APPENDIX A-2 SURVEY SCHEDULE

Appendix A-2 Survey Schedule

1. Field Survey Team (Period: September 12 to October 6, 1995)

NOD	Date	DOW	Activities	Flight / Accommodation
1	Sep. 12	Tue.	Narita (10:10) → Beijing (13:25) (①③④⑤⑥⑦)	NH905 / Beijing
2	13	Wed.	Beijing (14:30) → Ulaanbaatar (17:25) (①③④⑤⑥⑦)	OM224 / Ulaanbaatar
3	14	Thu.	Courtesy Call to the Embassy of Japan, JOCV, Ulaanbaatar City, Ministry of Infrastructure Development and USAG (①③④⑤⑥⑦)	Ulaanbaatar
4	15	Fri.	Explanation on Inception report at USAG and Ministry of Trade and Industry. Site survey on Intake/Distribution Pumping Stations. (①③④⑤⑥⑦)	Ulaanbaatar
5	16	Sat.	Data collection and interview on existing status of water supply facilities. (①③④⑤⑥⑦) Discussion with local contractor. (④)	Ulaanbaatar
6	17	Sun.	Data arrangement (①③) Interview to local well drilling company and site survey (④⑤⑥⑦)	Ulaanbaatar
7	18	Mon.	Discussion on M/D(①③⑦), Data collection and Interview on existing status of water supply facilities(④⑤⑥) Discussion with local contractor. (④)	Ulaanbaatar
8	19	Tue.	Discussion on M/D(①③⑦), Data collection and Interview on existing status of water supply facilities(④⑤⑥) Discussion with local contractor. (④)	Ulaanbaatar
9	20	Wed.	Osaka(9:40)→ Beijing (12:15)→Ulaanbaatar(17:30) (②) Discussion on M/D (①③⑦), Data collection and Interview on existing status of water supply facilities(④⑤⑥) Discussion with local contractor. (④)	JL705/OM224 Ulaanbaatar
10	21	Thu.	Discussion on M/D, Signing on M/D (①②③④⑤⑥⑦) Data collection and Interview on existing status of water supply facilities(④⑤⑥) Discussion with local contractor. (④)	Ulaanbaatar
11	22	Fri.	Ulaanbaatar (14:35)→ Beijing(15:25) (①) Site survey on Intake P/S (②③④⑦) Installation of auto water level recorder (storage reservoir of Distribution P/S) and flow measurement by ultra-sonic flow meter (Distribution P/S) (⑤⑥)	CA902/ Beijing Ulaanbaatar
12	23	Sat.	Beijing(15:00) →Narita(20:00) (①) Site survey on intake P/S (②③④⑦) Data arrangement (⑤⑥)	NH906 Ulaanbaatar
13	24	Sun.	Site survey on Intake P/S (②③④⑦) Data arrangement (⑤⑥)	Ulaanbaatar
14	25	Mon.	Ulaanbaatar (14:35)→ Beijing(15:25) (②③) Site survey on Intake P/S and data collection on well drilling rig (④⑦). Installation of auto water level recorder and measurement taking at Upper Water Source Distribution P/S(⑤⑥)	OM223/ Beijing Ulaanbaatar

NOD	Date	DOW	Activity	Flight / Accommodation
15	Sep. 26	Tue.	Beijing (15:00) →Narita (20:00) (②③) Data collection and Interview on existing status of water supply facilities(④⑦) Recorder installation (Central Water Source Distribution P/S, Tasgen Booster P/S, 3/4 District Reservoir), Flow measurement (Central, Industrial, Meat Complex Water Source Distribution P/S, Tasgen and Bariin Duriigen Booster P/S) (⑤⑥)	NH906 Ulaanbaatar
16	27	Wed.	Received radio management law and natural development plan from Ministry of Infrastructure Development. Drawing arrangement, measurement taking (Central, Industrial P/S). Received pump operation records(Central, Industrial, Meat Complex, Bariin Duriigen P/S) (⑤⑥)	Ulaanbaatar
17	28	Thu.	Data collection and Interview on existing status of water supply facilities(④⑦) Measurement taking (Meat Complex P/S) (⑤⑥) Technical discussion with USAG chairman and general engineer(④⑤⑥⑦)	Ulaanbaatar
18	29	Fri.	Data collection (Urban development plan, sewerage master plan and others) (④⑦) USAG workshop measurement taking, survey on operational status of existing equipment (Workshop) , received water quality analysis on treated water of sewerage treatment plant and conducted site survey on operational status (⑤⑥) Technical discussion with USAG chairman and general engineer(④⑤⑥⑦)	Ulaanbaatar
19	30	Sat.	Data arrangement (④⑤⑦), topographic survey, instruction at Intake P/S sites(④⑥), CTP data collection and inspection on flow meter in Apartment(⑤)	Ulaanbaatar
20	Oct. 1	Sun.	Site survey(Central P/S, Zavsariin Reservoir, kiosk(④⑦) Discussion with local contractor. (④) Site survey (Upper, Industrial, Tasgen, No.15, P/S, Zavsariin Reservoir) (⑤⑥)	Ulaanbaatar
21	2	Mon.	Report survey result to Embassy of Japan, JOCV. Final discussion with USAG(④⑦) Data arrangement, collection of recording chart in auto water level recorder, supplemental measurement taking at Meat Complex and Central P/S (⑤⑥) Discussion with local contractor. (④)	Ulaanbaatar
22	3	Tue.	Ulaanbaatar (14:35)→ Beijing(15:25) (④⑤⑥⑦)	CA902/ Beijing
23	4	Wed.	Beijing (15:00) →Narita (20:00) (⑤⑦) Market research(Material supplier, pump manufacturer) (④⑤)	NH906/ Beijing
24	5	Thu.	Market research(pump manufacturer, well drilling rig manufacturer)(④⑥)	Beijing
25	6	Fri.	Market research (general contractor) Beijing (15:00) →Narita (20:00) (④⑥)	NH906

Note : NOD = Number of Days
DOW = Day of Week
① Team Leader
② Grant Aid Planner
③ Project Coordinator
④ Hydrogeologist
⑤ Water Supply Facilities Planner
⑥ Equipment Planner / O&M planner
⑦ Interpreter

Appendix A-2 Survey Schedule

2. Draft Basic Design Report Explanation Team (Period: January 9 to January 18, 1996)

NOD	Date	DOW	Activities	Flight / Accommodation
1	Jan. 9	Tue.	Narita (10:10) → Beijing (13:25) (①②③④)	NH905 / Beijing
2	10	Wed.	Beijing (18:00) → Ulaanbaatar (20:00) (①②③④)	OM224 / Ulaanbaatar
3	11	Thu.	Courtesy Call and explanation of draft basic design report to the Embassy of Japan, JOCV, Ulaanbaatar City, Ministry of Infrastructure Development Ministry of Trade and Industry, and USAG (①②③④)	Ulaanbaatar
4	12	Fri.	Explanation of draft basic design report at USAG (①②③④)	Ulaanbaatar
5	13	Sat.	Explanation of draft basic design report at USAG (①②③④)	Ulaanbaatar
6	14	Sun.	Explanation of draft basic design report at USAG (①②③④)	Ulaanbaatar
7	15	Mon.	Discussion on signing of Minutes of Meeting (①②③④)	Ulaanbaatar
8	16	Tue.	Signing of Minutes of Meeting (①②③④)	Ulaanbaatar
9	17	Wed.	Ulaanbaatar (15:00)→ Beijing(17:00) (①②③④)	OM224/ Beijing
10	18	Thu.	Discussion with World Bank official Beijing (15:25) →Narita (20:05) (①②③④)	NH906

Note : NOD = Number of Days
DOW = Day of Week
① Team Leader
② Hydrogeologist
③ Water Supply Facilities Planner
④ Interpreter

APPENDIX A-3 LIST OF PARTY CONCERNED IN THE RECIPIENT COUNTRY

APPENDIX A-3 LIST OF PARTY CONCERNED IN THE RECIPIENT COUNTRY

Implementation Agency

USGS: Water Facilities Exploitation Department, Ulaanbaatar City

Mr. Osoryn Erdenebaatar	: Chairman
Mr. Bat-Ochir Purevjav	: General Manager, Water Supply and Exploitation Board
Mr. Togoo Nyamdavaa	: Engineer
Mr. Shatariin Gansukh	: Engineer

Ulaanbaatar City Office

Mr. Damdinsurengiin Byambaa	: General Manager of Ulaanbaatar City Office

Ministry of Trade and Industry

Mr. P. Ganhuyag	: Assistant of Director, Economy and Foreign Trade Policy Department

Ministry of Infrastructure Development

Mr. Tserendash Damiran	: Vice Minister
Mr. Shagdar Sonomdagva	: Head of Department
Mr. Dolgorjav Sain-ėr	: General Director, Department of Architecture, Urban Development Housing and Public Services
Ms. Luvsanchimed Banzragch	: Manager of Telecommunication Department

Embassy of Japan

Mr. Takuo Kidokoro	: Counsellor
Mr. Keizo Kagawa	: First Secretary

Japan Overseas Cooperation Volunteer's Office

Mr. Yukio Sasaki	: General Manager

APPENDIX A-4 MINUTES OF DISCUSSION

APPENDIX A-4 MINUTE OF DISCUSSION (No.1 21 September,1995)

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE EMERGENCY REHABILITATION OF SUPPLY FACILITIES IN ULAANBAATAR CITY IN MONGOLIA

In response to a request from the Government of Mongolia(GOM), the Government of Japan decided to conduct a Basic Design Study on the Emergency Rehabilitation of Water Supply Facilities in Ulaanbaatar City in Mongolia (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Mongolia a study team (hereinafter referred to as "the Team"), which is headed by Mr.Haruo Iwahori, Development Specialist , JICA, and is scheduled to stay in the country from 13 September to 3 October, 1995.

