THE IMPLEMENTATION REVIEW STUDY
ON
THE PROJECT
FOR
REHABILITATION OF WATER DISTRIBUTION PIPELINES
IN
DAMASCUS CITY (PHASE II)
IN
SYRIAN ARAB REPUBLIC

FEBRUARY 2002

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD.

PREFACE

In response to a request from the Government of the Syrian Arab Republic, the Government of Japan decided to conduct an implementation review study on the project for rehabilitation of water distribution pipelines in Damascus City (Phase II) and entrusted the study to the Japan International Cooperation Agency (JICA).

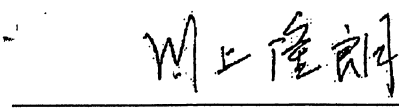
JICA sent to Syria a study team from December 7 to December 25, 2001.

The team held discussions with the officials concerned of the Government of Syria, and conducted a field study at the study area. After the team returned to Japan, further studies were made and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Syrian Arab Republic for their close cooperation extended to the teams.

February, 2002



Takao Kawakami
President
Japan International Cooperation Agency

February, 2002

LETTER OF TRANSMITTAL

We are pleased to submit to you the implementation review study report on the project for rehabilitation of water distribution pipelines in Damascus City (Phase II) in Syrian Arab Republic.

This study was conducted by Nippon Koei Co., Ltd., under a contract to JICA, during the period from December, 2001 to February, 2002. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Syria and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

