

LOCAL DEVELOPMENT II - PROVINCIAL

مشروع التنمية المحلية LDII-P

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Summary Report On Water Loss Reduction Program In Five Pilot Villages

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SECTION 1. INTRODUCTION

1.1 BACKGROUND

Water loss from village piped water systems in Egypt is a national problem. Several studies have reported the existence of large water losses. These studies are included as references in this report, and their findings can be summarized as follows:

- *Provincial Water Supplies Report* found 40 percent losses (Binnie-Taylor, 1980).
- *Water Supply and Sanitary Drainage for Qena and Aswan Governorates* reported 30 percent losses from old systems (Upper Egypt Consultants, 1987).
- *Assessment of Village Water Systems in Egypt* found the quantity lost from leakage and wastage to be greater than the quantity consumed by users (WASH, 1988).
- During their studies in five pilot villages, Chemonics advisors found losses in excess of 50 percent of the total production.

Chemonics developed a program by selecting five villages in which to reduce water losses. At the end of the period, the findings from the pilot village experience were compiled and put into the form of guidelines for setting up a water system loss reduction program and a manual for the operators of such a program. Two workshops with governorate, markaz and village representatives were held to review the first and second drafts of the guidelines.

1.2 PURPOSE OF REPORT

The purpose of this report is to outline the program of work followed and record the measured water losses observed in the pilot villages.

Documents delivered as a result of the program include *Guidelines for Water Loss Reduction* to assist governorate and markaz engineers in setting up a loss reduction program in rural communities; and *Water Loss Reduction Manual*, which details the various tasks necessary for a water loss reduction program. The manual is designed primarily to help village officials set up a loss reduction program under the guidance and direction of the village chief and maintenance workshop supervisor.

1.2.1 Scope of Work

USAID contract no. 263-0162-C-8041-00, dated 23 February 1988, includes the following tasks to address the national problem of water lost from piped water supply systems:

- g.5.i Water System Maintenance Plans
- g.5.ii Water System Leak Survey and O&M Assessment
- g.5.iii Develop Local, Public, and Private Sector Expertise in Water Leak Detection and Water System O&M Assessment

The approach adopted to fulfill the services in the Scope of Work and First Annual Work Plan is explained in *Upgrading Maintenance of Village Water Systems Start-up Report* (December 1988).

1.2.2 Start-up Report

The *Start-up Report* explains the method used to select five villages in five different governorates and suggests that a needs assessment be made to debate the role, if any, of the private sector in assisting with water leak detection. It also outlines a schedule of work to:

- Train counterpart staff in O&M improvements for water systems in villages other than the pilot villages
- Analyze basic data from the five pilot villages to find the existing level of service received by consumers and difficulties experienced by village staff with the O&M of water systems
- Develop and test simple procedures to improve the O&M of village water systems
- Prepare a manual detailing the most successful procedures
- Hold workshops to review and modify the manual
- Evaluate the use of private sector firms for leakage control work and O&M reviews

As work progressed in the pilot villages some modifications to the work plan became necessary.

No past records exist of the quantity of water supplied to networks; water pressures typically are low; and supply interruptions occur frequently every day. The resulting poor standard of service to customers minimizes the quantity of water lost from leaks. Thus, the observed high water losses are concluded to be largely the result of water wastage (or misuse) rather than leakage. Any leak detection would be premature under these circumstances. Hence, the emphasis of work in the pilot villages has been on developing record-keeping systems and curbing wastage.

1.2.3 Modifications

A letter to the Project Officer, LDII-P USAID, Cairo, dated 25 July 1989, clarifies the deliverables and modifies some of the delivery dates. The training deliverable under task g5iii in the Scope of Work is fulfilled through the two workshops. The second workshop to refine the manual was moved to September 1989.

The manual referred to in the *Start-up Report* has evolved into two documents:

- Guidelines to assist governorate and markaz engineers in designing a water system loss reduction program in a village
- A manual for use by village supervisors and their technicians to put into effect a loss reduction program

SECTION 2. WATER LOSS REDUCTION PROGRAM

2.1 PROGRAM APPROACH AND IMPLEMENTATION

The strategy developed in the 1988-89 Annual Work Plan (AWPI) was to group together the three subtasks in section g.5 (Upgrading Maintenance of Village Water Systems) of the Scope of Work and develop improvements from the experience gained by working in five pilot villages.

2.1.1 Objectives

The primary objectives of the work program and the direct benefit to ORDEV and the five selected governorates were twofold.

First, counterpart staff working with the advisors would be trained in improved methods of operating water systems and reducing losses. The intention was for the Chemonics advisors to work with five counterparts in each village--one each from ORDEV Cairo, the pilot governorate, the pilot markaz, and two from the pilot village.

Second, there were to be improvements to the operation and maintenance of the water systems in the five pilot villages, resulting in a decrease in operating costs and an increase in revenues collected.

2.1.2 In-depth study

Essential to achieving these two goals, an in-depth study of the water systems in five pilot villages was made to provide a clear picture of the actual problems in operating public sector water systems in rural Egypt.

2.2 SELECTION OF VILLAGES

The criteria for selecting the pilot villages outlined in the *Start-up Report* are as follows:

- Easy access to Cairo, a prime requisite to allow two advisors to spend the most time in the villages by minimizing travel time.
- High BVS investment in water subprojects, a requirement specified by USAID in the LDII-P contract.
- A mix between regional and independent water supply systems. The approach to loss reduction and improved O&M differs from one system to another.

- The villages are in different governorates. Thus, the program involves the maximum number of counterpart engineers within the limits of the program.
- Avoid overlap with the WHO program. ORDEV, WHO, and Chemonics agreed the greatest national benefit would be gained by spreading the limited resources of the two programs as widely as possible.