The Team held discussions with the officials concerned of the GOM and conducted a field survey at the study area.

In the course of the discussions and field survey, both sides have confirmed the main items described in the attached sheets. The team will proceed to further work and prepare a Basic Design Study report.

Ulanbaatar, 21 September, 1995

Mr. Choindon Enebish
Deputy Director
International Trade and Cooperation Department
Ministry of Trade and Industry

Mr. Haruo Iwahori
Leader
Basic Design Study Team
JICA

Mr. Osoryn Erdenebaatar
Chairman
Water Facilities Exploitation Department
Ulaanbaatar City

ATTACHMENT

1. Objective

The objective of the Project is to enhance the existing water supply system by means of rehabilitation of the deteriorated facilities of Ulaanbaatar City.

2. Project site

The project area is located in Ulaanbaatar City as shown in ANNEX I.

3. Executing Organization

The Ministry of Trade and Industry is responsible for the administration of the project and the Water Facilities Exploitation Department of Ulaanbaatar City (USAG) is responsible for the implementation of the Project.

4. Items requested by the GOM

After discussions with the Team, the items finally requested by the Mongolian side are shown in Annex II.

However the final components of the Project will be decided after further studies.

5. Japan's Grant Aid System

(1) The GOM has understood Japan's Grant Aid system in ANNEX III as explained by the Team.

(2) The GOM will take necessary measures described in ANNEX IV for the smooth implementation of the Project, in the event the Grant Aid Assistance by the Japanese Government is extended to the Project.

6. Schedule of the Study

(1) The consultants of the Team will proceed to further studies in Mongolia until 3 October, 1995.

(2) JICA will prepare the draft final report and dispatch a mission in order to explain its contents at the end of January, 1996.

(3) In the event the contents of the report is accepted in principle by the GOM, JICA will complete a final report and send it to the GOM by April, 1996.

7. Obligations of implementing agency in Mongolia (USAG)

USAG and the Team have confirmed the followings in order to achieve the Project purpose.

(1) Stage of Basic Design Study (from field study up to submission of the Basic Design Report)

USAG is required to make the following papers and submit them to the Embassy of Japan by 30 November, 1995.

①Strategic paper to reduce unit water consumption, including targets of unit water consumption, countermeasure and implementation schedule.

②Financial statements of USAG, including estimated profit and loss statements, cash flow statement and budgetary schedule from 1996 to 2002(refer to ANNEX VI).

(2) Stage of Implementation

USAG is required to prepare the following systems and measures by the assistance of Japanese engineer(s).

①Well control system

②Water distribution control system

USAG is required to prepare the following systems and measures by USAG's own effort.

③Periodic inspection system

④Execution plan of the strategic paper stated in (1)-① above

⑤Revision of the water tariff system in order to reduce unit water consumption

⑥Revision of the billing and collection system in order to increase total income

(3) After completion of the Project

USAG is required to execute the followings:

①To reduce unit water consumption by executing the strategic paper stated in (1)-① and (2)-② above

②To reduce electric power consumption by executing the well control system stated in (2)-① above

③To reduce the electric power consumption by executing water distribution control

system stated in (2)-② above

④To execute the periodic inspection system stated in (2)-③ above

⑤To reduce the unit cost of water rate

⑥To carry out budgetary plans shown in ANNEX VI

⑦To prepare reports describing the result of above items every year up to 2000, and submit them to the Embassy of Japan

8. Foreign Assistance

GOM and the Team have confirmed that components of the Project do not duplicate with those of other foreign assistance. The contents of the assistance are follows:

(1) In the assistance of the World Bank, improvement of water supply in the "ger" areas is included, but rehabilitation and renovation of the existing water supply system in the Ulaanbaatar City is excluded.

(2) In the assistance of the Asian Development Bank, expansion and renovation of water supply systems in the four "aimags"(UVSU, HÖVSUGÖL, HOVD, BAYAN-ÖLGII) are included.

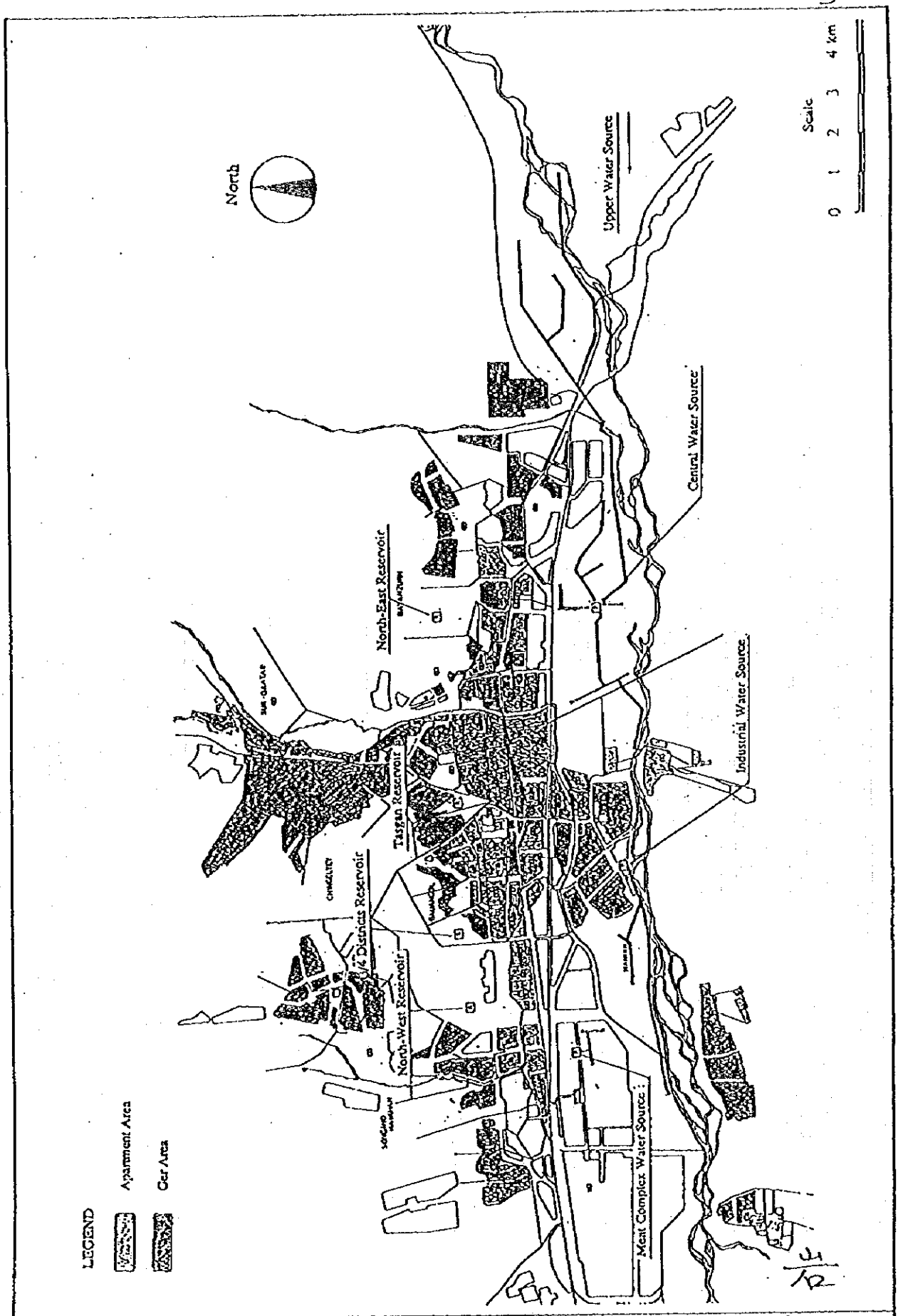
9. Others

(1) USAG is required to make all the answers to questionnaires in the Inception Report by 30 September, 1995.

(2) USAG will confirm the diameter and the number of the water meters for CTPs and submit the result to the Team by 30 September, 1995.

(3) USAG will confirm the following items concerning installation of the radio telecommunication system and submit the result to the Team by 30 September, 1995.

- Name of laws and regulations
- Contents of the articles relating the system
- Name of the ministry in charge of the system
- Procedure and possibility to get a permission for the system



Service Area by the USAG Water Supply System at Present

JICA

ANNEX II

Difference between original request and final request

Items		Unit	Original request	Final Request
Replacement of Intake Pumps	Central	Set	Yes(23)	Yes
	Industrial	Set	Yes(7)	Yes
	Meat complex	Set	Yes(5)	Yes
Procurement of Intake pumps		Set	Yes(11)	Yes
Replacement of Distribution Pumps	Central	Set	Yes(5)	Yes
	Tasgan	Set	Yes(1)	Yes
	Industrial	Set	Yes(2)	Yes
	Meat complex	Set	No	Yes
	Upper	Set	Yes(2)	No
Procurement of materials for wells	Drilling unit	Set	Yes(1)	Yes
	Screen,Casing	Set	Yes(20)	Yes
	Pipe	Set	No	Yes
Procurement of water meters for CTP		Set	Yes(40)	Yes
Installation of water meters	Intake Main	Set	No	Yes
	Outlet of Pumps	Set	No	Yes
Remote operation system	New Intake Pumps	Unit	Yes	Yes
	Existing Intake Pumps	Unit	Yes	Yes
Expansion of Upper Water Source		Unit	Yes	No
Procurement of machines for workshop		Unit	No	Yes
Installation of Radio telecommunication system		Unit	No	Yes
Replacement of chlorination equipment	Central	Set	No	Yes
	Industry	Set	No	Yes
	Meat complex	Set	No	Yes
Installation of water level meters at the reservoirs		Set	No	Yes

Notes;

① Procured equipment and materials will be installed and replaced by Mongolian side.

