROWs) can be used for new pipelines, or new ROWs can be obtained;
- Land is readily available for the construction of treatment plants and other facilities; and
- Any plants or systems that are under construction, that were designed or funded by others, will be completed by the respective GOE donor or funding agency.

Regional Service Area and Planning Criteria

The following criteria are used when developing wastewater service options:

- The use of available facilities is optimized where feasible;
- No capital costs are assumed when existing facilities and those currently under construction are utilized;
- Where it is cost-effective regional, wastewater plants are used in determining service areas; and
- Where practical wastewater service areas are to coincide with administrative boundaries and with water service areas.

WASTEWATER FLOW AND LOAD PROJECTION

Based on population projections wastewater flow and load projections have been developed for the urban and rural populations. These projections are summarized in Table ES-20 below.

TABLE ES-20
WASTEWATER FLOW AND LOADS
BENI SUEF GOVERNORATE

Markaz	Average Wastewater Flow (lps)			Average BOD (Kg./day)			Average TSS (Kg./day)		
	2007	2012	2022	2002	2012	2022	2007	2012	2022
Urban Areas									
Beni Suef City	441	523	715	9,823	11,395	14,891	11,704	12,854	15,182
Sumusta	43	53	77	3,081	3,687	5,072	2,090	2,295	2,711
El Fashn	85	99	132	2,677	3,028	3,781	3,578	3,929	4,641
Biba	80	93	124	2,516	2,845	3,553	3,361	3,692	4,360
Nasser	98	121	177	3,081	3,687	5,072	4,799	5,270	6,225
El Wasta	53	63	89	1,660	1,936	2,550	2,100	2,307	2,725
Ihnasya	45	55	79	1,371	1,627	2,209	2,142	2,353	2,779
Total	**844**	**1,007**	**1,392**	**24,210**	**28,205**	**37,128**	**29,773**	**32,700**	**38,621**
Rural Areas									
Beni Suef	126	167	273	14,141	15,944	20,383	16,969	19,132	24,460
Sumusta	69	90	143	7,539	8,500	10,866	9,046	10,199	13,039
El Fashn	110	148	236	12,708	14,328	18,317	15,249	17,193	21,980
Biba	106	141	228	12,758	14,384	18,390	15,310	17,261	22,067
Nasser	84	110	178	8,999	10,146	12,971	10,799	12,176	15,566
El Wasta	141	186	299	15,244	17,188	21,973	18,293	20,625	26,368
Ihnasya	95	126	205	11,346	12,792	16,354	13,615	15,351	19,625
Total	**732**	**802**	**1,288**	**82,736**	**93,281**	**119,255**	**99,283**	**111,938**	**143,106**

PLANNING APPROACH

Available service area options for the Governorate were identified. These available options were then reduced to those that are viable and the viable options then screened to identify the preferred option for the selected plan. Two options were developed to use as a benchmark for comparing the viable service area options. The first was an option where every city and village had a local wastewater service area with a wastewater treatment plant. The second was an option where villages were clustered into service areas covering several villages. Each cluster had a wastewater treatment plant. Next, options using the viable service area options and existing and currently planned facilities were developed and compared to one another. Another screening was performed to determine which option was the preferred option. Finally, the preferred option was developed further, with the required facilities identified and costs estimated.

AVAILABLE SERVICE AREA OPTIONS

Service areas ranging from one encompassing the entire governorate to separate service areas for each population center were possible. The size and shape of the Governorate, among other factors, dictates the cost-effectiveness of the different service areas. The available service areas are:

- Regional, the size of the region varied as follows:
  - Covering the entire Governorate;
  - Covering more than one markaz;
  - Covering an entire markaz; and
  - Covering parts of a markaz or marakez.
- Neighboring city/village level (cluster); and
- Individual city/village level (local).

These service area options were screened using several factors to determine the viable options. The viable option became the regional covering an entire markaz or parts of a markaz or marakez. Cluster and local systems were also considered viable options for some isolated villages and areas, but not for Governorate wide service.

Two collection system options are considered for the Governorate. The first is conventional gravity sewers and the second is small diameter gravity sewers (SDGS). Of the two, conventional gravity sewers are a better technical solution since they collect both the solids and the liquids in the wastewater. SDGS collect the liquid, but trucking is required to periodically remove solids that accumulate in the interceptor tanks required for this type of wastewater collection.

For the preferred option the type of collection system a village receives is primarily a function of population. In some cases the development pattern in the village also affects the type of collection system. For villages with populations greater than 20,000, conventional gravity collection systems are recommended. For villages with populations less than 5,000, SDGS are recommended. For villages with populations between 5,000 and 20,000, the type of collection system will be dependent on local conditions.

SELECTED PLAN - WASTEWATER

Service Area

Several service area types are included in the preferred option. This option is generally based on a regional service area covering each markaz. Following is a general description and a brief description by markaz.

The type of cost-effective service area for population centers is dependent of the population of a village, the number of and population of nearby villages and its distance from existing and currently planned facilities. In Beni Suef Governorate, service areas are based on the fact that NOPWASD wastewater treatment plants can be used to serve the entire markaz located west of the Nile River.

The lack of any existing wastewater treatment plants and the distribution and density of the settlement on the east side of the Nile River leads to cluster service areas and local service areas being the most cost-effective options. Table ES-21 summarizes the selected plan for each of the Governorate's markaz.

TABLE ES-21
SELECTED PLAN DESCRIPTION
BENI SUEF GOVERNORATE

Markaz	Subarea	Plan Description
El Wasta	None	One regional wastewater service area based on the fact that the NOPWASD WWTP can cost-effectively serve this markaz.
Nasser	West of Nile	One regional wastewater service area based on the fact that the NOPWASD WWTP can cost-effectively serve this markaz. Due to the location of this plant and its proximity to villages in Beni Suef Markaz some villages from this markaz are also included in this service area.
	East of Nile	One cluster service area is required to serve the villages located east of the Nile.
Beni Suef	West of Nile	One regional service based on the fact that the NOPWASD WWTP can cost-effectively serve all of this markaz excluding the villages that are in the wastewater service area for Nasser.
	East of Nile	One cluster service area is required to serve the two villages located east of the Nile.
Ihnasyia	None	One regional wastewater service area based on the fact that the NOPWASD WWTP can cost-effectively serve all of this markaz.
Biba	West of Nile	One regional wastewater service area based on the fact that the NOPWASD WWTP can cost-effectively serve all of this markaz.
	East of Nile	Two wastewater service areas are required to serve the villages east of the Nile. One is a cluster wastewater service area serving the northern villages and the other is a local wastewater service area serving the village of Beni Aqaba. The population of this village is such that onsite wastewater treatment is a more cost-effective option. In the event that there is need to connect this village to a WWTP, a local WWTP will be the most cost-effective option.
Sumusta	None	One regional wastewater service area based on the fact that the NOPWASD WWTP can cost-effectively serve all of this markaz.
Al Fashn	West of Nile	One regional wastewater service area based on the fact that the NOPWASD WWTP can cost-effectively serve all of this markaz.
	East of Nile	A local wastewater service area is required to serve the village of El Haiba.

The resulting wastewater treatment plant requirements associated with the selected plan is summarized in Table ES-22

TABLE ES-22
SELECTED PLAN WASTEWATER TREATMENT PLANT REQUIREMENTS
BENI SUEF GOVERNORATE

Markaz	WWTP Identification Number	Location	Existing, Planned or Proposed	Existing Capacity (m^3/day)	Additional Capacity Required (m^3/day)
Al Fashn	WWTP-7	0.8 Km North of Saft El Nour	Planned	20,000	10,400
	PWWTP-E-5	0.5 Km East of Haiba	Proposed		1,500
				Al Fashn Total	**11,900**
Beni Suef	WWTP-3	EL Sahara 4km south of Beni Suef on EL Minia road	Planned		79,200
	PWWTP-E-2	1.5 Km South of Bayad Al Arab	Proposed		1,900
				Beni Suef Total	**81,100**
Biba	WWTP-5	2 Km West of Biba	Planned	20,000	8,700
	PWWTP-E-4	0.5 Km East of Beni Aqaba	Proposed		400
	PWWTP-E-3	0.5 Km East of Bani Mohammed El Sharkia	Proposed		1,100
				Biba Total	**10,200**
El Wasta	WWTP-1	5 Km South West of Maydum	Planned	20,000	13,300
				El Wasta Total	**13,300**
Ihnasya	WWTP-4	2.5 Km South East of Ihnasya city	Planned	10,000	15,000
				Ihnasya Total	**15,000**
Nasser	WWTP-2	Desert North West of Nasser	Planned	33,000	100
	PWWTP-E-1	0.5 Km East of Gezirt Abu Salih	Proposed		1,100
				Nasser Total	**1,200**
Sumusta	WWTP-6	1.5 Km South West of Sumusta	Planned	10,000	9,600
				Sumusta Total	**9,600**
Grand Total					**142,300**

Capital Cost Estimates

The capital costs for completion of the recommended facilities in the selected plan are provided, by service area, in Table ES-23. Costs are in year 2000 US dollars. Where US contractor costs are given, local costs in US dollars, for the same quality of construction, can be estimated by multiplying the US contractor costs by 0.65.