The five villages selected, their governorates and marakez, are as follows:

Governorate	Markaz	Village
Gharbiya	Zifta	Nahtai
Giza	Badrasheen	Saqqara
Menufiya	Qwesna	Abnahs
Qalubiya	Toukh	Moshtohor
Sharkiya	Minya El Kamh	Sennahwa

2.2.1 Meetings with Secretaries General

Meetings were held with the secretaries general of the five governorates at the beginning and end of the program.

The first meeting was to introduce the water system loss reduction program, seek their approval for pilot village selection, and to request the appointment of counterpart staff from the governorate, markaz, and village to work on the program.

The secretaries general all committed their wholehearted support to the program, agreed to the preliminary named pilot villages, and nominated counterpart staff.

On completion of the field work and workshops, the secretaries general were visited a second time when Chemonics advisors gave an evaluation of the response by each pilot village to the program.

2.2.2 Village Visits

Technical assistance advisors have visited each of the pilot villages about 16 times, giving on-the-job assistance to village, markaz and governorate staff responsible for the O&M of water systems. Each visit has involved work with the five counterpart staff assigned to each pilot village.

2.3 WORKSHOPS

Two workshops were held with governorate and markaz engineers and village chiefs to discuss the first and second drafts of the guidelines for water system loss reduction. The first, held in June, assembled counterpart staff to study the first draft and to recommend changes that would make the document more useful. The September workshop involved engineers and village chiefs from marakez other than those of the pilot villages to provide a fresh perspective. This group studied the second draft and made recommendations for the final publication.

SECTION 3. PILOT VILLAGES

Response to the program varied in the five pilot villages. However, it soon became clear that those villages whose village chief had committed himself to the program would benefit most from the project.

Initially the village chief and maintenance supervisors were briefed on the tasks that required completion.

In turn, the advisors collected details on the the capacity, components and number of consumers served by each water system. None of the water systems at the pilot villages had bulk meters installed to measure the total quantity of water supplied by the source works; and overfilling water towers was a procedure adopted universally among the operators.

Many examples of high losses were observed to be associated with leaking glands. At each village except Saqqara, a hands-on demonstration was given on the correct procedure for repacking the glands of valves and pump shafts. A brief summary of each pilot village follows.

3.1 NAHTAI VILLAGE, ZEFTA MARKAZ, GHARBIYA (GRB/08/01)

The mother village and satellites are served by three water stations, all abstracting water from semi-artesian wells.

The village, markaz, and the governorate development department responded well to the program. However, no counterpart engineer was appointed by the governorate housing department.

The village responded quickly to all the tasks set. They installed water level indicators on all three water towers and modified the operating procedure to avoid overfilling the water tanks.

Pump capacities were measured, and the village staff adopted a pump log sheet designed to record daily production by measuring the running hours of each pump set and the changes in the amount of water stored. Meter consumption was recorded for small domestic consumers, but because of a shortage of large meters, the large non-domestic consumers were all unmetered. The large consumers were estimated to account for 30 percent of the total monthly consumption.

The aggregate loss over a 7-month period for the three water stations was found to be 59 percent or 138 L/service/hour.

3.2 SAQQARA VILLAGE, BADRASHEEN MARKAZ, GIZA (GIZ/02/06)

The mother village and satellite each have a water station. The Saqqara station serves areas beyond the village boundary. This village was selected for two reasons:

- A national training center is there.
- None of the services connections is fitted with meters.

There was no response to the program from the governorate counterpart official and little response by either the markaz or village. As a result, input to this village was prematurely stopped, and little or no data were collected on the distribution layout or losses. However, at one of the stations, the pumps ran continuously during the day, and the water tower overflowed for prolonged periods. The resulting wastage must have been considerable.

At the debriefing with the secretary general, it was agreed that the governorate staff would continue to implement the program at Saqqara, but with minimal input from Chemonics staff.

3.3 ABNAHS VILLAGE, QWESHA MARKAZ, MENUFIYA (MEN/06/01)

The mother village and satellites are supplied by three water stations. One satellite is supplied from an adjoining village.

Initially, there were some difficulties in motivating the counterparts to take an interest in the program. However, after a few visits, all levels of the governorate responded so enthusiastically that the final outcome was excellent. Pump capacity tests, distribution network maps, collection of meter consumption records, and production records were all completed.

The assessed loss for the three water stations is 45 percent or 48 L/service/hour. Of particular interest, the village staff reported to the secretary general that they observed a 7 percent savings in pump running time since the start of the program.

3.4 MOSHTOHOR VILLAGE, TOUKH MARKAZ, QALUBIYA (QAL/07/07)

There are four water stations serving the mother village and satellites. One of these will close after a new pipeline is constructed. Then the new pump station at El Hassna will supply a larger number of consumers.

The Moshtohor village chief was very supportive and interested in the program, even to the extent of regularly briefing the secretary general on progress. This interest may be partly because on the second visit the advisors demonstrated the

quantity of water loss from a faulty fire hydrant. They measured the flow rate of water dripping from the outlet and calculated it to be sufficient to supply six households for a month.

Support from the governorate and markaz counterparts was good but failed to match the village chief's enthusiasm. Tasks completed by the end of August 1989 were network maps, details of pump station production and consumption, and use of pump log sheets.

Assessed losses for the three water stations are 51 percent or 66 L/service/hour, and both the secretary general and village chief are prepared to be involved in future loss reduction programs.