② Final components of the Project will be decided after further studies.

ANNEX III

ON JAPAN'S GRANT AID PROGRAM

1. Japan's Grant Aid Procedures

(1) The Japan's Grant Aid Program is executed by the following procedures.

- **Application**
  (request made by a recipient country)
- **Study**
  (Preliminary Study / Basic Design Study conducted by JICA)
- **Appraisal & Approval**
  (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
- **Determination of Implementation**
  (Exchange of Notes between the both Governments)
- **Implementation**
  (Implementation of the Project)

(2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's Grand Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency)

Secondly , JICA conducts the Study (Basic Design Study) , using a Japanese consulting firm. If the background and objective of the requested project are not clear, a Preliminary Study is conducted prior to a Basic Design Study.

Thirdly, the Government of Japan appraises to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted for approval by the Cabinet.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by the both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Basic design Study

1) Contents of the Study

The purpose of the Study (Preliminary Study/Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation,
b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view,
c) to confirm items agreed on by the both parties concerning a basic concept of the project,
d) to prepare a basic design of the project,
e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchange of Notes.

2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency and also to avoid possible undue delay in implementation caused if a new selection process is repeated.

(3) Status of a Preliminary Study in the Grant Aid Program

A Preliminary Study is conducted during the second step of a project formulation & preparation as mentioned above.

A result of the study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study.

Based on the result of the Basic Design Study, the Government would proceed to the stage of decision making process(appraisal and approval) .

It is important to notice that at the stage of Preliminary Study, no commitment is made by the Japanese side concerning the realization of the Project in the scheme of Grant Aid Program.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant etc. are confirmed.

3) "The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.

However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following:

① to secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,

② to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,

③ to secure buildings prior to the installation work in case the Project is providing equipment,

④ to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,

⑤ to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,

⑥ to accord Japanese nationals whose services may be required in connection with the

supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

(a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank") . The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the contracts verified.

(b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay issued by the Government of the recipient country or its designated authority.

ANNEX IV

Necessary measures to be taken by the GOM on condition that Japan's Grant Aid is executed;

1. To provide necessary data and information for the Project.

2. To secure the site for the Project

3. To clear, level and reclaim the site prior to the commencement of the construction.

4. To construct the access road to the site prior to the commencement of the rehabilitation and construction.

5. To provide facilities for electricity to the site.

6. To undertake incidental works such as constructing collection pipelines between newly constructed wells and distribution pumps.

7. To bear commissions of Authorization to Pay (A/P) and payment commission to a Japanese foreign exchange bank for the banking services based on the Banking Arrangement (B/A).

8. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port /airport of disembarkment.

9. To accord Japanese nationals, whose services may be required in connection with the supply of products and the services under the verified contracts, such facilities as may be necessary for their entry into Mongolia and stay therein for the execution of the Project.

10. To maintain and use properly and effectively facilities constructed and equipment purchased under the Grant

11. To bear all the expenses other than those covered by the Grant, necessary for the construction of facilities as well as for the transportation and the installation of equipment.

The detail are shown in ANNEX V.

ANNEX V

Major Undertaking to be taken by Each Goverment

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the parking lot	●	
5	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
6	To construct the buildings	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site		●
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contact such facilities as may be neccessary for their entry into the recipient country and stay therein for the performance of their work.		●
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		●
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant.		●
13	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well al for the transportation and installation of the equipment.		●

ANNEX-VI

ESTIMATED PROFIT AND LOSS STATEMENT OF USAG

(Unit:1,000Tg. & %)

Item	1996	%	1997	%	1998	%	1999	%	2000	%	2001	%	2002	%
Water Supply Sewerage														
Total Income														
Water Supply Sewerage														
Total Expenditure														
Salary Social Insurance Power Heating Oil & Coal Office Exp.& Tel. Assignment Exp. Labour Safety Material Spare Parts Low-Cost Items Operation Exp. Guards Others Production Unit Depreciation Cost Dep.Spare Parts Dep.Low-Cost Item														
Profit before Tax														
Other Income(+)														
ManagementExp:(-) Transport Tax:(-) Sales Tax:(-) Penalty:(-) Profit Tax:(-)														
Net Profit														

CASH FLOYS STATEMENT OF USAG

(Unit:1,000Tg.)

Item	1996	1997	1998	1999	2000	2001	2002
SOURCE OF FUND: From Operations: Net income Depreciation Other-net Disposal of property Incurrence of long-term debt Fund from the government							
Total							
APPLICATION OF FUND: Payment for expansion of facility and equipment Payment for improvement of facility and equipment Reduction of long-term debt							
Total							
NET							

BUDGETARY SCHDULE OF USAG FOR THE PROJECT

(Unit:1,000Tg.)

Item	Total	1996	1997	1998	1999	2000	2001	2002
SCHEDULE: New wells construction Installation of meters for CTPs Reduction of wastage								
BUDGET: New wells construction Installation of meters for CTPs Reduction of wastage								
Total								

APPENDIX A-4 MINUTE OF DISCUSSION (No.2 16 January,1996)

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE EMERGENCY
REHABILITATION OF WATER SUPPLY FACILITIES
IN ULAANBAATAR CITY IN MONGOLIA

(CONSULTATION ON DRAFT REPORT)

In the autumn of 1995, the Japan International Cooperation Agency (JICA) dispatched a Basic Design team for the Project for Emergency Rehabilitation of Water Supply Facilities in Ulaanbaatar City in Mongolia (hereinafter referred to as "the Project") to Mongolia, and after a series of discussions, field surveys and technical examinations in Japan, has prepared the Draft Report of the study.

In order to explain to and consult with the Mongolian side regarding the components of the draft report, JICA sends to Mongolia a study team, which is headed by Mr. Haruo Iwahori, Development Specialist of JICA, and is scheduled to stay in the country from January 10 to January 17, 1996.

As a result of the discussions held between the JICA Study team and the Mongolian side, both parties confirm the main items described in the attached sheets.

Ulaanbaatar City, January 16, 1996

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ATTACHMENT

1. Component of the Draft Report

The Government of Mongolia has agreed and accepted in principle the components of the Draft Report proposed by the team.

2. Japan's Grant Aid system

(1) The Government of Mongolia understands the system of Japanese Grant Aid, as explained by the team, and as described in ANNEX I.

(2) The Government of Mongolia will take the necessary measures, described in Annex II, for the smooth implementation of the Project on condition that Grant Aid assistance by the Government of Japan is executed to the Project.

3. Further schedule

The team will make the Final Report in accordance with the confirmed items, and send it to the Government of Mongolia by the end of April 1996.

4. Others

(1) Remote control system

a. the Japanese side will train the USAG engineers to safely operate and maintain the remote control system for the intake pumps in the Central Water Source. Also, the Japanese side will draw up the operation manual with the cooperation of USAG to effectively and practically use the rehabilitated intake system.

b. USAG will keep up the rehabilitated system with good condition using the USAG engineers trained by the program as mentioned the above. Thus, USAG will use the system for a long time.

c. USAG will make the reduction program of distributed water in order to reduce the electrical charge in the USAG budget by the practical use of the remote control system. Also, USAG will carry out the program.

d. USAG maintains the system with the good condition by allotting the reduction rate of the electrical charge to the repair cost. Thus, USAG will be able

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to use the rehabilitated water supply system for a long time.

(2) Reduction program for water consumption per capita per day

e. The strategic plan for water consumption per capita per day was submitted by USAG in December, 1995. However, it has no satisfactory contents to explain. Thus, USAG is requested to re-make it on the basis of the discussions held between the team and USAG.

f. USAG draws up the reduction program of water consumption per capita per day based on the strategic plan as mentioned in the paragraph (2). e.

g. USAG will install the water meters for CTP without delay after the supply of the water meter equipment planned in 1996. USAG will carry out the reduction program as described in the paragraph (2). f from, 1997.

(3) Prevention of groundwater pollution

In order to prevent the groundwater pollution which may be caused by the Ulaanbaatar Capital Golf Club (the construction is now on-going), Ulaanbaatar City and USAG are requested to carry out the following:

h. to reconfirm the prohibition of the use of any agricultural chemicals described in "the Environmental Assessment Report" dated on May 1st, 1995.

I. to confirm the safety of water quality by the continuous monitoring of groundwater quality.

j. to reconfirm the safety of the treatment methods of rainfall drain and sewer water.

The Study team will convey the information relating to the clause (3) to Japan. The Japanese side will examine the contents and appraise the appropriateness of the Project.

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ANNEX I

ON JAPAN'S GRANT AID PROGRAM

1. Japan's Grant Aid Procedures

(1)The Japan's Grant Aid Program is executed by the following procedures.

