

APPENDIX K
ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

APPENDIX K ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

K.1 Surrounding Conditions of the Project Site (Transmission Reservoir and Pumping Station)

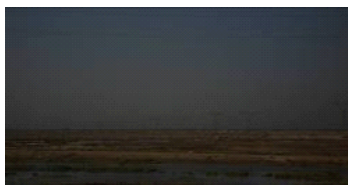
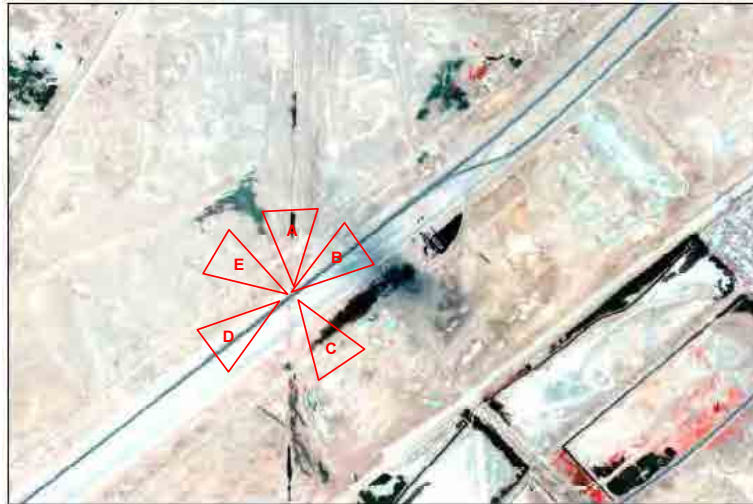


Photo - A (1)



Photo - B (1)

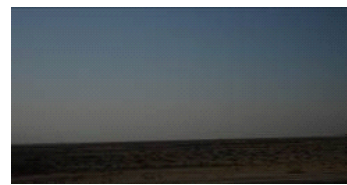


Photo - C(1)



Photo - A (2)



Photo - B (2)



Photo - C(2)



Photo - D(1)

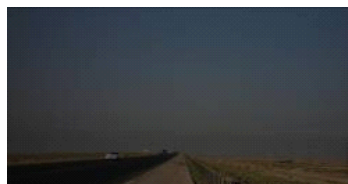


Photo -E(1)

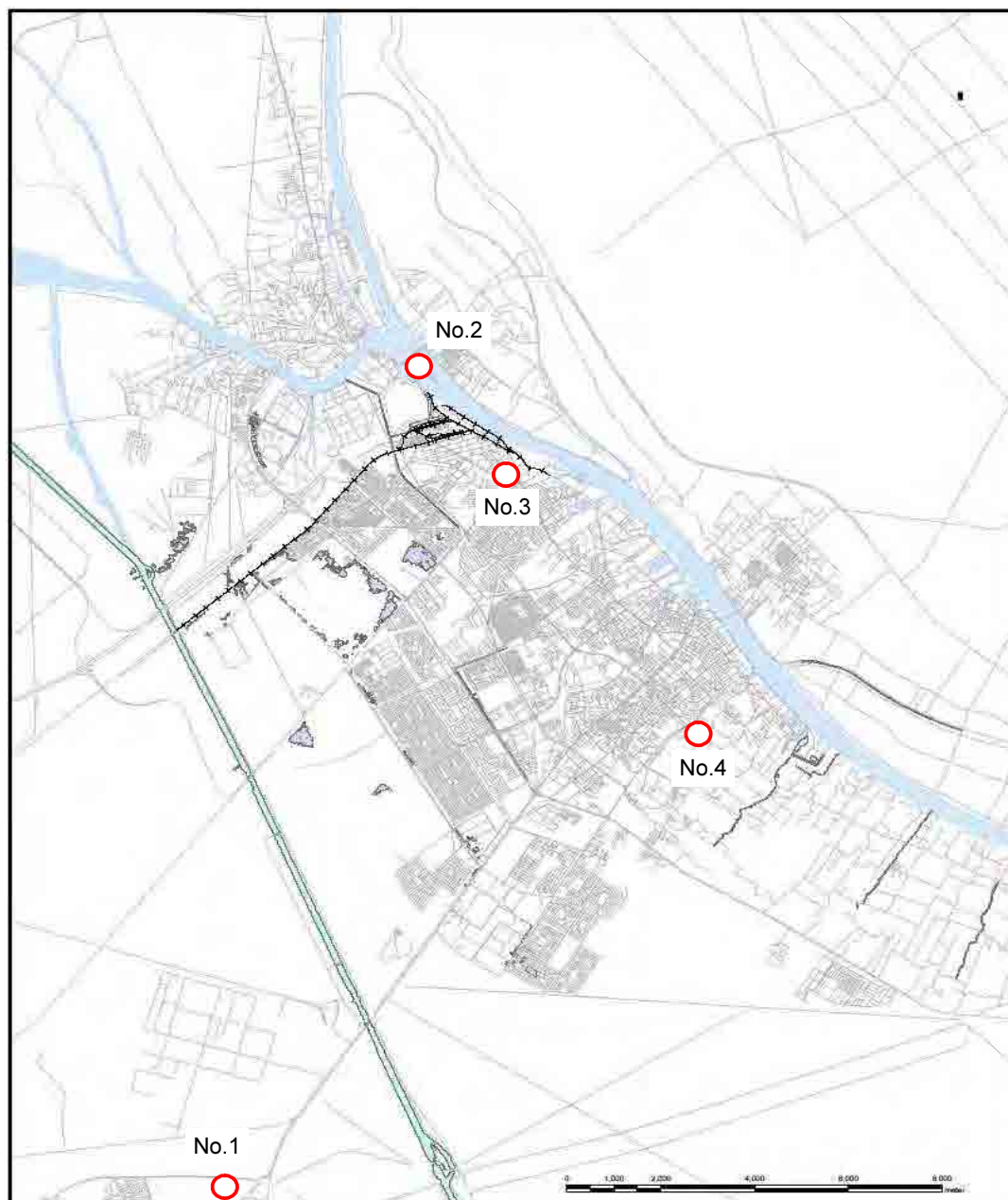


Photo - D (2)



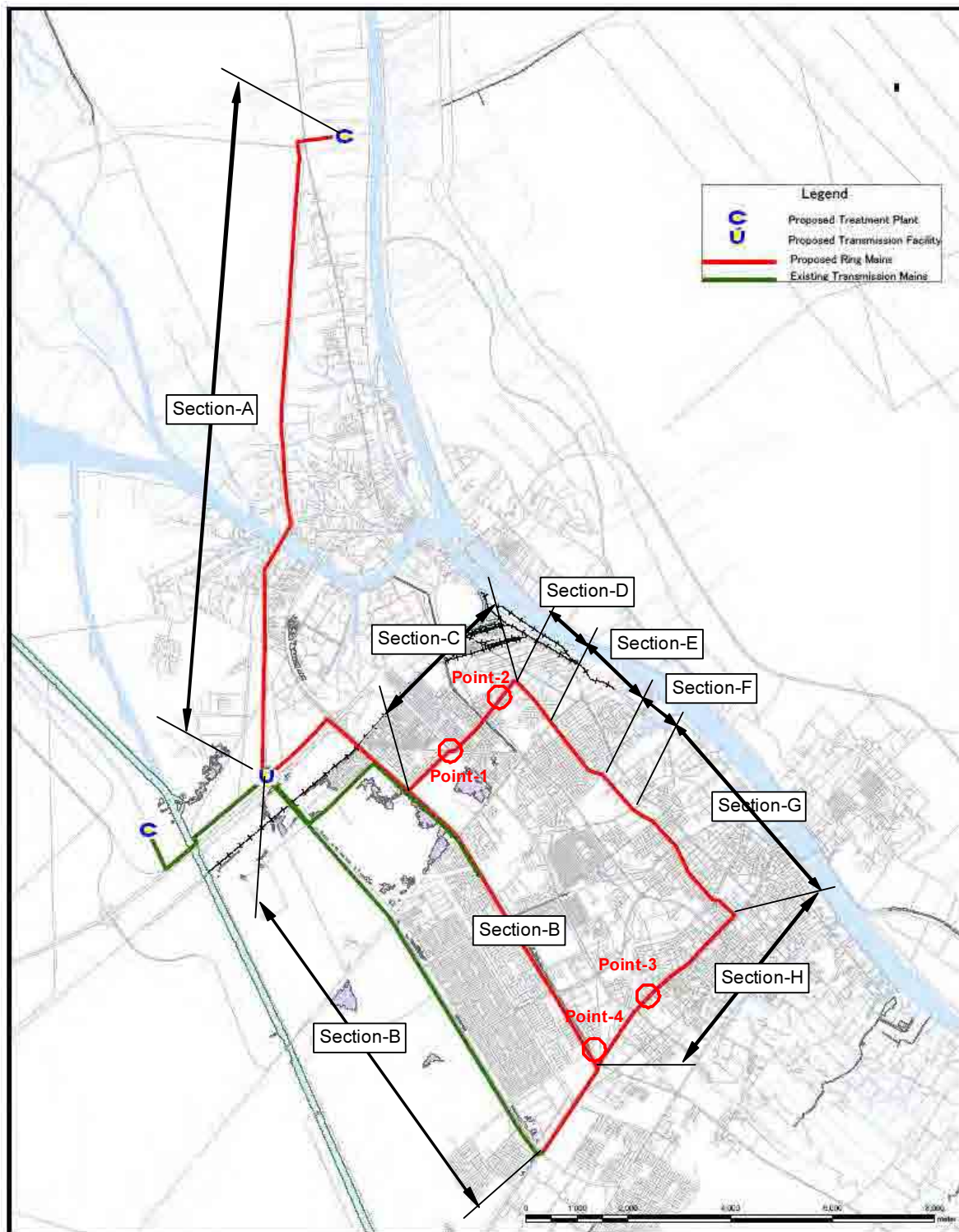
Photo - E (2)

K.2 Location of Cultural Heritage, Old Remains and National Parks in Basrah

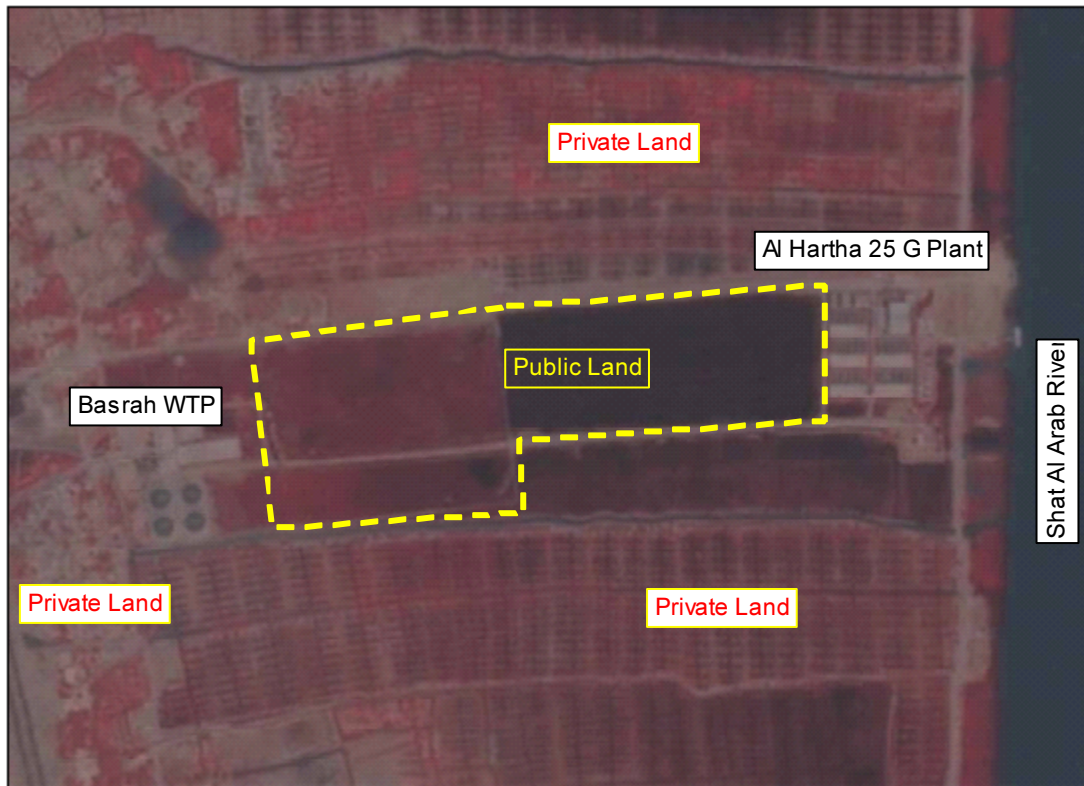


<Cultural Heritages and Old Remains>	
No.1	AL Imam Ali mosque in AL Zubair District
< National Park >	
No.2	AL Andules Park in al maqal
No.3	AL Sideband Park in al maqal
No.4	AL Khora Park

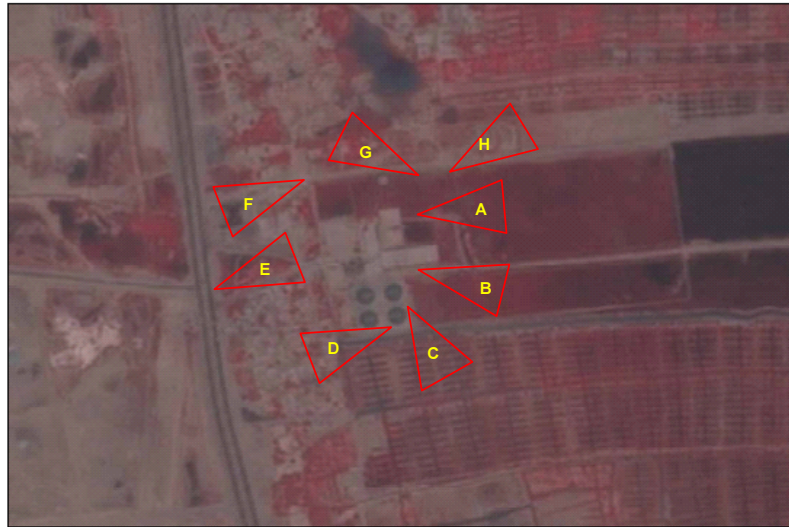
K.3 Route of Ring Main



K.4 Surrounding Conditions of Project Site (New Water Treatment Plant)



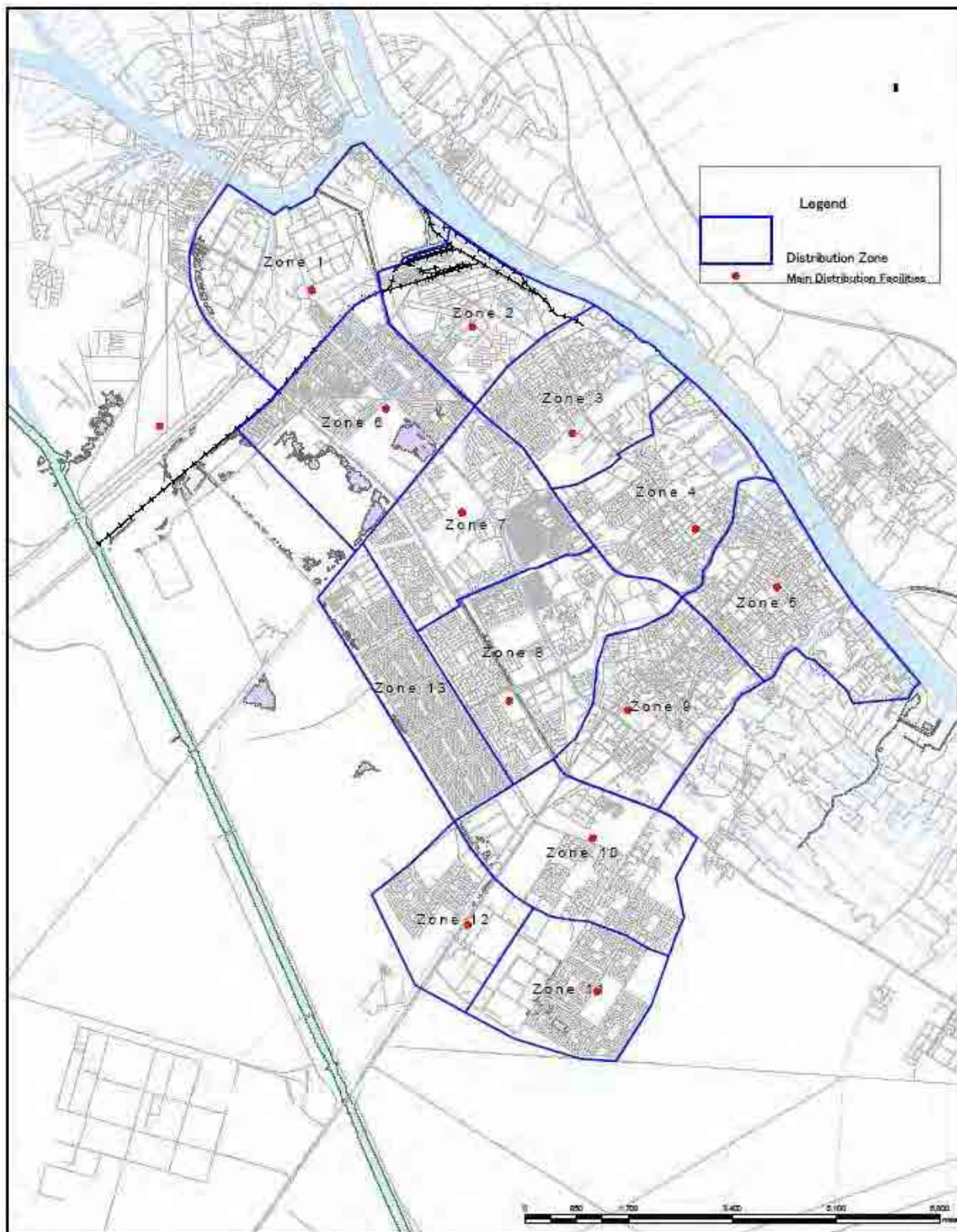
K.5 Surrounding Condition of Existing Basrah Unified Plant



K.6 Surrounding Conditions of Existing Hartha 25 MG Plant



K.7 Location of Main Distribution Facilities and Distribution Zone



K.8 Existing Conditions of the Project Site (Distribution Facilities) (1/2)



K.9 Existing Situation of the Project Site (Distribution Facilities) (2/2)



APPENDIX L
GIS DATA

APPENDIX L GIS DATA

L.1 General Explanation

(1) Overview of GIS database

This GIS database consists of map data and attributes data, which is managed by ArcGIS (Software of GIS). The attributes data include two (2) databases, i.e., map attribute database and observational database.