3.5 SENNAHWA VILLAGE, MINYA EL KAMH, MARKAZ SHARKIYA (SHR/11/08)

There are two water stations serving the mother village and satellites. All the water is supplied from semi-artesian wells. Little or no program support was received from the governorate level. Village and markaz counterpart staff had difficulty in understanding some of the basic concepts of the program, but were reasonably responsive to the tasks set for them.

Water level indicators were installed at the two pump stations. Pump flow capacities were measured, and the daily pump log sheets were completed.

Total losses for the two areas of supply averaged 43 percent and 43 L/service/hour, which may explain some of the problems with rising damp and collapsing buildings observed in parts of the mother village.

3.6 SUMMARY OF PILOT VILLAGE LOSS STUDIES

The percentage and losses/service/hour figures are high in all cases even after allowing 30 percent of total domestic consumption for non-domestic consumers. In many instances the daily pump station productions are consistently the same for days or even weeks on end. This suggests that the production figures may be unreliable.

Adjustments have been made by eliminating figures where consumption exceeds supply. With this adjustment, the range of figures varies from 59 percent to 43 percent and from 138 L/service/hour to 40 L/service/hour. By comparison, losses of 25 L/service/hour are regarded as "high" in developing nations.

SECTION 4. DELIVERABLES

In December 1988 the *Start-up Report* was delivered, explaining the philosophy and approach to the task of improving the operation and maintenance of village water systems. Extremely high losses were apparent, and for this reason the O&M effort focused entirely on reducing water losses.

4.1 TRAINING

On-the-job training was given to the counterparts and village officials during regular visits to each village between November 1988 and August 1989. During this period, the Chemonics advisors gained an appreciation of the limited resources available and learned how to tailor a program to the conditions in Egyptian villages. The project demonstrated that significant reductions in water loss can be achieved by an organized and logical approach. In one village, pump running time was reduced by 7 percent simply by stopping the routine of overflowing the water tower during each pumping period.

4.2 WORKSHOPS

Two workshops were held to give officials from the five pilot governorates the opportunity to comment and discuss various aspects of the methodology. Useful comments were received, and the program was modified as a result.

4.3 DOCUMENTS

Culmination of the efforts over the 12-month period, apart from the summary of data collected from the pilot villages (Appendix), includes two documents:

- *Water System Loss Reduction Guidelines*
- *Water Loss Reduction Manual*

Since the most successful loss reduction programs occurred where active, dynamic leadership and support came from the governorate level down, the guidelines are designed to help markaz policy makers and technical staff introduce a water loss reduction program in rural communities. The manual, on the other hand, will assist village staff in implementing a program which has been tested and developed in the pilot villages.

Such programs must stand the test of time, and improvements and refinements are inevitable to suit special local conditions. The program has been designed to use simple, but very effective methods to reduce losses in rural communities.

However, the program uses improved operating procedures to eliminate wasting of water before tackling the reduction of losses from defective pipe networks and waterworks structures.

SECTION 5. FUTURE WORK

The next step is to replicate the program in other governorates and eventually nationally.

Through conferences for secretaries general and O&M programs, governorates can be encouraged to promote indicators showing changes in the consumption of electricity and diesel fuel by rural water pump stations. Training programs can be set up to introduce engineers, village chiefs and technicians to the various techniques and simple skills required for a loss reduction program, based on the Guidelines and Manual.

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APPENDIX

WATER LOSS STUDY IN FIVE PILOT VILLAGES

Water Loss Records-MOSHTOHOR/QLB

File: WLMSTR Date
03/01/90

Governorate: Qalubiya
Markaz : Toukh
Village : Moshtohor

Pump Station MOSHTOHOR

Month 1989	Bldg No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av. Opr. Time (hr)	Losses l/ser/hr	Losses (Z)
Jan-89	2990	1251	4655	15615	20300	21964	6.0	7	8
Feb-89	2990	1251	4566	15221	19787	23698	9.5	12	17
Mar-89	2990	1251	4718	15728	20446	29025	10.6	21	30
Apr-89	2990	1251	4031	13435	17466	34697	13.1	35	50
May-89	2990	1251	3035	10118	13153	42285	15.7	48	69
Jun-89	2990	1251	3119	10396	13515	46682	18.8	47	71
Jul-89	2990	1251	2670	8901	11571	45298	16.8	52	74
Aug-89	2990	1251			0	ERR		ERR	ERR
7					116238	243649	90.5	221	

Av. Con./PS=Total Con.(per PS)/no of days/no of conn.44.5(person per ser.)

= 97 (l/c/d)

MOSHTOHOR PS

Moshtohor PS cont...

Men Record

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan 31	705	731	708	862	675	527	707	751	804	786	567	798	709	582	681	788	732	704	715	705	708	660	797	765	595	713	708	711	659	772	749
Feb 28	765	909	855	787	777	738	813	762	877	834	869	647	833	803	883	835	805	1090	820	942	835	957	890	839	765	771	870	927			
Mar 31	1019	1363	933	1010	888	972	895	1029	760	827	660	962	950	898	785	924	1024	943	900	1017	954	937	960	930	1163	991	1034	848	906	712	827
Apr 30	925	1048	1086	948	945	1010	983	1300	1248	1215	1268	1128	1244	1215	1322	1528	995	1168	915	1167	1048	1283	1205	1213	1170	1255	1115	1209	1175	1366	
May 31	1305	1064	1125	1133	1366	1115	960	1.20	1130	1312	1525	1328	1260	1482	1399	1664	1505	1455	978	1318	1606	1779	1537	1728	1320	1291	1534	1575	1556	1363	1440
Jun 30	1150	1349	1033	1642	1684	1655	1759	1761	1381	1247	1536	1324	1455	1530	1556	1662	1702	1541	1515	1225	1376	1616	1754	1640	2987	1783	1741	1701	1664	1663	
July 31	1444	1295	1460	1395	1530	1465	1395	1480	951	1708	1866	1498	1290	1331	1318	1248	1272	1557	1674	1457	1553	1537	1539	1659	1375	1495	1519	1259	1565	1603	1549
Aug 0																															

Notes:

1) No readings for August.