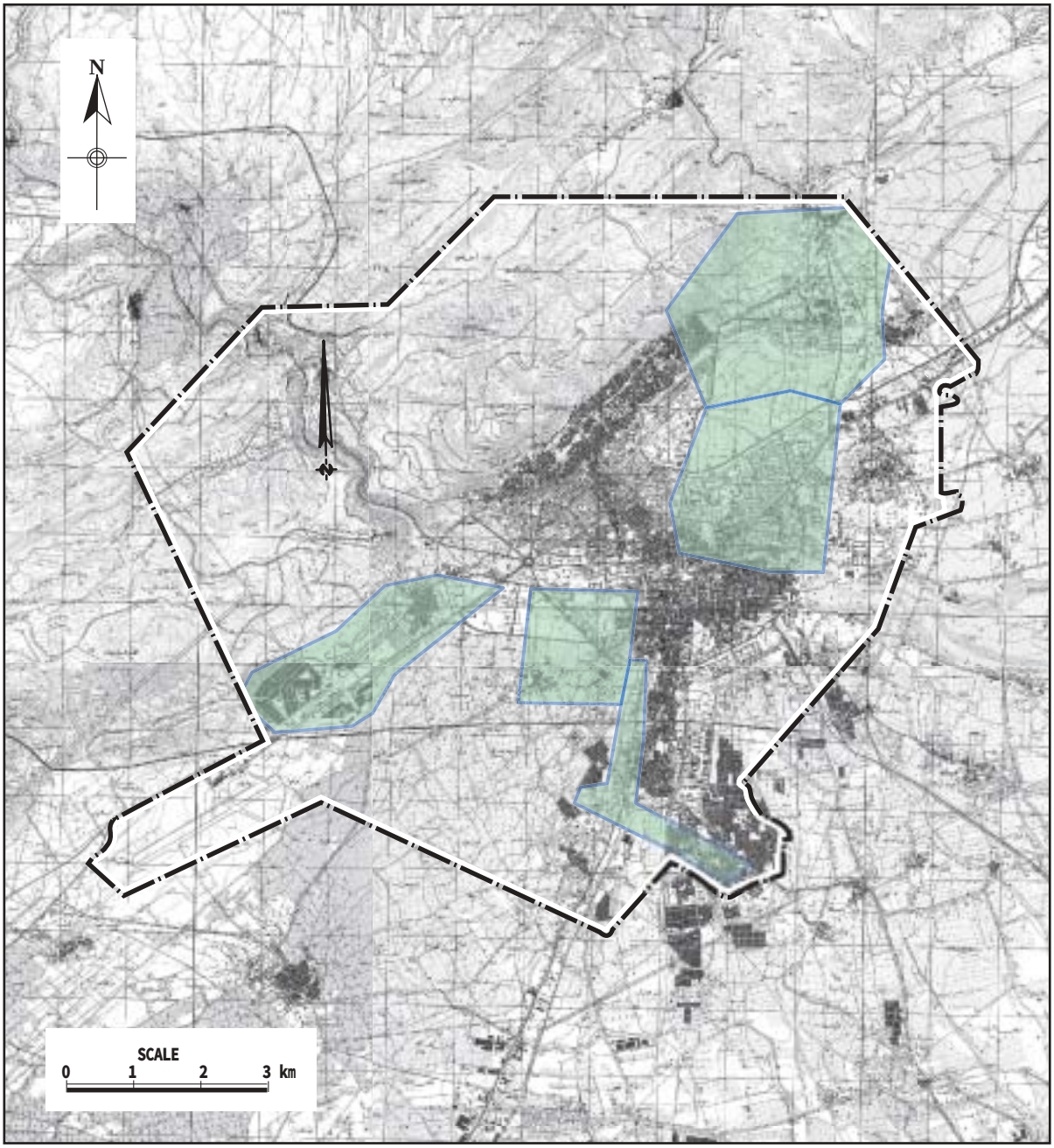
Very truly yours,

Yoshiharu Inabe
Project Manager,
Implementation review study team on
the project for rehabilitation of water distribution
pipelines in Damascus City (Phase II)
Nippon Koei Co., Ltd.

Legend

Project Area

Existing Boundary of the City



Location Map

LIST OF FIGURES AND TABLES

Figures

Tables

ABBREVIATIONS

Organizations

DAWSSA	-	Damascus City Water Supply and Sewerage Authority
EDWSSR	-	Establishment of Drinking Water Supply and Sewerage in the Rural Province of Damascus
ISO	-	International Standard Organization
JICA	-	Japan International Cooperation Agency
MOHU	-	Ministry of Housing and Utilities
SAR	-	Syrian Arab Republic
SPC	-	The State Planning Commission
UNESCO	-	United Nations Educational, Scientific, and Cultural Organization

Others

DMA	-	District Meter Areas
E/N	-	Exchange Note
GDP	-	Gross Domestic Product
JIS	-	Japan Industrial Standard
SCADA	-	Supervisory Control and Data Acquisition (System)
UFW	-	Unaccounted for Water

Currency

US $ = US Dollar
SL = Syrian Pound
¥ = Japanese Yen

SUMMARY

SUMMARY

The Syrian Arab Republic is located on the eastern Mediterranean Sea. Its total landmass is 185,000 square kilometers. According to the census information, the total population of the country in 2000 was 16.32 million. About 50% of the population live in urban areas. The GDP was US$16,500 million in the year 2000 and the per capita GDP was US$1,024 in 2000. The Project is planned for Damascus City, the national capital of Syria, where the total population is approximately 1.51 million. The urban area of Damascus is located on a thick alluvial fan formed where the Barada River leaves the Anti Lebanon Mountain Belt and flows east onto a plain of the El-Arab Trough. The climate of Damascus City is Mediterranean, characterized by a dry season from April to October and a wet season from November to March.

In Damascus City, a shortage of water supply (only a half-day water supply during the dry season) has been forcing the life of the people and the industrial activities into serious and critical conditions. In 1995, the Damascus City Water Supply and Sewerage Authority (DAWSSA) supplied a total of approximately 218 MCM, and there was an estimated 25 MCM demand which was not met. It is reported that the shortage of water supply occurred due to the seasonal variation in the amount of spring water and a high rate of Unaccounted for Water (UFW), estimated to be 64%. Leakage of water from the aging water supply pipes, estimated at 34.7% of the supply, contributes to these high levels of UFW. The aging water supply pipes also increase the risk of contamination by wastewater flowing into the network at leakage points during the water supply restriction periods.

As a step to improving the above mentioned conditions, the Government of the Syrian Arab Republic (hereinafter referred to as “the Government of Syria”) requested the Government of Japan to conduct a Study on the Development of the Water Supply System for Damascus City. In response to the official request from the Government of Syria, the Government of Japan dispatched a JICA Study Team in January 1996. This team prepared a master plan study of the water supply. In the study report, a target figure of 25% total UFW was set for the year 2015. It also recommended that counter measures be implemented urgently: 1) to convert all informal housing areas to formal status by providing metered service connections, and 2) to reduce system losses by carrying out a mains renewal program to replace old distribution mains.

Among the counter measures recommended in the JICA Master Plan, the Government of Syria adopted the pipe mains renewal program as the first priority. Thereafter, the Government of Syria requested the Government of Japan to conduct a procurement project for

rehabilitation of water distribution pipelines in Damascus City under Japan's Grant Aid program. In response to the official request from the Government of Syria, the Government of Japan, through JICA, conducted a review of the project for rehabilitation of water distribution pipelines in Damascus City. The Government of Japan dispatched a JICA Study Team to Damascus from January 9 to January 22, 1998, when the Team performed the study and had meetings with DAWSSA and other related organizations.