TABLE ES-23
WASTEWATER STRATEGIC MASTER PLAN SELECTED PLAN
SUMMARY OF ESTIMATED TOTAL CONSTRUCTION COSTS (MILLION US$)
BENI SUEF GOVERNORATE

Service Area	WWTP[1]	Regional Pump Station/ Forcemain[1]	Collection, Pumping Station, and Forcemains[1]		House Connections[2]	Latrines[2]	Total
			Urban[1]	Village[1]			
WWTP-1	12.9	25.0	5.6	119.0	6.5	14.5	183.6
WWTP-2	12.8	23.2	12.8	83.9	5.4	9.9	148.0
WWTP-3	27.1	22.2	31.2	94.3	5.0	10.3	190.0
WWTP-4	13.8	16.0	5.7	130.0	5.2	11.2	181.9
WWTP-5	10.3	24.6	8.9	102.1	5.5	11.1	162.6
WWTP-6	10.8	12.1	5.6	63.7	3.7	7.5	103.4
WWTP-7	11.3	16.0	9.5	111.6	5.7	11.5	165.7
WWTP-E-1	1.5	0.0	0.0	7.7	0.3	0.7	10.1
WWTP-E-2	2.2	0.0	0.0	10.7	0.4	1.0	14.3
WWTP-E-3	1.5	1.4	0.0	8.6	0.3	0.7	12.5
WWTP-E-4	0.9	0.0	0.0	3.4	0.1	0.3	4.7
WWTP-E-5	1.9	0.0	0.0	6.8	0.3	0.7	9.7
Total	**107.0**	**140.6**	**79.2**	**741.9**	**38.5**	**79.4**	**1,186.6**

1 U.S. contractor construction cost
2 Local construction cost
All estimated costs include 20% contingency and 15% engineering

Estimated Land Acquisition Costs

A summary of estimated land acquisition requirements and costs for 2022 by markaz are given in Table ES-24. Land acquisition costs are based on an estimated average cost of L.E. 60,000 (US$ 17,400 per feddan).

TABLE ES-24
WASTEWATER STRATEGIC MASTER PLAN SELECTED PLAN
SUMMARY OF ESTIMATED LAND ACQUISITION AND COSTS
BENI SUEF GOVERNORATE

Markaz	Estimated Land Acquisition Required (Feddans)	Estimated Land Acquisition Cost (Thousand US$)
El Wasta	4.0	70
Nasser	15.5	270
Beni Suef	24.8	432
Ihnasya	2.5	44
Sumusta	3.0	52
Biba	23.1	402
Al Fashn	14.5	252
Total	**87.4**	**1,522**

Operation and Maintenance Cost Estimates

The 2022 annual operation and maintenance costs (year 2000 US dollars) for the selected plan are provided in Table ES-25.

TABLE ES-25
ESTIMATED 2022 ANNUAL O&M COSTS
BENI SUEF GOVERNORATE

Service Area	Estimated 2022 Annual O&M Costs (Million US$)
El Wasta	1.3
Beni Suef	4.4
Nasser	1.2
Ihnasya	1.0
Sumusta	0.8
Biba	1.2
Al Fashn	1.3
East of Nile	0.2
Total	**11.4**

Recommended Additional Authority Programs

- Septic Tank Standards;
- Septic Tank Retro-fit Program (including septage pumping program);
- Small Bore Sewer Pilot Programs;
- Septic Tank Public Awareness Program;
- Regional Pumping Station Capital Investment Program;
- Industrial Pretreatment Program;
- Septage Handling Plan;
- Operation and Maintenance Improvement Programs;
- Safety Program;
- House Connection Financing Programs;
- Latrine Construction Programs;
- Sanitation Public Education Program;
- Effluent Monitoring Programs;
- Customer Registry Program;
- Financial Control Program; and
- Commercialization Programs.

Recommended Further Studies with Estimated Costs, by Priority

Study Name	Estimated Costs in US$
GIS AM/FM Mapping Program	5,000,000
Strategic Master Plan Management Training Program	1,000,000
Infiltration/Inflow Study	1,000,000
Urban Collection System Field Verification Program	500,000
Sludge Management Study	500,000

FIRST STAGE INVESTMENT PROGRAM

FIRST STAGE PROGRAM COMPONENTS

Selection of First Stage Components

BEGAWS First Stage investment Program (FSIP) consists of twenty four infrastructure and technical assistance projects covering the urban and rural water supply and wastewater sectors in the Authority's service area. The FSIP projects were selected through a process involving Harza Team members, and officials from BEGAWS and the governorate

The selection of the water system first stage components consisted of the following methodology:

1. Identify 2007 critical:
   - Water supply deficits by district for regional and local systems; or
   - Water supply and pressure deficits in urban systems.
2. Develop projects to satisfy the critical need deficits using:
   - Urban Systems - Long-term master planned facilities; and
   - Regional Systems - Long-term master planned facilities, where applicable, or intermediate facilities where necessary.
3. Develop projects for critical immediately needed support investigations/programs.

The selection of the wastewater system first stage components consisted of the following methodology:

1. Identify:
   - Wastewater treatment plants requiring rehabilitation or replacement by 2007;
   - Pumping station and force main deficiencies by 2007 in urban systems; and
   - Villages having 2022 populations greater than 20,000 located near wastewater treatment plants whose wastewater pumping stations would serve as regional pumping stations in the master plan.
2. Develop projects to satisfy the critical needs using long-term master planned facilities; and
3. Develop projects for critical immediately needed support investigations/programs.

List, Description, Justification and Estimated Costs of First Stage Components

The estimated cost (US dollar costs) are base year 2000 costs. The costs are based upon the planning level costs provided in Annexes of the Strategic Master Plans. These costs are representative for USAID projects implemented by US contractors working under USAID regulations, including the requirement to furnish and install US equipment or special materials. The estimated project costs include allowances for engineering design, construction management services and cost contingencies.

Table ES-26 gives a summary of these items for the first stage components.

TABLE ES-26
SUMMARY OF FIRST STAGE COMPONENTS

Project Name	Service	Description	Justification	Estimated Cost (US$ Thousands)	
				Capital	Yearly O&M
U.S. Water Treatment Plant Expansion	Urban Water	Construction of an additional second 330 l/s conventional water treatment module at the existing US Water Treatment Facility to increase the total production capability of the plant to 660 l/s. Construction to include: ➢ Enlargement of raw water pumping station and addition of six pumping units; ➢ Two new rectangular flocculation tanks; ➢ Two new rectangular clarifiers; ➢ Five new rapid sand filters; ➢ Associated alum and chlorine storage and feed facilities; ➢ Additional sludge lagoon area; ➢ Two additional rectangular clear water reservoirs; and ➢ Enlargement of finished water pumping station	The Beni Suef City water service area has a current maximum day water demand of approximately 900 l/s. The projected maximum day demand by 2012 is 1130 l/s and by 2022 will be 1430 l/s. Current water production by Beni Suef City's three existing water treatment plants is approximately 740 l/s at their rated capacities. Based on the Harza Team's assessment of the plants, the total maximum production capability of the three plants is approximately 940 l/s. Additional water production capacity will be necessary to meet future maximum day water demands. Only the US Water Treatment Plant has the potential to be expanded to support this growth in water demand.	16,000	555
Beni Suef City WWTP Upgrade/Expansion	Urban Wastewater	A final design study of the Beni Suef Waste Water Treatment Facility rehabilitation and expansion plan to validate the assumptions made in the past studies. The goal of the study will be to identify and evaluate appropriate alternatives for rehabilitating and expanding the existing 26,000-m3/day facility and define the capacity that can be developed within the available area. Specific design criteria will be established, including minimum, average, and peak demands on the treatment system. Applicable upgrade alternatives will be delineated and analyzed. A preferred alternative will be selected for design development.	The existing Beni Suef City wastewater treatment plan has a current estimated capacity of approximately 26,000 m^3/day. This capacity (excluding the limitations of the sand drying beds) was confirmed by the recently completed assessment of the facility. Actual average daily flows to the plant were measured in 1999 to be approximately 35,000 m^3/day. These measurements confirm that the plant is hydraulically overloaded. As a result USAID agreed to proceed with a final design report development project under the Middle Egypt High Priority Projects program and implementation of its recommendations under the First Stage Investment Program.	16,200	1,825
Zone #7 Wastewater Collection System	Urban Wastewater	Install major trunk lines of the wastewater collection system, pumping station, and force main to serve the currently developed areas of Beni Suef's Zone 7. Wastewater from Zone 7 will be routed directly to the City's existing wastewater treatment plant, provided that rehabilitation and expansion of the existing facility under a separate project proves feasible.	Zone 7 is an area within Beni Suef City that has a large potential for growth. The northwest corner of Zone 7, approximately 0.8 km^2 in size, is already well populated the remainder of the area is well suited for further development. This area is projected to have a population of over 20,000 by 2022. Presently, there is no sewer service. BEGAWS has requested that priority be given to extending wastewater collection services to this area.	5,653	135