Losses=Total Losses/(30*Total Hrs.*No. of Conn.)

= 38 l/ser/hr

= 46929 l/hr

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Pump Station DANDANA

Month 1989	Bldgs No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Average Time(hr)	Losses l/ser/hr	Losses (Z)
Jan-89	579	186	976	3254	4230	2015	1.5	-256	ERR
Feb-89	579	186	726	2420	3146	1741	1.5	-180	-110
Mar-89	579	186	766	2353	3319	1957	1.5	-157	-81
Apr-89	579	186	456	1521	1977	2159	1.7	19	-70
May-89	579	186	409	1362	1771	2312	1.7	55	8
Jun-89	579	186	377	1263	1642	2041	1.6	45	23
Jul-89	579	186	420	1399	1819	2327	1.7	52	20
Aug-89	579	186			0	ERR		ERR	22
					4	7209	8839	6.7	171

Av. Con./PS=Total Con.(per PS)/no of days*no of conn.*4.5(person per ser.)

= 71 (l/c/d)

DANDANA PS

Dandana PS cont...

Mon	Recon	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Jan	31	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	
Feb	29	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61
Mar	31	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61	61
Apr	30	61	61	72	72	72	72	72	72	72	72	76	72	72	76	72	72	76	72	72	72	72	76	72	72	72	72	72	72	72	72	72	72	72
May	31	68	68	79	79	68	68	76	90	72	76	72	76	68	72	68	68	69	68	79	79	79	72	72	76	79	76	79	76	79	83	79	79	
Jun	30	69	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	68	72	61	68	68	83	65	68	68	68	68	68	68	68	68	
July	31	72	72	72	72	72	72	72	72	72	72	72	72	72	86	83	72	72	72	72	72	72	72	72	72	83	65	83	83	83	83	83	83	
Aug	0																																	

Notes:

- 1) No readings for August.
- 2) Ignore -ve loss values.
- 3) Consistency of daily supply is unrealistic.

Losses=Total Losses/(30*Total Hrs.*No. of Conn.)

= 44 l/ser/hr
= 8109 l/hr

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Water Loss Records-MOSHTDHR/DLB

Pump Station KAFR ELWAN

Month 1989	Bldgs No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av.Opr. Time(hr)	Losses l/ser/hr	Losses (Z)
Jan-89	427	251	1045	3484	4529	3249	2.4	-69	-39
Feb-89	427	251	963	3209	4172	3178	2.6	-54	-31
Mar-89	427	251	1297	4296	5585	3952	2.9	-72	-41
Apr-89	427	251	1086	3354	4360	3899	3.0	-20	-12
May-89	427	251	968	3227	4195	4220	3.5	1	1
Jun-89	427	251	898	2961	3849	3926	3.0	3	2
Jul-89	427	251	924	3081	4005	4194	3.0	8	5
Aug-89	427	251			0	ERR		ERR	ERR
3			12049 12340			9.5 12			

Av. Con./PS=Total Con.(per PS)/no of days*no of conn.*4.5(person per ser.)

= 116 (l/c/d)

KAFR ELWAN

KAFR ELWAN

RunRecoDate No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan 31	108	97	108	108	108	130	97	97	97	130	108	108	119	108	108	108	108	108	108	97	108	97	97	108	97	97	108	97	97	97	97
Feb 28	130	130	108	108	108	108	108	108	108	130	108	130	108	108	108	130	108	130	108	130	108	108	108	108	108	108	108	108	108	108	130
Mar 31	130	130	130	130	130	108	130	130	108	130	130	130	130	130	130	108	130	130	130	130	130	108	119	151	130	130	130	130	130	130	130
Apr 30	108	130	108	108	130	108	130	119	130	130	130	130	130	162	130	140	140	108	130	118	140	130	140	130	140	140	140	130	140	140	130
May 31	130	151	108	130	172	130	151	118	140	118	140	151	130	130	140	130	130	140	162	130	130	130	140	140	140	151	118	140	140	130	130
Jun 30	140	118	151	130	130	130	151	130	140	130	140	130	130	130	140	152	97	119	130	118	140	140	130	118	151	118	118	118	118	130	
July 30	151	108	140	108	108	151	151	151	108	130	118	130	151	162	130	130	130	130	162	119	162	140	151	108	108	151	140	140	140	151	
Aug 0																															

Notes:

- 1) No readings for August.
- 2) Ignored -ve loss values.
- 3) Consistency of daily supply is unrealistic.

Losses=Total Losses/(30*Total Hrs.*No. of Conn.)