* Application
  (request made by a recipient country)
* Study
  (Preliminary Study/Basic Design Study conducted by JICA)
* Appraisal & Approval
  (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
* Determination of Implementation
  (Exchange of Notes between the both Governments)
* Implementation
  (Implementation of the Project)

(2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan Grant Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency).

Secondly, JICA conducts the Study (Basic Design Study), using a Japanese consulting firm. If the background and objective of the requested project are not clear, a Preliminary Study is conducted prior to a Basic Design Study.

Thirdly, the Government of Japan appraises to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted for approval by the Cabinet.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by the both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

preparing contracts and so on.

2. Basic Design Study

1) Contents of the Study

The purpose of the Study (Preliminary Study/Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation.

b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view.

c) to confirm items agreed on by the both parties concerning a basic concept of the project.

d) to prepare a basic design of the project.

e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchange of Notes.

2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency and also to avoid possible undue delay in implementation caused if a new selection process is repeated.

3) Status of a Preliminary Study in the Grant Aid Program

A Preliminary Study is conducted during the second step of a project formulation & preparation as mentioned above.

A result of the study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study.

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Based on the results of the Basic Design Study, the Government would proceed to the stage of decision making process (appraisal and approval).

It is important to notice that at the stage of Preliminary Study, no commitment is made by the Japanese side concerning the realization of the Project in the scheme of Grant Aid Program.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant etc. are confirmed.

3) "The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.

However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

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5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following.

a. to secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,
b. to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,
c. to secure buildings prior to the installation work in case the Project is providing equipment,
d. to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,
e. to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,
f. to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work."

7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the

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recipient country.

9) Banking Arrangement (B/A)

(a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will executed the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the contracts verified.

(b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay issued by the Government of the recipient country or its designated authority.

ANNEX II

Necessary measures to be taken by the Government of Mongolia on condition that Japan's Grant Aid is executed.

1. To secure the site for the Project.
2. To clear, level and reclaim the site prior to the commencement of the construction.
3. To construct the access road to the site prior to the commencement of the rehabilitation and construction.
4. To provide facilities for the distribution of electricity and other incidental facilities to the site.
5. To undertake incidental works such as gardening, fencing, gates and exterior lighting in and around the site.
6. To bear commissions to a Japanese foreign exchange bank for the banking services based on the Banking Arrangement (B/A).
7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port/airport of disembarkation.
8. To accord Japanese nationals, whose services may be required in connection with the supply of products and the services under the verified contracts, such facilities as may be necessary for their entry into Mongolia and stay therein for the execution of the Project.
9. To maintain and use properly and effectively facilities constructed and equipment purchased under the Grant.
10. To bear all the expenses other than those covered by the Grant, necessary for the construction of facilities as well as for the transportation and the installation of equipment.

The detail are shown in ANNEX III.

ANNEX III

Major Undertaking to be taken by Each Goverment

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the parking lot	●	
5	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
6	To construct the buildings	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site		●
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contact such facilities as may be neccessary for their entry into the recipient country and stay therein for the performance of their work.		●
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		●
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant.		●
13	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.		●

APPENDIX A-5 COST ESTIMATION BORNE BY THE RECIPIENT COUNTRY

Appendix A-5 Cost Estimation Borne by the Recipient Country

1) Construction Cost

The Mongolian side for the implementation of the Project is obligated to provide for the secureness of the construction sites, the arrangement of level land, the supply of electricity to the sites, and the installation of CTP flow meters. Regarding these items, the project sites are located on state owned land and are mostly flat. The sites are already secured. The recipient country needs to supply electricity to the sites and to install the CTP flow meters by itself. The USAG's information is used for the cost estimation. The cost for the construction is estimated as follows:

(1) Cost estimation for supply of electricity

The electric wire lines for reconstruction and new construction wells need to be installed from the locations of the existing wells to the new proposed sites. The distance from the locations of existing wells to the new proposed sites is almost the same as that of the new transmission pipelines. Thus, the design length of the transmission pipelines is used to estimate cost for the supply of electricity. This cost is calcluated from the figure of 4.985 m as shown in Basic Design 2.3.2.

(a) Material cost

The material cost for construction is 2,256,000 Tg/km. The cost includes the material cost of electric poles, concrete base, insulators, insulator holders, barrestors, barker switches, and electric wires.

(b) Labor cost

The labor cost is 870,000 Tg/km for the installation of electric wire. This cost includes transportation cost, labor cost, the cost of used machines, excavation cost, miscellaneous costs, and permission cost.

Thus, the total cost for supply of electricity is estimated at 3,126,000 Tug/km by adding the sums of (a) material cost and (b) labor cost.

In order to implement the Project, the total cost for electricity supply is :

3,126,000 Tg/km x L 4.985 = 15,583,110 Tg

= about 15,580,000 Tg (Yen 3,630,000)

(2) Installation cost of CTP flow meter

54 CTP units x 9,500 Tg/unit = 513,000 Tg (Yen 120,000)

(3) Total cost borne by the recipient country

As a result of estimation as mentioned the above, the total cost borne by the recipient country is estimated at 16,093,000 Tg (Yen 3,748,000) by adding the sums of (1) the cost of electricity supply and (2) the installation cost of CTP flow meter.

2) Operation and Maintenance Cost

In order to estimate the operation and maintenance cost of the completed system, the electric charge for the operation of the intake pumps and the distribution pumps, and for heating the chlorinator, and chemicals (chlorine gas) cost are counted.

Table 3-6 Operation and Maintenance Cost

(Unit: 1,000 Tg)

Water Source	Electric Charge			Chemicals Cost	Total
	Intake Pump	Distribution Pump	Heater		
Central W. S.	11,212	12,469	384	661	24,726
Industry W. S.	2,000	1,188	256	140	3,584
Meat C. W. S.	2,272	2,487	256	147	5,162
Total	15,484	16,144	896	948	33, 472

(Note) the cost estimation of electric charge, the calculation is conducted by the following equation:

(renewal motor output - existing motor output) x operating hours

x unit electric charge

Thus, in case the sum of existing motor output > the sum of renewal motor output,

the electric charge become negative.

APPENDIX A-6 STUDY ON BENEFICIAL EFFECT OF REMOTE CONTROL SYSTEM

APPENDIX A-6 STUDY ON BENEFICIAL EFFECT OF REMOTE CONTROL SYSTEM

1) Beneficial effect of remote control system

a. Effect of Intake Pump

At present, it is regulated that on-off operation of the intake pump is conducted manually by the manager who check around the pump station. The Intake Pumps are, however, always working since it is difficult to decide when to switch off the pump due to the lack of intake flow meter and water level meter. Application of remote control system into intake pump facility in Central system could effectively control a series of wells by remote controlling on-off operation of the 79 sets of intake pumps(including 8 sets of proposed pumps) in accordance with measured data of intake flow meter and water level meter(installation is proposed in storage tank) and operation conditions. Consequently, prevention of excessive pumping and mutual intervention of wells, appropriate distribution of pumped water are promoted. Longer useful lives of facilities and reduction of electrical expenditure are also expected.

b. Effects of distribution pump

Distribution pumps, likewise intake pumps, are operated all the day regardless of the daily fractuation of water demand. Volume balance in distribution system could be regulated properly by operating distribution pumps in compliance with the data obtained from measurement of flow and water level of the reservoir through wireless system. Longer useful lives of facilities and reduction of electrical expenditure are also expected.

c. Benefit of reduction of electrical expenditure

Reduction of electrical expenditure of intake and distribution pumps amount to 127 million Tg~172 million Tg(27.4 million yen ~37.1 million yen) annually during 1997 and 2006. This figure account for 15~21 % of electrical expenditure in 1994(834 million Tg equal to 180 million yen) and in other words 10~14 % of total expenditure. Estimated cost for installing remote control system is 225 million yen and above-

mentioned possible saving is 12~16 % of the cost, which means initial installation cost can be set off in 7 years.

d. Indirect benefit related to the useful lives of the facilities

As to the operative lives of USAG intake and distribution facilities, 48 % of all the facilities will become unworkable within 16 years of useful lives (see Table A-3), which means useful lives of the facilities has become half of the expected period. Assets of intake facilities and distribution facilities, related to this Project, are estimated to be roughly 4.4 billion yen of total 20.7 billion assets. Assuming these facilities will be available as specified, depreciation cost is about 150 million per year.(see Table A-4) In case useful lives are reduced by 50%, depreciation cost will double to 300 million yen. If saved electrical expenditure described in above c. paragraph could cover repair cost, repair cost would increase from 2.2 % TO 14.0 %(see Table A-5). Consequently, depreciation cost will be reduced to 150 million yen per year by increasing repair cost to prolong useful lives of the facilities. Wasted cost due to the scanty repair cost is calculated 150 million yen(300 - 150). While depreciation cost is calculated to be 100 million under the condition that total Project cost is 1,600 million yen and useful lives are as specified, it will increase to 200 million in case useful lives will be reduced to 8 years, half of 16 years, and additional 100 million yen is in need. 150 million yen of depreciation cost per year seems reasonable from this point. Beneficial cost stemming from prolonged useful lives is calculated 150 million yen per year and it can set off the cost now wasted without this system.

These beneficial effect endorse the involvement of remote control system in this project.