TABLE ES-26 (Cont.)
SUMMARY OF FIRST STAGE COMPONENTS

Project Name	Service	Description	Justification	Estimated Cost (US$ Thousands)	
				Capital	Yearly O&M
Beni Suef City Infiltration/Inflow Study	Urban Wastewater	Perform a follow up Infiltration/Inflow study to determine if Beni Suef City's wastewater collection system is subjected to excessive amounts of infiltration and/or inflow. Under this study, the estimates of infiltration/inflow developed during the master planning study will be refined and subdivided into the various drainage districts of the City's service area. An analysis will then be performed to determine the portion of the identified infiltration that can be removed from the system.	Portions of the Beni Suef City wastewater service area are subjected to high levels of groundwater. From information collected and analyzed for Beni Suef City's wastewater collection system, it was estimated that up to 18% of the existing wastewater flow is due to infiltration entering the collection system. This amount of infiltration is generally considered to be potentially excessive and warrants further investigation.	1,000	NA
Beni Suef City Water Distribution Improvements	Urban Water	Under this project, hydraulic deficiencies identified during the hydraulic modeling of the Beni Suef City urban water distribution system will be corrected. The proposed water distribution system improvement program is intended to correct current as well as potential problems through 2012. The proposed program will be a combination of new pipelines and the replacement of existing ones too small for future demand conditions. The primary improvement entails construction of a new pipeline northward from the central part of the city to the area where new development is occurring.	As part of the master planning activities, a hydraulic model was developed to analyze the existing water distribution system within the Beni Suef City water service area. Once verified, the model was used to identify current and potential future problems under 2012 and 2022 water demand condition. Several existing hydraulic deficiencies were identified, as well as additional potential problems that will occur in the near-term as growth and related water demands increase. These primarily stem from the fact that extensive growth is occurring to the north of the City while the main sources of water are south along River Nile. These deficiencies need to be addressed or the current level of water service within Beni Suef City will decline.	2,145	49
Qirman Al Arus Wastewater Collection System	Rural Wastewater	Installation of a wastewater collection, pumping station and force main to serve the village of Qirman Al-Arus. This village lies approximately 11 km southeast of the new NOPWASD wastewater treatment plant under construction along the western border of the markaz. The projected 2012 wastewater flow from Qirman Al-Arus is estimated to be approximately 1,095 m^3/day.	Qirman Al Arus is a major unsewered village southwest of El Wasta City. As part of the wastewater master planning activities, it was identified that this village could readily be incorporated into the wastewater service area tributary to the new NOPWASD 20,000 m^3/day trickling filter wastewater treatment plant. The new El Wasta wastewater treatment plant under construction in the desert northwest of El Wasta City will have the capacity to handle this additional flow during this planning period.	9,876	42

TABLE ES-26 (Cont.)
SUMMARY OF FIRST STAGE COMPONENTS

Project Name	Service	Description	Justification	Estimated Cost (US$ Thousands)	
				Capital	Yearly O&M
Barout Wastewater Collection System	Rural Wastewater	Installation of a wastewater collection, pumping station and force main to serve the village of Barout. Barout village lies approximately 6.2 km east of the new NOPWASD wastewater treatment plant under construction in Ihnasya.	Barout is a major un-sewered village in the southwestern portion of Beni Suef Markaz. Wastewater from this village could be incorporated into either the existing wastewater treatment plant serving Beni Suef City or the new NOPWASD wastewater treatment facility in Ihnasya City. Though the Beni Suef plant is closer to Barout , its capacity is limited. Therefore, it is recommended that wastewater be routed to the new Ihnasya wastewater treatment plant under construction to southeast of Ihnasya City and directly west of Barout..	7,267	59
Saft Rasheem Wastewater Collection System	Rural Wastewater	Installation of a wastewater collection, pumping station and force main to serve the village of Saft Rasheem. This village lies approximately 9.3 km northwest of the new NOPWASD wastewater treatment plant under construction southwest of Biba City.	Saft Rasheem is a major unsewered village in the northwest corner of Biba Markaz. Wastewater from Saft Rasheem village could be routed to the new Biba wastewater treatment facility. This plant will have the capacity to handle this additional flow throughout the master planning period.	7,786	34
Sumusta Water System Improvements	Rural Water	Construction of new water transmission mains from the Biba District system to replace the existing contaminated well supplies in this area of Biba and Sumusta. Excess capacity from the Biba District resulting from construction of a new NOPWASD water treatment plant will be adequate to supply this additional demand.	Several groundwater well fields presently supply the villages within the interior districts of Biba (Districts 7 and 8) and Sumusta (District 4). All of the well fields are contaminated therefore, decommissioning of these wells is recommended. Excess capacity from the new Biba water treatment plant will adequately satisfy this additional demand in the near-term.	25,521	185
Mazoura Wastewater Collection System	Rural Wastewater	This proposed project consists of the installation of a wastewater collection, pumping station and force main to serve the village of Mazoura. This village lies approximately 5 km southwest of the new NOPWASD wastewater treatment plant under construction southwest of Sumusta City. The projected 2012 wastewater flow from Mazoura is estimated to be approximately 1,400 m^3/day.	Mazoura is a major unsewered village in the southwest corner of Sumusta Markaz. As part of the wastewater master planning activities, it was identified that this village could readily be incorporated into the wastewater service area tributary to the new NOPWASD 10,000 m^3/day oxidation ditch wastewater treatment plant. The new Sumusta wastewater treatment plant is under construction in the central portion of the markaz just southwest of Sumusta City. This plant will have the capacity to handle this additional flow during this planning period.	9,182	46

TABLE ES-26 (Cont.)
SUMMARY OF FIRST STAGE COMPONENTS

Project Name	Service	Description	Justification	Estimated Cost (US$ Thousands)	
				Capital	Yearly O&M
El Fent Wastewater Collection System	Rural Wastewater	This proposed project consist of the installation of a wastewater collection, pumping station and force main to serve the village of El Fent. This village lies approximately 10.2 km southeast of the new NOPWASD wastewater treatment plant under construction southwest of Al Fashn City. The projected 2012 wastewater flow from El Fent is estimated to be approximately 920 m^3/day.	El Fent is a major unsewered village in the southeast corner of Al Fashn Markaz. As part of the wastewater master planning activities, it was identified that this village could readily be incorporated into the wastewater service area tributary to the new NOPWASD 20,000 m^3/day trickling filter wastewater treatment plant in Al Fashn. The new Al Fashn wastewater treatment plant is under construction in the central portion of the markaz just southwest of Al Fashn City. This plant will have the capacity to handle this additional flow during this planning period.	8,104	34
Appurtenant Assessment & Repair/ Replacement	Regional/ Urban Water	The purpose of this project is to initiate a program for the inspection, assessment, repair and/or replacement of faulty water transmission and distribution system appurtenances such as line valves and air release valves.	During the master planning activity existing conditions field investigations, it was determined that a large number of existing water transmission and distribution system appurtenances, such as line valves, air release valves, etc. were leaking. These leaking appurtenances were found to contribute significantly to potable water loss and unaccounted for water. In many cases, repair or replacement of these appurtenances is very economical. Their repair/replacement will go a long way to reduce the leakage and unaccounted for water within the Beni Suef developing regional and existing urban water systems.	1,000	NA
Sludge Management Study	Regional Wastewater	The purpose of this project is to develop a governorate-wide sludge management plan for Beni Suef.	Historically, sludges generated from the Beni Suef City Wastewater Treatment Facility have been gravity thickened and then dewatered on-site using sand drying beds. The dewatered sludge is removed and hauled by the local farmers to be used as a fertilizer. Problems have been reported in the timely removal of the dewatered material from the drying beds, thus restricting the capacity of the dewatering system. Further there exists no enforced monitoring program to insure that wastewater sludge is properly treated before disposal. A well-defined sludge management program will provide the framework to develop adequate solids treatment, storage and disposal protocol for wastewater sludge.	500	NA

TABLE ES-26 (Cont.)
SUMMARY OF FIRST STAGE COMPONENTS

Project Name	Service	Description	Justification	Estimated Cost (US$ Thousands)	
				Capital	Yearly O&M
Hydro-geological & Groundwater Study	Rural Water	A hydro-geologic study to define the aquifer systems in the Beni Suef Governorate, delineate their boundaries, and evaluate their long term sustainable yield and ultimate capacity under varying management strategies. Additionally, an assessment of the pollution potential at well sites based on factors such as depth to water table, sorption capacity of the soil, hydraulic conductivity, water table gradient and distance to pollution source. Wellhead protection and other measures necessary to preserve groundwater quality will be recommended based upon the fore mentioned assessment.	Biological and/or chemical (iron, manganese and sodium chloride) constituents are presently contaminating groundwater supplies throughout the Beni Suef Governorate. Some of these problems are a direct result of village development and irrigation practices. Others are due to geologic conditions within the aquifer. As a result, many potable wells are contaminated to levels exceeding the GOE minimum drinking water quality standards. It is recommended that potable water drawn from contaminated wells be treated if practical or abandoned. The reliance on groundwater as a potable supply will decrease as surface water supplies and transmission systems are constructed to provide water to the more populated rural districts. Isolated villages however, may continue to rely upon groundwater. Given the limited available information on the nature and extent of groundwater in these areas, it is recommended that a hydro-geological study be performed to assist in identifying potential sites that can be developed as groundwater supplies and recommending measures to protect water quality of groundwater sources.	2,028	NA
Transmission Main Leak Repair	Regional Water	Implementation of an aggressive water loss and leak repair program for the Beni Suef regional water transmission mains. Activities to be performed during this program should include but not limit to: Locating and measuring leaks: ➢ Assessing leak repair needs; ➢ Prioritizing the leaks; and ➢ Repairing leaks.	Beni Suef Governorate has a large number of regional transmission mains. Harza's evaluation and assessment of the existing transmission mains determined that extensive water leakage apparently occurs. This leakage results in: ➢ Lost water system revenues; ➢ Inefficient regional water system operation; and ➢ Inefficient utilization of limited water system resources. Implementation of a major transmission water loss and leak repair program will aid to control and minimize these impacts in the future.	1,000	NA