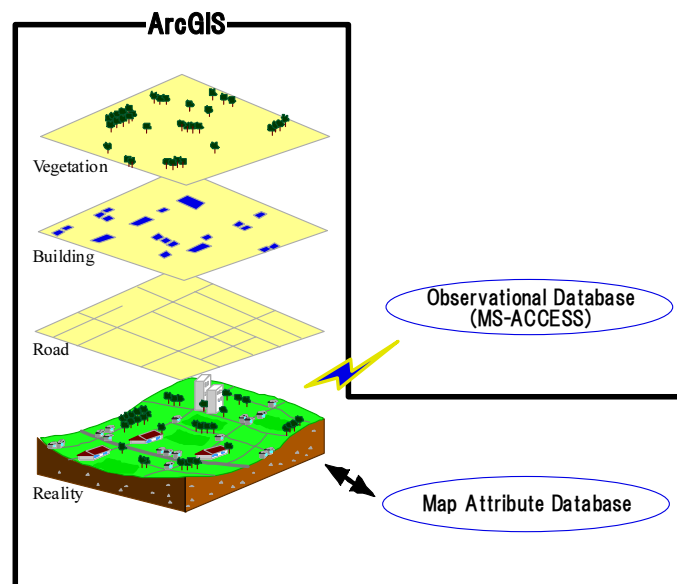


Figure L.1 Image of Data Composition

(2) Projection of Map Data

Map data is expressed two-dimensionally on paper or a computer. However, as the earth is in ellipse, it is necessary to apply the projection which distortion is minimum for latitudes. Therefore, “GCS_WGS_84” and “WGS_1984_UTM_Zone_38N” are applied to projection of these map data. This projection is one of the methods for middle latitudes.

(3) Structure of Data

Data consist of two (2) types, such as ArcGIS file format, MS-Access file format and raster file format (satellite image).

(4) ArcGIS Data

GIS data has the layered structure and each layer is composed of several files. These files are stored in a given folder.

Table L.1 Folder Structure of ArcGIS Data

Main Folder Name	Sub Folder Name	Layer Name
BASEMAP	BASE	IRAQ_POL_BOUND
		BASRAH_BOUNDARY
		INTERPRETATED_AREAS
		RIVER
		SWC
		WATER1
		WATER2
		WATER3
		ROAD
		BASRAH_ROAD_LOCAL
		AIRPORT
		RAILWAY
	ADDITION	BASRAH_ROAD_LOCAL_B
		ROAD_B
		NEW_ROAD
WSF	AREA	DIS_ZONE
		DIS_SUB_ZONE
		TOWN_UTM
		DISTRICT
		TOWN
	EXISTING	EX_TRANS_PUMP
		EX_DIS_FACILITY
		EX_RES
		EX_WTP
		EX_TRANS_MAIN
		EX_TRANS_PIPE
	PROPOSED	EX_DIS_PIPE
		PRO_DIS_FACILITY_A
		PRO_WTP
		PRO_TRANS_FACILITY
		PRO_DIS_FACILITY_B
		PRO_CON_MAIN_EX_WTP
		PRO_TRANS_ALQUORNA
		PRO_TRANS_ALHARTHA
		PRO_DIS_PIPE
		PRO_CON_MAIN_PRO_RES
		PRO_RISING_MAIN

(5) MS-Access Data

Observational database are in the access file format. It stores monthly operation and maintenance data for water treatment plants and pump stations.

Table L.2 Folder Structure of MS Access Data

Main Folder Name	Sub Folder Name	File Name
WSF_DATA	Database	BWD_WTP_2006.mdb
		BWD_PS_2006.mdb

(6) Raster Data

The satellite data were prepared for creating the base map. The file format is TIFF corrected geometrically.

Table L.3 The List of Raster Data

Data Name	Target Area	Projection	Resolution	Date	Remark
IMAGERY_0_0.tif	Surrounding cities of Al-Basrah city	Lat/Long, Geographic	2.5m	17-Apr-2005	SPOT View Level3, ortho, multiple spectra
IMAGERY_0_1.tif	Surrounding cities of Al-Basrah city	Lat/Long, Geographic	2.5m	17-Apr-2005	SPOT View Level3, ortho, multiple spectra
IMAGERY_0_0.tif	Al-Basrah city and its surroundings	Lat/Long, Geographic	2.5m	11-May-2005	SPOT View Level3, ortho, multiple spectra
IMAGERY_0_1.tif	Al-Basrah city and its surroundings	Lat/Long, Geographic	2.5m	11-May-2005	SPOT View Level3, ortho, multiple spectra
IMAGERY.TIF	Al-Basrah city and its surroundings	Lat/Long, Geographic	10.0m	28-Sep-2005	SPOT View Level3, ortho, panchromatic
MODIS_IRAQ_FC_N1.tif	Basrah State	Lat/Long, Geographic	250m	28-Feb-2006	False Color: 121
MODIS_IRAQ_FC_N2.tif	Basrah State	Lat/Long, Geographic	250m	28-Feb-2006	False Color: 121
MODIS_IRAQ_TC_N1.tif	Basrah State	Lat/Long, Geographic	250m	28-Feb-2006	True Color- 143
MODIS_IRAQ_TC_N2.tif	Basrah State	Lat/Long, Geographic	250m	28-Feb-2006	True Color- 143

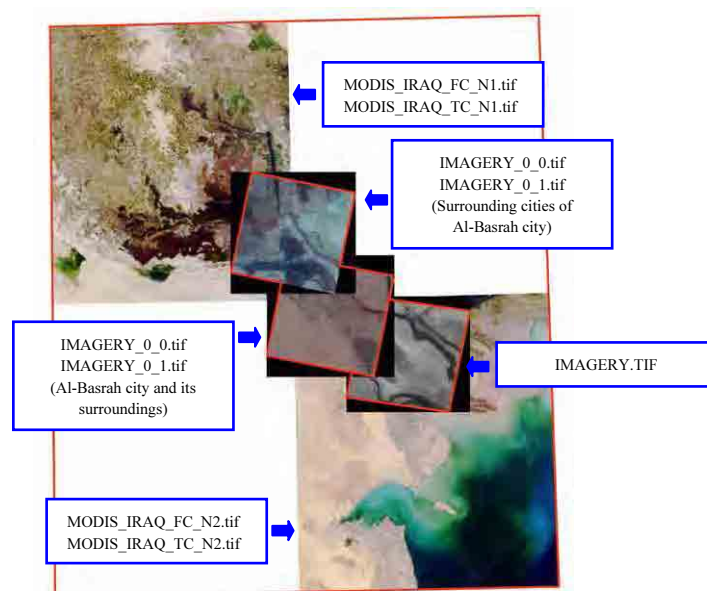


Figure L.2 Raster Data Image

L.2 Definition of Maps and Attribute Data

Table L.4 List of Map and Map Attribute Data List

No	Map (Layer) Name	Type	Data Content	Main Attribute Data
1	IRAQ_POL_BOUND	Polyline	Political boundary line	Id, type, name
2	BASRAH_BOUNDARY	Polyline	Basrah state boundary line	Id, type, name
3	INTERPRETATED_AREAS	Polygon	Interpreted areas of each satellite	Id, type, name
4	RIVER	Polygon	River polygon	Id, type, name
5	SWC	Polyline	Sweet Water Canal	Id, type, name
6	WATER1	Polyline	Water canal line	Id, type, name
7	WATER2	Polygon	Water canal polygon	Id, type, name
8	WATER3	Polygon	Lakes and marshes polygon	Id, type, name
9	ROAD	Polyline	Road line	Id, type, name
10	BASRAH_ROAD_LOCAL	Polyline	Basrah city local road line	Id, type, name
11	AIRPORT	Polygon	Airport location	Id, type, name
12	RAILWAY	Polyline	Railway line	Id, type, name
13	BASRAH_ROAD_LOCAL_B	Polyline	Basrah city local road line with length	Id, type, name, length
14	ROAD_B	Polyline	Road line with length	Id, type, name, length
15	NEW_ROAD	Polyline	Road line with length	Id, length, type, name
16	DIS_ZONE	Polygon	Distribution zone	Id, name, ave2006, ave2015, ave2025, type, district, area, Pop, house, daily_max, hourly_max, daily_ave, remark
17	DIS_SUB_ZONE	Polygon	Distribution sub-zone	Id, name, type, district, area, pop, house, daily_max, hourly_max, daily_ave, remark
18	TOWN_UTM	Polygon	Town (projection; utm)	Id, name_2, area, den2006, den2015, den2025, pop2006, pop2015, pop2025, ave2006, ave2015, ave2025, type, district, pop, house, daily_max, hourly_max, daily_ave
19	DISTRICT	Polygon	District	Id, name
20	TOWN	Polygon	Town (projection; WGS)	Id, name
21	EX_TRANS_PUMP	Point	Existing transmission pump station	Id, name, type, address, lat, lon, type_p, year_c, year_r, no_p, capa_d, capa_a, remark
22	EX_DIS_FACILITY	Point	Existing distribution facilities	Id, name, capacity, lwl, hwl, address, lat, lon, structure, remark, type
23	EX_RES	Point	Existing reservoir	Id, name, capacity, lwl, hwl, address, lat, lon, structure, remark, type
24	EX_WTP	Point	Existing water treatment plant	Id, name, lat, lon, type, address, type_t, ws, year_c, year_r, no_u, capa_d, capa_a, remark
25	EX_TRANS_MAIN	Polyline	Existing transmission main pipeline	Id, diameter, type, length, material, year_c, year_a, remark
26	EX_TRANS_PIPE	Polyline	Existing transmission pipeline from R-zero	Id, diameter, length, type, material, year_c, year_r, remark

No	Map (Layer) Name	Type	Data Content	Main Attribute Data
27	EX_DIS_PIPE	Polyline	Existing distribution pipeline	Id, diameter, length, type, material, year_c, year_r, remark
28	PRO_DIS_FACILITY_A	Point	Existing distribution main facilities	Id, type, name, lat, lon, address, structure, capacity, hwl, lwl, remark
29	PRO_WTP	Point	Proposed water treatment plant	Id, type, name, address, lat, lon, type_t, ws, year_c, year_r, no_u, capa_d, capa_a, remark
30	PRO_TRANS_FACILITY	Point	Proposed transmission facilities	Id, type, name, address, lat, lon, type_p, year_c, year_r, no_p, capa_d, capa_a, remark
31	PRO_DIS_FACILITY_B	Point	Proposed distribution facilities	Id, type, name, address, lat, lon, structure, capacity, hwl, lwl, remark
32	PRO_CON_MAIN_EX_WTP	Polyline	Connection main pipeline from existing water treatment plant	Id, type, diameter, length, material, year_c, year_r, remark
33	PRO_TRANS_ALQUORNA	Polyline	Proposed transmission main pipeline from Al-Quorna	Id, type, diameter, length, material, year_c, year_r, remark
34	PRO_TRANS_ALHARTHA	Polyline	Proposed transmission main pipeline from Al-Harthia	Id, type, diameter, length, material, year_c, year_r, remark
35	PRO_DIS_PIPE	Polyline	Proposed distribution pipeline	Id, type, diameter, length, material, year_c, year_r, remark
36	PRO_CON_MAIN_PRO_RES	Polyline	Proposed connection main pipeline	Id, type, diameter, length, material, year_c, year_r, remark
37	PRO_RISING_MAIN	Polyline	Proposed rising main pipeline	Id, type, diameter, length, material, year_c, year_r, remark

Table L.5 Map Data List

No	Map (Layer) Name	Type	Source	Number of "Type" Attribute Value	A value of "Type" Attribute Value
1	IRAQ_POL_BOUND	Polyline	Prepared by JICA study team from satellite image	2	1-Border line from a source 2-Hand draw line
2	BASRAH_BOUNDARY	Polyline	Prepared by JICA study team from satellite image	1	1-Border line from a source
3	INTERPRETATED_AREAS	Polygon	Prepared by JICA study team from satellite image	3	1-Interpretated area of SPOT 5.5M 2-Interpretated area of SPOT 10M 3-Interpretated area of MODIS
4	RIVER	Polygon	Prepared by JICA study team from satellite image	3	1-Small rivers 2-River polygon from SPOT 3-River polygon from MODIS
5	SWC	Polyline	Prepared by JICA study team from satellite image	1	3-Sweet Water Canal
6	WATER1	Polyline	Prepared by JICA study team from satellite image	2	1-Small water canal 3-Sweet Water Canal
7	WATER2	Polygon	Prepared by JICA study team from satellite image	2	2-Large water canal from SPOT and MODIS 4-Large water canal from SPOT
8	WATER3	Polygon	Prepared by JICA study team from satellite image	1	1-Artificial lakes and marshes
9	ROAD	Polyline	Prepared by JICA study team from satellite image	3	1-Ordinary road 2-Hand draw Road line 3-Wide road

No	Map (Layer) Name	Type	Source	Number of "Type" Attribute Value	A value of "Type" Attribute Value
10	BASRAH_ROAD_LOCAL	Polyline	Prepared by JICA from satellite image	1	1-Local road of Basrah city
11	AIRPORT	Polygon	Prepared by JICA study team from satellite image	1	1-Airpot
12	RAILWAY	Polyline	Prepared by JICA study team from satellite image	1	1-Railway
13	BASRAH_ROAD_LOCAL_B	Polyline	Prepared by JICA from satellite image, length data was prepared by JICA study team	1	1-Local road of Basrah city (with length data)
14	ROAD_B	Polyline	Prepared by JICA study team from satellite image, length data was prepared by JICA study team	3	1-Ordinary road
					2-Hand draw line
					3-Wide road
15	NEW_ROAD	Polyline	Prepared by JICA study team from satellite image	1	1-Road (with length data)
16	DIS_ZONE	Polygon	Prepared by JICA study team from proposed water supply plan	1	1-Distribution zone
17	DIS_SUB_ZONE	Polygon	Prepared by JICA study team from proposed water supply plan	1	1-Distribution sub-zone
18	TOWN_UTM	Polygon	Prepared by JICA study team from proposed water supply plan	1	1-Town (projection; utm)
19	DISTRICT	Polygon	Prepared by JICA study team from proposed water supply plan	1	1-District
20	TOWN	Polygon	Prepared by JICA study team from proposed water supply plan	1	1-Town (projection; WGS)
21	EX_TRANS_PUMP	Point	Prepared by JICA study team from the maps including the water supply facilities in Basrah city	1	1-Existing transmission pump station
22	EX_DIS_FACILITY	Point	Prepared by JICA study team from the maps including the water supply facilities in Basrah city	1	1-Existing distribution facilities (new construction)
23	EX_RES	Point	Prepared by JICA study team from the maps including the water supply facilities in Basrah city	1	1-Existing reservoir
24	EX_WTP	Point	Prepared by JICA study team from the maps including the water supply facilities in Basrah city	1	1-Existing water treatment plant
25	EX_TRANS_MAIN	Polyline	Prepared by JICA study team from the maps including the water supply facilities in Basrah city	1	1-Existing transmission main pipeline
26	EX_TRANS_PIPE	Polyline	Prepared by JICA study team from the maps including the water supply facilities in Basrah city	1	1-Existing transmission pipeline from R-zero
27	EX_DIS_PIPE	Polyline	Prepared by JICA study team from the maps including the water supply facilities in Basrah city	1	1-Existing distribution pipeline
28	PRO_DIS_FACILITY_A	Point	Prepared by JICA study team from proposed water supply plan	1	1-Existing distribution main facilities
29	PRO_WTP	Point	Prepared by JICA study team from proposed water supply plan	1	1-Proposed water treatment plant
30	PRO_TRANS_FACILITY	Point	Prepared by JICA study team from proposed water supply plan	1	1-Proposed transmission facilities
31	PRO_DIS_FACILITY_B	Point	Prepared by JICA study team from proposed water supply plan	1	1-Proposed distribution facilities
32	PRO_CON_MAIN_EX_WTP	Polyline	Prepared by JICA study team from proposed water supply plan	1	1-Connection main pipeline from existing water treatment plant
33	PRO_TRANS_ALQUORNA	Polyline	Prepared by JICA study team from proposed water supply plan	1	1-Proposed transmission main pipeline from Al-Quorna
34	PRO_TRANS_ALHARTHA	Polyline	Prepared by JICA study team from proposed water supply plan	1	1-Proposed transmission main pipeline from Al-Hartha
35	PRO_DIS_PIPE	Polyline	Prepared by JICA study team from proposed water supply plan	1	1-Proposed distribution pipeline
36	PRO_CON_MAIN_PRO_RES	Polyline	Prepared by JICA study team from proposed water supply plan	1	1-Proposed connection main pipeline
37	PRO_RISING_MAIN	Polyline	Prepared by JICA study team from proposed water supply plan	1	1-Proposed rising main pipeline

Table L.6 Attribute Data List

No	Map (Layer) Name	No.	Field Name	Type	With	Unit	Description
1	IRAQ_POL_BOUND	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of political boundary line
		3	Name	String	15	-	Name of political boundary line
2	BASRAH_BOUNDARY	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of Basrah state boundary
		3	Name	String	15	-	Name of Basrah state boundary
3	INTERPRETATED_AREAS	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of interpreted areas of each satellite
		3	Name	String	15	-	Name of interpreted areas of each satellite
4	RIVER	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of river scale
		3	Name	String	15	-	Name of river
5	SWC	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of sweet water canal
		3	Name	String	15	-	Name of canal
6	WATER1	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of water canal
		3	Name	String	15	-	Name of water canal
7	WATER2	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of water canal (polygon)
		3	Name	String	15	-	Name of water canal (polygon)
8	WATER3	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of lakes and marshes
		3	Name	String	15	-	Name of lakes and marshes
9	ROAD	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of Basrah state local road
		3	Name	String	15	-	Name of Basrah state local road
10	BASRAH_ROAD_LOCAL	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of Basrah city local road
		3	Name	String	15	-	Name of Basrah city local road
11	AIRPORT	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of facility
		3	Name	String	15	-	Name of facility
12	RAILWAY	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of facility
		3	Name	String	15	-	Name of facility
13	BASRAH_ROAD_LOCAL_B	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of Basrah city local road
		3	Name	String	15	-	Name of Basrah city local road
		4	Length	Double	19	m	Length of Basrah city local road
14	ROAD_B	1	ID	Integer	11	-	Key ID
		2	Type	Integer	11	-	Type of Basrah state local road
		3	Name	String	15	-	Name of Basrah state local road
		4	Length	Double	19	m	Length of Basrah state local road
15	NEW_ROAD	1	ID	Integer	4	-	Key ID
		2	Length	Double	19	m	Length of Basrah state local additional road
		3	Type	Integer	4	-	Type of Basrah state local additional road
		4	Name	String	50	-	Name of Basrah state local additional road
16	DIS_ZONE	1	ID	Integer	6	-	Key ID
		2	Name	String	50	-	Name of distribution zone
		3	Ave2006	Double	19	m ³ /day	Daily average water supply in 2006
		4	Ave2015	Double	19	m ³ /day	Daily average water supply in 2015
		5	Ave2025	Double	19	m ³ /day	Daily average water supply in 2025
		6	Type	Integer	4	-	Key ID
		7	District	String	25	-	District of distribution zone
		8	Area	Double	19	m ²	Area of distribution zone
		9	Pop	Integer	9	people	Population in distribution zone
		10	House	Integer	9	households	Households in distribution zone
		11	Daily_Max	Double	19	m ³ /day	Daily maximum water supply
		12	Hourly_Max	Double	19	m ³ /day	Hourly maximum water supply
		13	Daily_Ave	Double	19	m ³ /day	Daily average water supply
		14	Remark	String	50	-	Remark of distribution zone
17	DIS_SUB_ZONE	1	ID	Integer	6	-	Key ID
		2	Name	String	50	-	Name of sub-distribution zone
		3	Type	Integer	4	-	Type of sub-distribution zone