2) Study on the reduction of electrical expenditure by introducing remote control system

a. present electricity consumption of intake pump

- Central

Pumped volume (m^3/h)	Generating Power (Kw)	Number (Set)	Total Pumped Volume(m^3/h)	Total Generated Power(Kw)

120	32	4	600	160
63	22	40	3,520	880
40	11	1	40	11
25	11	22	550	242
10	2.8	2	20	5.6
Total		70	3,730	1,298.6

1,298.6 kw ÷3,730 m^3/h = 0.348 kwh/ m^3

- Industrial

Pumped volume (m^3/h)	Generating Power (Kw)	Number (Set)	Total Pumped Volume(m^3/h)	Total Generated Power(Kw)
200	55	5	1,000	275
160	45	4	640	180
63	22	7	441	154
Total		16	2,081	609

609 kw ÷2,081 m^3/h = 0.293 kwh/ m^3

- Meat Complex

Pumped volume (m^3/h)	Generating Power (Kw)	Number (Set)	Total Pumped Volume(m^3/h)	Total Generated Power(Kw)
200	55	1	200	55
160	45	2	320	90
120	45	2	240	90
63	22	3	189	66
Total		8	949	301

301 kw ÷949 m^3/h = 0.317 kwh/ m^3

b. present electricity consumption of distribution pump

- Central

Pumped volume (m^3/h)	Generating Power (Kw)	Number (Set)	Total Pumped Volume(m^3/h)	Total Generated Power(Kw)
630	250	2	1,260	500
630	200	2	1,260	400
2,000	800	3	6,000	2,400
Total		7	8,520	3,300

3,300 kw ÷8,520 m^3/h = 0.387 kwh/ m^3

- Industrial

Pumped volume	Generating Power	Number	Total Pumped	Total Generated

(m^3/h)	(Kw)	(Set)	Volume(m^3/h)	Power(Kw)
1,250	200	2	2,500	400
1,050	200	2	2,100	400
Total		4	4,600	800

800 kw ÷4,600 m^3/h = 0.174 kwh/ m^3

- Meat Complex

Pumped volume (m^3/h)	Generating Power (Kw)	Number (Set)	Total Pumped Volume(m^3/h)	Total Generated Power(Kw)
500	160	3	1,500	480
630	260	1	630	260
Total		4	2,130	740

740 kw ÷2,130 m^3/h = 0.347 kwh/ m^3

c. Electricity expenditure reduction by the introduction of remote control system

The following benefits stemming from the reduction of electricity expenditure is expected.

c-1. Expected reduction of electrical expenditure of Intake Pump

Daily fractuation on water consumption is calculated based on the Japanese data since Ulaanbaatar City has no data on the peak consumption.(see Table A-1) Maximum water consumption occurs during 9 and 10 in the morning.

Water distribution system in Ulaanbaatar City adopts pumping delivery system, although Central distribution area has a small capacity of reservoir. While raw water from intake pump is conveyed into the storage tank which combines distribution tank for the distribution pump, their capacity, which are equivalent to the 2.4~3.8 hours of retention time in comparison to the intake pump capacity as shown in the following table.

System	Capacity of Intake Pumps	Storage tank volume	Retention hours
Central	98,760 m^3/d = 4,115 m^3/h	10,000 m^3	2.4 h
Industrial	37,992 m^3/d = 1,583 m^3/h	4,000 m^3	2.5 h
Meat Complex	25,416 m^3/d = 1,059 m^3/h	4,000 m^3	3.8 h
Total	162,168 m^3/d = 6,757 m^3/h	18,000 m^3	Ave. 2.8 h

Assuming 9~10 hour consumption is equal to the intake pump capacity, hourly consumption and 24-hour consumption (which is regarded as daily maximum consumption) are computed in Table A-1. Actual (Design) daily maximum water consumption includes 9 % of invalid water.

Possible reduction of electrical expenditure in response to the possible reduction of water consumption is shown in Table A-2.

Water distribution system is actually pump direct delivery system because capacity of storage tank and distribution reservoir are small. So it is necessary that intake pumps can cope with the peak distribution volume. Under this notion, temporal water source capacity is calculated as follows.

Temporal water source capacity = Existing water source capacity shown in water demand in the main report - (existing water source capacity - water demand) / (existing water source - reduced water demand).

As to the water volume projection, water source capacity constantly exceeds water supply accomplishment (expected volume) but temporal water source capacity tops existing water source capacity during 5 years from 1994 to 1998, when distribution volume can not satisfy peak demand. In 1996, however, when deficit volume is maximum, it account for no more than 8 % of existing water source capacity and its duration is 2~3 hours. This condition can be softened with the operational maneuver like filling up the existing three distribution reservoir before the peak hour measuring the water level of each reservior. And promotion of "save the water policy" is expected to contribute to the reduction of water supply breakdown hours.

According to the schedule proposed in this Project, water demand reduction plan will start by installing flow meter in CTP during 1996~1997 and by reviewing existing tariff system, while no remarkable accomplishment is gained before 1996. Alteration of tariff system includes review of assumed unit consumption rate from 150 liters per capita per day (lpcd) to 250 lpcd. With the completion of this Project in 2000 which comprise installation of flow meter to the intake / distribution main, installation of level meter to

the storage tank / reservoir and introduction of remote control system, the intake and distribution pumps can be effectively operated in compliance with the fractuation of water demand and it reduce the volume otherwise wasted in intaking and distributing. Consequently, electrical expenditure is reduced and it contribute to establishment of the stable waterworks.

Similar improved operation is applicable to the Industrial and Meat Complex System by introducing wireless communication system making use of the fact that number of intake pump is small and its locates near the distribution station, though new facilities will not be introduced into these two systems.

Total electrical expenditure saved during the period from1997 to 2006 for three systems is expected to be 171 million Tg to 127 million Tg, while it will be zero from 1993 to 1996 when this project is unde construction stage. Electrical expenditure is computed based on the balance between intake pump capacity and water supply accomplishment (estimation) setting electrical rate at 14.6 Tg/kwh(3.15 yen/kwh).

Each item in Table A-2 is shown as follows;

- A Existing Water Source Capacity

  Existing capacity is applied all through the Project period. Expansion of Central Water Source in 1999 will increase its capacity from 122,760 m^3/d to 134,280 m^3/d

- B Tenporal Water Source Capacity

  Existing water source capacity shown in water demand in the main report - (existing water source capacity - water demand) / (existing water source - reduced water demand).

- C Daily Maximum Distribution Water Volume

  C = B x 0.588 (0.588 is the ratio of daily maximum water volume against hourly maximum water volume based on Japanese water supply accomplishment)

- D Daily Maximum Water Volume in Ulaanbaatar

  D = C x 1.09 (9 % account for in valid water like leakage and others)

- E Water Supply Accomplishment(Projected water supply volume)

  E = B x 0.883 (based on the accomplishment data in Central System)

- F Reduced Volume (Possible reduction volume)

  F = E - D

- G, H Electrical consumption computed in a. and b. in former section 2).

- I Yearly electrical expenditure(Possible reduction electrical expenditure in intaking and distribution pump system)

  I = F m^3/d x 365 d x (G kwh/m^3 + H kwh/m^3) x 14.6 Tg/kwh

- Σ I Possible reduction electrical expenditure(Total reduction electrical expenditure of Central, Industrial and Meat Complex)

Table A- 1 Hourly Fractuation of Daily Maximum Water Supply

Hour	hourly ratio	hourly ratio against peak hour flow	Hourly water supply		
			Central	Industrial	Meat Complex
0~1	0.35	0.21	874	332	222
1~2	0.30	0.18	726	285	191
2~3	0.25	0.15	605	237	159
3~4	0.20	0.12	484	190	127
4~5	0.15	0.09	363	142	95
5~6	0.30	0.18	726	285	191
6~7	0.95	0.56	2,300	886	593
7~8	1.30	0.76	3,147	1,203	805
8~9	1.60	0.94	3,873	1,488	995
9~10	1.70	1.00	4,115	1,583	1,059
10~11	1.65	0.97	3,994	1,536	1,027
11~12	1.55	0.91	3,752	1,440	964
12~13	1.35	0.79	3,268	1,251	837
13~14	1.25	0.74	3,026	1,171	784
14~15	1.15	0.68	2,784	1,076	720
15~16	1.10	0.65	2,663	1,029	688
16~17	1.20	0.71	2,905	1,124	752
17~18	1.40	0.82	3,389	1,298	868
18~19	1.55	0.91	3,752	1,441	964
19~20	1.50	0.88	3,631	1,393	932
20~21	1.25	0.74	3,026	1,171	784
21~22	0.90	0.53	2,179	839	561
22~23	0.60	0.35	1,452	554	371
23~24	0.45	0.26	1,089	412	275
		Total daily Maximum	58,094	22,366	14,964
		Daily Maximum Flow in Ulaanbaatar	63,323	24,379	16,311