TABLE ES-26 (Cont.)
SUMMARY OF FIRST STAGE COMPONENTS

Project Name	Service	Description	Justification	Estimated Cost (US$ Thousands)	
				Capital	Yearly O&M
Nasser/El Wasta Markaz Water System Improvements – Districts 17 and El Wasta	Rural Water	Construction of regional transmission mains to connect the villages in District 17 and El Wasta District to the El Wasta regional system. Approximately 22 km of new transmission are recommended under this program.	District 17 and El Wasta District together have a projected 2007 water supply deficit of 51 l/s, since the majority of the area's wells are contaminated. The City of El Wasta has a 2007 surplus of 64 l/s. The surplus from the city can be used to supply the villages in these districts.	8,977	37
Nasser/El Wasta Markaz Water System Improvements - District 16	Rural Water	Conduct hydro-geologic studies in District 16 to determine the location of a new well field. Three 30 l/s wells are required to meet the district's needs up to the year 2012. The cost includes well and storage construction costs as well as contingency and anticipated engineering fees.	Several groundwater well fields and compact units currently supply villages in District 16, west of the Nile River in El Wasta Markaz. These villages are also connected to the Ihansya regional system. It is known that one well field, located near Kamn El Arous, is contaminated. If this well is decommissioned, the affected villages will have a projected deficit of 38 l/s by 2007. An additional source of water is required for this area until the MEMPP-proposed regional system is operational.	1,737	114
Nasser/El Wasta Markaz Water System Improvements - Districts 14	Rural Water	Conduct hydro-geologic studies in District 14 to determine the location of new well fields near Ashmant, Tansa el Malaq, and Dalass Villages The cost listed above includes well and storage construction costs as well as contingency and anticipated engineering fees.	District 14 has a projected 2007 deficit of 60 l/s. The district is currently supplied water by well fields and a compact unit. Three of the four well fields in the district are contaminated. Temporary water supplies are needed until the new NOPWASD water treatment plant in Nasser Markaz is in operation.	2,315	151
Nasser/El Wasta Markaz Water System Improvements - Nasser District	Rural Water	Conduct hydro-geologic studies in Nasser District to determine the location of new well fields required near Nasser City. The cost listed above includes well and storage construction costs as well as contingency and anticipated engineering fees.	Nasser District has a projected 2007 deficit of 161 l/s. Three compact units, two well fields, and a 35 l/s water treatment plant currently supply the district. Both well fields are chemically and/or biologically contaminated. Thus, temporary water supplies are needed until the new NOPWASD water treatment plant in Nasser Markaz is in operation and able to meet the district's needs.	4,052	265

TABLE ES-26 (Cont.)
SUMMARY OF FIRST STAGE COMPONENTS

Project Name	Service	Description	Justification	Estimated Cost (US$ Thousands)	
				Capital	Yearly O&M
Ihnasya Markaz Water System Improvements	Rural Water	Construction of a new water treatment plant near Bhnmouth Village. Components of the proposed water supply include a: ➢ Water intake from the River Nile; ➢ Conventional 300 l/s surface water treatment plant, and; ➢ Finished water transmission main to connect to the existing water distribution system.	Ihnasya Markaz is presently supplied by a 200 l/s water treatment plant in Masarat Nassan Village. The markaz shares this supply with villages in EL Wasta and Nasser Markez with exception of several villages in Ihansya Markaz that have local supplies. The City of Ihnasya and its surrounding villages are projected to have a water deficit of 152 l/s by the year 2007. Additional potable water supply is necessary to meet future water demands within this service area.	19,454	505
Beni Suef Markaz Water System Improvements - District 12	Rural Water	Conduct hydro-geologic studies in District 12 to determine the locations of new well fields. Costs include well and storage construction, as well as contingency and anticipated engineering fees.	District 12, located west of the Nile River in Beni Suef Markaz, is currently supplied potable water by well fields. Two of the three well fields in this service area are contaminated. The affected villages are predicted to have a deficit of 71 l/s by the year 2007. Additional sources of water are required until the regional system proposed under the 2022 Master plan is operational.	2,895	189
Beni Suef Markaz Water System Improvements - District 11	Rural Water	A hydro-geologic study to determine the location of new well fields in Distrect11. The costs include well and storage construction as well as contingency and anticipated engineering fees. Construction of approximately 940-meter of 250 -mm transmission main to connect Damoushia Village to Manshaat Asim water supply.	All of the well fields in District 11, located west of the Nile River in Beni Suef Markaz are contaminated The district relies on one compact unit, located in Manshaat Asim Village. Additionally, the village of Damoushia has a contaminated well, and is not connected to the Manshaat Asim water supply. Additional sources of water are required for this service area.	3,712	227
Sumusta Markaz System Improvements	Rural Water	A hydro-geologic study near the Ezbat El Shantour well field is recommended to determine the well field's suitability for expansion. Construction of a 30 l/s slow sand filter to serve District 3 and the village El Mahmoudia. The filter, will be constructed near Beni Soleiman village and will use the Bahr Youssef as its water source.	The villages in District 7, located east of Bahr Youssef and west of the Nile River in Sumusta Markaz, are currently supplied potable water by groundwater well field. Two of the three well fields in the district 7 are contaminated resulting in a projected water deficit of 57 l/s by 2007. The villages in District 3 and Al Mahmoudia, located near the Bahr Youssef, face a collective water deficit of 23 l/s in 2007. Thus, an additional supply is required for this service area.	3,221	44

TABLE ES-26 (Cont.)
SUMMARY OF FIRST STAGE COMPONENTS

Project Name	Service	Description	Justification	Estimated Cost (US$ Thousands)	
				Capital	Yearly O&M
AM/FM GIS System	Governorate Water and Wastewater	Develop an AM/FM GIS system for Beni Suef Governorate. Including but not limited to: ➢ GIS facility mapping , ➢ GIS distribution/collection system mapping, ➢ Customer databases, ➢ Facility databases, ➢ Base mapping at an appropriate scale, ➢ Digital imagery, ➢ Hydraulic modeling, ➢ Interactive billing and collection systems, ➢ Work order control, ➢ Facilities inventories, and ➢ Organizational information.	An Automated Mapping/Facilities Management Georaphic Information System can form the basis of an integrated information system that can greatly enhance the ability of the EGAWS to function effectively. In each of the following areas it can form the basis of an integrated geographic data base, these areas include, but are not limited to: An AM/FM GIS will enable BEGAWS to operate more effectively on a day basis and will position the utility to better control its future development.	5,000	NA

IMPLEMENTATION PLAN

Project Priority and USAID Participation Selection

The projects comprising the FSIP are identified, as projects required to be completed by year 2012. The FSIP projects are divided into two phases:

- First phase FSIP projects defined as those immediately needed and scheduled for completion by year 2004 (top priority);
- Second phase FSIP projects defined as projects scheduled for completion in years 2005 through 2012 (medium priority).

The projects included in the BEGAWS FSIP are listed in Table ES-27 with their

TABLE ES-27
FSIP PROJECTS
BENI SUEF GOVERNORATE

FSIP No.	Project Name	Estimated Costs (US$)	Priority
B-01	Beni Suef City (Water): Expansion of US WTP	16,000,000	Top
B-02	Beni Suef City (Wastewater): WWTP Rehab/Expansion	16,200,000	Top
B-03	Beni Suef City (Wastewater): Zone # 7Collection System	5,653,000	Top
B-04	Beni Suef City Infiltration / Inflow Studies (Wastewater)	1,000,000	Top
B-05	Beni Suef City (Water): Beni Suef City Distribution Sys. Imps	2,145,000	Top
B-06	Qirnan Al Arus WW Collection System (El Wasta Markaz)	9,876,000	Medium
B-07	Barout WW Collection System (Inasya Markaz)	7,267,000	Medium
B-08	Saft Rasheem WW Collection System (Biba Markaz)	7,786,000	Medium
B-09	Sumusta Water System Improvements (Biba/Sumusta Markaz)	25,521,000	Medium
B-10	Mazoura WW Collection System (Sumusta Markaz)	9,182,000	Medium
B-11	El Fent WW Collection System (Al Fashn Markaz)	8,104,000	Medium
B-12	Appurtenant Assessment & Repair/Repl. (Regional WS)	1,000,000	Top
B-13	Sludge Management Study (Regional WW)	500,000	Top
B-14	Hydrogeologic and Groundwater Studies (Regional WS)	2,028,000	Top
B-15	Transmission Main and Leak Repair (Regional WS)	1,000,000	Top
B-16	Improvement District 17 and El Wasta (Regional WS)	8,977,000	Medium
B-17	Improvement District 16 (Regional WS)	1,737,000	Medium
B-18	Improvement District 14 (Regional WS)	2,315,000	Medium
B-19	Improvements - Nasser District (Regional WS)	4,052,000	Medium
B-20	Ihnasya Markaz Water System Improvements (Regional WS)	19,454,000	Medium
B-21	Beni Suef Markaz Wat. Sys. Improvements- District 12 (Regional WS)	2,895,000	Medium
B-22	Beni Suef Markaz Wat. Sys. Improvements- District 11 (Regional WS)	3,712,000	Medium
B-23	Sumusta Markaz Water System Improvements (Regional WS)	3,221,000	Medium
B-24	GIS Enhancement & Hydraulic Model Calibration. (Regional WS/WW)	5,000,000	Top
Total		**164,625,000**	

USAID and officials from BEGAWS and the governorate preliminarily selected projects for USAID implementation participation. The projects are listed in Table III-28.