No	Map (Layer) Name	No.	Field Name	Type	With	Unit	Description
		4	District	String	25	-	District of sub-distribution zone
		5	Area	Double	19	m ²	Area of sub-distribution zone
		6	Pop	Integer	9	people	Population in distribution zone
		7	House	Integer	9	households	Households in distribution zone
		8	Daily_Max	Double	19	m ³ /day	Daily maximum water supply
		9	Hourly_Max	Double	19	m ³ /day	Hourly maximum water supply
		10	Daily_Ave	Double	19	m ³ /day	Daily average water supply
		11	Remark	String	50	-	Remark of distribution zone
		1	ID	Integer	6	-	Key ID
		2	Name_2	String	50	-	Name of town
		3	Area	Double	19	m ²	Area of town
18	TOWN_UTM	4	Den2006	Double	19	people/ha	Population density of town in 2006
		5	Den2015	Double	19	people/ha	Population density of town in 2015
		6	Den2025	Double	19	people/ha	Population density of town in 2025
		7	Pop2006	Double	19	people	Population of town in 2006
		8	Pop2015	Double	19	people	Population of town in 2015
		9	Pop2025	Double	19	people	Population of town in 2025
		10	Ave2006	Double	19	m ³ /day	Daily average water supply in 2006
		11	Ave2015	Double	19	m ³ /day	Daily average water supply in 2015
		12	Ave2025	Double	19	m ³ /day	Daily average water supply in 2025
		13	Type	Integer	4	-	Type of area
		14	District	String	25	-	District of town
		15	Pop	Integer	9	people	Population in town
		16	House	Integer	9	households	Households in town
		17	Daily_Max	Double	19	m ³ /day	Daily maximum water supply
		18	Hourly_Max	Double	19	m ³ /day	Hourly maximum water supply
		19	Daily_Ave	Double	19	m ³ /day	Daily average water supply
		1	ID	Integer	6	-	Key ID
		2	Name	String	50	-	Name of district
		1	ID	Integer	6	-	Key ID
		2	Name	String	50	-	Name of town
		1	ID	Integer	6	-	Key ID
		2	Name	String	50	-	Name of existing transmission pump station
21	EX_TRANS_PUMP	3	Type	Integer	4	-	Type of equipment
		4	Address	String	50	-	Address of existing transmission pump station
		5	Lat	String	20	-	Latitude of existing transmission pump station
		6	Lon	String	20	-	Longitude of existing transmission pump station
		7	Type_P	String	25	-	Type of pump equipment
		8	Year_C	Integer	4	-	Year of construction
		9	Year_R	String	25	-	Year of rehabilitation
		10	No_P	String	10	no	Number of pumps
		11	Capa_D	String	25	m ³ /h	Design capacity of pump
		12	Capa_A	String	25	m ³ /h	Actual capacity of pump
		13	Remark	String	50	-	Remark of existing pump station
22	EX_DIS_FACILITY	1	ID	Integer	6	-	Key ID
		2	Type	Integer	4	-	Type of existing distribution facility
		3	Name	String	25	-	Name of existing distribution facility
		4	Address	String	50	-	Address of existing distribution facility
		5	Lat	String	20	-	Latitude of existing distribution facility
		6	Lon	String	20	-	Longitude of existing distribution facility
		7	Structure	String	25	-	Structure of existing distribution facility
		8	Capacity	Double	19	m ³	Capacity of existing distribution facility
		9	HWL	Double	19	m	High water level of existing distribution facility
		10	LWL	Double	19	m	Low water level of existing distribution facility
		11	Remark	String	50	-	Remark of existing distribution facility
		1	ID	Integer	6	-	Key ID
		2	Name	String	50	-	Name of existing reservoir
		3	Capacity	Integer	9	m ³	Capacity of existing reservoir
		4	LWL	Integer	9	m	High water level of existing reservoir
		5	HWL	Integer	9	m	Low water level of existing reservoir
		6	Address	String	50	-	Address of existing reservoir
		7	Lat	String	20	-	Latitude of existing reservoir
		8	Lon	String	20	-	Longitude of existing reservoir
		9	Structure	String	25	-	Structure of existing reservoir
		10	Remark	String	50	-	Remark of existing reservoir
		11	Type	Integer	4	-	Type of existing reservoir
24	EX_WTP	1	ID	Text	10	-	Key ID
		2	Name	String	50	-	Name of existing water treatment plant
		3	Lat	String	20	-	Latitude of existing water treatment plant

No	Map (Layer) Name	No.	Field Name	Type	With	Unit	Description
		4	Lon	String	20	-	Longitude of existing water treatment plant
		5	Type	Integer	4	-	Type of existing water treatment plant
		6	Address	String	50	-	Address of existing water treatment plant
		7	Type T	String	25	-	Type of treatment method
		8	WS	String	25	-	Water resource
		9	Year C	Integer	4	-	Year of construction
		10	Year R	String	25	-	Year of rehabilitation
		11	No U	Integer	4	no	Number of units
		12	Capa D	Double	19	m ³ /h	Design capacity of existing water treatment plant
		13	Capa A	Double	19	m ³ /h	Actual capacity of existing water treatment plant
		14	Remark	String	50	-	Remark of existing water treatment plant
25	EX_TRANS_MAIN	1	ID	Integer	6	-	Key ID
		2	Diameter	Integer	9	mm	Diameter of existing transmission main pipeline
		3	Type	Integer	4	-	Type of pipeline
		4	Length	Double	19	m	Length of existing transmission main pipeline
		5	Material	String	25	-	Material of existing transmission main pipeline
		6	Year C	Integer	4	-	Year of construction
		7	Year R	String	25	-	Year of rehabilitation
		8	Remark	String	50	-	Remark of existing transmission main pipeline
26	EX_TRANS_PIPE	1	ID	Integer	6	-	Key ID
		2	Diameter	Integer	9	mm	Diameter of existing transmission pipeline
		3	Material	String	30	-	Material of existing transmission pipeline
		4	Length	Double	19	m	Length of existing transmission pipeline
		5	Reference	String	50	-	Reference
		6	Type	Integer	4	-	Type of existing transmission pipeline
		7	Year C	Integer	4	-	Year of construction
		8	Year R	String	25	-	Year of rehabilitation
27	EX_DIS_PIPE	9	Remark	String	50	-	Remark of existing transmission pipeline
		1	ID	Integer	6	-	Key ID
		2	Diameter	Integer	9	mm	Diameter of existing distribution pipeline
		3	Length	Double	13	m	Length of existing distribution pipeline
		4	Type	Integer	4	-	Type of pipeline
		5	Material	String	25	-	Material of existing distribution pipeline
		6	Year C	Integer	4	-	Year of construction
		7	Year R	String	25	-	Year of rehabilitation
28	PRO_DIS_FACILITY_A	8	Remark	String	50	-	Remark of existing distribution pipeline
		1	ID	Integer	6	-	Key ID
		2	Type	Integer	4	-	Type of proposed distribution facility
		3	Name	String	30	-	Name of proposed distribution facility
		4	Lat	String	20	-	Latitude of proposed distribution facility
		5	Lon	String	20	-	Longitude of proposed distribution facility
		6	Address	String	50	-	Address of proposed distribution facility
		7	Structure	String	25	-	Structure of proposed distribution facility
		8	Capacity	Double	19	m ³	Capacity of proposed distribution facility
		9	HWL	Double	19	m	High water level of proposed distribution facility
		10	LWL	Double	19	m	Low water level of proposed distribution facility
		11	Remark	String	50	-	Remark of existing proposed distribution facility
29	PRO_WTP	1	ID	Integer	6	-	Key ID
		2	Type	Integer	4	-	Type of proposed water treatment plant
		3	Name	String	25	-	Name of proposed water treatment plant
		4	Address	String	50	-	Address of proposed water treatment plant
		5	Lat	String	19	-	Latitude of proposed water treatment plant
		6	Lon	String	20	-	Longitude of proposed water treatment plant
		7	Type T	String	20	-	Type of proposed water treatment plant
		8	WS	String	25	-	Water resource
		9	Year C	Integer	4	-	Year of construction
		10	Year R	String	25	-	Year of rehabilitation
		11	No U	Integer	4	no	Number of units
		12	Capa D	Double	19	m ³ /h	Design capacity of proposed water treatment plant
		13	Capa A	Double	19	m ³ /h	Actual capacity of proposed water treatment plant
		14	Remark	String	50	-	Remark of proposed water treatment plant
30	PRO_TRANS_FACILITY	1	ID	Integer	6	-	Key ID
		2	Type	Integer	4	-	Type of proposed transmission facility
		3	Name	String	25	-	Name of proposed transmission facility
		4	Address	String	50	-	Address of proposed transmission facility
		5	Lat	String	20	-	Latitude of proposed transmission facility
		6	Lon	String	20	-	Longitude of proposed transmission facility
		7	Type P	String	25	-	Type of pump equipment
		8	Year C	Integer	4	-	Year of construction

No	Map (Layer) Name	No.	Field Name	Type	With	Unit	Description
		9	Year_R	String	25	-	Year of rehabilitation
		10	No_P	String	10	-	Number of pumps
		11	Capa_D	String	25	m ³ /h	Design capacity of pump
		12	Capa_A	String	25	m ³ /h	Actual capacity of pump
		13	Remark	String	50	-	Remark of proposed transmission facility
31	PRO_DIS_FACILITY_B	1	ID	Integer	6	-	Key ID
		2	Type	Integer	4	-	Type of proposed distribution facility
		3	Name	String	25	-	Name of proposed distribution facility
		4	Address	String	50	-	Address of proposed distribution facility
		5	Lat	String	20	-	Latitude of proposed distribution facility
		6	Lon	String	20	-	Longitude of proposed distribution facility
		7	Structure	String	25	-	Structure of proposed distribution facility
		8	Capacity	Double	19	m ³	Capacity of proposed distribution facility
		9	HWL	Double	19	m	High water level of proposed distribution facility
		10	LWL	Double	19	m	Low water level of proposed distribution facility
		11	Remark	String	50	-	Remark of existing proposed distribution facility
32	PRO_CON_MAIN_EX_WTP	1	ID	Integer	6	-	Key ID
		2	Type	Integer	4	-	Type of pipeline
		3	Diameter	Integer	9	mm	Diameter of proposed connection main
		4	Length	Double	19	m	Length of proposed connection main
		5	Material	String	25	-	Material of proposed connection main
		6	Year_C	Integer	4	-	Year of construction
		7	Year_R	String	25	-	Year of rehabilitation
		8	Remark	String	50	-	Remark of proposed connection main
33	PRO_TRANS_ALQUORNA	1	ID	Integer	6	-	Key ID
		2	Diameter	Integer	9	mm	Diameter of proposed transmission pipeline from Al-quorna
		3	Length	Double	19	m	Length of proposed transmission pipeline from Al-quorna
		4	Type	Integer	4	-	Type of pipeline
		5	Material	String	25	-	Material of proposed transmission pipeline from Al-quorna
		6	Year_C	Integer	4	-	Year of construction
		7	Year_R	String	25	-	Year of rehabilitation
		8	Remark	String	50	-	Remark of proposed transmission pipeline from Al-quorna
34	PRO_TRANS_ALHARTHA	1	ID	Integer	6	-	Key ID
		2	Diameter	Integer	9	mm	Diameter of proposed transmission pipeline from Al-harthha
		3	Length	Double	19	m	Length of proposed transmission pipeline from Al-harthha
		4	Type	Integer	4	-	Type of pipeline
		5	Material	String	25	-	Material of proposed transmission pipeline from Al-harthha
		6	Year_C	Integer	4	-	Year of construction
		7	Year_R	String	25	-	Year of rehabilitation
		8	Remark	String	50	-	Remark of proposed transmission pipeline from Al-harthha
35	PRO_DIS_PIPE	1	ID	Integer	6	-	Key ID
		2	Diameter	Integer	9	mm	Diameter of proposed distribution pipeline
		3	Type	Integer	4	-	Type of pipeline
		4	Length	Double	19	m	Length of proposed distribution pipeline
		5	Material	String	25	-	Material of proposed distribution pipeline
		6	Year_C	Integer	4	-	Year of construction
		7	Year_R	String	25	-	Year of rehabilitation
		8	Remark	String	50	-	Remark of proposed distribution pipeline
36	PRO_CON_MAIN_PRO_RES	1	ID	Integer	6	-	Key ID
		2	Type	Integer	4	-	Type of pipeline
		3	Diameter	Integer	9	mm	Diameter of proposed connection main from proposed reservoir
		4	Length	Double	19	m	Length of proposed connection main from proposed reservoir
		5	Material	String	25	-	Material of proposed connection main from proposed reservoir
		6	Year_C	Integer	4	-	Year of construction
		7	Year_R	String	25	-	Year of rehabilitation
		8	Remark	String	50	-	Remark of proposed connection main from proposed reservoir
37	PRO_RISING_MAIN	1	ID	Integer	6	-	Key ID
		2	Diameter	Integer	9	mm	Diameter of proposed connection main from proposed

No	Map (Layer) Name	No.	Field Name	Type	With	Unit	Description
							reservoir
		3	Type	Integer	4	-	Type of pipeline
		4	Length	Double	19	m	Length of proposed rising main
		5	Material	String	25	-	Material of proposed rising main
		6	Year_C	Integer	4	-	Year of construction
		7	Year_R	String	25	-	Year of rehabilitation
		8	Remark	String	50	-	Remark of proposed rising main

L.3 Definition of Observational Database

Table L.7 List of Attribute Data

Category	Attribute Data Name	Contents
Observational Database	BWD_WTP_2006	Raw water pumping station nominal capacity
		Water treatment plant nominal capacity
		Treated water pumping station nominal capacity
		Treated water tanks
		Electrical power nominal capacity
		Number of bulk meters for Internal production
		Number of existing bulk meters for treated water
		Number of operating bulk meters for treated water
		Volume of raw water
		Treated water metered production
		Treated water estimated production
		Total volume of treated water production
		Operated water flow
		Plant average operating time
		Treated water pumping station average operating time
		Water volume for process
		Power consumption for production
		NTU of raw water
		Alum sulfate consumption
		Lime consumption
		Chlorine consumption
		Operating ratio
		Metering ratio
		Efficiency
		Water lost by water treatment plant
		Power consumption
		Alum sulfate consumption
		Lime consumption
		Chlorine consumption
	BWD_PS_2006	Pumping station nominal capacity
		Electrical power nominal capacity
		Number of bulk meters for pumping
		Total volume of pumped water
		Operated average flow
		Pump station average operating time
		Power consumption for pumping

Table L.8 Definition of Query Tables

Category	Attribute Data Name	Query Table	Contents	Data Type	Byte	Description
Observational Database	BWD_WTP_2006	W_01_2006~W_37_2006	WTP_ID	String	10	ID: W_01~W_37
			WTP_NAME	String	30	The name of water treatment plant
			DATA_NAME	String	80	The data items for operation and maintenance for water supply plant
			UNIT_NAME	String	50	The unit name for each data items
			Jan-2006	Double	4	Monthly data for each data item in 2006
			Feb-2006	Double	4	
			Mar-2006	Double	4	
			Apr-2006	Double	4	
			May-2006	Double	4	
			Jun-2006	Double	4	
			Jul-2006	Double	4	
			Aug-2006	Double	4	
			Sep-2006	Double	4	
			Oct-2006	Double	4	
			Nov-2006	Double	4	
			Dec-2006	Double	4	
Observational Database	BWD_PS_2006	PS_01_2006~PS_10_2006	PS_ID	String	10	ID: PS_01~PS_10
			PS_NAME	String	30	The name of pumping station
			DATA_NAME	String	80	The data items for operation and maintenance for pumping station
			UNIT_NAME	String	50	The unit name for each data items
			Jan-2006	Double	4	Monthly data for each data item in 2006
			Feb-2006	Double	4	
			Mar-2006	Double	4	
			Apr-2006	Double	4	
			May-2006	Double	4	
			Jun-2006	Double	4	
			Jul-2006	Double	4	
			Aug-2006	Double	4	
			Sep-2006	Double	4	
			Oct-2006	Double	4	
			Nov-2006	Double	4	
			Dec-2006	Double	4	

Table L.9 Contents of “DATA_NAME”

Contents of "DATA_NAME"	Unit	Description
Raw water pumping station nominal capacity	m ³ /h	Hourly average in a month
Water treatment plant nominal capacity	m ³ /h	Hourly average in a month
Treated water pumping station nominal capacity	m ³ /h	Hourly average in a month
Treated water tanks	m ³	-
Electrical power nominal capacity	kW	-
Number of bulk meters for Internal production	no.	-
Number of existing bulk meters for treated water	no.	-
Number of operating bulk meters for treated water	no.	-
Volume of raw water	m ³ /month	Monthly average
Treated water metered production	m ³ /month	Monthly average
Treated water estimated production	m ³ /month	Monthly average
Total volume of treated water production	m ³ /month	Monthly average
Operated water flow	m ³ /h	Hourly average in a month
Plant average operating time	h/day	Daily average in a month
Treated water pumping station average operating time	h/day	Daily average in a month
Water volume for process	m ³ /month	Monthly average
Power consumption for production	kWh/month	Monthly average
NTU of raw water	NTU	
Alum sulfate consumption	kg/month	Monthly average
Lime consumption	kg/month	Monthly average
Chlorine consumption	kg/month	Monthly average
Operating ratio	%	-
Metering ratio	%	-
Efficiency	%	-
Water lost by water treatment plant	%	-
Power consumption	wh/m ³	-
Alum sulfate consumption	g/m ³	-
Lime consumption	g/m ³	-
Chlorine consumption	g/m ³	-

APPENDIX M

FACILITY DESIGN FOR PRIORITY PROJECT

APPENDIX M FACILITY DESIGN FOR PRIORITY PROJECT

1. Facility Design of Water Treatment Plant

1-1. Capacity of Water Treatment Plant

235,000 m³/day= 9,792 m³/hr= 163.2 m³/min= 2.720 m³/sec

1-2. Raw Water Pump

1) Capacity of Raw Water Pump

Required Capacity: 163.2*1.04= 169.7 m³/min

2) Condition

Head: 10.0 m
Number: 4(1) nos

3) Required Power

0.163*169.7*10.0/3/0.77*1.15 140 kW

3) Specification

Q56.6m³/min*H10m*140kW*4(1)unit

1-3. Receiving Well

1) Detention Time

Detention Time: 1.5 min (1.5-min)
Required Capacity: 163.2*1.10*1.5= 269.3 m³
Actual Capacity: 6.00*(4.50+1.50)*8.00*1= 288.0 m³
269.3 < 288 O.K.