= 4 l/ser/hr
= 1022 l/hr

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Water Loss Records-MOSHTOHOR/QLB

Av. Losses(Z) =(Supply-Consumption)/Supply*100

= 56 Z

Av. Losses(l/ser/hr)=Sum of Losses(l/ser/hr)/no of month

= 113 l/ser/hr

Net Sum of Consumption = 155685 Cubic Meters

Net Sum of Supply = 357868 Cubic Meters

Total no of Connections = 1916 Connections

Total Hours of Supply = 141.1 Hours

Total no of Month = 20 Month

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Water Loss Records - NAHTAI/SRB

File: WLNHTAI Date
03/01/90

Governorate: GHARRIYA
Marka: ZEFTA
Village: NAHTAI

Pump Station NAHTAI

Month 1989	Bldgs No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av. Opr. Time (hr)	Losses l/ser/hr	Losses (%)
Jan-89	1829	572	No water	supplie	0	Zero		ERR	ERR
Feb-89	1829	572	No water	No water	0	Zero		ERR	ERR
Mar-89	1829	572	No water	No water	0	Zero		ERR	ERR
Apr-89	1829	572	1807	6023	7830	10864	1.8	98	28
May-89	1829	572	1504	5013	6517	11495	1.9	156	43
Jun-89	1829	572	1821	6071	7892	11704	1.9	119	33
Jul-89	1829	572	1762	5873	7635	12426	1.9	142	39
Aug-89	1829	572			0	ERR		ERR	ERR
					29874	46569	7.4	516	

Av. Con./PS=Total Con. (per PS)/no of days#no of conn.#4.5(person per ser.)

= 95 (l/c/d)

Nahtai Ps

Nahtai PS cont...

Mon	Reco	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan		0																															
Feb		0																															
Mar		0																															
Apr	30	371	328	401	360	368	370	338	380	380	344	355	432	440	326	307	350	350	348	408	272	385	322	330	398	370	314	305	435	420	337		
May	31	398	342	387	378	382	365	397	303	370	374	390	333	368	328	318	370	432	427	353	342	355	375	360	365	380	358	423	395	383	353	371	
Jun	30	453	388	359	368	419	408	338	405	373	410	372	415	395	378	335	348	405	359	315	415	405	370	378	388	462	343	444	425	428	457		
July	31	385	433	435	415	457	439	445	408	453	380	395	383	355	408	390	358	375	363	420	380	450	368	385	408	410	398	395	370	418	395	353	
Aug		0																															

Notes:

Losses=Total Losses/(30 day#Total Hrs#No. of Conn.)

1) No water supply from January to March due to pipe replacement.

2) No readings for August.

= 131.5 l/ser/hr

= 75203 l/yr

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Water Loss Records - NAHTAI/GRB

Pump Station KAFT IPR1 PS

Month 1969	Bldgs No	SerVs No	UMC k	MC kl	Tot Con k	Supply kl	Av.Opr. Time(hr)	Losses l/ser/hr	Losses (%)
Jan-89	802	446	1335	4450	5785	21749	6.8	170	73
Feb-89	802	446	1221	4070	5291	19920	7.3	159	73
Mar-89	802	446	1478	4992	6490	21926	7.0	158	70
Apr-89	802	446	1466	4888	6354	21120	7.0	158	70
May-89	802	446	2146	7153	9299	21245	7.0	123	56
Jun-89	802	446	1679	5596	7275	20936	7.0	146	65
Jul-89	802	446	1691	5635	7326	21258	7.0	144	66
Aug-89	802	446			0	ERR		ERR	ERR
7			47820 147954			49.1		1059	

Av. Con./PS=Total Con. (per PS)/no of days*no of conn.44.5(person per ser.)

= 112 (l/c/d)

Kafr Ibri PS con...

Kafr Ibri PS

Mon	Reco	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	31	731	656	680	765	731	670	731	656	599	765	731	676	706	731	731	656	676	765	731	676	676	765	731	656	765	731	676	731	656	597	702	
Feb	30	760	676	656	731	731	765	676	656	731	731	765	676	656	731	731	765	731	656	765	731	656	597	765	731	676	686	656	676	765	708		
Mar	31	731	765	676	731	765	676	731	656	597	765	731	676	656	731	765	731	676	686	656	676	765	731	676	686	656	676	765	731	676	731	656	
Apr	30	676	656	765	731	676	701	765	731	656	676	760	731	676	656	795	731	680	671	675	715	705	676	750	671	726	656	765	671	701	676	656	
May	31	680	656	675	731	656	680	681	731	780	656	675	730	680	711	675	730	656	680	660	675	731	680	656	671	731	680	656	675	631	680	656	
Jun	30	771	627	726	771	771	675	725	675	656	680	656	675	731	680	675	731	780	656	675	731	656	680	675	731	680	656	675	731	660			
July	31	731	675	656	660	656	675	731	680	675	656	731	680	656	675	731	656	680	675	731	780	656	675	731	656	680	675	731	726	656	675	587	
Aug		0																															

Notes:

1) No readings for August.

Losses=Total Losses/(30 day)Total Hrs*No. of Conn.)

= 152.4 l/ser/hr
 = 67980 l/hr

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Water Loss Records - NAHTAI/6RB

Pump Station: KAFR NAWAI

Month 1989	Bldg No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av. Opr. Time (hr)	Losses l/ser/hr	Losses (Z)
Jan-89	950	334	618	2061	2679	6329	2.4	147	58
Feb-89	950	334	551	1836	2387	5872	2.6	143	59
Mar-89	950	334	507	1911	2418	6621	3.1	131	63
Apr-89	950	334	1452	4941	6293	6491	3.3	6	3
May-89	950	334	748	2494	3242	8485	4.4	115	62
Jun-89	950	334	1510	5034	6544	8060	4.9	31	19
Jul-89	950	334			0	8626		ERR	100
Aug-89	950	334			0	ERR		ERR	ERR
6					23563	41848	20.7	573	
Grand Total					101257	236371	77.2		

Av. Con./PS=Total Con. (per PS)/no of days*no of conn.*4.5(person per ser.)

KAFR NAWAI PS cont...