TABLE ES-28
FSIP PROJECTS SELECTED FOR USAID IMPLEMENTATION PARTICIPATION
BENI SUEF GOVERNORATE

FSIP No.	Project Name	Estimated Costs (US$)
B-01	Beni Suef City (Water): Expansion of US WTP	16,000,000
B-02	Beni Suef City (Wastewater): WWTP Rehab/Expansion	16,200,000
B-03	Beni Suef City (Wastewater): Zone # 7Collection System	5,653,000
B-05	Beni Suef City (Water): Beni Suef City Distribution Sys. Imps	2,145,000
Total		**39,998,000**

Thus, a major requirement for FSIP implementation is BEGAWS actions to provide or obtain funding for the portion of the first phase projects, which will not have USAID participation, and all of the FSIP's second phase projects.

Cost Schedule

The cost matrices shown in Tables ES-29 and ES-30 respectively illustrate the cost and construction schedules for first and second phases of BEGAWS' FSIP.

Each table is divided into two portions:

1. The first portion of each of the tables indicates the projected base costs expenditures by year for each of the projects listed in the left hand column. The annual expenditures for each project are estimated by applying the percentages shown in the heading area of each table.

2. The second portion of each of the tables applies inflation to the base costs allocations. An inflation rate of six percent per year on all costs has been applied throughout the twelve year (2001-2012) FSIP period. In effect the second portion of the tables presents the projected annual expenditure valued in the year they are expected to be made. The sum of the annual costs represent the total expenditure for each project over the total project cycle shown.

Table ES-30, for the projects covered in the second phase of the FSIP, adjusts the base costs for inflation and also adjusts the base costs downward to reflect the fact that these projects will be local projects with no USAID participation, and can be constructed solely by Egyptian contractors, using local specifications and without the need to purchase US equipment or special materials. A ratio of 65% was adopted as the factor to convert the US base costs to local costs associated with purely local projects.

As shown in Table ES-29, BEGAWS' first phase FSIP is estimated to cost approximately US$ 60 million including inflation (about LE 210 million at US$ 1 = LE 3.5) for ten projects to be constructed over the year 2001 through 2004 period. USAID is expected to provide about two thirds of Table ES-28 project costs as a grant to BEGAWS.

As shown in Tables ES-30 and ES-31, BEGAWS' second phase FSIP is estimated to cost approximately US$ 109 million (about LE 382 million at US$ 1 = LE 3.5) for fourteen projects to be implemented throughout the BEGAWS service area over the period covering year 2004 through 2012. This phase two FSIP is not expected to have any USAID participation.

TABLE ES-29
PHASE ONE FSIP PROGRAM
BASE COST ANALYSIS
BENI SUEF GOVERNORATE

BASIS OF PROGRAM :

PROJECT DURATION :
Studies : One to two years; Annual Expenditure rate of base cost= 50 t0 100 %
Infrastructure:

Cost = $10 million or less	Annual Expenditure rate of base cost=	15%	45%	40%		
Cost > $10mill.< 20 million		10%	30%	35%	25%	
Cost > $20 million		10%	25%	25%	25%	15%

Inflation rate = 6% on all items of cost
Adjustment to Egyptian Prices (non-USAID Projects) = 65% of base costs

BEGAWS - PHASE ONE FSIP **INCLUDING USAID SPONSORED PROJECTS -- BASE COST ANALYSIS**

Id No.	PROJECT NAME	SECTOR	PRIORITY	Year 2000 Base Cost (thous $)	Estimated Base Cost Expenditure Per Year				
					Year 2001	Year 2002	Year 2003	Year 2004	Year 2005
					(All Cost in $, thousands)				
B-01	BS City US WTP Expansion	WS-Urban	TOP-USAID (1)	16,000	1,600	4,800	5,600	4,000	-
B-02	BS City US WWTP Rehab/Exp.	WW-Urban	TOP-USAID (1)	16,200	1,620	4,860	5,670	4,050	
B-03	Zone 7 WW Collection System	WW-Urban	TOP-USAID (1)	5,653	848	2,544	2,261	-	
B-04	Infiltration/Inflow Study BS City	WW-Urban	TOP (3)	1,000		500	500		
B-05	BS City Distrib. Syst. Imps.	WS-Urban	TOP-USAID (1)	2,145	322	965	858	-	
B-12	Appurtenant. Repair/Replace.	WS Reg/Urban	TOP (3)	1,000		500	500		
B-13	Sludge Management Study	WW-Regional	TOP (3)	500		500			
B-14	Hydrogeologic Studies	WS Regional	TOP (3)	2,000			1,000	1,000	
B-15	Transmission Main Leak Repair	WS Regional	TOP (3)	1,000		500	500		
B-24	GIS Enhance & Hyd. Mod Cal	Water/WW	TOP-USAID (2)	5,000	1,250	1,250	1,250	1,250	
								-	
	Sub-Total - Base Cost			50,498	5,640	16,419	18,139	10,300	
	Inflation Allowance (6% on all costs)			8,536	338	2,029	3,465	2,704	
	Totals incl. Inflation			**59,034**	**5,978**	**18,449**	**21,604**	**13,004**	-

Note (1) These project preliminarily selected by USAID for inclusion in their funded FSIP program at a level of about approximately 65% of the total cost.
Note (2) This project preliminarily selected by USAID and governorate officials for funding
Note (3) These projects of highest priority should additional USAID funds become available

TABLEES-29 (Cont.)
PHASE ONE FSIP PROGRAM
COST ANALYSIS INCLUDING INFLATION
BENI SUEF GOVERNORATE

BASIS OF PROGRAM :

PROJECT DURATION :
Studies : One to two years; Annual Expenditure rate of base cost= 50 t0 100 %
Infrastructure:

Cost = $10 million or less	Annual Expenditure rate of base cost=	15%	45%	40%			
Cost > $10mill.< 20 million		10%	30%	35%	25%		
Cost > $20 million		10%	25%	25%	25%	15%	

Inflation rate = 6% on all items of cost
Adjustment to Egyptian Prices (non-USAID Projects) = 65% of base costs

BEGAWS - PHASE ONE FSIP **INCLUDING USAID SPONSORED PROJECTS -- COST ANALYSIS INCLUDING INFLATION**

Id No.	PROJECT NAME	SECTOR	PRIORITY	Year 2000 Base Cost (thous $)	Total Project Cost w/Infl. (thous $)	Estimated Cost Expenditure Incl. Inflation Per Yr. Year 2001	Year 2002	Year 2003	Year 2004	Year 2005
						(All Cost in $, thousands)				
B-01	BS City US WTP Expansion	WS-Urban	TOP-USAID (1)	16,000	18,809	1,696	5,393	6,670	5,050	-
B-02	BS City US WWTP Rehab/Exp.	WW-Urban	TOP-USAID (1)	16,200	19,044	1,717	5,461	6,753	5,113	-
B-03	Zone 7 WW Collection System	WW-Urban	TOP-USAID (1)	5,653	6,450	899	2,858	2,693	-	-
B-04	Infiltration/Inflow Study BS City	WW-Urban	TOP (3)	1,000	1,157	-	562	596	-	-
B-05	BS City Distrib. Syst. Imps.	WS-Urban	TOP-USAID (1)	2,145	2,448	341	1,085	1,022	-	-
B-12	Appurtenant. Repair/Replace.	WS Reg/Urban	TOP (3)	1,000	1,157	-	562	596	-	-
B-13	Sludge Management Study	WW-Regional	TOP (3)	500	562	-	562	-	-	-
B-14	Hydrogeologic Studies	WS Regional	TOP (3)	2,000	2,453	-	-	1,191	1,262	-
B-15	Transmission Main Leak Repair	WS Regional	TOP (3)	1,000	1,157	-	562	596	-	-
B-24	GIS Enhance & Hyd. Mod Cal	Water/WW	TOP-USAID (2)	5,000	5,796	1,325	1,405	1,489	1,578	
	Totals incl. Inflation			**50,498**	**59,034**	**5,978**	**18,449**	**21,604**	**13,004**	**-**

Note (1) These project preliminarily selected by USAID for inclusion in their funded FSIP program at a level of about approximately 65% of the total cost.
Note (2) This project preliminarily selected by USAID and governorate officials for funding
Note (3) *These projects of highest priority should additional* USAID funds become available

TABLE ES-30
PHASE TWO FSIP PROGRAM
BASE COST ANALYSIS - WATER SUPPLY
BENI SUEF GOVERNORATE

BASIS OF PROGRAM :

PROJECT DURATION :
Studies : One to two years; Annual Expenditure rate of base cost= 50 t0 100 %
Infrastructure:

Cost = $10 million or less	Annual Expenditure rate of base cost=	15%	45%	40%			
Cost > $10mill.< 20 million		10%	30%	35%	25%		
Cost > $20 million		10%	25%	25%	25%	15%	

Inflation rate = 6% on all items of cost
Adjustment to Egyptian Prices (non-USAID Projects) = 65% of base costs