2) Dimension

W8.00m*L6.00m*D6.00m*1unit

1-4. Mixing Basin

1) Detention Time

Detention Time: 1.0 min (1-5min)
Required Capacity: 163.2*1.10*1.0= 179.5 m³
Actual Capacity: 4.00*4.00*4.00*4= 256.0 m³
179.5 < 256.0 O.K.

2) Dimension

W4.00m*L4.00m*D4.00m*4unit

1-5. Flocculation Basin

1) Mean Flow Rate

Mean Flow Rate: 25 cm/sec (15-30cm/sec)
Required Section Area: 2.720*1.10/(25/100)= 12.0 m²
Actual Section Area: 1.50*1.50*8= 18.0 m²
12.0 < 18.0 O.K.

2) Detention Time

Detention Time:		30.0 min	(20-40min)
Required Capacity:	$163.2 \times 1.10 \times 30 =$	5,385.6 m ³	
Actual Capacity:	$1.50 \times 13.00 \times 4.00 \times 9 \times 8 =$	5,616.0 m ³	
	5,385.6	<	5,616 O.K.

3) Dimension

W1.50m*L(13.00m*9)*D4.00m*8unit

1-6. Chemical Sedimentation Basin

1) Mean Flow Rate

Mean Flow Rate:		0.4 m/min	(-0.4m/min)
Required Section Area:	$163.2 \times 1.10 / 0.4 =$	448.8 m ²	
Actual Section Area:	$13.00 \times 4.50 \times 8 =$	468.0 m ²	
	448.8	<	468.0 O.K.

2) Surface Loading Rate

Surface Loading Rate:		25.0 mm/min	(15-30mm/min)
Required Capacity:	$163.2 \times 1.1 / (25 / 1000) =$	7,180.8 m ²	
Actual Capacity:	$13.00 \times 70.00 \times 8 =$	7,280.0 m ²	
	7,180.8	<	7,280 O.K.

3) Dimension

W13.00m*L70.00m*D4.50m*8unit

1-7. Rapid Sand Filter

1) Filtration Rate

Fintration Rate:		150 m/day	(120-150m/day)
Required Filtration Area:	$235000 \times 1.10 / 150 =$	1,723.3 m ²	
Required Filtration Area of Each Filter:	$1723.3 / ((8-1) \times 2) =$	123.1 m ²	
Actual Area of Each Filte	$(4.50 \times 2) \times 14 =$	126.0 m ²	
	123.1	<	126.0 O.K.

2) Dimension

W(4.50*2)m*L14.00m*8set*2unit

3) Capacity of Back Wash Pump

Condition:		
Flow:	0.8 m ³ /m ² /min	
Head:	10.0 m	
Number:	3(1) nos	
Required Capacity	$4.5 \times 14 \times 2 \times 0.8$	101.0 m ³ /min
	$0.163 \times 101.0 \times 10.0 / 2 / 0.77 \times 1.15$	123.0 kW
Specification	Q50.5m ³ /min*H10m*123kW*3(1)unit	

4) Capacity of Surface Wash Pump

Condition:		
Flow:	0.15 m ³ /m ² /min	
Head:	30.0 m	
Number:	2(1) nos	
Required Capacity	$4.5 \times 14 \times 2 \times 0.15$	19.0 m ³ /min
	$0.163 \times 19.0 \times 30.0 / 1 / 0.77 \times 1.15$	139.0 kW
Specification	Q19.0m ³ /min*H30m*139kW*2(1)unit	

1-8. Receiving & Distribution Well

1) Detention Time

Detention Time:		1.5 min	(1.5-min)
Required Capacity:	$163.2 \times 1.5 =$	244.8 m ³	
Actual Capacity:	$8.00 \times 8.00 \times 4.00 =$	256.0 m ³	
	244.8	<	256 O.K.

2) Dimension

W8.00m*L8.00m*D4.00m*1unit

1-9. Chlorine Facility

1) Injection Rate of Chlorine

	Max (mg/l)	Ave (mg/l)	Min (mg/l)
Pre	15.0	5.0	2.0
Post	3.0	2.0	0.5

2) Condition

Injection Point	Pre	4 point
	Post	2 point
Strage period of Chlorine		10 days

3) Capacity of Required Choline

Cylinder		$235000 \times 1.1 \times (5.0 + 2.0) \times 10 / 1000 / 1000$	18.1 ton
Injector	Pre	$9792 \times 1.1 \times 15.0 / 4 / 1000$	40.0 kg/h
	Post	$9792 \times 1.1 \times 3.0 / 2 / 1000$	16.0 kg/h

4) Specification

Chlorine Cyliner 1.0ton*19unit
Dosing Equipment 40kg/h*6(2)unit
Dosing Equipment 16kg/h*3(1)unit
Chlorine Neutralization Equipment*1unit

1-10. Aluminum Facility

1) Injection Rate of Alum

	Max (mg/l)	Ave (mg/l)	Min (mg/l)
Alum	100.0	30.0	10.0

2) Condition

Injection Point	4 point
Strage period of Alum	20 days
Effective Rate of Al ₂ O ₃	14 %
Concentration of Solution	8.3 %
Relative Density	1.315

3) Capacity of Required Choline

Strage	$235000 \times 1.1 \times 30.0 \times 20 / 0.14 / 1000 / 1000$	1,107.9 ton
Injector	$9792 \times 1.1 / 4 \times 100 / 0.083 / 1.315 / 1000$	2,467.2 L/h

4) Specification

Mixing Tank 15.0m³*4unit
Injection Pump 2,500L/h*6(2)unit

1-11. Drainage Tank

1) Capacity of Drainage Tank

Required Capacity:	$126.00 \times (0.15 \times 5 + 0.8 \times 5) \times 2 =$	1,197.0 m ³
Actual Capacity:	$12.00 \times 25.00 \times 4.00 =$	1,200.0 m ²
	1,197.0 <	1,200.0 O.K.

2) Dimension

W12.00m*L25.00m*D4.00m*2unit

1-12. RO Plant

1) Capacity of RO Treated Water

145,000 m ³ /day=	6,042 m ³ /hr=	100.7 m ³ /min=	1.678 m ³ /sec
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2) Condition

Rate of Recovery:	75.0 %
Required Feeding Water: $145000/0.75 =$	193,000 m ³ /day

3) Specification

Input: 193,000m³.day - Output: 145,000m³/day

1-13. Clear Water Reservoir

1) Capacity of Clear Water Reservoir

145000+(235000-193000)+(60000-55000) =	192,000 m2		
192,000 m3/day=	8,000 m3/hr=	133.3 m3/min=	2.222 m3/sec

2) Detention Time

Detention Time:		1.0 hr	(-1hr)
Required Capacity:	$8000 \times 1 =$	8,000.0 m ³	
Actual Capacity:	$25.00 \times 40.00 \times 4.00 \times 2 =$	8,000.0 m ³	
	8,000.0 <	8,000 O.K.	

3) Dimension

W25.00m*L40.00*D4.00m*2unit

1-14. Transmission Pump for Transmission Reservoir

1) Capacity of Clear Water Pump

145000+(235000-193000)+(60000-55000) =	192,000 m2		
192,000 m3/day=	8,000 m3/hr=	133.3 m3/min=	2.222 m3/sec

2) Condition

Head:	40.0 m
Number:	4(1) nos

3) Required Power

$0.163 \times 133.3 \times 40.0 / 3 / 0.77 \times 1.15$	440.0 kW
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3) Specification

Q44.4m³/min*H40m*440kW*4(1)unit

1-15. Transimission Pump for Basrah Unified WTP

1) Capacity of Clear Water Pump

55,000 m ³ /day=	2,292 m ³ /hr=	38.2 m ³ /min=	0.637 m ³ /sec
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2) Condition

Head:	10.0 m
Number:	4(1) nos

3) Required Power

$0.163 \times 38.2 \times 10.0 / 3 / 0.77 \times 1.15$	40.0 kW
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2. Facility Design of Transmission Facility

2-1. Capacity of Transmission Facility

Transmission Reservoir

48,000 m³

Transmission Pump Station

538,000 m³/day= 22,417 m³/hr= 373.6 m³/min= 6.227 m³/sec

2-2. Transmission Reservoir

1) Capacity of Clear Water Reservoir

Required Capacity: 48,000.0 m³

Actual Capacity: $30.00 \times 100.00 \times 4.00 \times 4 =$ 48,000.0 m³

48,000.0 < 48,000 O.K.

3) Dimension

W30.00m*L100.00*D4.00m*4unit

2-3. Transmission Pump Station

1) Capacity of Clear Water Pump

538,000 m³/day= 22,417 m³/hr= 373.6 m³/min= 6.227 m³/sec

2) Condition

Head: 60.0 m

Number: 8(1) nos

3) Required Power

$0.163 \times 373.6 \times 60.0 / 7 / 0.77 \times 1.15$ 780.0 kW

3) Specification

Q53.4m³/min*H60m*780kW*8(1)unit

APPENDIX N

COST ESTIMATION FOR PRIORITY PROJECT

APPENDIX N COST ESTIMATION FOR PRIORITY PROJECT

N.1 Cost Estimation for Priority Project

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
I Direct Construction Cost							
-1 Rehabilitation of Distribution Network							
DCIP dia.700mm	m	7,000	176	483	1,232,000	3,381,000	4,613,000
DCIP dia.500mm	m	6,500	163	267	1,060,000	1,736,000	2,796,000
DCIP dia.400mm	m	1,000	156	186	156,000	186,000	342,000
HDPE dia.225mm	m	18,500	36	64	666,000	1,184,000	1,850,000
HDPE dia.160mm	m	54,000	30	32	1,620,000	1,728,000	3,348,000
HDPE dia.110mm	m	198,500	26	15	5,161,000	2,978,000	8,139,000
Sub Total of -1					9,895,000	11,193,000	21,088,000
-2 Rehabilitation of WTP							
1) R-Zero 25 compact units							
Sub Total of 1)					175,000	1,003,000	1,178,000
2) R-Zero Raw Water Pumps							
Sub Total of 2)					250,000	298,000	548,000
3) Al Hartha 25 C.U.							
Sub Total of 3)					175,000	882,000	1,057,000
4) Basra Unified							
Sub Total of 4)					90,000	1,189,000	1,279,000
5) Garmal							
Sub Total of 5)					35,000	329,000	364,000
6) Garma 2							
Sub Total of 6)					25,000	206,000	231,000
7) Ribat							
Sub Total of 7)					35,000	159,000	194,000
8) Al Maqil 1							
Sub Total of 8)					0	96,000	96,000
9) Jubaila 1							
Sub Total of 9)					40,000	592,000	632,000
10) Jubaila 2							
Sub Total of 10)					25,000	186,000	211,000
11) Bradiah 1							
Sub Total of 11)					60,000	647,000	707,000
12) Bradiah 2							
Sub Total of 12)					60,000	707,000	767,000
13) Bradiah C.U.							
Sub Total of 13)					25,000	66,000	91,000
Sub Total of -2					995,000	6,360,000	7,355,000
-3 Construction of Transmission System							
1) Ring Transmission Mains, Connection Mians and Connection Mains from Existing WTPs							
DCIP dia.2000mm	m	1,900	375	3,870	713,000	7,353,000	8,066,000
DCIP dia.1800mm	m	2,000	363	3,027	726,000	6,054,000	6,780,000
DCIP dia.1400mm	m	1,200	278	1,747	334,000	2,096,000	2,430,000
DCIP dia.1200mm	m	2,500	245	1,302	613,000	3,255,000	3,868,000
DCIP dia.1100mm	m	3,600	235	1,112	846,000	4,003,000	4,849,000
DCIP dia.1000mm	m	5,500	226	932	1,243,000	5,126,000	6,369,000
DCIP dia.900mm	m	4,200	215	760	903,000	3,192,000	4,095,000
DCIP dia.800mm	m	3,000	208	618	624,000	1,854,000	2,478,000
DCIP dia.700mm	m	6,800	176	483	1,197,000	3,284,000	4,481,000
DCIP dia.600mm	m	4,500	169	368	761,000	1,656,000	2,417,000
Sub Total of 1)					7,960,000	37,873,000	45,833,000
2) Transmission Reservoir							
Transmission Reservoir	m3	48,000	-	-	14,061,000	4,259,000	18,320,000
Sub Total of 2)					14,061,000	4,259,000	18,320,000
3) Transmission Pump Station							
Transmission Pump Station	m3/day	538,000	-	-	2,313,000	12,803,000	15,116,000
Sub Total of 3)					2,313,000	12,803,000	15,116,000
Sub Total of -3					24,334,000	54,935,000	79,269,000

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
-4 Construction of Water Treatment Plant							
1) Water Treatment Plant							
Water Treatment Plant	m3/day	235,000	-	-	23,351,000	34,179,000	57,530,000
Sub Total of 1)					23,351,000	34,179,000	57,530,000
Sub Total of -4					23,351,000	34,179,000	57,530,000
-5 Restructuring of Distribution Network and Zoning							
1) Strengthening of Distribution Network							
DCIP dia.700mm	m	3,500	176	483	616,000	1,691,000	2,307,000
DCIP dia.600mm	m	2,000	169	368	338,000	736,000	1,074,000
DCIP dia.500mm	m	6,300	163	267	1,027,000	1,682,000	2,709,000
DCIP dia.400mm	m	6,100	156	186	952,000	1,135,000	2,087,000
HDPE dia.355mm	m	2,500	44	157	110,000	393,000	503,000
HDPE dia.315mm	m	2,600	41	124	107,000	322,000	429,000
HDPE dia.280mm	m	2,200	39	98	86,000	216,000	302,000
HDPE dia.250mm	m	1,000	37	78	37,000	78,000	115,000
HDPE dia.200mm	m	900	35	50	32,000	45,000	77,000
Sub Total of 1)					3,305,000	6,298,000	9,603,000
1) Zone Delineation							
Zone Delineation	-	LS			469,000	893,000	1,362,000
Sub Total of 2)					469,000	893,000	1,362,000
Sub Total of -5					3,774,000	7,191,000	10,965,000
-6 Construction of RO Plant							
RO Plant	m3/day	145,000	40	570	5,052,000	89,940,000	94,992,000
Sub Total of -6					5,052,000	89,940,000	94,992,000
Sub Total of -1+-2+-3+-4+-5+-6					67,401,000	203,798,000	271,199,000
2 Administration Expenses							
-1 Security							
Security Issue of Transportation	L.S				0	4,251,000	4,251,000
Security Issue of Construction Site	L.S				6,714,000	0	6,714,000
Sub-Total of -1					6,714,000	4,251,000	10,965,000
-2 Insurance							
Insurance for Transportation	%	3.5			0	7,133,000	7,133,000
Insurance for Construction	%	3.5			2,359,000	0	2,359,000
Sub-Total of -2					2,359,000	7,133,000	9,492,000
-3 Administration Cost							
Administration Cost 10% of Direct Cost	%	10.0			6,740,000	20,380,000	27,120,000
Sub-Total of -3					6,740,000	20,380,000	27,120,000
Sub-Total of -1+-2+-3					15,813,000	31,764,000	47,577,000
3 Tax and Duty							
-1 Import Duty of Material Procurement and Supply	%	5.0			10,190,000	0	10,190,000
-2 Contract of Civil Works	%	10.0			31,878,000	0	31,878,000
Sub-Total of -1+-2+-3					42,068,000	0	42,068,000
4 Engineering Cost							
-1 Engineering Cost							
Engineering Cost (11.0% of Direct Cost)	%	11.0			7,414,000	22,418,000	29,832,000
Sub-Total of -1					7,414,000	22,418,000	29,832,000
-2 Contingency							
Price Contingency (9.0% of LC & 1.7% of FC)	L.S.	1.0			3,882,000	1,935,000	5,817,000
Physical Contingency (20% of LC & FC)	L.S.	1.0			2,259,000	4,871,000	7,130,000
Sub-Total of -2					6,141,000	6,806,000	12,947,000
Sub-Total of -1+-2					13,555,000	29,224,000	42,779,000
5 Price Contingency (Escalation Cost)							

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
-1 For Local Portion of Item 1 and 2	%	9.0			54,021,000	0	54,021,000
-2 For Foreign Portion of Item 1 and 2	%	1.7			0	24,575,000	24,575,000
Sub-Total of -1+-2					54,021,000	24,575,000	78,596,000
Sub-Total (Item 1, 2 and 5)					137,235,000	260,137,000	397,372,000
6 Physical Contingency							
-1 For Local Portion of Item 1, 2 and 5 for Construction Cost	%	20.0			27,447,000	0	27,447,000
-2 For Foreign Portion of Item 1, 2 and 5 for Construction Cost	%	20.0			0	52,027,000	52,027,000
Sub-Total of -1+-2					27,447,000	52,027,000	79,474,000
Total							
With Tax (1+2+3+4+5+6)					220,305,000	341,388,000	561,693,000
Without Tax (1+2+4+5+6)					178,237,000	341,388,000	519,625,000

N.2 Unit Cost of Pipeline

	Unit	Unit Cost (L/C)	Unit Cost (F/C)	Unit Cost (Total)
1. Pipeline				
Diameter 110mm	US\$/m	26 US\$	16 US\$	42 US\$
Diameter 125mm	US\$/m	27 US\$	20 US\$	47 US\$
Diameter 140mm	US\$/m	28 US\$	25 US\$	53 US\$
Diameter 160mm	US\$/m	30 US\$	32 US\$	62 US\$
Diameter 180mm	US\$/m	31 US\$	41 US\$	72 US\$
Diameter 200mm	US\$/m	35 US\$	50 US\$	85 US\$
Diameter 225mm	US\$/m	36 US\$	64 US\$	99 US\$
Diameter 250mm	US\$/m	37 US\$	78 US\$	115 US\$
Diameter 280mm	US\$/m	38 US\$	98 US\$	137 US\$
Diameter 315mm	US\$/m	41 US\$	124 US\$	165 US\$
Diameter 355mm	US\$/m	44 US\$	157 US\$	201 US\$
Diameter 400mm	US\$/m	156 US\$	186 US\$	343 US\$
Diameter 450mm	US\$/m	159 US\$	225 US\$	384 US\$
Diameter 500mm	US\$/m	163 US\$	267 US\$	430 US\$
Diameter 600mm	US\$/m	169 US\$	368 US\$	537 US\$
Diameter 700mm	US\$/m	176 US\$	483 US\$	659 US\$
Diameter 800mm	US\$/m	208 US\$	618 US\$	825 US\$
Diameter 900mm	US\$/m	215 US\$	760 US\$	975 US\$
Diameter 1000mm	US\$/m	226 US\$	932 US\$	1,158 US\$
Diameter 1100mm	US\$/m	235 US\$	1,112 US\$	1,347 US\$
Diameter 1200mm	US\$/m	245 US\$	1,302 US\$	1,547 US\$
Diameter 1400mm	US\$/m	278 US\$	1,747 US\$	2,040 US\$
Diameter 1500mm	US\$/m	293 US\$	1,991 US\$	2,284 US\$
Diameter 1600mm	US\$/m	317 US\$	2,464 US\$	2,781 US\$
Diameter 1800mm	US\$/m	363 US\$	3,027 US\$	3,390 US\$
Diameter 2000mm	US\$/m	375 US\$	3,870 US\$	4,245 US\$