KAFR NAWAI PS

Mon	Rec	Date	No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	31	151	200	238	222	215	265	195	217	176	207	189	200	225	211	230	220	276	242	207	207	149	146	208	123	119	140	222	225	234	234	236		
Feb	28	248	249	249	269	231	189	212	218	186	182	213	199	215	220	202	224	232	198	200	187	183	146	193	199	196	210	207	215					
Mar	31	222	200	242	232	202	230	210	226	221	234	228	237	115	235	149	169	195	208	187	215	217	220	230	233	219	220	238	219	219	228	231		
Apr	30	220	192	181	205	212	231	134	230	220	235	203	213	196	220	196	214	221	209	202	223	236	222	212	209	241	242	232	257	232	241	273		
May	31	245	265	264	266	260	266	261	270	282	262	260	281	255	266	264	269	274	296	305	273	292	298	291	286	280	307	283	251	273	267	273		
Jun	30	281	313	245	297	268	275	20	275	274	152	158	161	261	236	237	242	266	290	284	279	301	295	312	293	294	304	297	308	292	290	289		
July	31	289	273	277	273	266	267	326	280	284	254	265	273	278	235	262	282	290	298	228	276	275	286	285	273	282	306	285	316	280	279	289		
Aug		0																																

Notes:

Losses=Total Losses/(30 day*total Hrs*No. of Conn.)

1) No readings for August.

= 88 l/ser/hr
= 29444 l/hr

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Water Loss Records - NANTAI/GRB

Av. Losses (%) = (Supply - Consumption) / Supply * 100

= 57 %

Av. Losses (l/ser/hr) = Sum of Losses (l/ser/hr) / no of month

= 126 l/ser/hr

Net Sum of Consumption = 101257 Cubic Meters

Net Sum of Supply = 236371 Cubic Meters

Total no of Connections = 1352 Connection

Total Hours of Supply = 77.2 Hours

Total no of Month = 17 Month

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Water Loss Records - SINNAHWA/SHR

File: WLSINNA Date
03/01/90

Governorate: SHARKIYA
Marbuz: HENYA EL KAMH
Village: SINNAHWA

Pump Station: SINNAHWA

Month 1989	Bldg No	Ps vs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av.Opr. Time(hr)	Losses l/ser/hr	Losses (l)
Jan-89	1778	478	851	2837	3688	11202	7.2	70	67
Feb-89	1778	478	783	2611	3394	10010	6.6	75	66
Mar-89	1778	478	851	2837	3688	11087	6.8	73	67
Apr-89	1778	478	1690	5634	7324	11272	7.5	37	35
May-89	1778	478	1685	5615	7300	11646	7.4	40	37
Jun-89	1778	478	1694	5647	7341	11960	7.6	41	38
Jul-89	1778	478	1389	4630	6019	14093	9.0	61	57
Aug-89	1778	478			0	ERR		ERR	ERR
7					38754	81170	52.1	397	

Av. Con./PS=Total Con. (per PS)/no of days *no of conn./4.5(person per ser.)

= 35 (l/c/d)

SINNAHWA PS

SINNAHWA PS cont...

MonRec No	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	31	356	402	426	410	419	424	394	401	400	346	364	341	305	217	295	416	406	388	363	409	355	280	300	314	362	347	310	412	284	399	358
Feb	28	351	381	405	350	355	395	375	377	373	369	391	316	335	377	329	351	341	357	323	385	189	358	382	429	317	411	331	348			
Mar	31	403	395	373	356	349	381	365	390	417	417	369	328	392	371	390	360	312	365	373	295	148	298	330	335	330	294	379	341	358	389	387
Apr	30	367	356	324	381	307	329	452	326	354	422	396	426	327	385	443	316	311	419	301	395	350	403	352	439	397	400	387	397	384	342	
May	31	376	405	358	423	329	381	378	387	387	390	332	315	345	348	350	352	347	347	405	331	401	385	414	393	388	438	423	429	381	375	332
Jun	30	373	346	412	398	414	426	374	440	350	397	412	373	385	306	406	393	418	298	450	434	450	400	397	424	424	385	378	449	386	393	
July	30	373	454	432	413	429	413	463	457	449	416	374	389	328	517	446	446	483	490	400	400	523	529	521	528	536	546	480	361	451	544	

Notes:

1) No readings for August.

Losses=Total Losses/(301Total Hrs.*NO. of Conn.)

= 57 l/ser/hr
= 27137 l/hr

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Water Loss Records - SINNAHWA/SHR

Pump Station MEIT SEHAIL

Month 1989	Bldgs No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av. Opr. Time (hr)	Losses l/ser/hr	Losses (Z)
Jan-89	1833	544	1305	4351	5656	11603	9.3	38	51
Feb-89	1833	544	1308	4361	5669	7771	6.9	20	27
Mar-89	1833	544	1305	4350	5655	8115	6.6	22	30
Apr-89	1833	544	2757	9189	11946	9869	7.3	-17	-21
May-89	1833	544	2756	9185	11941	13383	7.3	12	11
Jun-89	1833	544	2757	9189	11946	17384	11.4	29	31
Jul-89	1833	544			0	ERR		ERR	ERR
Aug-89	1833	544			0	ERR		ERR	ERR
					5	40867	59256	42	121

Grand Total 79621 139426 93.6

Av. Con./PS=Total Con. (per PS)/no of days #no of conn. #4.5 (person per ser.)

= 185 (l/c/d)

Meit Sehail PS

Meit Sehail PS cont...