BEGAWS - PHASE TWO FSIP **WATER SUPPLY FSIP ALL NON - USAID SPONSORED PROJECTS -- BASE COST ANALYSIS**

Id No.	PROJECT NAME	SECTOR	PRIORITY	Year 2000 Base Cost (thous $)	Estimated Base Cost Expenditure Per Year (All Cost in $, thousands) Year 2001	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
B-09	Samusta Water Syst. Improves.	WS-Rural	TOP	25,521				2,552	6,380	6,380	6,380	3,828				
B-16	Improve. Distr. 17 and El Wasta	WS Regional	MEDIUM	8,977					1,347	4,040	3,591	-				
B-17	Improvement District 16	WS Regional	MEDIUM	1,737					261	782	695	-	-			
B-18	Improvement District 14	WS Regional	MEDIUM	2,315					347	1,042	926	-	-	-		
B-19	Improvements - Nassr District	WS Regional	MEDIUM	4,052					608	1,823	1,621	-	-	-		
B-20	Ihnasya Markaz Wat.Syst. Impr.	WS Regional	MEDIUM	19,454					1,945	5,836	6,809	4,864	-	-		
B-21	BS Mark. Wat. Syst.Imps.Dist.12	WS Regional	MEDIUM	2,895					434	1,303	1,158	-	-	-		
B-22	BS Mark. Wat. Syst.Imps.Dist.11	WS Regional	MEDIUM	3,712					557	1,670	1,485	-	-	-		
B-23	Samusta Markaz Wat. Sys. Impr.	WS Regional	MEDIUM	3,221					483	1,449	1,288	-	-	-		
	Total - Base Costs - Unadjusted			**71,884**	-	-	-	**2,552**	**12,362**	**24,326**	**23,953**	**8,692**	-	-	-	-

TABLEES-30 (Cont.)
PHASE TWO FSIP PROGRAM
COST ANALYSIS INCLUDING INFLATION - WATER SUPPLY
BENI SUEF GOVERNORATE

BASIS OF PROGRAM :

PROJECT DURATION :
Studies : One to two years; *Annual Expenditure rate of base cost= 50 t0 100 %*
Infrastructure:

Cost = $10 million or less	Annual Expenditure rate of base cost=	15%	45%	40%		
Cost > $10mill.< 20 million		10%	30%	35%	25%	
Cost > $20 million		10%	25%	25%	25%	15%

Inflation rate = 6% on all items of cost
Adjustment to Egyptian Prices (non-USAID Projects) = 65% of base costs

BEGAWS - PHASE TWO FSIP **WATER SUPPLY FSIP- ALL NON - USAID SPONSORED PROJECTS -- COST ANALYSIS INCLUDING INFLATION AND COST ADJUSTMENTS**

Id No.	PROJECT NAME	SECTOR	PRIORITY	Year 2000 Base Cost (thous $)	Total Project Cost w/Infl. And and Adjustmen (thous $)	Year 2001	Year 2002	Year 2003	Year 2004	Estimated Total Cost Expenditure Per Year Including Inflation and Adjustments to Cost (All Cost in $, thousands) Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
B-09	Samusta Water Syst. Improves.	WS-Rural	TOP	25,521	23,729				2,094	5,550	5,883	6,236	3,966	-	-	-	-
B-16	Improve. Distr. 17 and El Wasta	WS Regional	MEDIUM	8,977	8,406				-	1,171	3,725	3,510	-	-	-	-	-
B-17	Improvement District 16	WS Regional	MEDIUM	1,737	1,626				-	227	721	679	-	-	-	-	-
B-18	Improvement District 14	WS Regional	MEDIUM	2,315	2,168				-	302	961	905	-	-	-	-	-
B-19	Improvements - Nassr District	WS Regional	MEDIUM	4,052	3,794				-	529	1,681	1,584	-	-	-	-	-
B-20	Ihnasya Markaz Wat.Syst. Impr.	WS Regional	MEDIUM	19,454	18,767				-	1,692	5,381	6,655	5,039	-	-	-	-
B-21	BS Mark. Wat. Syst.Imps.Dist.12	WS Regional	MEDIUM	2,895	2,711				-	378	1,201	1,132	-	-	-	-	-
B-22	BS Mark. Wat. Syst.Imps.Dist.11	WS Regional	MEDIUM	3,712	3,476				-	484	1,540	1,451	-	-	-	-	-
B-23	Samusta Markaz Wat. Sys. Impr.	WS Regional	MEDIUM	3,221	3,016				-	420	1,336	1,259	-	-	-	-	-
	Totals incl. Inflation and Price Adjustments				**67,691**			**-**	**2,094**	**10,753**	**22,429**	**23,410**	**9,005**	**-**	**-**	**-**	**-**

TABLE ES-31
PHASE TWO FSIP PROGRAM
BASE COST ANALYSES - WASTEWATER
BENI SUEF GOVERNORATE

BASIS OF PROGRAM :

PROJECT DURATION :

Studies : One to two years; Annual Expenditure rate of base cost= 50 t0 100 %

Infrastructure:

Cost = $10 million or less	Annual Expenditure rate of base cost=	15%	45%	40%			
Cost > $10mill.< 20 million		10%	30%	35%	25%		
Cost > $20 million		10%	25%	25%	25%	15%	

Inflation rate = 6% on all items of cost

Adjustment to Egyptian Prices (non-USAID Projects 65% of base costs

BEGAWS - PHASE TWO FSIP **WASTEWATER FSIP - ALL NON - USAID SPONSORED PROJECTS -- BASE COST ANALYSIS**

Id No.	PROJECT NAME	SECTOR	PRIORITY	Year 2000 Base Cost (thous $)	Estimated Base Cost Expenditure Per Year (All Cost in $, thousands)											
					Year 2001	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
B-06	Qiman Al Arus WW Collect. Syst.	WW-Rural	MID	9,876					1,481	4,444	3,950	-				
B-07	Barout WW Collection System	WW-Rural	MID	7,267					1,090	3,270	2,907					
B-08	Shaft Rash.WW Collect. Syst.	WW-Rural	MID	7,786						1,168	3,504	3,114				
B-10	Mazoura WW Collection Syst.	WW-Rural	MID	9,182						1,377	4,132	3,673	-			
B-11	El Fent WW Collection Syst.	WW-Rural	MID	8,104							1,216	3,647	3,242		-	
	Total - Base Costs - Unadjusted			**42,215**					**2,571**	**10,260**	**15,708**	**10,434**	**3,242**	-	-	-

BEGAWS - PHASE TWO FSIP **WASTEWATER FSIP ALL NON - USAID SPONSORED PROJECTS -- COST ANALYSIS INCLUDING INFLATION AND COST ADJUSTMENTS**

Id No.	*PROJECT NAME*	*SECTOR*	*PRIORITY*	Year 2000 Base Cost (thous $)	Total Project Cost w/Infl. And and Adjustmen (thous $)	Estimated Total Cost Expenditure Per Year Including Inflation and Adjustments to Cost (All Cost in $, thousands)										
						Year 2001	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
B-06	Qiman Al Arus WW Collect. Syst.	WW-Rural	MID	9,876	9,247					1,289	4,098	3,861	-	-	-	-	-
B-07	Barout WW Collection System	WW-Rural	MID	7,267	6,804					948	3,015	2,841	-	-	-	-	-
B-08	Shaft Rash.WW Collect. Syst.	WW-Rural	MID	7,786	7,728					-	1,077	3,424	3,227	-	-	-	-
B-10	Mazoura WW Collection Syst.	WW-Rural	MID	9,182	9,113					-	1,270	4,038	3,805	-	-	-	-
B-11	El Fent WW Collection Syst.	WW-Rural	MID	8,104	8,526					-	-	1,188	3,778	3,560	-	-	-
	Total - Base Costs - Unadjusted			**42,215**	**41,419**					**2,237**	**9,460**	**15,353**	**10,810**	**3,560**	-	-	-

FINANCIAL ANALYSIS

General

Cost matrices are shown in Tables ES-29 and ES-30 respectively. The Tables illustrate the cost and construction schedules for first and second phases of BEGAWS' FSIP.

FSIP Capital Cost Requirements

General

The Authority's total annual cost will be increased by the capital cost requirements of the FSIP and increases in O&M costs due to operating any new facilities. The FSIP's annual capital cost requirements will be comprised of the interest and principal payments required to service any loans taken to construct the infrastructure, and conduct the special studies as recommended in the FSIP. In addition, annual costs will increase to an even greater degree due to increased O&M costs for the existing facilities.

Tables ES-32A and ES-32B illustrate the projected annual expenditures of capital costs required for BEGAWS to implement the Phase Two FSIPs for water supply and wastewater. Only the Phase Two FSIP's are analyzed as it is assumed that the Authority would have no capital cost responsibility for the first phase FSIP planned for the year 2001 through 2004 period. This is equivalent to assuming the first phase FSIP will be constructed using USAID grant funds supplemented by NIB funding which will totally be paid back by the MoF. This is logical considering the MoF is treating BEGAWS as a fledgling authority and as such, the MoF will assume the non-USAID funded portion of the first major construction program of the Authority.

BEGAWS Phase Two FSIP consists of 9 water supply and 5 wastewater projects planned for implementation in the year 2004 through 2012 period. Tables III-32A and III-32B are formulated assuming the annual capital cost expenditures - as shown in the lower portions of Tables ES-30 and ES-31 - are provided each year as a separate loan from the NIB. This is a very conservative approach as all or a portion of these capital costs may be covered by external funding sources discussed in the previous section, and/or portions of these capital costs be covered by the MoF without charge to BEGAWS.

The analyses illustrated in Tables ES-32A and ES-32B indicate that the annual cost requirements for implementing the water supply and wastewater components of the Phase two FSIP.

FSIP Affect on Annual Charges and Tariffs

General

The discussion in the previous section and even a cursory examination of Tables ES-32A and ES-32B clearly indicate that whatever level of FSIP is adopted the tariffs for both water and wastewater service will have to increase for BEGAWS to become a financially self sustaining authority. A close examination of Tables ES-32A and ES-32B provides a good indication of the required tariff levels for various levels of payback of the debt service required to finance the FSIP.