N.3 Breakdown of Rehabilitation Cost of Water Treatment Plants

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
1) R-Zero 25 compact units							
Rehabilitation of C.U.	nr	25		30,000		750,000	750,000
Rehabilitation of storage tank	-			-	75,000		75,000
Rehabilitation of high lift p.s.	nr	8		3,000		24,000	24,000
Rehabilitation of low lift p.s.	nr	9		3,000		27,000	27,000
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments(33kv/11kv) substation & low tension equipments	-			-		150,000	150,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		100,000		100,000
Rehabilitation of waste water pumps	nr	4		3,000		12,000	12,000
Sub Total of 1)					175,000	1,003,000	1,178,000
2) R-Zero Raw Water Pumps							
Rehabilitation of Al Hartha pumps	nr	6		4,000		24,000	24,000
Rehabilitation of Basra Unified. pumps	nr	6		4,000		24,000	24,000
Rehabilitation of Al Jubaila pumps	nr	4		4,000		16,000	16,000
Rehabilitation of Bradiah pumps	nr	3		4,000		12,000	12,000
Rehabilitation of Shuaiba pumps	nr	4		4,000		16,000	16,000
Rehabilitation of Abu Al khaseeb pumps	nr	6		4,000		24,000	24,000
Rehabilitation of Khor Al Zubair pumps	nr	3		4,000		12,000	12,000
Rehabilitation of the plant buildings	-		-		250,000		250,000
Rehabilitation of electrical equipments	-			-		80,000	80,000
Rehabilitation of mechanical equipments	-			-		90,000	90,000
Sub Total of 2)					250,000	298,000	548,000
3) Al Hartha 25 C.U.							
Rehabilitation of C.U.	nr	25		30,000		750,000	750,000
Rehabilitation of storage tank	-		-		75,000		75,000
Rehabilitation of high lift p.s.	nr	8		3,000		24,000	24,000
Rehabilitation of low lift p.s.	nr	7		2,500		17,500	17,500
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		50,000	50,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		100,000		100,000
Sub Total of 3)					175,000	881,500	1,056,500
4) Basra Unified							
Rehabilitation of gravity sand filters	nr	20		30,000		600,000	600,000
Rehabilitation of storage tank	-		-		30,000		30,000
Rehabilitation of high lift p.s.	nr	7		3,000		21,000	21,000
Rehabilitation of low lift p.s.	nr	5		2,500		12,500	12,500
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		25,000	25,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		60,000		60,000
Rehabilitation of the sedimentation tanks	nr	4		50,000		200,000	200,000
Rehabilitation of the alum dosing system	-			-		15,000	15,000
Rehabilitation of the pack washing system	-			-		25,000	25,000
Rehabilitation of the pneumatic system & measuring equipments	-			-		250,000	250,000
Sub Total of 4)					90,000	1,188,500	1,278,500
5) Garmal							
Rehabilitation of C.U.	nr	8		30,000		240,000	240,000
Rehabilitation of low lift p.s.	nr	3		3,000		9,000	9,000
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		40,000	40,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		35,000		35,000
Sub Total of 5)					35,000	329,000	364,000
6) Garma 2							
Rehabilitation of C.U.	nr	7		20,000		140,000	140,000
Rehabilitation of low lift p.s.	nr	2		3,000		6,000	6,000

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		20,000	20,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		25,000		25,000
Sub Total of 6)					25,000	206,000	231,000
7) Ribat							
Rehabilitation of C.U.	nr	3		30,000		90,000	90,000
Rehabilitation of low lift p.s.	nr	3		3,000		9,000	9,000
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		20,000	20,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		35,000		35,000
Sub Total of 7)					35,000	159,000	194,000
8) Al Maqil 1							
Rehabilitation of C.U.	nr	3		20,000		60,000	60,000
Rehabilitation of low lift p.s.	nr	2		3,000		6,000	6,000
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		20,000	20,000
Sub Total of 8)					0	96,000	96,000
9) Jubaila 1							
Rehabilitation of pressure sand filters	nr	12		30,000		360,000	360,000
Rehabilitation of high lift p.s.	nr	3		3,000		9,000	9,000
Rehabilitation of low lift p.s.	nr	3		2,500		7,500	7,500
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		25,000	25,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		40,000		40,000
Rehabilitation of the sedimentation tanks	nr	2		40,000		80,000	80,000
Rehabilitation of the alum dosing system	-			-		15,000	15,000
Rehabilitation of the pack washing system	-			-		25,000	25,000
Rehabilitation of the inlet piping system	-			-		30,000	30,000
Sub Total of 9)					40,000	591,500	631,500
10) Jubaila 2							
Rehabilitation of C.U.	nr	4		30,000		120,000	120,000
Rehabilitation of low lift p.s.	nr	2		3,000		6,000	6,000
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		20,000	20,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		25,000		25,000
Sub Total of 10)					25,000	186,000	211,000
11) Bradih 1							
Rehabilitation of pressure sand filters	nr	14		30,000		420,000	420,000
Rehabilitation of high lift p.s.	nr	4		3,000		12,000	12,000
Rehabilitation of low lift p.s.	nr	4		2,500		10,000	10,000
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		25,000	25,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		60,000		60,000
Rehabilitation of the sedimentation tanks	nr	2		50,000		100,000	100,000
Rehabilitation of the alum dosing system	-			-		15,000	15,000
Rehabilitation of the pack washing system	-			-		25,000	25,000
Sub Total of 11)					60,000	647,000	707,000
12) Bradih 2							
Rehabilitation of pressure sand filters	nr	14		30,000		420,000	420,000
Rehabilitation of high lift p.s.	nr	4		3,000		12,000	12,000
Rehabilitation of low lift p.s.	nr	4		2,500		10,000	10,000
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		25,000	25,000
Rehabilitation of diesel generators	-			-		30,000	30,000
Rehabilitation of the plant buildings	-		-		60,000		60,000
Rehabilitation of the sedimentation tanks	nr	2		80,000		160,000	160,000
Rehabilitation of the alum dosing system	-			-		15,000	15,000
Rehabilitation of the pack washing system	-			-		25,000	25,000
Sub Total of 12)					60,000	707,000	767,000

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
13) Bradiah C.U.							
Rehabilitation of C.U.	nr	1		30,000		30,000	30,000
Rehabilitation of low lift p.s.	nr	2		3,000		6,000	6,000
Rehabilitation of chlorine system	-			-		10,000	10,000
Rehabilitation of electrical equipments	-			-		20,000	20,000
Rehabilitation of the plant buildings	-			-	25,000		25,000
Sub Total of 13)					25,000	66,000	91,000
Total of 1) - 13)					995,000	6,358,500	7,353,500

N.4 Breakdown of Construction of Transmission Reservoir

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
1) Clear Water Reservoir							
Civil Work					14,061,000		14,061,000
Sub Total of 1)					14,061,000	0	14,061,000
2) Piping Work							
Piping Work						4,259,000	4,259,000
Sub Total of 2)					0	4,259,000	4,259,000
Total of 1) -2)					14,061,000	4,259,000	18,320,000

N.5 Breakdown of Construction of Transmission Pump Station

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
1) Transmission Pump Facility							
Architecture Work					852,000		852,000
Mechanical & Electrical Work						4,813,000	4,813,000
Sub Total of 1)					852,000	4,813,000	5,665,000
2) Operation Facility							
Architecture Work					438,000		438,000
Mechanical & Electrical Work						1,094,000	1,094,000
Sub Total of 2)					438,000	1,094,000	1,532,000
3) Electrical & Generator Facility							
Architecture Work					1,023,000		1,023,000
Mechanical & Electrical Work						6,896,000	6,896,000
Sub Total of 3)					1,023,000	6,896,000	7,919,000
Total of 1) - 3)					2,313,000	12,803,000	15,116,000

N.6 Breakdown of Construction of Water Treatment Plant

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
1) Intake Facility							
Civil Work					74,000		74,000
Mechanical & Electrical Work						22,000	22,000
Sub Total of 1)					74,000	22,000	96,000
2) Raw Water Pump Facility							
Civil Work					659,000		659,000
Architecture Work					409,000		409,000
Mechanical & Electrical Work						1,616,000	1,616,000
Sub Total of 2)					1,068,000	1,616,000	2,684,000

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
3) Receiving Well							
Civil Work					142,000		142,000
Mechanical & Electrical Work						137,000	137,000
Sub Total of 3)					142,000	137,000	279,000
4) Chemical Sedimentation Basin							
Civil Work					9,495,000		9,495,000
Mechanical & Electrical Work						3,099,000	3,099,000
Sub Total of 4)					9,495,000	3,099,000	12,594,000
5) Rapid Sand Filter							
Civil Work					3,280,000		3,280,000
Mechanical & Electrical Work						10,223,000	10,223,000
Sub Total of 5)					3,280,000	10,223,000	13,503,000
6) Receiving & Distribution Well							
Civil Work					109,000		109,000
Sub Total of 6)					109,000	0	109,000
7) Chemical Facility							
Architecture Work					584,000	0	584,000
Mechanical & Electrical Work						1,474,000	1,474,000
Sub Total of 7)					584,000	1,474,000	2,058,000
8) Clear Water Reservoir							
Civil Work					3,383,000		3,383,000
Sub Total of 8)					3,383,000	0	3,383,000
9) Transmisssion Pump Facility							
Civil Work					896,000		896,000
Architecture Work					1,040,000		1,040,000
Mechanical & Electrical Work						2,546,000	2,546,000
Sub Total of 9)					1,936,000	2,546,000	4,482,000
10) Drainage Tank							
Civil Work					554,000		554,000
Mechanical & Electrical Work						130,000	130,000
Sub Total of 10)					554,000	130,000	684,000
11) Operation Facility							
Architecture Work					333,000		333,000
Mechanical & Electrical Work						3,940,000	3,940,000
Sub Total of 11)					333,000	3,940,000	4,273,000
12) Electrical & Generator Facility							
Architecture Work					639,000		639,000
Mechanical & Electrical Work						3,130,000	3,130,000
Sub Total of 12)					639,000	3,130,000	3,769,000
13) Piping Work							
Piping Work						7,862,000	7,862,000
Sub Total of 13)					0	7,862,000	7,862,000
14) Temporary Work							
Civil Work					1,754,000		1,754,000
Sub Total of 14)					1,754,000	0	1,754,000
Total of 1) - 14)					23,351,000	34,179,000	57,530,000

N.7 Breakdown of Construction of Reverse Osmosis Plant

Item Description	Unit	Quantity	Unit Rate (US\$)		Amount (US\$)		Total Amount (US\$)
			L.C	F.C	L.C	F.C	
1) Building							
Architecture Work					5,052,000		5,052,000
Sub Total of 1)					5,052,000	0	5,052,000
2) Reverse Osmosis Facility							
Mechanical & Electrical Work						82,650,000	82,650,000
Sub Total of 2)					0	82,650,000	82,650,000
3) Generator Facility							
Mechanical & Electrical Work						7,290,000	7,290,000
Sub Total of 3)					0	7,290,000	7,290,000
Total of 1) - 3)					5,052,000	89,940,000	94,992,000

APPENDIX O
FINANCIAL AND ECONOMIC EVALUATION
FOR PRIORITY PROJECT

APPENDIX O FINANCIAL AND ECONOMIC EVALUATION FOR PRIORITY PROJECT

O.1 Results of Financial Analysis (Full Cost Recovery)

Table O.1 Summary of Financial Indicators (Full Cost Recovery)

Case		Financial Cost (Million USD)	Revenue (Million USD)	Water price (USD/ m ³)	Net Present value ¹⁾ Million US\$	FIRR	B/C ratio ¹⁾	Remarks The existing price level (EPL)	
								Times of EPL	% of house income
Case 1	(1)	1,198	39	0.0074	-369	#DIV/0!	0.016	1	0.11%
	(2)	1,198	1,925	0.372	-76	6.9%	0.798	50	5.5%
	(3)	1,198	2,426	0.468	2	10.1%	1.005	63	6.9%
	(4)	1,198	3,850	0.743	223	17.3%	1.596	100	11.0%
Case 2	(1)	951	39	0.0074	-328	#DIV/0!	0.018	1	0.11%
	(2)	951	1,925	0.372	-35	8.6%	0.895	50	5.5%
	(3)	951	2,156	0.416	1	10.0%	1.002	56	6.2%
	(4)	951	3,850	0.743	264	18.5%	1.789	100	11.0%
Case 3	(1)	697	39	0.0074	-227	#DIV/0!	0.026	1	0.11%
	(2)	697	1,502	0.290	0	10.0%	0.999	39	4.3%
	(3)	697	1,925	0.372	66	13.4%	1.281	50	5.5%
	(4)	697	3,850	0.743	365	25.4%	2.561	100	11.0%
Case 4	(1)	584	39	0.0074	-209	#DIV/0!	0.028	1	0.11%
	(2)	584	1,386	0.267	0	10.0%	1.001	36	4.0%
	(3)	584	1,925	0.372	84	14.3%	1.390	50	5.5%
	(4)	584	3,850	0.743	383	26.1%	2.780	100	11.0%

1) in the condition of discount rate at 10 %

2) This value is percentage of expenditure for water in the monthly household income

Average of monthly household income is 836,000 ID/household/month (around 557 USD/household/month)

Average size of family is 7.9 persons. Planned water consumption is 338 litter/person/day.

According to the above condition,

Water consumption of household = 7.9 person/hh x 338 lcd x 30 days = 80.1 m³/month

Expenditure for water = 80.1 m³/household/month x 0.0074 USD/m³ = 0.59 USD/household/month

This amount is equivalent to 0.11% of the average monthly household income.

Table O.2 Calculation of Financial Indicator (Case 1 (1))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue (Million USD)							Cash Balance
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)	Revenue	
		F/C portion	L/C portion											
1	2006						807,000					-		
2	2007	0.0	0.0				876,500	338				-		
3	2008	0.5	0.3			0.8	946,000	338				-		-1
4	2009	5.7	2.3			8.0	1,015,500	338				-		-8
5	2010	16.1	11.6			27.7	1,085,000	338				-		-28
6	2011	87.2	47.3			134.5	1,119,400	338				-		-135
7	2012	76.4	38.0			114.4	1,153,800	338				-		-114
8	2013	78.8	39.4			118.2	1,188,200	338				-		-118
9	2014			19.1		19.1	1,222,600	338	30%	215.5		60%	1.0	-18
10	2015			19.1		19.1	1,257,000	338	30%	221.5		60%	1.0	-18
11	2016			19.1		19.1	1,296,800	332	29%	221.6		62%	1.0	-18
12	2017			19.1		19.1	1,336,600	327	28%	221.4		63%	1.0	-18
13	2018			19.1		19.1	1,376,400	321	27%	221.0		65%	1.1	-18
14	2019			19.1		19.1	1,416,200	316	26%	220.5		66%	1.1	-18
15	2020			19.1		19.1	1,456,000	310	25%	219.7		68%	1.1	-18
16	2021			19.1		19.1	1,502,400	304	24%	219.6		69%	1.1	-18
17	2022			19.1		19.1	1,548,800	299	23%	219.4		71%	1.1	-18
18	2023			19.1		19.1	1,595,200	293	22%	218.9		72%	1.2	-18
19	2024			19.1		19.1	1,641,600	288	21%	218.1		74%	1.2	-18
20	2025			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
21	2026			19.1		19.1	1,688,000	282	20%	217.2	7.43	75%	1.2	-18
22	2027			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
23	2028			19.1	82.1	101.2	1,688,000	282	20%	217.2		75%	1.2	-100
24	2029			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
25	2030			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
26	2031			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
27	2032			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
28	2033			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
29	2034			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
30	2035			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
31	2036			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
32	2037			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
33	2038			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
34	2039			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
35	2040			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
36	2041			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
37	2042			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
38	2043			19.1	82.1	101.2	1,688,000	282	20%	217.2		75%	1.2	-100
39	2044			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
40	2045			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
41	2046			19.1		19.1	1,688,000	282	20%	217.2		75%	1.2	-18
Total		265	139	630	164.2	1,198							38.5	-1160

in the condition of discount rate at 10 %

Net Present Value 375 6 -369

Internal rate of return (FIRR) #DIV/0!