Mon	Reco	Date	Mo	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	31	360	339	310	310	360	310	310	388	443	443	393	364	364	296	408	374	298	499	360	360	427	439	427	427	310	310	320	419	429	403	403		
Feb	29	319	324	264	324	214	209	324	314	179	309	294	254	259	289	189	229	314	239	364	264	266	283	289	287	284	274	324	299					
Mar	31	295	249	259	224	295	289	305	344	325	264	304	290	240	225	285	205	325	250	240	290	300	295	220	275	340	335	309	130	179	179	59		
Apr	30	108	39	340	315	390	320	315	175	125	245	315	330	390	155	265	325	391	409	392	413	462	389	426	442	360	460	390	393	425	325			
May	31	388	372	440	388	392	416	402	430	358	442	380	430	430	410	427	442	456	388	472	388	472	460	388	432	460	508	542	450	450	450	480		
Jun	30	450	462	515	599	613	613	559	580	599	510	699	627	546	577	643	551	607	531	597	514	599	615	559	579	599	510	699	599	619	566			
July	0																																	

Notes:

- 1) No readings for July and August.
- 2) Ignore -ve loss values.
- 3) Consistency of daily supply is unrealistic.

Losses=Total Losses/(30#Total Hrs.#NO. of Conn.)

= 26 l/ser/hr
= 13967 l/hr

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24

Water Loss Records - SINNAHWA/SHR

Av. Losses (Z) =(Supply-Consumption)/Supply#100

= 43 Z

Av.Losses(l/ser/hr)=Sum of Losses (l/ser/hr)/no of month

= 43 l/ser/hr

Net Sum of Consumption = 79621 Cubic Meters

Net Sum of Supply = 139426 Cubic Meters

Total no of Connections = 1022 Connections

Total no of Month = 12 Month

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Water Loss Records - Abnahs/MNF

File: WLABNAH Date
03/01/90

Governorate: MENDOUFIYA
Markaz: QUESNA
Village: ABNAHS

Pump Station: ABNAHS

Month 1989	Bldgs No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av.Hrs. /Day	Losses L/ser/hr	Losses (%)
Jan-89	2432	776	1891	6306	8197	12710	6.9	27	36
Feb-89	2432	776	1941	6471	8412	13280	6.1	37	37
Mar-89	2432	776	1959	6530	8489	14900	6.5	41	43
Apr-89	2432	776	1788	5959	7747	11500	6.4	25	33
May-89	2432	776	5727	19098	24825	12920	7.0	-71	-92
Jun-89	2432	776	1271	4236	5507	14340	7.8	49	62
Jul-89	2432	776	2233	7443	9676	14880	8.0	27	35
Aug-89	2432	776			0	ERR		ERR	ERR
6				48028	81610		41.7	206	

Av. Con./PS=Total Con.(per PS)/no of days/no of conn. #4.5(person per ser.)

= 76 (l/c/d)

ABNAHS PS

MonRec No	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	31	480	480	480	480	480	480	480	480	480	480	280	160	260	250	250	300	190	480	480	480	480	480	480	480	480	200	380	480	360	480	480
Feb	29	460	340	480	480	480	480	480	400	460	460	480	490	480	460	480	450	480	470	490	480	480	480	480	480	480	480	480	480	480	480	
Mar	31	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	
Apr	30	480	540	540	540	540	540	340	300	320	280	320	280	380	340	380	340	380	340	380	340	360	360	360	360	360	380	340	360	360	360	
May	31	360	360	360	360	360	360	340	360	340	360	420	390	340	390	400	360	480	450	480	480	480	480	480	480	480	480	480	480	480	480	
Jun	30	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	
Jly	31	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	
Aug	0																															

Notes:

- 1) No readings for August.
- 2) Ignore -ve loss values.

Losses=Total Losses/(30 day*Total Hrs.#No. of Conn.)

= 35 l/ser/hr
= 26244 l/hr

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Water Loss Records - Abnabs/MHF

Pump Station: MOSTAI

Month 1989	Bldg No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av.Hrs. /Day	Losses L/ser/hr	Losses (%)
Jan-89	3772	1002	1274	4245	5519	23565	10	58	77
Feb-89	3772	1002	2132	7107	9239	22140	9	55	58
Mar-89	3772	1002	3032	19107	13139	25510	9	47	48
Apr-89	3772	1002	3272	10995	14177	23045	10	31	38
May-89	3772	1002	3645	12151	15796	24370	11	25	35
Jun-89	3772	1002	3306	11019	14325	25702	11	34	44
Jul-89	3772	1002	2874	9579	12453	28830	10	54	57
Aug-89	3772	1002			0	ERR		ERR	ERR
7					84648	173162	68.5	303	

Av. Con./PS=Total Con.(per PS)/no of days*no of conn.*4.5(person per ser.)

= 89 (l/c/d)

MOSTAI PS

MonReconDate

MOSTAI PS cont..

No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan 31	490	515	515	630	550	440	585	650	690	705	480	460	660	605	800	780	680	920	850	880	950	1010	1000	920	1000	990	1030	890	780	1020	1140
Feb 28	920	910	830	590	700	790	750	780	700	810	680	760	790	910	850	730	900	890	690	670	770	800	750	960	820	730	750	850			
Mar 31	740	760	890	530	880	980	780	810	890	870	960	1060	910	890	930	760	900	900	700	630	600	780	620	760	800	900	800	900	800	900	680
Apr 30	800	800	600	890	800	640	550	520	550	965	1000	900	700	665	810	875	630	775	630	875	775	965	865	705	875	830	500	1065	830	660	
May 31	550	605	440	550	660	755	720	830	705	940	605	555	510	785	740	750	655	895	900	1360	720	1400	1300	765	740	845	865	895	640	980	790
Jun 29	1260	605	1040	900	855	1040	940	845	805	715	1075	935	705	655	975	1120	785	610	870	685	785	720	815	775	795	800	990	915	790		
July 31	900	900	900	900	900	900	900	900	900	900	900	900	900	1070	1190	1210	940	1000	920	800	1090	960	1030	960	840	850	640	930	930	930	
Aug 0																															

Notes:

- 1) No readings for August.
- 2) Consistency of daily supply is unrealistic.