Table ES-32A indicates that for year 2005 the estimated required tariff yield to cover all costs for the water supply service ranges from LE 0.47 per M3 to 0.56 per M3 respectively for zero payback of the debt service to 100 percent payback of the debt service. For year 2010, the

TABLE ES-32 PART (A)
PHASE TWO FSIP - NON USAID SPONSORED WATER SUPPLY PROJECTS
BENI SUEF GOVERNORATE

APPROXIMATE IMPACT ON PROJECTED TARIFFS FOR BEGWAS PHASE TWO FSIP WATER SUPPLY PROGRAM
ANALYSIS BASED UPON NIB FUNDING ONLY, TREATING AMOUNT REQUIRED IN EACH YEAR AS A SEPARATE LOAN

NIB LOAN TERMS : 15 YEAR PAYBACK PERIOD, AT AN INTEREST RATE OF 12%, WITH A THREE YEAR GRACE PERIOD ON CAPITAL RE-PAYMENT

YEAR	WS Capital Required In Year Note (1)	Amount of Capital to be Repaid at 100%	Annual Payment Required	Year of First Repayment w/3 Yr. Grace Period	Amount Owed If BEGWAS at Begin. of year	P Paid in Yr. At Term = 12 Years	Amount Owed at End of Year	Interest at 12.00% per/yr. Paid in Year	Total Annual Payment	Water Supply Delivered to Customers Note (2)	Unit Cost of Capital Repayment			Approximate Cost per M3 For O&M Only	Total Cost Recovery Requirement Per Cubic Meter		
											If BEGWAS Repays 100%	If BEGWAS Repays 50%	If BEGWAS Repays 33%		If BEGWAS Repays 100%	If BEGWAS Repays 50%	If BEGWAS Repays 33%
	(thous $)	(thous $)	(thous $)		(thous $)	(thous $)	(thous $)	(thous $)	(thous $)	Million M3/Yr.	LE/M3	LE/M3	LE/M3	LE/M3	LE/M3	LE/M3	LE/M3
2001					-		-										
2002					-		-										
2003	-	-	-		-		-	-	-								
2004	2,094	2,094	175	2007	2,094		2,094	251	251	58.29	0.02	0.01	0.00	0.44	0.46	0.45	0.45
2005	10,753	10,753	896	2008	12,847		12,847	1,542	1,542	60.43	0.09	0.04	0.03	0.47	0.56	0.51	0.50
2006	22,429	22,429	1,869	2009	35,276		35,276	4,233	4,233	62.57	0.24	0.12	0.08	0.50	0.73	0.61	0.57
2007	23,410	23,410	1,951	2010	58,687	175	58,512	7,042	7,217	64.71	0.39	0.20	0.13	0.53	0.92	0.72	0.66
2008	9,005	9,005	750	2011	67,517	1,071	66,446	8,102	9,173	66.85	0.48	0.24	0.16	0.56	1.04	0.80	0.72
2009	-	-	-		66,446	2,940	63,507	7,974	10,913	68.99	0.55	0.28	0.18	0.59	1.15	0.87	0.77
2010	-	-	-		63,507	4,891	58,616	7,621	12,511	71.13	0.62	0.31	0.20	0.63	1.24	0.93	0.83
2011	-	-	-		58,616	5,641	52,975	7,034	12,675	73.27	0.61	0.30	0.20	0.66	1.27	0.97	0.86
2012	-	-	-		52,975	5,641	47,334	6,357	11,998	75.41	0.56	0.28	0.14	0.70	1.26	0.98	0.84
2013					47,334	5,641	41,693	5,680	11,321	77.67	0.51	0.26	0.13	0.75	1.26	1.00	0.87
2014					41,693	5,641	36,052	5,003	10,644	79.93	0.47	0.23	0.12	0.79	1.26	1.02	0.91
2015					36,052	5,641	30,411	4,326	9,967	82.20	0.42	0.21	0.11	0.84	1.26	1.05	0.94
2016					30,411	5,641	24,770	3,649	9,290	84.46	0.38	0.19	0.10	0.89	1.27	1.08	0.99
2017					24,770	5,641	19,129	2,972	8,613	86.72	0.35	0.17	0.09	0.94	1.29	1.12	1.03
2018					19,129	5,641	13,488	2,296	7,936	88.99	0.31	0.16	0.08	1.00	1.31	1.16	1.08
2019					13,488	5,466	8,022	1,619	7,085	91.25	0.27	0.14	0.07	1.06	1.33	1.19	1.13
2020					8,022	4,570	3,452	963	5,533	93.51	0.21	0.10	0.05	1.12	1.33	1.23	1.17
2021					3,452	2,701	750	414	3,115	95.78	0.11	0.06	0.03	1.19	1.30	1.25	1.22
2022					750	750	0	90	840	98.04	0.03	0.02	0.01	1.26	1.29	1.28	1.27
2023						-											
2024						-											

Note (1) : Total for Capital furnished per year from program cost matrix, TableES-30
Note (2) : Value of water supplied delivered approximated at 25% of the production values determined from master planning analysis.

TABLE ES-32 PART (B)
PHASE TWO FSIP - NON USAID SPONSORED WASTEWATER PROJECTS
BENI SUEF GOVERNORATE

APPROXIMATE IMPACT ON PROJECTED TARIFFS FOR BEGWAS PHASE TWO FSIP WASTEWATER PROGRAM
ANALYSIS BASED UPON NIB FUNDING ONLY, TREATING AMOUNT REQUIRED IN EACH YEAR AS A SEPARATE LOAN

NIB LOAN TERMS : 15 YEAR PAYBACK PERIOD, AT AN INTEREST RATE OF 12%, WITH A THREE YEAR GRACE PERIOD ON CAPITAL RE-PAYMENT

YEAR	WS Capital Required In Year Note (3)	Amount of Capital to be Repaid at 100%	Annual Payment Required	Year of First Repayment w/3 Yr. Grace Period	Amount Owed by BEGWAS at Begin. of year	P Paid in Yr. At Term = 12 Years	Amount Owed at End of Year	Interest at 12.00% per/yr. Paid in Year	Total Annual Payment	Wastewater Handled in Collect. Systs. Note (4)	Unit Cost of Capital Repayment			Approximate Cost per M3 For O&M Only	Total Cost Recovery Requirement Per Cubic Meter		
											If BEGWAS Repays 100%	If BEGWAS Repays 50%	If BEGWAS Repays 33%		If BEGWAS Repays 100%	If BEGWAS Repays 50%	If BEGWAS Repays 33%
	(thous $)	(thous $)	(thous $)		(thous $)	(thous $)	(thous $)	(thous $)	(thous $)	Million M3/Yr.	LE/M3	LE/M3	LE/M3	LE/M3	LE/M3	LE/M3	LE/M3
2001					-		-										
2002					-		-										
2003	-				-		-										
2004	-				-		-										
2005	2,237	2,237	186	2008	2,237		2,237	268	268	25.37	0.04	0.02	0.01	0.47	0.51	0.49	0.48
2006	9,460	9,460	788	2009	11,696		11,696	1,404	1,404	26.71	0.18	0.09	0.06	0.50	0.68	0.59	0.56
2007	15,353	15,353	1,279	2010	27,049		27,049	3,246	3,246	28.11	0.40	0.20	0.13	0.53	0.93	0.73	0.66
2008	10,810	10,810	901	2011	37,859	186	37,672	4,543	4,729	30.81	0.54	0.27	0.18	0.56	1.10	0.83	0.74
2009	3,560	3,560	297	2012	41,232	975	40,258	4,948	5,923	33.51	0.62	0.31	0.20	0.59	1.21	0.90	0.80
2010	-	-	-	2013	40,258	2,254	38,003	4,831	7,085	36.21	0.68	0.34	0.23	0.63	1.31	0.97	0.85
2011	-	-	-		38,003	3,155	34,849	4,560	7,715	38.91	0.69	0.35	0.23	0.66	1.36	1.01	0.89
2012	-	-	-		34,849	3,452	31,397	4,182	7,633	41.61	0.64	0.32	0.21	0.70	1.35	1.03	0.92
2013					31,397	3,452	27,945	3,768	7,219	42.54	0.59	0.30	0.20	0.75	1.34	1.04	0.94
2014					27,945	3,452	24,494	3,353	6,805	43.47	0.55	0.27	0.18	0.79	1.34	1.07	0.97
2015					24,494	3,452	21,042	2,939	6,391	44.40	0.50	0.25	0.17	0.84	1.34	1.09	1.01
2016					21,042	3,452	17,591	2,525	5,977	45.33	0.46	0.23	0.15	0.89	1.35	1.12	1.04
2017					17,591	3,452	14,139	2,111	5,562	46.26	0.42	0.21	0.14	0.94	1.36	1.15	1.08
2018					14,139	3,452	10,688	1,697	5,148	47.18	0.38	0.19	0.13	1.00	1.38	1.19	1.13
2019					10,688	3,452	7,236	1,283	4,734	48.11	0.34	0.17	0.11	1.06	1.40	1.23	1.17
2020					7,236	3,265	3,971	868	4,133	49.04	0.29	0.15	0.10	1.12	1.42	1.27	1.22
2021					3,971	2,477	1,494	477	2,953	49.97	0.21	0.10	0.07	1.19	1.40	1.29	1.26
2022					1,494	1,197	297	179	1,377	50.90	0.09	0.05	0.03	1.26	1.36	1.31	1.29
2023					297	297	(0)	36	332	51.83	0.02	0.01	0.01	1.34	1.36	1.35	1.34
2024																	
2025																	
2026																	

Note (3) : Total for Capital furnished per year from program cost matrix, Table ES-30
Note (4) : Value of wastewater handled from master planning analysis.

estimated required tariff yields for the same conditions would range from LE 0.63 per M3 to LE 1.24 per M3.