B/C 0.016

<Condition of calculation>

Assumed water rate: the existing water rate (11 lD/m³, or 0.0074 USD/m³)

Table O.3 Calculation of Financial Indicator (Case 1 (2))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m³/year)	unit water rate (USD /1000 m³)	Collection rate (%)		Revenue
F/C portion	L/C portion													
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	5.7	2.3			8.0	1,015,500	338				-		-8
4	2010	16.1	11.6			27.7	1,085,000	338				-		-28
5	2011	87.2	47.3			134.5	1,119,400	338				-		-135
6	2012	76.4	38.0			114.4	1,153,800	338				-		-114
7	2013	78.8	39.4			118.2	1,188,200	338				-		-118
8	2014			19.1		19.1	1,222,600	338	30%	215.5		60%	48.0	29
9	2015			19.1		19.1	1,257,000	338	30%	221.5		60%	49.4	30
10	2016			19.1		19.1	1,296,800	332	29%	221.6		62%	50.6	32
11	2017			19.1		19.1	1,336,600	327	28%	221.4		63%	51.8	33
12	2018			19.1		19.1	1,376,400	321	27%	221.0		65%	53.0	34
13	2019			19.1		19.1	1,416,200	316	26%	220.5		66%	54.1	35
14	2020			19.1		19.1	1,456,000	310	25%	219.7		68%	55.1	36
15	2021			19.1		19.1	1,502,400	304	24%	219.6		69%	56.3	37
16	2022			19.1		19.1	1,548,800	299	23%	219.4		71%	57.5	38
17	2023			19.1		19.1	1,595,200	293	22%	218.9		72%	58.5	39
18	2024			19.1		19.1	1,641,600	288	21%	218.1		74%	59.6	40
19	2025			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
20	2026			19.1		19.1	1,688,000	282	20%	217.2	372	75%	60.5	41
21	2027			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
22	2028			19.1	82.1	101.2	1,688,000	282	20%	217.2		75%	60.5	-41
23	2029			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
24	2030			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
25	2031			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
26	2032			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
27	2033			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
28	2034			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
29	2035			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
30	2036			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
31	2037			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
32	2038			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
33	2039			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
34	2040			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
35	2041			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
36	2042			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
37	2043			19.1	82.1	101.2	1,688,000	282	20%	217.2		75%	60.5	-41
38	2044			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
39	2045			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
40	2046			19.1		19.1	1,688,000	282	20%	217.2		75%	60.5	41
Total		265	139	630	164.2	1,198							1,925.1	727
in the condition of discount rate at 10 %														
Net Present Value						375							299	-76
Internal rate of return (FIRR)														6.9%
B/C														0.798
Condition of calculation														
Assumed water rate:						50 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)								

Table O.4 Calculation of Financial Indicator (Case 1 (3))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)		Revenue
F/C portion	L/C portion													
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	5.7	2.3			8.0	1,015,500	338				-		-8
4	2010	16.1	11.6			27.7	1,085,000	338				-		-28
5	2011	87.2	47.3			134.5	1,119,400	338				-		-135
6	2012	76.4	38.0			114.4	1,153,800	338				-		-114
7	2013	78.8	39.4			118.2	1,188,200	338				-		-118
8	2014			19.1		19.1	1,222,600	338	30%	215.5		60%	60.5	41
9	2015			19.1		19.1	1,257,000	338	30%	221.5		60%	62.2	43
10	2016			19.1		19.1	1,296,800	332	29%	221.6		62%	63.8	45
11	2017			19.1		19.1	1,336,600	327	28%	221.4		63%	65.3	46
12	2018			19.1		19.1	1,376,400	321	27%	221.0		65%	66.7	48
13	2019			19.1		19.1	1,416,200	316	26%	220.5		66%	68.1	49
14	2020			19.1		19.1	1,456,000	310	25%	219.7		68%	69.4	50
15	2021			19.1		19.1	1,502,400	304	24%	219.6		69%	70.9	52
16	2022			19.1		19.1	1,548,800	299	23%	219.4		71%	72.4	53
17	2023			19.1		19.1	1,595,200	293	22%	218.9		72%	73.8	55
18	2024			19.1		19.1	1,641,600	288	21%	218.1		74%	75.0	56
19	2025			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
20	2026			19.1		19.1	1,688,000	282	20%	217.2	468	75%	76.2	57
21	2027			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
22	2028			19.1	82.1	101.2	1,688,000	282	20%	217.2		75%	76.2	-25
23	2029			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
24	2030			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
25	2031			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
26	2032			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
27	2033			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
28	2034			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
29	2035			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
30	2036			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
31	2037			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
32	2038			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
33	2039			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
34	2040			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
35	2041			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
36	2042			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
37	2043			19.1	82.1	101.2	1,688,000	282	20%	217.2		75%	76.2	-25
38	2044			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
39	2045			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
40	2046			19.1		19.1	1,688,000	282	20%	217.2		75%	76.2	57
Total		265	139	630	164.2	1,198							2,425.6	1228
in the condition of discount rate at 10 %														
Net Present Value						375							377	2
Internal rate of return (FIRR)														10.1%
B/C														1.005
Condition of calculation														
Assumed water rate:						63 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)								

Table O.5 Calculation of Financial Indicator (Case 1 (4))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m³/year)	unit water rate (USD /1000 m³)	Collection rate (%)		Revenue
F/C portion	L/C portion													
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	5.7	2.3			8.0	1,015,500	338				-		-8
4	2010	16.1	11.6			27.7	1,085,000	338				-		-28
5	2011	87.2	47.3			134.5	1,119,400	338				-		-135
6	2012	76.4	38.0			114.4	1,153,800	338				-		-114
7	2013	78.8	39.4			118.2	1,188,200	338				-		-118
8	2014			19.1		19.1	1,222,600	338	30%	215.5		60%	96.1	77
9	2015			19.1		19.1	1,257,000	338	30%	221.5		60%	98.8	80
10	2016			19.1		19.1	1,296,800	332	29%	221.6		62%	101.3	82
11	2017			19.1		19.1	1,336,600	327	28%	221.4		63%	103.7	85
12	2018			19.1		19.1	1,376,400	321	27%	221.0		65%	105.9	87
13	2019			19.1		19.1	1,416,200	316	26%	220.5		66%	108.1	89
14	2020			19.1		19.1	1,456,000	310	25%	219.7		68%	110.2	91
15	2021			19.1		19.1	1,502,400	304	24%	219.6		69%	112.6	94
16	2022			19.1		19.1	1,548,800	299	23%	219.4		71%	114.9	96
17	2023			19.1		19.1	1,595,200	293	22%	218.9		72%	117.1	98
18	2024			19.1		19.1	1,641,600	288	21%	218.1		74%	119.1	100
19	2025			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
20	2026			19.1		19.1	1,688,000	282	20%	217.2	743	75%	121.0	102
21	2027			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
22	2028			19.1	82.1	101.2	1,688,000	282	20%	217.2		75%	121.0	20
23	2029			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
24	2030			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
25	2031			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
26	2032			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
27	2033			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
28	2034			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
29	2035			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
30	2036			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
31	2037			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
32	2038			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
33	2039			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
34	2040			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
35	2041			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
36	2042			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
37	2043			19.1	82.1	101.2	1,688,000	282	20%	217.2		75%	121.0	20
38	2044			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
39	2045			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
40	2046			19.1		19.1	1,688,000	282	20%	217.2		75%	121.0	102
Total		265	139	630	164.2	1,198							3,850.2	2652
in the condition of discount rate at 10 %														
Net Present Value						375							598	223
Internal rate of return (FIRR)														17.3%
B/C														1.596
Condition of calculation														
Assumed water rate:		100 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)												

Table O.6 Calculation of Financial Indicator (Case 2 (1))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue (Million USD)							Cash Balance
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)	Revenue	
		F/C portion	L/C portion											
1	2006						807,000						-	
2	2007	0.0	0.0				876,500	338					-	
3	2008	0.5	0.3			0.8	946,000	338					-	-1
4	2009	5.7	2.3			8.0	1,015,500	338					-	-8
5	2010	16.1	11.6			27.7	1,085,000	338					-	-28
6	2011	87.2	47.3			134.5	1,119,400	338					-	-135
7	2012	76.4	38.0			114.4	1,153,800	338					-	-114
8	2013	78.8	39.4			118.2	1,188,200	338					-	-118
9	2014			11.6		11.6	1,222,600	338	30%	215.5		60%	1.0	-11
10	2015			11.6		11.6	1,257,000	338	30%	221.5		60%	1.0	-11
11	2016			11.6		11.6	1,296,800	332	29%	221.6		62%	1.0	-11
12	2017			11.6		11.6	1,336,600	327	28%	221.4		63%	1.0	-11
13	2018			11.6		11.6	1,376,400	321	27%	221.0		65%	1.1	-11
14	2019			11.6		11.6	1,416,200	316	26%	220.5		66%	1.1	-11
15	2020			11.6		11.6	1,456,000	310	25%	219.7		68%	1.1	-10
16	2021			11.6		11.6	1,502,400	304	24%	219.6		69%	1.1	-10
17	2022			11.6		11.6	1,548,800	299	23%	219.4		71%	1.1	-10
18	2023			11.6		11.6	1,595,200	293	22%	218.9		72%	1.2	-10
19	2024			11.6		11.6	1,641,600	288	21%	218.1		74%	1.2	-10
20	2025			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
21	2026			11.6		11.6	1,688,000	282	20%	217.2	7.43	75%	1.2	-10
22	2027			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
23	2028			11.6	82.1	93.7	1,688,000	282	20%	217.2		75%	1.2	-92
24	2029			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
25	2030			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
26	2031			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
27	2032			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
28	2033			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
29	2034			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
30	2035			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
31	2036			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
32	2037			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
33	2038			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
34	2039			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
35	2040			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
36	2041			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
37	2042			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
38	2043			11.6	82.1	93.7	1,688,000	282	20%	217.2		75%	1.2	-92
39	2044			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
40	2045			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
40	2046			11.6		11.6	1,688,000	282	20%	217.2		75%	1.2	-10
Total		265	139	383	164.2	951							38.5	-912

in the condition of discount rate at 10 %

Net Present Value 334 6 -328

Internal rate of return (FIRR) #DIV/0!

B/C 0.018

<Condition of calculation>

Assumed water rate: the existing water rate (11 lD/m³, or 0.0074 USD/m³)

Table O.7 Calculation of Financial Indicator (Case 2 (2))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m³/year)	unit water rate (USD /1000 m³)	Collection rate (%)		Revenue
F/C portion	L/C portion													
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	5.7	2.3			8.0	1,015,500	338				-		-8
4	2010	16.1	11.6			27.7	1,085,000	338				-		-28
5	2011	87.2	47.3			134.5	1,119,400	338				-		-135
6	2012	76.4	38.0			114.4	1,153,800	338				-		-114
7	2013	78.8	39.4			118.2	1,188,200	338				-		-118
8	2014			11.6		11.6	1,222,600	338	30%	215.5		60%	48.0	36
9	2015			11.6		11.6	1,257,000	338	30%	221.5		60%	49.4	38
10	2016			11.6		11.6	1,296,800	332	29%	221.6		62%	50.6	39
11	2017			11.6		11.6	1,336,600	327	28%	221.4		63%	51.8	40
12	2018			11.6		11.6	1,376,400	321	27%	221.0		65%	53.0	41
13	2019			11.6		11.6	1,416,200	316	26%	220.5		66%	54.1	42
14	2020			11.6		11.6	1,456,000	310	25%	219.7		68%	55.1	43
15	2021			11.6		11.6	1,502,400	304	24%	219.6		69%	56.3	45
16	2022			11.6		11.6	1,548,800	299	23%	219.4		71%	57.5	46
17	2023			11.6		11.6	1,595,200	293	22%	218.9		72%	58.5	47
18	2024			11.6		11.6	1,641,600	288	21%	218.1		74%	59.6	48
19	2025			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
20	2026			11.6		11.6	1,688,000	282	20%	217.2	372	75%	60.5	49
21	2027			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
22	2028			11.6	82.1	93.7	1,688,000	282	20%	217.2		75%	60.5	-33
23	2029			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
24	2030			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
25	2031			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
26	2032			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
27	2033			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
28	2034			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
29	2035			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
30	2036			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
31	2037			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
32	2038			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
33	2039			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
34	2040			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
35	2041			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
36	2042			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
37	2043			11.6	82.1	93.7	1,688,000	282	20%	217.2		75%	60.5	-33
38	2044			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
39	2045			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
40	2046			11.6		11.6	1,688,000	282	20%	217.2		75%	60.5	49
Total		265	139	383	164.2	951							1,925.1	975
in the condition of discount rate at 10 %														
Net Present Value						334							299	-35
Internal rate of return (FIRR)														8.6%
B/C														0.895
Condition of calculation														
Assumed water rate:		50 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)												

Table O.8 Calculation of Financial Indicator (Case 2 (3))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)		Revenue
F/C portion	L/C portion													
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	5.7	2.3			8.0	1,015,500	338				-		-8
4	2010	16.1	11.6			27.7	1,085,000	338				-		-28
5	2011	87.2	47.3			134.5	1,119,400	338				-		-135
6	2012	76.4	38.0			114.4	1,153,800	338				-		-114
7	2013	78.8	39.4			118.2	1,188,200	338				-		-118
8	2014			11.6		11.6	1,222,600	338	30%	215.5		60%	53.8	42
9	2015			11.6		11.6	1,257,000	338	30%	221.5		60%	55.3	44
10	2016			11.6		11.6	1,296,800	332	29%	221.6		62%	56.7	45
11	2017			11.6		11.6	1,336,600	327	28%	221.4		63%	58.0	46
12	2018			11.6		11.6	1,376,400	321	27%	221.0		65%	59.3	48
13	2019			11.6		11.6	1,416,200	316	26%	220.5		66%	60.5	49
14	2020			11.6		11.6	1,456,000	310	25%	219.7		68%	61.7	50
15	2021			11.6		11.6	1,502,400	304	24%	219.6		69%	63.1	51
16	2022			11.6		11.6	1,548,800	299	23%	219.4		71%	64.3	53
17	2023			11.6		11.6	1,595,200	293	22%	218.9		72%	65.6	54
18	2024			11.6		11.6	1,641,600	288	21%	218.1		74%	66.7	55
19	2025			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
20	2026			11.6		11.6	1,688,000	282	20%	217.2	416	75%	67.8	56
21	2027			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
22	2028			11.6	82.1	93.7	1,688,000	282	20%	217.2		75%	67.8	-26
23	2029			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
24	2030			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
25	2031			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
26	2032			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
27	2033			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
28	2034			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
29	2035			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
30	2036			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
31	2037			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
32	2038			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
33	2039			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
34	2040			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
35	2041			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
36	2042			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
37	2043			11.6	82.1	93.7	1,688,000	282	20%	217.2		75%	67.8	-26
38	2044			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
39	2045			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
40	2046			11.6		11.6	1,688,000	282	20%	217.2		75%	67.8	56
Total		265	139	383	164.2	951							2,156.1	1206
in the condition of discount rate at 10 %														
Net Present Value						334							335	1
Internal rate of return (FIRR)														10.0%
B/C														1.002
Condition of calculation														
Assumed water rate:		56 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)												

Table O.9 Calculation of Financial Indicator (Case 2 (4))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m³/year)	unit water rate (USD /1000 m³)	Collection rate (%)		Revenue
F/C portion	L/C portion													
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	5.7	2.3			8.0	1,015,500	338				-		-8
4	2010	16.1	11.6			27.7	1,085,000	338				-		-28
5	2011	87.2	47.3			134.5	1,119,400	338				-		-135
6	2012	76.4	38.0			114.4	1,153,800	338				-		-114
7	2013	78.8	39.4			118.2	1,188,200	338				-		-118
8	2014			11.6		11.6	1,222,600	338	30%	215.5		60%	96.1	84
9	2015			11.6		11.6	1,257,000	338	30%	221.5		60%	98.8	87
10	2016			11.6		11.6	1,296,800	332	29%	221.6		62%	101.3	90
11	2017			11.6		11.6	1,336,600	327	28%	221.4		63%	103.7	92
12	2018			11.6		11.6	1,376,400	321	27%	221.0		65%	105.9	94
13	2019			11.6		11.6	1,416,200	316	26%	220.5		66%	108.1	97
14	2020			11.6		11.6	1,456,000	310	25%	219.7		68%	110.2	99
15	2021			11.6		11.6	1,502,400	304	24%	219.6		69%	112.6	101
16	2022			11.6		11.6	1,548,800	299	23%	219.4		71%	114.9	103
17	2023			11.6		11.6	1,595,200	293	22%	218.9		72%	117.1	105
18	2024			11.6		11.6	1,641,600	288	21%	218.1		74%	119.1	108
19	2025			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
20	2026			11.6		11.6	1,688,000	282	20%	217.2	743	75%	121.0	109
21	2027			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
22	2028			11.6	82.1	93.7	1,688,000	282	20%	217.2		75%	121.0	27
23	2029			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
24	2030			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
25	2031			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
26	2032			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
27	2033			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
28	2034			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
29	2035			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
30	2036			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
31	2037			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
32	2038			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
33	2039			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
34	2040			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
35	2041			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
36	2042			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
37	2043			11.6	82.1	93.7	1,688,000	282	20%	217.2		75%	121.0	27
38	2044			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
39	2045			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
40	2046			11.6		11.6	1,688,000	282	20%	217.2		75%	121.0	109
Total		265	139	383	164.2	951							3,850.2	2900
in the condition of discount rate at 10 %														
Net Present Value						334							598	264
Internal rate of return (FIRR)														18.5%
B/C														1.789
Condition of calculation														
Assumed water rate:		100 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)												

Table O.10 Calculation of Financial Indicator (Case 3 (1))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue (Million USD)							Cash Balance
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)	Revenue	
		F/C portion	L/C portion											
1	2006						807,000					-		
2	2007	0.0	0.0				876,500	338				-		
3	2008	0.5	0.3			0.8	946,000	338				-		-1
4	2009	3.2	2.1			5.3	1,015,500	338				-		-5
5	2010	13.8	11.4			25.2	1,085,000	338				-		-25
6	2011	51.0	40.2			91.2	1,119,400	338				-		-91
7	2012	40.0	30.8			70.8	1,153,800	338				-		-71
8	2013	41.3	31.9			73.2	1,188,200	338				-		-73
9	2014			9.8		9.8	1,222,600	338	30%	215.5		60%	1.0	-9
10	2015			9.8		9.8	1,257,000	338	30%	221.5		60%	1.0	-9
11	2016			9.8		9.8	1,296,800	332	29%	221.6		62%	1.0	-9
12	2017			9.8		9.8	1,336,600	327	28%	221.4		63%	1.0	-9
13	2018			9.8		9.8	1,376,400	321	27%	221.0		65%	1.1	-9
14	2019			9.8		9.8	1,416,200	316	26%	220.5		66%	1.1	-9
15	2020			9.8		9.8	1,456,000	310	25%	219.7		68%	1.1	-9
16	2021			9.8		9.8	1,502,400	304	24%	219.6		69%	1.1	-9
17	2022			9.8		9.8	1,548,800	299	23%	219.4		71%	1.1	-9
18	2023			9.8		9.8	1,595,200	293	22%	218.9		72%	1.2	-9
19	2024			9.8		9.8	1,641,600	288	21%	218.1		74%	1.2	-9
20	2025			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
21	2026			9.8		9.8	1,688,000	282	20%	217.2	7.43	75%	1.2	-9
22	2027			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
23	2028			9.8	53.3	63.1	1,688,000	282	20%	217.2		75%	1.2	-62
24	2029			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
25	2030			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
26	2031			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
27	2032			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
28	2033			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
29	2034			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
30	2035			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
31	2036			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
32	2037			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
33	2038			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
34	2039			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
35	2040			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
36	2041			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
37	2042			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
38	2043			9.8	53.3	63.1	1,688,000	282	20%	217.2		75%	1.2	-62
39	2044			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
40	2045			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
40	2046			9.8		9.8	1,688,000	282	20%	217.2		75%	1.2	-9
Total		150	117	323	106.6	697							38.5	-658
in the condition of discount rate at 10 %														
Net Present Value						233						6		-227
Internal rate of return (FIRR)														#DIV/0!
B/C														0.026
<Condition of calculation>														
Assumed water rate:		the existing water rate (11 lD/m ³ , or 0.0074 USD/m ³)												