Table A-2 Possible Reduction of Electrical Expenditure

Central	Unit	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
A. Existing Water Source Capacity	m3/day	122,760	122,760	122,760	122,760	122,760	122,760	134,280	134,280	134,280	134,280	134,280	134,280	134,280	134,280
B. Tenporal Water Source Capacity	m3/day	121,514	127,166	131,865	135,468	132,876	130,131	126,933	123,452	119,888	115,802	111,567	107,004	102,120	97,047
C. Daily Maximum Distribution Water Volume	m3/day	71,450	74,774	77,537	79,655	78,131	76,517	74,637	72,590	70,494	68,092	65,601	62,918	60,047	57,064
D. Daily Maximum Water Volume in Ulaanbaatar	m3/day	77,881	81,503	84,515	86,824	85,163	83,404	81,354	79,123	76,839	74,220	71,506	68,581	65,451	62,199
E. Water Supply Accomplishment	m3/day	107,297	112,288	116,437	119,618	117,330	114,906	112,082	109,008	105,861	102,253	98,514	94,485	90,172	85,693
F. Reduced Volume	m3/day	0	0	0	0	32,167	31,502	30,728	29,885	29,022	28,033	27,008	25,904	24,721	23,493
G. Electricity Consumption of Intake Pump	Kwh/m3	0.348	0.348	0.348	0.348	0.348	0.348	0.348	0.348	0.348	0.348	0.348	0.348	0.348	0.348
H. Electricity Consumption of Distribution Pump	Kwh/m3	0.387	0.387	0.387	0.387	0.387	0.387	0.387	0.387	0.387	0.387	0.387	0.387	0.387	0.387
I. Yearly Electrical Expenditure	1,000Tg	0	0	0	0	125,991	123,388	120,356	117,055	113,676	109,801	105,786	101,459	96,828	92,018

Industrial	Unit	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
A. Existing Water Source Capacity	m3/day	37,992	37,992	37,992	37,992	37,992	37,992	37,992	37,992	37,992	37,992	37,992	37,992	37,992	37,992
B. Tenporal Water Source Capacity	m3/day	36,703	38,210	39,720	40,952	41,953	43,247	38,555	37,710	36,780	35,692	34,563	33,335	32,013	30,597
C. Daily Maximum Distribution Water Volume	m3/day	21,581	22,467	23,355	24,080	24,668	25,429	22,670	22,173	21,627	20,987	20,323	19,601	18,824	17,991
D. Daily Maximum Water Volume in Ulaanbaatar	m3/day	23,524	24,490	25,457	26,247	26,889	27,718	24,711	24,169	23,573	22,876	22,152	21,365	20,518	19,610
E. Water Supply Accomplishment	m3/day	32,409	33,739	35,073	36,161	37,044	38,187	34,044	33,298	32,477	31,516	30,519	29,435	28,267	27,017
F. Reduced Volume	m3/day	0	0	0	0	10,156	10,469	9,333	9,129	8,904	8,640	8,367	8,070	7,750	7,407
G. Electricity Consumption of Intake Pump	Kwh/m3	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293	0.293
H. Electricity Consumption of Distribution Pump	Kwh/m3	0.174	0.174	0.174	0.174	0.174	0.174	0.174	0.174	0.174	0.174	0.174	0.174	0.174	0.174
I. Yearly Electrical Expenditure	1,000Tg	0	0	0	0	25,275	26,054	23,227	22,718	22,158	21,503	20,823	20,083	19,286	18,433

MeatComplex	Unit	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
A. Existing Water Source Capacity	m3/day	25,416	25,416	25,416	25,416	25,416	25,416	25,416	25,416	25,416	25,416	25,416	25,416	25,416	25,416
B. Tenporal Water Source Capacity	m3/day	22,074	22,558	23,770	24,476	24,177	23,861	23,466	23,027	22,549	21,984	21,409	20,788	20,122	19,411
C. Daily Maximum Distribution Water Volume	m3/day	12,980	13,264	13,977	14,392	14,216	14,030	13,798	13,540	13,259	12,927	12,588	12,223	11,832	11,414
D. Daily Maximum Water Volume in Ulaanbaatar	m3/day	14,148	14,458	15,235	15,687	15,496	15,293	15,040	14,758	14,452	14,090	13,721	13,323	12,897	12,441
E. Water Supply Accomplishment	m3/day	19,491	19,919	20,989	21,612	21,348	21,069	20,720	20,333	19,911	19,412	18,904	18,356	17,768	17,140
F. Reduced Volume	m3/day	0	0	0	0	5,853	5,776	5,681	5,574	5,459	5,322	5,183	5,032	4,871	4,699
G. Electricity Consumption of Intake Pump	Kwh/m3	0.317	0.317	0.317	0.317	0.317	0.317	0.317	0.317	0.317	0.317	0.317	0.317	0.317	0.317
H. Electricity Consumption of Distribution Pump	Kwh/m3	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347
I. Yearly Electrical Expenditure	1,000Tg	0	0	0	0	20,710	20,439	20,101	19,725	19,315	18,831	18,339	17,807	17,236	16,627

Σ I Possible Reduction of Electrical Expenditure	1,000Tg	0	0	0	0	171,975	169,881	163,684	159,498	155,149	150,135	144,947	139,349	133,351	127,079

d. Data on the indirect benefit related to the useful lives(durable years) of the facilities

Operating condition of the existing distribution pump is shown in Table A-3, which put out following figure.

- Percentage of pumps unoperational before specified durable years 12/25 = 48%
- Percentage of pumps still working within specified durable years 10/25 = 40%
- Percentage of pumps still working beyond specified durable years 1/25 = 4%

Table A-3 Operating Conditions of the Existing Pumps

Operating years	Sets unoperational	working
less than 5 years	2	0
6	0	2
7	0	2
8	6	2
9	0	0
10	4	1
11	0	2
12	0	0
13	0	0
14	0	1
15	0	0
16	0	0
Sub-tota	12	10
less than 20 years	0	0
25	1	0
30	0	1
35	1	0
Sub-total	2	1
Total	14	11
Total Number		25

Estimated USAG fixed assets, depreciation and repair cost estimated is shown in Table A-4.

Table A-4 Fixed Assets, depreciation and repair cost

(unit : 100 million)

	USAG(estimation)	Japanese sample	
Fixed Assets	207	207	
Intake		12	
Treatment/Transmit		32	12+32=44
Distribution		142	
Oters		21	
O&M,repair	3.00	40.34	
Depreciation(Annual)	0.18	6.99	
Intake		0.41	
Treatment/Transmit		1.08	0.41+1.08=1.49
Distribution		4.80	
Others	0.07	0.71	
Repair (Annual)		2.91	
Depreciation/Fixed Assets(%)	0.09	3.41	
Repair cost/Fixed Assets(%)	0.03	1.42	

Expenditure item in case of expansion of repair cost in 1994 for USAG is shown in Table A-5.

Table A-5 Comparison of expenditure

(Unit : 10^3 x Tg)

Japanese sample (same scale as USAG)		Item	USAG			
			1994		Expansion of repair cost	
Item	%		Expenditure	%	Expenditure	%
Salary	22.6	Salary	147,359		147,359	
		Social insurance	19,883		19,883	
		Guardman	7,000		7,000	
		Out-going	180		180	
		Health insurance	4,420		4,420	
Sub-total	22.6		178,842	14.3	178,842	14.3
interest	18.6		0	0	0	0
Depreciation	16.4	Large Scale	71,531		71,531	
		Small Scale	2,715		2,715	
Sub-total	16.4		74,246	5.9	74,246	5.9
Power	3.3	Power	834,360	66.6	685,360	54.7
Lighting/Heating	0.1	Heating	9,180		9,180	

		Fuel	4,619		4,619	
Sub-total	0.1		13,799	1.1	13,799	
Communication/ Transportation	0.3	Gasoline	93,233		93,233	
		Paper,Tel	1,494		1,494	
		Vechile	3,859		3,859	
Sub-total	0.3		98,586	7.9	98,586	7.9
Repair	6.9	Spare parts	27,137		176,137	
pavement	0.4					
material	0.5					
Sub-total	7.8		27,137	2.2	176,137	14.0
Chemical	0.8		9,842	0.8	9,842	0.8
Contract-out	5.5					
Receiving water	17.1					
Others	7.5	consumption	2,744		2,744	
		Car tax	1,357		1,357	
		workwear	11,826		11,826	
		Environmental	540		540	
		Protection				
Sub-total	7.5		16,467	1.3	16,467	1.3
Total	100.0		1,253,279	100.0	1,253,279	100.0

Note. Possible reduction electrical expenditure is average figure between 1996 ~2006 (see Table A-2)
1/2 x (171 million Tg + 127 million Tg) = 149 million Tg (32 million yen)