If the water supply tariffs are set at the average tariff yields discussed above, the estimated annual water supply **charges for a household of 5 persons** would be as follows.

Annual water supply charges computed with no capital costs covered

-At an average use of 100 lpcd, water bill level year 2005 = LE 85; year 2010 = LE 113
-At an average use of 150 lpcd, water bill level year 2005 = LE127; year 2010 = LE 170
At an average use of 200 lpcd, water bill level year 2005 = LE 169; year 2010 = LE 227

Annual water supply charges computed with 100 % of the capital costs covered

-At an average use of 100 lpcd, water bill for year 2005 = LE 101; year 2010 = LE 220
-At an average use of 150 lpcd, water bill for year 2005 = LE151; year 2010 = LE 329
- At an average use of 200 lpcd, water bill for year 2005 = LE 202; year 2010 = LE 439

These estimated charges are very high, and represent billing levels from about 2 to 6 times the existing level of charges. (See further discussion in the next section.)

The wastewater tariffs would be similarly high. Tariffs set at the unit values given in Table ES-32B, will cause the annual wastewater bills **for a family of 5 persons** to be as follows.

(Note: the following estimates assume wastewater tariffs will be computed using the full volume of water supply.)

Annual wastewater charges computed with no capital costs covered

-At an average use of 150 lpcd, wastewater bill for year 2005 = LE127; year 2010 = LE 170
-At an average use of 200 lpcd, wastewater bill for year 2005 = LE169; year 2010 = LE 227

Annual wastewater charges computed with 100 % of the capital costs covered

-At an average use of 150 lpcd, wastewater bill for year 2005 = LE127; year 2010 = LE 221
-At an average use of 200 lpcd, wastewater bill for year 2005 = LE 169; year 2010 = LE 295

FINANCING MECHANISMS

Internal Financing

The primary financing agency in Egypt is the Ministry of Finance (MoF). The MoF can provide funds to economic authorities to offset any deficits which occur in their current and capital accounts. Upon the approval of the Minister of Finance, these funds are then added to the capital of the respective economic agencies. This practice is supposed to be a temporary measure, designed to enable faltering economic authorities to continue to operate and still allow their local and foreign debts to be serviced. As soon as the revenues of any economic authority become adequate to meet its current and capital expenses, the MoF ordinarily will stop providing assistance to the said authority.

External Financing

In addition to funding provided by USAID's program, Egypt's water supply and wastewater sector has benefited from the programs sponsored by many governments and institutions. These include the bi-lateral donor aid programs sponsored by the governments of Great

Britain, France, the Netherlands, Germany, Finland, Sweden,, Canada, and Japan. Additional funding has been made available through the Arab Fund for Social and Economic Development, and the multi - lateral programs -- usually loans -- of the World Bank, the European Union, and of various United Nations organizations. Fayoum governorate has benefited from technical assistance and direct aid from programs sponsored by the Netherlands for the past ten years. This aid program is still continuing.

Financing Options for BEGAWS

As discussed above, a portion of BEGAWS' FSIP will be provided through grants from USAID. Additional sources of funding for BEGAWS' FSIP are:

- Borrowing from the NIB,
- Grants made available by the MoF,
- Direct grants in aid or loans at favorable terms, made available through the external aid programs as discussed in the previous section.

The least expensive source of funding is obviously grant funding. Except for USAID, there are no external grant funds pledged or apparently available for application to the BEGAWS' FSIP. The NIB loans are the most expensive source of financing. However, it appears the MoF will opt over the next several years to continue to provide financing to BEGAWS as a "fledgling economic authority." If this is the case, loans provided by NIB, will actually be grants for BEGAWS' FSIP.

The greatest risk to implementing the FSIP appears to be BEGAWS's ability to obtain and utilize investment funding at highly favorable terms. Thus the challenge for BEGAWS is to mobilize their political resources within the Governorate, and communicate their commitment to implementing the FSIP to the MoF and other ministries. The commitment message must make clear the need to obtain as much GOE and donor grant aid as possible.

PRIVATIZATION CONSIDERATIONS

BEGAWS-AVAILABLE PSP OPTIONS

The PSP options available to BEGAWS under existing Egyptian law (not including the proposed new law on water concessions) are summarized on Table ES-33.

TABLE ES-33
PSP OPTIONS FOR BEGAWS

PSP Option	Brief Description
Service Contract	short-term agreement (1-5 years) for a private company to perform a defined scope of support services, such as meter repair, preventive maintenance, or leak detection
Management Contract	short-term agreement (2 to 5 years) for a private company to assume responsibility for management and operation of a facility or entire utility system, such as a wastewater treatment plan or the entire water system
Lease	similar to a Management Contract, except that it is a long-term agreement (10 to 20 years) and the private company may also be responsible for revenue collection
BOT	long-term agreement (20-30 years) for a private company to build, operate, and transfer, as well as provide financing for, a new facility, such as a water or wastewater treatment plant

The concession and privatization (i.e., sale of shares or assets) options for PSP are excluded from Table ES-29, because until the proposed new law on water concessions is enacted, it is doubtful that this option could be implemented under existing law, and the legal framework necessary to support a privatization by BEGAWS does not exist at present (although the proposed new presidential decree to reform the water sector will address this).

RECOMMENDED PSP OPTIONS

It is recommended that an incremental strategy be followed by BEGAWS to increase the participation of the private sector in its delivery of water and wastewater services. That is, small but meaningful steps should initially be undertaken and such steps should employ the service contract method. Eventually -- depending on BEGAWS's experience with its initial PSP steps and on the progress of Egypt's water sector reform program -- the broader PSP methods (management contract and concession) should be also be considered.

The following overall PSP strategy is recommended for BEGAWS:

First: A limited, carefully-selected number of service contracts (primarily "commercial") and benchmarking studies should be implemented.

Second: A second round of service contracts should be implemented (primarily "technical").

Third: Implementation of management contract and concession methods should be considered.

The recommended strategy is based on the following logic and assumptions:

1. Significant progress towards BEGAWS's important goal of reducing its revenue deficit can be made in the near-term through participation of the private sector in selected commercial operations and such contracts can be funded by the resulting increases in revenue and reductions in the cost of operations. Also, the true value of PSP in technical operations can only be known if the costs and performance results of existing operations are accurately documented.

2. While increased tariffs appear to be a necessary component of an over BEGAWS program for BEGAWS to achieve financial self-sufficiency, it would be more acceptable to its customer base if any such increase is preceded by an observable improvement in the level and quality of services provided. The second round of service contracting would be designed to achieve such improvements in service.

3. While the management contract and concession methods may offer substantial benefits to BEGAWS, any near-term movements in this direction might undermine efforts to effectuate in-house improvements in management and operations (through the Institutional Strengthening Contract and other means) and would better be considered in concert with Egypt's reform program for the water sector, a major element of which is PSP and which is expected to show significant progress in the 2001-02 time frame.

If the above PSP strategy is implemented and enhanced by institutional strengthening (in-house improvements) in management and operations (both commercial and technical), the net result of efficiency gains and revenue gains (ultimately from increased tariff levels) would certainly put BEGAWS on the path to fulfilling its mission of independence and financial self-sufficiency.

ENVIRONMENTAL ASSESSMENT

For USAID-funded projects, environmental review must be carried out under applicable U.S. regulations (Title 22 of the US Code of Federal Regulations, Section 216 – Environmental Procedures [22 CFR 216]). Under 22 CFR 216, actions that will have a significant effect on the environment within a country will be the subject of an Environmental Assessment (EA). Water and wastewater projects that are not small-scale are typically considered to have a significant potential impact on the environment (22 CFR 216.2(d)(1)(xi)). Thus, projects to be funded under the First Stage Investment Program (FSIP) are subject to Environmental Assessment requirements.

The initial phase of Environmental Assessment activity included conducting a Scoping Session where all interested and affected parties were given an opportunity to comment on the potential environmental consequences of a proposed action and identify issues that require analysis. The Scoping Session for projects in Beni Suef Governorate was held on August 15, 2000.

The information developed at the Scoping Session is the basis for a Scoping Statement that addresses the following objectives:

- Identify the scope and significance of issues to be analyzed in the EA, including direct and indirect effects of the project on the environment;

- Identify, and eliminate from detailed study, issues that are not significant, or that have been covered by earlier environmental review or approved design considerations, and provide a brief presentation as to why they will not have a significant effect on the environment;
- Present a work plan, including timing and phasing if appropriate, for the preparation of an EA, which identifies any required variations in the format of the EA and describes the planning and decision-making schedule; and
- Describe how the analysis of environmental impacts will be conducted, and identify the disciplines that will participate in the analysis.

Scoping Statements for the FSIP's were prepared and submitted to the USAID Cairo Mission. Approval of Scoping Statements by the USAID Bureau Environmental Officer for Asia and Near East is required prior to completing Environmental Assessments.

Preparation of the Environmental Assessments is currently being carried out in parallel with the anticipated approval of Scoping Statements for the governorates' FSIP's. The EA's will be stand-alone documents and are separate from this Master Plan. EA's will be finalized upon receipt of comments and final approval of Scoping Statements.