Table O.11 Calculation of Financial Indicator (Case 3 (2))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m³/year)	unit water rate (USD /1000 m³)	Collection rate (%)		Revenue
		F/C portion	L/C portion											
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	3.2	2.1			5.3	1,015,500	338				-		-5
4	2010	13.8	11.4			25.2	1,085,000	338				-		-25
5	2011	51.0	40.2			91.2	1,119,400	338				-		-91
6	2012	40.0	30.8			70.8	1,153,800	338				-		-71
7	2013	41.3	31.9			73.2	1,188,200	338				-		-73
8	2014			9.8		9.8	1,222,600	338	30%	215.5		60%	37.5	28
9	2015			9.8		9.8	1,257,000	338	30%	221.5		60%	38.5	29
10	2016			9.8		9.8	1,296,800	332	29%	221.6		62%	39.5	30
11	2017			9.8		9.8	1,336,600	327	28%	221.4		63%	40.4	31
12	2018			9.8		9.8	1,376,400	321	27%	221.0		65%	41.3	32
13	2019			9.8		9.8	1,416,200	316	26%	220.5		66%	42.2	32
14	2020			9.8		9.8	1,456,000	310	25%	219.7		68%	43.0	33
15	2021			9.8		9.8	1,502,400	304	24%	219.6		69%	43.9	34
16	2022			9.8		9.8	1,548,800	299	23%	219.4		71%	44.8	35
17	2023			9.8		9.8	1,595,200	293	22%	218.9		72%	45.7	36
18	2024			9.8		9.8	1,641,600	288	21%	218.1		74%	46.5	37
19	2025			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
20	2026			9.8		9.8	1,688,000	282	20%	217.2	290	75%	47.2	37
21	2027			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
22	2028			9.8	53.3	63.1	1,688,000	282	20%	217.2		75%	47.2	-16
23	2029			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
24	2030			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
25	2031			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
26	2032			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
27	2033			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
28	2034			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
29	2035			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
30	2036			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
31	2037			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
32	2038			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
33	2039			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
34	2040			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
35	2041			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
36	2042			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
37	2043			9.8	53.3	63.1	1,688,000	282	20%	217.2		75%	47.2	-16
38	2044			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
39	2045			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
40	2046			9.8		9.8	1,688,000	282	20%	217.2		75%	47.2	37
Total		150	117	323	106.6	697							1,501.6	805

in the condition of discount rate at 10 %

Net Present Value 233 233 0

Internal rate of return (FIRR) 10.0%

B/C 0.999

Condition of calculation

Assumed water rate: 39 times of the existing water rate (11 lD/m³, or 0.0074 USD/m³)

Table O.12 Calculation of Financial Indicator (Case 3 (3))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)		Revenue
F/C portion	L/C portion													
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	3.2	2.1			5.3	1,015,500	338				-		-5
4	2010	13.8	11.4			25.2	1,085,000	338				-		-25
5	2011	51.0	40.2			91.2	1,119,400	338				-		-91
6	2012	40.0	30.8			70.8	1,153,800	338				-		-71
7	2013	41.3	31.9			73.2	1,188,200	338				-		-73
8	2014			9.8		9.8	1,222,600	338	30%	215.5		60%	48.0	38
9	2015			9.8		9.8	1,257,000	338	30%	221.5		60%	49.4	40
10	2016			9.8		9.8	1,296,800	332	29%	221.6		62%	50.6	41
11	2017			9.8		9.8	1,336,600	327	28%	221.4		63%	51.8	42
12	2018			9.8		9.8	1,376,400	321	27%	221.0		65%	53.0	43
13	2019			9.8		9.8	1,416,200	316	26%	220.5		66%	54.1	44
14	2020			9.8		9.8	1,456,000	310	25%	219.7		68%	55.1	45
15	2021			9.8		9.8	1,502,400	304	24%	219.6		69%	56.3	47
16	2022			9.8		9.8	1,548,800	299	23%	219.4		71%	57.5	48
17	2023			9.8		9.8	1,595,200	293	22%	218.9		72%	58.5	49
18	2024			9.8		9.8	1,641,600	288	21%	218.1		74%	59.6	50
19	2025			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
20	2026			9.8		9.8	1,688,000	282	20%	217.2	372	75%	60.5	51
21	2027			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
22	2028			9.8	53.3	63.1	1,688,000	282	20%	217.2		75%	60.5	-3
23	2029			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
24	2030			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
25	2031			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
26	2032			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
27	2033			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
28	2034			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
29	2035			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
30	2036			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
31	2037			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
32	2038			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
33	2039			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
34	2040			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
35	2041			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
36	2042			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
37	2043			9.8	53.3	63.1	1,688,000	282	20%	217.2		75%	60.5	-3
38	2044			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
39	2045			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
40	2046			9.8		9.8	1,688,000	282	20%	217.2		75%	60.5	51
Total		150	117	323	106.6	697							1,925.1	1229
in the condition of discount rate at 10 %														
Net Present Value						233							299	66
Internal rate of return (FIRR)														13.4%
B/C														1.281
Condition of calculation														
Assumed water rate:		50 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)												

Table O.13 Calculation of Financial Indicator (Case 3 (4))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue							Cash Balance
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)	Revenue	
		F/C portion	L/C portion											
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	3.2	2.1			5.3	1,015,500	338				-		-5
4	2010	13.8	11.4			25.2	1,085,000	338				-		-25
5	2011	51.0	40.2			91.2	1,119,400	338				-		-91
6	2012	40.0	30.8			70.8	1,153,800	338				-		-71
7	2013	41.3	31.9			73.2	1,188,200	338				-		-73
8	2014			9.8		9.8	1,222,600	338	30%	215.5		60%	96.1	86
9	2015			9.8		9.8	1,257,000	338	30%	221.5		60%	98.8	89
10	2016			9.8		9.8	1,296,800	332	29%	221.6		62%	101.3	91
11	2017			9.8		9.8	1,336,600	327	28%	221.4		63%	103.7	94
12	2018			9.8		9.8	1,376,400	321	27%	221.0		65%	105.9	96
13	2019			9.8		9.8	1,416,200	316	26%	220.5		66%	108.1	98
14	2020			9.8		9.8	1,456,000	310	25%	219.7		68%	110.2	100
15	2021			9.8		9.8	1,502,400	304	24%	219.6		69%	112.6	103
16	2022			9.8		9.8	1,548,800	299	23%	219.4		71%	114.9	105
17	2023			9.8		9.8	1,595,200	293	22%	218.9		72%	117.1	107
18	2024			9.8		9.8	1,641,600	288	21%	218.1		74%	119.1	109
19	2025			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
20	2026			9.8		9.8	1,688,000	282	20%	217.2	743	75%	121.0	111
21	2027			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
22	2028			9.8	53.3	63.1	1,688,000	282	20%	217.2		75%	121.0	58
23	2029			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
24	2030			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
25	2031			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
26	2032			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
27	2033			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
28	2034			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
29	2035			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
30	2036			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
31	2037			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
32	2038			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
33	2039			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
34	2040			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
35	2041			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
36	2042			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
37	2043			9.8	53.3	63.1	1,688,000	282	20%	217.2		75%	121.0	58
38	2044			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
39	2045			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
40	2046			9.8		9.8	1,688,000	282	20%	217.2		75%	121.0	111
Total		150	117	323	106.6	697							3,850.2	3154
in the condition of discount rate at 10 %														
Net Present Value						233							598	365
Internal rate of return (FIRR)														25.4%
B/C														2.561
Condition of calculation														
Assumed water rate:		100 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)												

Table O.14 Calculation of Financial Indicator (Case 4 (1))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue (Million USD)							Cash Balance
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)	Revenue	
		F/C portion	L/C portion											
1	2006						807,000						-	
2	2007	0.0	0.0				876,500	338					-	
3	2008	0.5	0.3			0.8	946,000	338					-	-1
4	2009	3.2	2.1			5.3	1,015,500	338					-	-5
5	2010	13.8	11.4			25.2	1,085,000	338					-	-25
6	2011	51.0	40.2			91.2	1,119,400	338					-	-91
7	2012	40.0	30.8			70.8	1,153,800	338					-	-71
8	2013	41.3	31.9			73.2	1,188,200	338					-	-73
9	2014			6.4		6.4	1,222,600	338	30%	215.5		60%	1.0	-5
10	2015			6.4		6.4	1,257,000	338	30%	221.5		60%	1.0	-5
11	2016			6.4		6.4	1,296,800	332	29%	221.6		62%	1.0	-5
12	2017			6.4		6.4	1,336,600	327	28%	221.4		63%	1.0	-5
13	2018			6.4		6.4	1,376,400	321	27%	221.0		65%	1.1	-5
14	2019			6.4		6.4	1,416,200	316	26%	220.5		66%	1.1	-5
15	2020			6.4		6.4	1,456,000	310	25%	219.7		68%	1.1	-5
16	2021			6.4		6.4	1,502,400	304	24%	219.6		69%	1.1	-5
17	2022			6.4		6.4	1,548,800	299	23%	219.4		71%	1.1	-5
18	2023			6.4		6.4	1,595,200	293	22%	218.9		72%	1.2	-5
19	2024			6.4		6.4	1,641,600	288	21%	218.1		74%	1.2	-5
20	2025			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
21	2026			6.4		6.4	1,688,000	282	20%	217.2	7.43	75%	1.2	-5
22	2027			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
23	2028			6.4	53.3	59.7	1,688,000	282	20%	217.2		75%	1.2	-58
24	2029			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
25	2030			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
26	2031			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
27	2032			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
28	2033			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
29	2034			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
30	2035			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
31	2036			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
32	2037			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
33	2038			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
34	2039			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
35	2040			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
36	2041			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
37	2042			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
38	2043			6.4	53.3	59.7	1,688,000	282	20%	217.2		75%	1.2	-58
39	2044			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
40	2045			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
40	2046			6.4		6.4	1,688,000	282	20%	217.2		75%	1.2	-5
Total		150	117	211	106.6	584							38.5	-546

in the condition of discount rate at 10 %

Net Present Value 215 6 -209

Internal rate of return (FIRR) #DIV/0!

B/C 0.028

<Condition of calculation>

Assumed water rate: the existing water rate (11 lD/m³, or 0.0074 USD/m³)

Table O.15 Calculation of Financial Indicator (Case 4 (2))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place- ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)		Revenue
		F/C portion	L/C portion											
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	3.2	2.1			5.3	1,015,500	338				-		-5
4	2010	13.8	11.4			25.2	1,085,000	338				-		-25
5	2011	51.0	40.2			91.2	1,119,400	338				-		-91
6	2012	40.0	30.8			70.8	1,153,800	338				-		-71
7	2013	41.3	31.9			73.2	1,188,200	338				-		-73
8	2014			6.4		6.4	1,222,600	338	30%	215.5		60%	34.6	28
9	2015			6.4		6.4	1,257,000	338	30%	221.5		60%	35.6	29
10	2016			6.4		6.4	1,296,800	332	29%	221.6		62%	36.5	30
11	2017			6.4		6.4	1,336,600	327	28%	221.4		63%	37.3	31
12	2018			6.4		6.4	1,376,400	321	27%	221.0		65%	38.1	32
13	2019			6.4		6.4	1,416,200	316	26%	220.5		66%	38.9	33
14	2020			6.4		6.4	1,456,000	310	25%	219.7		68%	39.7	33
15	2021			6.4		6.4	1,502,400	304	24%	219.6		69%	40.5	34
16	2022			6.4		6.4	1,548,800	299	23%	219.4		71%	41.4	35
17	2023			6.4		6.4	1,595,200	293	22%	218.9		72%	42.2	36
18	2024			6.4		6.4	1,641,600	288	21%	218.1		74%	42.9	36
19	2025			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
20	2026			6.4		6.4	1,688,000	282	20%	217.2	267	75%	43.6	37
21	2027			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
22	2028			6.4	53.3	59.7	1,688,000	282	20%	217.2		75%	43.6	-16
23	2029			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
24	2030			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
25	2031			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
26	2032			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
27	2033			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
28	2034			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
29	2035			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
30	2036			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
31	2037			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
32	2038			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
33	2039			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
34	2040			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
35	2041			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
36	2042			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
37	2043			6.4	53.3	59.7	1,688,000	282	20%	217.2		75%	43.6	-16
38	2044			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
39	2045			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
40	2046			6.4		6.4	1,688,000	282	20%	217.2		75%	43.6	37
Total		150	117	211	106.6	584							1,386.1	802
in the condition of discount rate at 10 %														
Net Present Value						215							215	0
Internal rate of return (FIRR)														10.0%
B/C														1.001
Condition of calculation														
Assumed water rate:		36 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)												

Table O.16 Calculation of Financial Indicator (Case 4 (3))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue							Cash Balance
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m³/year)	unit water rate (USD /1000 m³)	Collection rate (%)	Revenue	
F/C portion	L/C portion													
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	3.2	2.1			5.3	1,015,500	338				-		-5
4	2010	13.8	11.4			25.2	1,085,000	338				-		-25
5	2011	51.0	40.2			91.2	1,119,400	338				-		-91
6	2012	40.0	30.8			70.8	1,153,800	338				-		-71
7	2013	41.3	31.9			73.2	1,188,200	338				-		-73
8	2014			6.4		6.4	1,222,600	338	30%	215.5		60%	48.0	42
9	2015			6.4		6.4	1,257,000	338	30%	221.5		60%	49.4	43
10	2016			6.4		6.4	1,296,800	332	29%	221.6		62%	50.6	44
11	2017			6.4		6.4	1,336,600	327	28%	221.4		63%	51.8	45
12	2018			6.4		6.4	1,376,400	321	27%	221.0		65%	53.0	47
13	2019			6.4		6.4	1,416,200	316	26%	220.5		66%	54.1	48
14	2020			6.4		6.4	1,456,000	310	25%	219.7		68%	55.1	49
15	2021			6.4		6.4	1,502,400	304	24%	219.6		69%	56.3	50
16	2022			6.4		6.4	1,548,800	299	23%	219.4		71%	57.5	51
17	2023			6.4		6.4	1,595,200	293	22%	218.9		72%	58.5	52
18	2024			6.4		6.4	1,641,600	288	21%	218.1		74%	59.6	53
19	2025			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
20	2026			6.4		6.4	1,688,000	282	20%	217.2	372	75%	60.5	54
21	2027			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
22	2028			6.4	53.3	59.7	1,688,000	282	20%	217.2		75%	60.5	1
23	2029			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
24	2030			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
25	2031			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
26	2032			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
27	2033			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
28	2034			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
29	2035			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
30	2036			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
31	2037			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
32	2038			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
33	2039			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
34	2040			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
35	2041			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
36	2042			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
37	2043			6.4	53.3	59.7	1,688,000	282	20%	217.2		75%	60.5	1
38	2044			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
39	2045			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
40	2046			6.4		6.4	1,688,000	282	20%	217.2		75%	60.5	54
Total		150	117	211	106.6	584							1,925.1	1341
in the condition of discount rate at 10 %														
Net Present Value						215							299	84
Internal rate of return (FIRR)														14.3%
B/C														1.390
Condition of calculation														
Assumed water rate:						50 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)								

Table O.17 Calculation of Financial Indicator (Case 4 (4))

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m³/year)	unit water rate (USD /1000 m³)	Collection rate (%)		Revenue
F/C portion	L/C portion													
	2006						807,000					-		
1	2007	0.0	0.0				876,500	338				-		
2	2008	0.5	0.3			0.8	946,000	338				-		-1
3	2009	3.2	2.1			5.3	1,015,500	338				-		-5
4	2010	13.8	11.4			25.2	1,085,000	338				-		-25
5	2011	51.0	40.2			91.2	1,119,400	338				-		-91
6	2012	40.0	30.8			70.8	1,153,800	338				-		-71
7	2013	41.3	31.9			73.2	1,188,200	338				-		-73
8	2014			6.4		6.4	1,222,600	338	30%	215.5		60%	96.1	90
9	2015			6.4		6.4	1,257,000	338	30%	221.5		60%	98.8	92
10	2016			6.4		6.4	1,296,800	332	29%	221.6		62%	101.3	95
11	2017			6.4		6.4	1,336,600	327	28%	221.4		63%	103.7	97
12	2018			6.4		6.4	1,376,400	321	27%	221.0		65%	105.9	100
13	2019			6.4		6.4	1,416,200	316	26%	220.5		66%	108.1	102
14	2020			6.4		6.4	1,456,000	310	25%	219.7		68%	110.2	104
15	2021			6.4		6.4	1,502,400	304	24%	219.6		69%	112.6	106
16	2022			6.4		6.4	1,548,800	299	23%	219.4		71%	114.9	109
17	2023			6.4		6.4	1,595,200	293	22%	218.9		72%	117.1	111
18	2024			6.4		6.4	1,641,600	288	21%	218.1		74%	119.1	113
19	2025			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
20	2026			6.4		6.4	1,688,000	282	20%	217.2	743	75%	121.0	115
21	2027			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
22	2028			6.4	53.3	59.7	1,688,000	282	20%	217.2		75%	121.0	61
23	2029			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
24	2030			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
25	2031			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
26	2032			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
27	2033			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
28	2034			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
29	2035			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
30	2036			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
31	2037			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
32	2038			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
33	2039			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
34	2040			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
35	2041			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
36	2042			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
37	2043			6.4	53.3	59.7	1,688,000	282	20%	217.2		75%	121.0	61
38	2044			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
39	2045			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
40	2046			6.4		6.4	1,688,000	282	20%	217.2		75%	121.0	115
Total		150	117	211	106.6	584							3,850.2	3266
in the condition of discount rate at 10 %														
Net Present Value						215							598	383
Internal rate of return (FIRR)														26.1%
B/C														2.780
Condition of calculation														
Assumed water rate:		100 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)												

O.2 Results of Financial Analysis (O&M Cost Recovery with Generator Option)

Table O.18 Results of Financial Analysis (O&M cost recovery with generator option)

Case	Water price (USD/ m ³)	multiple of the current tariff level	% of the family income	Net Present value 1)	FIRR	B/C ratio
Case 1	0.126	17	1.9	-2	-	0.985
Case 2	0.104	14	1.5	1	-	1.012
Case 3	0.067	9	1.0	1	-	1.017
Case 4	0.059	8	0.9	2	-	1.048

1) in the condition of discount rate at 10 %

2) This value is percentage of expenditure for water in the monthly household income

Average of monthly household income is 836,000 ID/household/month (around 557 USD/hh/month)

Average size of family is 7.9 persons. Planned water consumption is 338 litter/person/day.

According to the above condition,

Water consumption of household = 7.9 person/hh x 338 lcd x 30 days = 80.1 m³/month

Expenditure for water = 80.1 m³/hh/month x 0.0074 USD/m³ = 0.59 USD/hh/month

This amount is equivalent to 0.11% of the average monthly household income.