APPENDIX A-7 STRATEGIC PLAN

Table 1 Strategic Plan Matrix

Item	Yearly Plan	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	Water tariff alteration schedule from constant rate to metered amount rate to reduce unit water consumption (A l/cd)	Constant rate(150l/cd)	Increase of constant rate amount from 150 to 250 l/cd*1	Constant rate system will be retained, however, to alter to metered water system in 1999, USAG will improve the distribution lines		Alteration to metered amount rate system							
2	Installation schedule of water flow meters in the CTP and the possibility of reduction of water consumption		Installation of 34 water flow meters in the CTP	Installation of 15 water flow meters in the CTP by									
			Charge by 250 l/cd										
3	Tariff collection by supplied amount to CTP(B m3/mon.) and unit water tariff (C Tg/m3)		Charge by new constant rate of 250 l/cd			Charge by metered amount	same as left	same as left	same as left	same as left	same as left	same as left	same as left
		C=16 Tg/m3	C=20 Tg/m3			C=20	C=22	C=26 Tg/m3	C=30	C=34 Tg/m3	C=38 Tg/m3	C=42 Tg/m3	C=46 Tg/m3
4	Distribution to residents of apartment area (D l/cd) from CTP(B m3/mon.)		Distribution to residents of apartment area by altered rate	same as left	same as left	same as left	same as left	same as left	same as left	same as left	same as left	same as left	same as left
5	Computation of CTP water rate (E Tg/m3)		Charged by metered consumption up to 250 l/cd			Charged by metered amount	same as left	same as left	same as left	same as left	same as left	same as left	same as left
			0.25×C=E	0.25×C=E	0.25×C=E	D×C=E	D×C=E	D×C=E	D×C=E	D×C=E	D×C=E	D×C=E	D×C=E
6	Measures against complaints from residents for difference in unit water tariff among CTP	Public relations activities for tariff increase Monitoring of toilet leak by administration department		Warning by reducing supply amount to residents who will not take measures for leakage control		same as left	same as left	same as left	same as left	same as left	same as left	same as left	same as left
7	Measures against complaints from apartment residents for charge increase with supply reduction	Propaganda by mass media Supplied pressure adjustment by stories, water use, and valve control		same as left	same as left	same as left	same as left	same as left	same as left	same as left	same as left	same as left	same as left
8	Tap repaire or replacement for reduction of water consumption of apartment residents (D l/cd)	Set up of action plan for tap replacement or replacement (ex. operation of tap factory)		Give priority to saving water for apartment		Set up of a department exclusively for installation of water							
9	Target level of saving water consumption of apartment residents(D l/cd : estimated by existing data of apartment with a low water consumption)			Propaganda by mass media		same as left	same as left	same as left	same as left	same as left	same as left	same as left	same as left
				417 l/cd	417 l/cd	382 l/cd	361 l/cd	339 l/cd	318 l/cd	292 l/cd	266 l/cd	240 l/cd	215 l/cd
10	Water demand projection from 1997 to 2006, taking into consideration water consumption reduction of apartment residents		Set up of lekage prevention section Control of supply pressure in the night										
			200,896 m3/d	197,198 m3/d	193,517	188,954	184,189	179,218 m3/d	173,479	167,540 m3/d	161,128 m3/d	154,255 m3/d	147,056 m3/d
11	Unit cost of supplied water (Qn: at current price level) Q_{1995}=G Tg/m3 Q_{2000}=H Tg/m3 Q_{2005}=I Tg/m3	Q_{1995}:*2 22.14Tg/m3					Q_{2000}:*3 22.53Tg/m3					Q_{2005}:*4 29.41Tg/m3	

*1: The city will take measures for those apartments which consume more than 250 l/cd to reduce unaccounted-for water.

*2: Q_{1995}= G =1,578,550Tg / 71,304.6m3 = 22.14 Tg/m3

*3: Q_{2000}=H_1=(1,578,550-250,798)Tg / 70,073m3 = 18.94 Tg/m3, H_2=1,578,550Tg / 70,073m3=22.53Tg/m3
(in case of electricty cost and water tariff be reduc (in case of maintenance cost be paid by reducted electricity cost)

*4: Q_{2005}=I_1=(1,578,550-134,540)Tg / 53,675.4m3 = 26.90 Tg/m3, I_2=1,578,550Tg / 53,675.4m3=29.41Tg/m3
(in case of electricty cost and water tariff be reduc (in case of maintenance cost be paid by reducted electricity cost)

APPENDIX A-8 REVIEW ON EXISTING WATER SUPPLY

Appendix A-8 Review on the Existing Water Supply

During (1) the site survey, from September 12 to October 6, 1995 and (2) the dispatch of mission for explanation of draft basic design report, from January 9 to January 18, 1996, the following investigations for the existing water supply were conducted:

1. Existing Water Sources

The city's water supply system has four water sources which are located along the Tuul River, which are as follows:

- the Upper Water Source
- the Central Water Source

  The general location of existing wells is shown in Fig. 1. Detailed well data is summarized in Table-1.

- the Industry Water Source

  The general location of existing wells is shown in Fig. 2. Detailed well data is summarized in Table-2.

- the Meat Complex Water Source

  The general location plan of existing wells is shown in Fig. 2. Detailed well data is summarized in Table-3.

2. Well Structure

   The structure of the existing wells is composed of three casings, as shown in Fig.3. Those are from outside: 1) guide casing, 2) outer casing, and 3) casing screen. The screen is of a perforated pipe wound with steel wire. The diameter of the wells ranges from 200 to 400 mm.

3. Water Quality

   Water quality analysis was conducted, taking samples from several wells as shown in Figs. 4 and 5, to ensure the availability of the existing water sources to meet the Mongolian Drinking Water Standard (refer to Table -9).

   Heavy metals such as lead and cadmium, and fluoride were detected from the Industry and the Meat Complex Water Sources. The levels of these heavy metals and fluoride exceeded the drinking water standard. Their presence is possibly caused by industrial wastes and wastes from thermal power plant and Industry that are dumped near the

water sources as shown in Fig. 6. This Project, therefore, will include only rehabilitation of the water supply system of the Central Water Source. The rehabilitation of the system of the Industry and the Meat Complex Water Source will be excluded.

Moreover, a golf course development project, which plans to open the course in June, 1996 on the western side of the Central Water Source, was found during the mission for the explanation of the draft basic design report. Water quality analysis in terms of pesticides (analyzed in Japan) was conducted as shown in Table-5. The results were all acceptable under the Drinking Water Standard of Japan.

In connection to the above, the following matters are confirmed to implement this Project.

- The golf club agreed that pesticides will not be used on the golf course.

- In case some pesticide will be used, the authority concerned of the City will cancel the permission for land use of the golf course. In addition, the Mongolian government will direct the city to cancel its permission for the golf course to operate in the case that the golf course firm violates the agreement.

- The result of water quality analysis conducted in Japan showed that pesticides were not detected and was below the Japanese Drinking Water Standard, though the lawn seed was already sown in the last year.

- There are five wells within 200 m of the golf course, which amounts to only six percent of the 79 wells. Most of the wells are located 400 m away from the golf course and upstream of the groundwater flow. Considering the facts as mentioned the above, hazardous groundwater pollution should not be a practical consideration. However, the USGS shall hereafter monitor water quality of the existing wells around the golf course.

4. Intake Pump Facilities

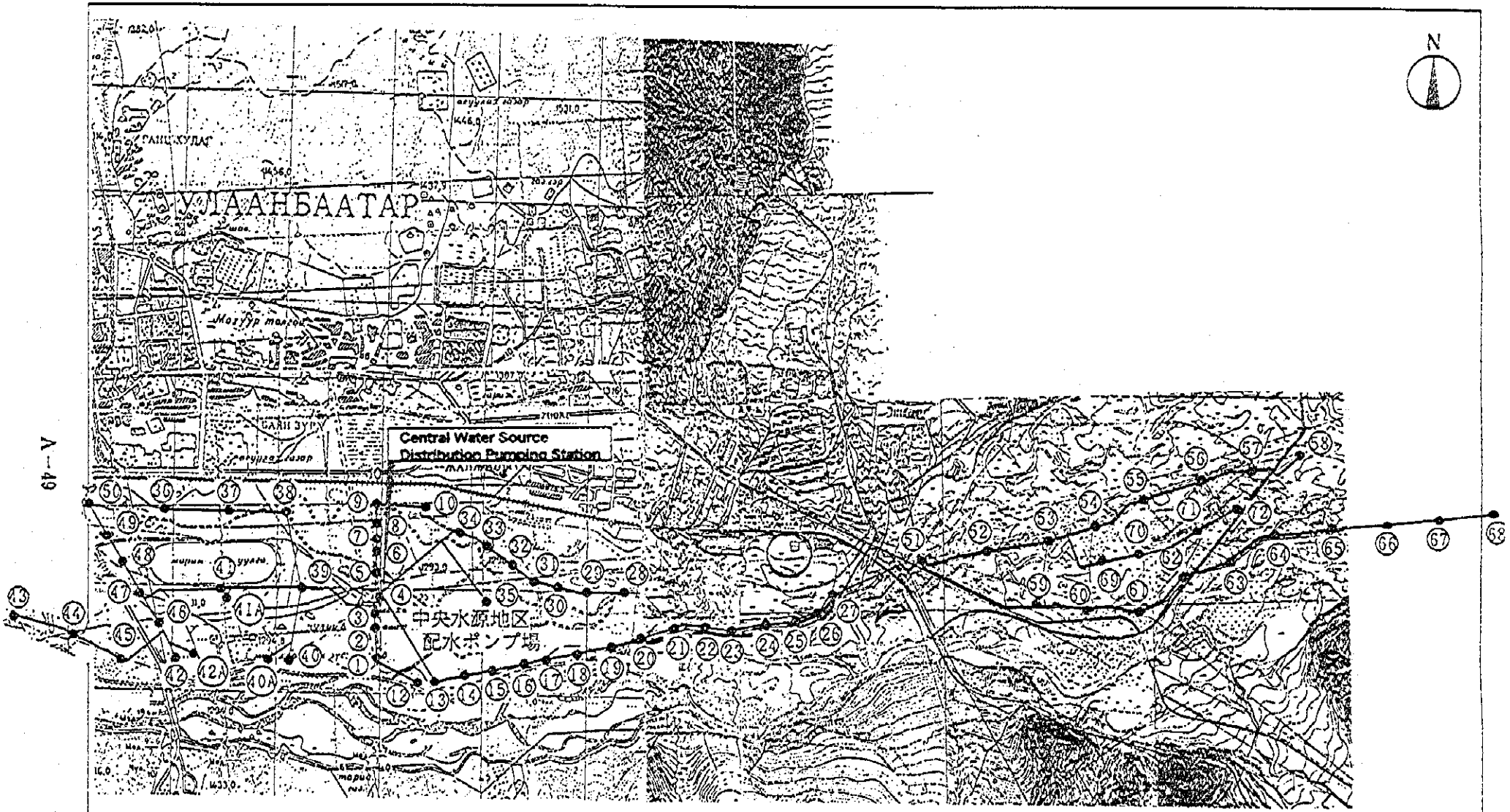
There are 71 wells for the Central Water Source, 10 wells for the Industry Water Source, and 16 wells for the Meat Complex Water Source. To exploit these water sources, four USSR-built types of pumps are utilized as shown in Figs. 6 and 7. The discharge capacity ranges from 25 to 160 m^3 /hr. The electric power source is of 380 V with 50 Hz.