Losses=Total Losses/(30 day*Total Hrs.*No. of Conn.)

= 43 l/ser./hr
= 43072 l/hr

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Water Loss Records - Abnaha/MNF

Pump station: KAFR TAHA SHOBRRA

Month 1989	Bldgs No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av.Hrs. /Day	Losses L/ser/hr	Losses (2)	
Jan-89	2038	851	1360	4534	5894	14902	8.4	41	60	
Feb-89	2038	851	3086	10286	13372	12887	9.5	-2	-4	
Mar-89	2038	851	4577	15255	19832	16005	8.6	-17	-24	
Apr-89	2038	851	4192	13972	18164	14906	9.1	-14	-22	
May-89	2038	851	3571	11903	15474	17100	10.4	6	10	
Jun-89	2038	851	2961	9871	12832	18679	11.7	20	31	
Jul-89	2038	851	2371	7902	10273	20550	12.5	31	50	
Aug-89	2038	851			0	ERR		ERR	ERR	
4			44473 71230.2				43	97		

Av. Con./PS:Total Con.(per PS)/no of days/no of conn.#4.5(person per ser.)

= 94 (l/c/d)

Kafr Taha Shobra

MonRec No	Date	Kafr Taha Shobra PS Cont...																															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Jan	31	485	490	436	500	473	470	480	470	470	490	480	470	480	490	480	470	490	490	485	485	495	450	467	485	470	480	495	495	465	485	490	
Feb	29	475	475	480	480	465	490	485	480	470	513	505	349	470	384	419	500	447	412	422	520	326	374	402	528	640	432	384	570				
Mar	31	480	480	670	412	399	384	432	432	480	528	615	480	665	560	528	490	528	550	592	617	575	550	560	525	520	480	472	432	616	461	560	
Apr	30	530	420	427	447	510	450	660	442	525	520	568	630	553	480	417	374	439	374	482	447	510	432	495	495	500	713	480	528	508	550		
May	31	508	568	540	528	556	624	624	624	596	604	624	576	558	450	528	558	538	556	518	630	640	510	546	530	590	480	480	480	480	480	576	
Jun	29	624	586	556	576	624	616	538	574	690	720	576	606	690	675	591	622	624	644	604	624	680	664	520	632	640	672	576	640	672			
July	27	650	650	650	650	650	720	692	692	680	526	662	720	672	672	660	682	690	720	664	632	640	616	536	672	750	640						
Aug	0																																

Notes:

- 1) No readings for August.
- 2) Ignore -ve loss values.
- 3) Consistency of daily supply is unrealistic.

Losses=Total Losses/(30 day*Total Hrs.#No. of Conn.)

= 24 l/ser./hr

= 20742 l/hr

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Water Loss Records - Abnajs/MNF

Pump station: KAFR ABNAHS

Month 1989	Bldgs No	Servs No	UMC kl	MC kl	Tot Con kl	Supply kl	Av.Hrs. /Day	Losses L/ser/hr	Losses (Z)
Jan-89	1180	241	425	1418	1843	4967	2.0	269	63
Feb-89	1180	241	332	1105	1437	4077	1.8	217	65
Mar-89	1180	241	686	2320	3006	4123	1.6	93	27
Apr-89	1180	241	890	2968	3858	4802	2.0	65	20
May-89	1180	241	1011	3372	4383	6798	2.7	120	36
Jun-89	1160	241	1073	3578	4651	8280	3.5	143	44
Jul-89	1180	241	1681	5605	7286	8680	3.5	53	16
Aug-89	1180	241			0	ERR		ERR	ERR
7	31			26464	41727		17.1	902	
Grand Total				203613	367729		170.3		

Av. Con./PS=Total Con.(per PS)/no of days/no of conn.#4.5(person per ser.)

= 115 (l/c/d)

Kafr Abnajs

MonRec no	Date	Kafr Abnajs PS Cont...																														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan	31	161	161	157	158	159	168	157	163	157	163	156	159	163	158	161	163	157	152	162	159	157	169	157	162	159	163	156	164	161	163	
Feb	29	161	158	163	159	159	160	160	159	161	159	162	158	159	159	161	159	162	159	117	122	121	119	121	119	121	119	121	119	121		
Mar	31	119	118	120	123	119	120	119	160	119	161	120	119	119	120	121	123	161	121	126	118	121	112	121	161	123	162	159	159	161	159	159
Apr	30	164	154	162	159	161	160	157	162	159	162	161	156	162	161	160	159	162	157	164	157	165	157	156	161	161	161	158	161	161	160	
May	31	159	161	159	160	201	203	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	
Jun	30	240	240	240	281	279	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	
July	31	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	
Aug	n																															

Notes: Losses=Total Losses/(30 day*Total Hrs.#No. of Conn.)
 1) No readings for August.
 2) Consistency of daily supply is unrealistic. = 123 l/ser./hr
 = 29752 l/hr

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Water Loss Records - Abnabs/MNF

Av. Losses(Z)=(Supply-Consumption)/Supply*100

= 45 Z

Av. Losses(l/ser/hr)=Sum of Losses(l/ser/hr)/no of month

= 63 (l/ser/hr)

Net Sum of Consumption

= 203613 Cubic Meters

Net Sum of Supply

= 367729 Cubic Meters

Total no of Connections

= 2870 Connection

Total Hours of Supply

= 170.3 Hours

Total no of Month

= 24 Month

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