Table O.19 Calculation of Financial Indicator (Case 1)

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)		Revenue
		F/C portion	L/C portion											
1	2006						807,000					-		
2	2007						876,500	338				-		
3	2008					0.0	946,000	338				-		0
4	2009					0.0	1,015,500	338				-		0
5	2010					0.0	1,085,000	338				-		0
6	2011					0.0	1,119,400	338				-		0
7	2012					0.0	1,153,800	338				-		0
8	2013					0.0	1,188,200	338				-		0
9	2014			19.1		19.1	1,222,600	338	30%	215.5		60%	16.3	-3
10	2015			19.1		19.1	1,257,000	338	30%	221.5		60%	16.8	-2
11	2016			19.1		19.1	1,296,800	332	29%	221.6		62%	17.2	-2
12	2017			19.1		19.1	1,336,600	327	28%	221.4		63%	17.6	-1
13	2018			19.1		19.1	1,376,400	321	27%	221.0		65%	18.0	-1
14	2019			19.1		19.1	1,416,200	316	26%	220.5		66%	18.4	-1
15	2020			19.1		19.1	1,456,000	310	25%	219.7		68%	18.7	0
16	2021			19.1		19.1	1,502,400	304	24%	219.6		69%	19.1	0
17	2022			19.1		19.1	1,548,800	299	23%	219.4		71%	19.5	0
18	2023			19.1		19.1	1,595,200	293	22%	218.9		72%	19.9	1
19	2024			19.1		19.1	1,641,600	288	21%	218.1		74%	20.3	1
20	2025			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
21	2026			19.1		19.1	1,688,000	282	20%	217.2	126	75%	20.6	1
22	2027			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
23	2028			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
24	2029			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
25	2030			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
26	2031			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
27	2032			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
28	2033			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
29	2034			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
30	2035			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
31	2036			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
32	2037			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
33	2038			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
34	2039			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
35	2040			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
36	2041			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
37	2042			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
38	2043			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
39	2044			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
40	2045			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
41	2046			19.1		19.1	1,688,000	282	20%	217.2		75%	20.6	1
Total		0	0	630	0	630							654.5	24
in the condition of discount rate at 10 %														
Net Present Value						103							102	-2
Internal rate of return (FIRR)														-
B/C														0.985
Condition of calculation														
Assumed water rate:						17 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)								

Table O.20 Calculation of Financial Indicator (Case 2)

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue					Cash Balance		
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)		Revenue	
		F/C portion	L/C portion											
	2006						807,000				-			
1	2007						876,500	338	108.1		-			
2	2008					0.0	946,000	338	116.7		-		0	
3	2009					0.0	1,015,500	338	125.3		-		0	
4	2010					0.0	1,085,000	338	133.9		-		0	
5	2011					0.0	1,119,400	338	138.1		-		0	
6	2012					0.0	1,153,800	338	142.3		-		0	
7	2013					0.0	1,188,200	338	146.6		-		0	
8	2014			11.6		11.6	1,222,600	338	150.8		60%	9.4	-2	
9	2015			11.6		11.6	1,257,000	338	155.1		60%	9.7	-2	
10	2016			11.6		11.6	1,296,800	332	157.3		62%	10.1	-2	
11	2017			11.6		11.6	1,336,600	327	159.4		63%	10.4	-1	
12	2018			11.6		11.6	1,376,400	321	161.4		65%	10.8	-1	
13	2019			11.6		11.6	1,416,200	316	163.1		66%	11.2	0	
14	2020			11.6		11.6	1,456,000	310	164.7		68%	11.6	0	
15	2021			11.6		11.6	1,502,400	304	166.9		69%	12.0	0	
16	2022			11.6		11.6	1,548,800	299	168.9		71%	12.4	1	
17	2023			11.6		11.6	1,595,200	293	170.7		72%	12.8	1	
18	2024			11.6		11.6	1,641,600	288	172.3		74%	13.2	2	
19	2025			11.6		11.6	1,688,000	282	173.7	104	75%	13.6	2	
20	2026			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
21	2027			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
22	2028			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
23	2029			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
24	2030			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
25	2031			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
26	2032			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
27	2033			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
28	2034			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
29	2035			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
30	2036			11.6		11.6	1,688,000	282	173.7		75%	13.6	2	
31	2037			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
32	2038			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
33	2039			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
34	2040			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
35	2041			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
36	2042			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
37	2043			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
38	2044			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
39	2045			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
40	2046			11.6		11.6	1,688,000	282	173.7	75%	13.6	2		
Total		0	0	383	0	383						421.7	39	
in the condition of discount rate at 10 %														
Net Present Value						63							63	1
Internal rate of return (FIRR)														-
B/C														1.012

Table O.21 Calculation of Financial Indicator (Case 3)

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue						Cash Balance	
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Ratio of Leakage (%)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)		Revenue
F/C portion	L/C portion													
	2006						807,000					-		
1	2007						876,500	338				-		
2	2008					0.0	946,000	338				-		0
3	2009					0.0	1,015,500	338				-		0
4	2010					0.0	1,085,000	338				-		0
5	2011					0.0	1,119,400	338				-		0
6	2012					0.0	1,153,800	338				-		0
7	2013					0.0	1,188,200	338				-		0
8	2014			9.8		9.8	1,222,600	338	30%	215.5		60%	8.6	-1
9	2015			9.8		9.8	1,257,000	338	30%	221.5		60%	8.9	-1
10	2016			9.8		9.8	1,296,800	332	29%	221.6		62%	9.1	-1
11	2017			9.8		9.8	1,336,600	327	28%	221.4		63%	9.3	0
12	2018			9.8		9.8	1,376,400	321	27%	221.0		65%	9.5	0
13	2019			9.8		9.8	1,416,200	316	26%	220.5		66%	9.7	0
14	2020			9.8		9.8	1,456,000	310	25%	219.7		68%	9.9	0
15	2021			9.8		9.8	1,502,400	304	24%	219.6		69%	10.1	0
16	2022			9.8		9.8	1,548,800	299	23%	219.4		71%	10.3	1
17	2023			9.8		9.8	1,595,200	293	22%	218.9		72%	10.5	1
18	2024			9.8		9.8	1,641,600	288	21%	218.1		74%	10.7	1
19	2025			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
20	2026			9.8		9.8	1,688,000	282	20%	217.2	67	75%	10.9	1
21	2027			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
22	2028			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
23	2029			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
24	2030			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
25	2031			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
26	2032			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
27	2033			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
28	2034			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
29	2035			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
30	2036			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
31	2037			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
32	2038			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
33	2039			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
34	2040			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
35	2041			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
36	2042			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
37	2043			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
38	2044			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
39	2045			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
40	2046			9.8		9.8	1,688,000	282	20%	217.2		75%	10.9	1
Total		0	0	323	0	323							346.5	23
in the condition of discount rate at 10 %														
Net Present Value						53							54	1
Internal rate of return (FIRR)													-	
B/C													1.017	
Condition of calculation														
Assumed water rate:						9 times of the existing water rate (11 lD/m3, or 0.0074 USD/m3)								

Table O.22 Calculation of Financial Indicator (Case 4)

Year in Order	Fiscal Year	Financial Cost (Million USD)					Revenue					Cash Balance		
		Construction Cost		O & M Cost	Re-place-ment Cost	Total	Served population	unit water consumption (l/person /day)	Water supply amount (x10 ⁶ m ³ /year)	unit water rate (USD /1000 m ³)	Collection rate (%)		Revenue	
		F/C portion	L/C portion											
1	2006						807,000				-			
2	2007						876,500	338	108.1		-			
3	2008					0.0	946,000	338	116.7		-		0	
4	2009					0.0	1,015,500	338	125.3		-		0	
5	2010					0.0	1,085,000	338	133.9		-		0	
6	2011					0.0	1,119,400	338	138.1		-		0	
7	2012					0.0	1,153,800	338	142.3		-		0	
8	2013					0.0	1,188,200	338	146.6		-		0	
9	2014			6.4		6.4	1,222,600	338	150.8		60%	5.4	-1	
10	2015			6.4		6.4	1,257,000	338	155.1		60%	5.5	-1	
11	2016			6.4		6.4	1,296,800	332	157.3		62%	5.8	-1	
12	2017			6.4		6.4	1,336,600	327	159.4		63%	6.0	0	
13	2018			6.4		6.4	1,376,400	321	161.4		65%	6.2	0	
14	2019			6.4		6.4	1,416,200	316	163.1		66%	6.4	0	
15	2020			6.4		6.4	1,456,000	310	164.7		68%	6.6	0	
16	2021			6.4		6.4	1,502,400	304	166.9		69%	6.8	0	
17	2022			6.4		6.4	1,548,800	299	168.9		71%	7.1	1	
18	2023			6.4		6.4	1,595,200	293	170.7		72%	7.3	1	
19	2024			6.4		6.4	1,641,600	288	172.3		74%	7.5	1	
20	2025			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
21	2026			6.4		6.4	1,688,000	282	173.7	59	75%	7.7	1	
22	2027			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
23	2028			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
24	2029			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
25	2030			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
26	2031			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
27	2032			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
28	2033			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
29	2034			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
30	2035			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
31	2036			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
32	2037			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
33	2038			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
34	2039			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
35	2040			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
36	2041			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
37	2042			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
38	2043			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
39	2044			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
40	2045			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
41	2046			6.4		6.4	1,688,000	282	173.7		75%	7.7	1	
Total		0	0	211	0	211						241.0	30	
in the condition of discount rate at 10 %														
Net Present Value						35							36	2
Internal rate of return (FIRR)														
B/C														
1.048														

O.3 Results of Economic Analysis

Table O.23 Results of Economic Analysis

Economic Cost		Economic Benefit		EIRR
without project	with project	without project	with project	
Willingness to pay for the existing situation 0.21 USD/person/month	Project	Existing water supply system	Willingness to pay for the satisfied condition (0.73 USD/person/month)	#DIV/0!
			2% of the average household income (1.41 USD/person/month)	#DIV/0!
			3% of the average household income (2.11 USD/person/month)	5.5%

Table O.24 Calculation of Economic Indicator (1)

Year in Order	Fiscal Year	Economic Cost (Million USD)										Financial Benefit						Cash Balance			
		Without Project					With Project					Without Project			With Project						
		Construction Cost			Re-place-ment Cost	Total	Construction Cost			O & M Cost	Re-place-ment Cost	Total	Additional Cost	Served Population	Unit water price	Benefit	Unit water price		Benefit	Additional Benefit	
		F/C portion	L/C portion	O & M Cost			F/C portion	L/C portion	O & M Cost												
1	2006																				0
2	2007																				-1
3	2008																				-8
4	2009																				-17
5	2010																				-119
6	2011																				-101
7	2012																				-105
8	2013																				-1
9	2014																				-1
10	2015																				-1
11	2016																				0
12	2017																				8
13	2018																				0
14	2019																				1
15	2020																				1
16	2021																				2
17	2022																				2
18	2023																				2
19	2024																				3
20	2025																				11
21	2026																				3
22	2027																				3
23	2028																				3
24	2029																				3
25	2030																				-76
26	2031																				3
27	2032																				3
28	2033																				3
29	2034																				11
30	2035																				3
31	2036																				3
32	2037																				3
33	2038																				3
34	2039																				3
35	2040																				3
36	2041																				3
37	2042																				3
38	2043																				3
39	2044																				3
40	2045																				-76
41	2046																				3
Total																					-409

Unit water price 1) willingness to pay (2,500 ID/household/month, family size= 7.9 persons, 320 ID/person/month, 0.21USD/person/month)
2) willingness to pay (8,600 ID/household/month, family size= 7.9 persons, 1,090 ID/person/month, 0.73USD/person/month)

Internal rate of return (ERR) #DIV/0!

Table O.25 Calculation of Economic Indicator (2)

Year in Order	Fiscal Year	Economic Cost (Million USD)												Financial Benefit					Cash Balance			
		Without Project						With Project						Without Project								
		Construction Cost			Re-place-ment Cost	Total	F/C portion	Construction Cost			O & M Cost	Re-place-ment Cost	Total	Additional Cost	Served Population	With Project						
		F/C portion	L/C portion	O & M Cost				F/C portion	L/C portion	O & M Cost						Unit water price 1)	Benefit	Unit water price 2)		Benefit	Additional Benefit	
1	2006																				0	
2	2007					0.0	0.0	0.0					0	0.0	876,500							
3	2008					0.0	0.5	0.3					0.785	0.8	946,000						-1	
4	2009					0.0	5.7	2.2					7.9	7.9	1,015,500						-8	
5	2010			8.27		8.3	16.1	9.2					25.3	17.0	1,085,000						-17	
6	2011					0.0	87.2	31.7					118.9	118.9	1,119,400						-119	
7	2012					0.0	76.4	24.7					101.1	101.1	1,153,800						-101	
8	2013					0.0	78.8	25.7					104.5	104.5	1,188,200						-105	
9	2014			2.8		2.8				12.6			12.6	9.8	1,222,600	2.2	20.7	18.5	9	9		
10	2015			2.8		2.8				12.6			12.6	9.8	1,257,000	2.2	21.3	19.1	9	9		
11	2016			2.8		2.8				12.6			12.6	9.8	1,296,800	2.2	21.9	19.7	10	10		
12	2017			2.8		2.8				12.6			12.6	9.8	1,336,600	2.2	22.6	20.4	11	11		
13	2018			8.27		11.1				12.6			12.6	1.5	1,376,400	2.2	23.3	21.1	20	20		
14	2019			2.8		2.8				12.6			12.6	9.8	1,416,200	2.2	24.0	21.8	12	12		
15	2020			2.8		2.8				12.6			12.6	9.8	1,456,000	2.2	24.6	22.4	13	13		
16	2021			2.8		2.8				12.6			12.6	9.8	1,502,400	2.2	25.4	23.2	14	14		
17	2022			2.8		2.8				12.6			12.6	9.8	1,548,800	2.2	26.2	24.0	13	13		
18	2023			2.8		2.8				12.6			12.6	9.8	1,595,200	0.21	27.0	24.8	15	15		
19	2024			2.8		2.8				12.6			12.6	9.8	1,641,600	USD/ person/ month	27.8	25.6	16	16		
20	2025			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
21	2026			8.27		11.1				12.6			12.6	1.5	1,688,000	month	28.6	26.4	25	25		
22	2027			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
23	2028			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
24	2029			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
25	2030			2.8		2.8				12.6		78.8	91.4	88.6	1,688,000	2.2	28.6	26.4	-62	-62		
26	2031			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
27	2032			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
28	2033			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
29	2034			8.27		11.1				12.6			12.6	1.5	1,688,000	2.2	28.6	26.4	25	25		
30	2035			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
31	2036			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
32	2037			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
33	2038			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
34	2039			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
35	2040			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
36	2041			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
37	2042			8.27		11.1				12.6			12.6	1.5	1,688,000	2.2	28.6	26.4	25	25		
38	2043			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
39	2044			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	17	17		
40	2045			2.8		2.8				12.6		78.8	91.4	88.6	1,688,000	2.2	28.6	26.4	-62	-62		
40	2046			2.8		2.8				12.6			12.6	9.8	1,688,000	2.2	28.6	26.4	22	22		
Total		0	0	92	41.35	134	265	94	416	158	798	73	893	820	22							
Unit water price		Internal rate of return (EIRR)																				#DIV/0!
1) willingness to pay																						
2) 2 % of average household income (average income=836,000 ID/household/month, 2% of income= 141 USD/person/month)																						

Internal rate of return (ERR) #DIV/0!

Unit water price 1) willingness to pay 2) 2 % of average household income (average income=836,000 ID/household/month, 2% of income= 1.41 USD/person/month)

Table O.26 Calculation of Economic Indicator (3)

Year in Order	Fiscal Year	Economic Cost (Million USD)										Financial Benefit						Cash Balance		
		Without Project					With Project					Without Project			With Project					
		Construction Cost			Re-place-ment Cost	Total	Construction Cost			O & M Cost	Re-place-ment Cost	Total	Additional Cost	Served Population	Unit water price 1)	Benefit	Unit water price 2)		Benefit	Additional Benefit
		F/C portion	L/C portion	O & M Cost			F/C portion	L/C portion	O & M Cost											
1	2006																			0
2	2007			0.0	0.0	0.0	0.0	0.0			0	0.0	876,500							0
3	2008			0.0	0.5	0.3	0.785	0.8			0.785	0.8	946,000							-1
4	2009			0.0	5.7	2.2	7.9	7.9			7.9	7.9	1,015,500							-8
5	2010			8.27	8.3	16.1	9.2	25.3			25.3	17.0	1,085,000							-17
6	2011			0.0	87.2	31.7	118.9	118.9			118.9	118.9	1,119,400							-119
7	2012			0.0	76.4	24.7	101.1	101.1			101.1	101.1	1,153,800							-101
8	2013			0.0	78.8	25.7	104.5	104.5			104.5	104.5	1,188,200							-105
9	2014			2.8	2.8		12.6	12.6			12.6	9.8	1,222,600				2.2	31.0	28.7	19
10	2015			2.8	2.8		12.6	12.6			12.6	9.8	1,257,000				2.2	31.8	29.6	20
11	2016			2.8	2.8		12.6	12.6			12.6	9.8	1,296,800				2.2	32.8	30.6	21
12	2017			2.8	2.8		12.6	12.6			12.6	9.8	1,336,600				2.2	33.8	31.6	22
13	2018			2.8	11.1		12.6	12.6			12.6	1.5	1,376,400				2.2	34.9	32.6	23
14	2019			2.8	2.8		12.6	12.6			12.6	9.8	1,416,200				2.2	35.9	33.6	24
15	2020			2.8	2.8		12.6	12.6			12.6	9.8	1,456,000				2.2	36.9	34.7	25
16	2021			2.8	2.8		12.6	12.6			12.6	9.8	1,502,400				2.2	38.0	35.8	26
17	2022			2.8	2.8		12.6	12.6			12.6	9.8	1,548,800				2.2	39.2	37.0	27
18	2023			2.8	2.8		12.6	12.6			12.6	9.8	1,595,200		0.21	2.11	2.2	40.4	38.2	28
19	2024			2.8	2.8		12.6	12.6			12.6	9.8	1,641,600		USD/ person/ month	USD/ person/ month	2.2	41.6	39.4	29
20	2025			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000		person/ month	person/ month	2.2	42.7	40.5	30
21	2026			2.8	8.27		12.6	12.6			12.6	1.5	1,688,000		month	month	2.2	42.7	40.5	31
22	2027			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	32
23	2028			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	33
24	2029			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	34
25	2030			2.8	2.8		12.6	91.4	78.8		12.6	88.6	1,688,000				2.2	42.7	40.5	-48
26	2031			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
27	2032			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
28	2033			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
29	2034			2.8	11.1		12.6	12.6			12.6	1.5	1,688,000				2.2	42.7	40.5	31
30	2035			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	39
31	2036			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
32	2037			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
33	2038			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
34	2039			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
35	2040			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
36	2041			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
37	2042			2.8	11.1		12.6	12.6			12.6	1.5	1,688,000				2.2	42.7	40.5	39
38	2043			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
39	2044			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
40	2045			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	-48
40	2046			2.8	2.8		12.6	12.6			12.6	9.8	1,688,000				2.2	42.7	40.5	31
Total				0	0	0	94	932	798	158	416	73	1,337	1,264						466

Unit water price 1) willingness to pay 2) 3 % of average household income (average income=836,000 ID/household/month, 3% of income= 2.11 USD/person/month)

Internal rate of return (EIRR) 5.5%