The JICA Team settled on a rehabilitation program in which the highest priority is given to areas where the frequency of leakage from large pipes is high. According to the program, the Project for Rehabilitation of Water Distribution Pipelines in Damascus City was implemented under Japan's Grant Aid program. As a result of the project, the procurement of pipe materials totaling 46 km has been performed in three stages since 1998.

Following the procurement of pipe materials, pipes were laid in five areas: Wali, Malki, Old City, Presidential and Nasr areas. As the rehabilitation works for water supply pipes in the central part of the City has progressed, water pressures in the pipes in the outer parts of the City have risen to normal levels. As a result, more frequent water leakage problems in the remaining old pipes have been observed. In order to cope with the system leakage, therefore, the Government of Syria requested the Government of Japan to conduct another procurement project (75 km pipe materials) for rehabilitation of water distribution pipelines in Damascus City under Japan's Grant Aid.

In response to the official request from the Government of Syria, the Government of Japan conducted an implementation review study on the Project for Rehabilitation of Water Distribution Pipelines in Damascus City, Phase II, and JICA implemented the study. The Government of Japan dispatched a JICA Study Team to Damascus from December 6 to December 26, 2001, when the Team performed the study and had meetings with DAWSSA and other related organizations.

The original total length of pipe materials requested by the Government of Syria was 51 km. Afterwards, however, an additional 24 km of pipelines was found, through a study of DAWSSA, to be urgently in need of replacement. The areas of Berzeh, Bagdad and Kafar Sousa, where new pipes are to be connected to the pipes installed in the phase I project, and Midan, a part of which is the Yarmouk area where there are Palestine refugee camps, take priority over the Mezze area. Lists of all the necessary components to complete the replacement of each pipeline, including straight pipes, fittings, accessories, and other associated units, should be prepared. Ductile iron pipes with inside mortar lining will be adopted for new replacement pipe for their high durability and corrosion proof mortar lining,

which prevents rust-colored water and poor water flow. Accessories such as snap taps with saddles, stop valves, and air valves are also to be replaced during the pipe renewal works. A contingency allowance for quantity has to be taken into account in case additional materials are needed to divert around underground obstructions or damage to materials during handling. Based on the above basic plan, as well as the requirements of Japan's Grant Aid scheme, the procurement plan is designed as shown in the following table:

Year	Area	Pipe Diameter (mm)								Total
		100	150	200	250	300	400	500	600	(m)
1	Kafar Sousa	2,400	2,000		1,400					5,800
	Bagdad	10,500	5,100	2,600	1,900	500		1,300	1,100	23,000
	Berzeh	3,400	500		2,600	3,200				9,700
	Midan	200	1,700	4,900	570		2,920		1,200	11,490
	Subtotal	16,500	9,300	7,500	6,470	3,700	2,920	1,300	2,300	49,990
2	Mezze	8,500	5,000	6,600	2,900		2,100			25,100
Total		25,000	14,300	14,100	9,370	3,700	5,020	1,300	2,300	75,090

In consideration of the ability of local contractors, the procurement of materials will be made in two stages in order to realize early completion of the immediate program for leakage reduction. The total project period will be 23 months (first stage; 11 months, second stage; 11 months plus 1 month between the end of the first stage and the beginning of the second stage). For each stage the detailed design and material procurement will require 4 months and 6.5 months respectively.

Technical Assistance will be provided to DAWSSA staff for a period of 8 months (first stage; 4 months, second stage; 4 months) to realize proper and speedy repair works of broken pipes by means of quickly accessible, centrally stored digital data. During the implementation period, techniques for management of construction progress will be transferred to the DAWSSA engineers to standardize and up-grade their capacity.

DAWSSA, an organization under the Ministry of Housing and Utilities, is responsible for the implementation of this project. DAWSSA has 15 directorates including, amongst others, Study/Design Directorate, Construction/Supervision Directorate, Finance Directorate, Planning/Statistic Directorate, Accounting Directorate, and the Distribution Directorate. It also has five offices such as the Public Relations Office and Secretary Office. The total number of employees is 1,639, which consists of 1,146 permanent staff, 493 temporary staff and 33 contracted specialists. Directorates responsible for the implementation of this project

are the Study/Design, Finance, Construction/Supervision and Distribution Directorates; these directorates have a total of 481 staff. Contractors selected by DAWSSA through tender will undertake the construction works, which will be supervised by a team organized under the Construction/Supervision Directorate. The director of the Construction/Supervision Directorate holds the post of project manager concurrently. Under the project manager, there is a position of deputy project manager. The execution unit has four construction supervision groups with six engineers and four assistant engineers. The Finance Directorate is responsible for receiving goods at Tartus port, transporting them to Adra stockyard and inventory management including bank arrangements and tax exemption applications. Preparation of drawings and tender documents for procurement of contractors/suppliers is a responsibility of the Study/ Design Directorate. The Distribution Directorate will be responsible for maintaining the water supply facilities after completion.

The effects expected from replacing the old cast iron pipes with new ductile iron pipes are: 1) saving water for use in water supply, 2) cutting repair costs of the distribution network, and 3) increasing revenue. The 1.51 million people of Damascus City will have a more stable and safer water supply service after the Project. The Project will improve people's livelihood and hygienic conditions. Water saved by the project (renewal of 75 km pipelines) is expected to be about 12,600 m^3/day or equivalent to 10% of the total leakage volume, 133,200 m^3/day, in 2000. The amount of saved water is equivalent 4.6 million m^3 of yearly water yield enough to supply 74,000 people and contribute to improvement of DAWSSA's revenue.

After the implementation of the project, not only the people living in areas of Kafar Sousa, Bagdad, Berzeh, Midan and Mezze, but also the people in entire area of Damascus (1.51 million of population) will have a more stable and safer water supply. Judging from the study results, it is expected that the Project will significantly increase the supply of safe drinking water to more inhabitants without the need to develop new water resources. Accordingly, it is concluded that the implementation of the Project is suitable and viable for Japan's Grant Aid. Furthermore, it is expected that the replacement of pipelines procured under the Project will be implemented smoothly and effectively provided the concerned parties meet the following commitments:

- Prepare the budget and to establish an organization for the implementation stage to arrange customs clearance of materials and replace the distribution pipes procured under the Project;
- Procure contractors in line with the implementation schedule; and

  Follow application procedures for construction permits for pipe replacement along road alignments to meet the implementation schedule.

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THE DAMASCUS CITY (Phase II)

TABLE OF CONTENTS

APPENDICES

CHAPTER 1

BACKGROUND OF THE PROJECT

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The Damascus City Water Supply and Sewerage Authority (DAWSSA) provides water, mainly from Figeh spring, for Damascus City. However, water restrictions occur in Damascus during the dry season, despite supplementary groundwater being pumped from deep wells in the City. The shortage of water is caused by seasonal variation in the amount of spring water and a high rate of Unaccounted for Water (UFW), estimated at 64%. This unacceptably high level of UFW is due mostly to leakage from an aging infrastructure, and unmetered use from informal pipe connections. The main components of UFW are attributed to: leakage (34.7%), meter malfunctions (14.4%), informal use (13.6%), and religious and public fountain use (1.7%).

As a step towards improving the above mentioned conditions, the Government of the Syrian Arab Republic (hereinafter referred to as “the Government of Syria”) requested the Government of Japan to conduct a Study on the Development of the Water Supply System for Damascus City. In response to the official request from the Government of Syria, the Government of Japan dispatched a JICA Study Team in January 1996 to carry out the Master Plan Study. In the study report, a target figure of 25 % total UFW was set for the year 2015. It recommended carrying out the following counter measures urgently; 1) to convert all informal housing areas to formal status by providing metered service connections, 2) to reduce system losses by carrying out a mains renewal program to replace old distribution mains.

According to the JICA feasibility study on leakage reduction, the existing cast iron mains with leaded joints, whose average age is 42 years old, far exceeding their expected service life, are the main cause of UFW. Since 1997, replacement pipe materials (46 km) have been procured in three stages under Japan’s Grant Aid program for the project referred to as Rehabilitation of Water Distribution Pipelines in Damascus City.

In the overall scope of the system renewal program recommended in the Master Plan by JICA, however, there is still a total length of 75 km of pipes to be renewed and DAWSSA has not been able to fund the procurement of these pipe without external aid. In this connection, the Government of Syria requested the Government of Japan to conduct the procurement project (75 km pipe materials) for rehabilitation of the water distribution pipelines in Damascus City under Japan’s Grant Aid program.