As these pumping facilities are operated manually, the pump motors occasionally become overheated and damaged because the water level drops to the lower limit of the distribution pump facilities as the operators cannot always successfully maintain the water level.

Distribution pumps are provided in the Central, the Upper, the Industry, and the Meat Complex Water Source areas. The Tasgan pumps function as booster pumps. The detailed specifications of these pumping facilities are summarized in Table-5 and Table-6.

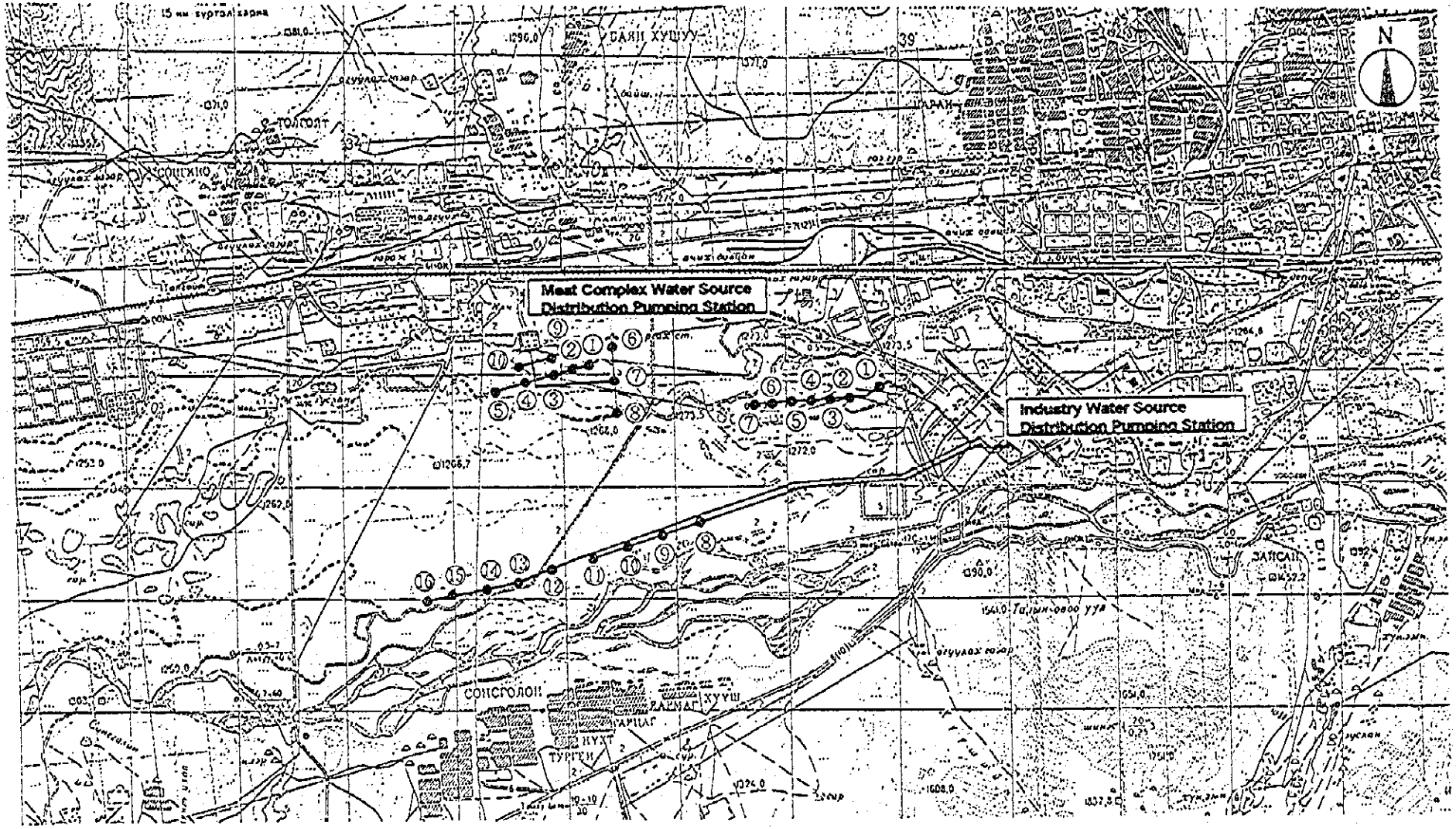
5. Storage Tank and Reservoir

Table-15 and -16 summarize the particulars of the storage tanks at the distribution pumping station and reservoirs.



Legend ① : Well Number

Fig. 1 General Plot Plan of Existing Wells
(Central Water Source)



Legend ① : Well Number

Fig. 2 General Plot Plan of Existing Wells
(Meat Complex Water Source)

Table-1 Well Data of Water Source

Central Water Source								
Well No.	Well Depth (m)	Static Water Level (m)	Dynamic Water Level (m)	Well Casing Dia (mm)	Well Screen Installation (m)	Pump Capacity (m3/hr)	Pump Head (m)	Pump Setting Depth (m)
1	22.5	2.25	5.42	350	4.0-15.5	40	60	16.5
2	22.6	0.35	2.55	350	5.0-15.0	40	60	15.5
3	25.2	1.65	4.15	250	6.0-17.4	25	100	15.2
4	27.3	2.90	5.18	250	6.0-18.1	63	65	15.0
5	26.7	2.25	4.49	250	6.1-17.5	63	65	15.3
6	28.2	1.68	2.60	250	6.1-18.9	63	65	17.2
7	25.7	2.00	2.95	250	6.1-17.8	63	65	16.0
8	25.0	2.09	3.25	350	4.1-17.6	63	65	17.5
9	29.4	5.39	7.29	400	4.3-22.1	63	65	20.2
10	30.7	2.93	5.25	400	4.6-24.1	63	65	19.5
11	Abandoned Well							
12	27.0	3.30	4.45	400	5.3-18.85	63	65	16.0
13	30.6	5.10	5.80	400	4.0-24.0	63	65	17.5
14	31.0	0.83	2.10	400	3.3-25.7	63	65	17.0
15	32.0	1.15	5.55	400	5.0-24.3	63	65	18.0
16	30.0	2.30	3.45	400	4.0-20.7	120	65	18.0
17	30.0	1.50	2.30	400	3.45-23.0	63	65	17.6
18	30.0	2.26	7.00	400	5.3-21.7	63	65	17.5
19	30.0	2.86	7.28	400	5.0-22.0	63	65	18.0
20	33.6	4.24	7.49	400	4.9-26.7	63	65	20.3
21	32.6	1.54	3.78	400	4.05-24.1	120	65	19.6
22	33.2	1.89	3.74	300	5.2-23.8	63	65	20.1
23	31.0	1.28	4.49	300	5.1-25.9	63	65	17.5
24	30.0	1.63	4.12	300	5.3-21.7	63	65	17.6
25	30.0	1.94	3.02	300	5.3-21.7	120	65	18.0
26	30.0	1.43	4.15	300	4.0-23.0	63	65	17.5
27	30.0	1.03	7.69	300	5.3-18.7	63	65	18.0
28	32.0	2.57	5.57	300	5.5-21.5	63	65	21.0
29	42.0	3.22	4.28	300	5.5-29.5	63	150	21.5
30	45.0	2.45	3.65	300	5.0-35.0	63	65	22.0
31	44.0	3.26	4.97	300	5.0-35.0	63	65	21.0
32	42.0	3.56	4.61	300	6.0-30.0	63	65	21.5
33	37.0	4.15	5.40	300	5.5-26.5	63	65	20.0
34	37.0	4.60	5.60	300	5.0-26.0	63	65	20.5
35	37.0	3.55	5.94	300	5.6-26.4	63	65	21.0
36	31.0	3.50	7.00	300	7.0-19.0	63	65	20.0
37	29.5	4.67	6.70	300	6.8-18.0	63	65	17.0
38	31.0	4.00	6.68	300	5.0-21.0	63	65	17.6
39	30.0	3.63	5.45	300	5.0-20.0	63	65	17.6
40	40.0	1.42	4.26	300	5.3-29.7	63	150	24.0
41	30.0	2.74	5.33	300	5.1-19.0	63	65	17.6
42	34.0	2.10	3.84	300	5.0-23.0	63	65	17.8
43	32.0	1.20	7.10	300	5.0-23.0	63	65	19.0
44	35.0	2.17	5.35	300	7.8-23.2	25	100	19.5
45	27.0	2.50	7.67	300	6.0-16.0	25	100	16.0
46	30.0	2.40	4.53	300	6.0-20.0	63	65	18.0

Table-2 Well Data of Water Source

Central Water Source					
Dynamic Water Level (m)	Well Casing Dia (mm)	Well Screen Installation (m)	Pump Capacity (m3/hr)	Pump Head (m)	Pump Setting Depth (m)
9.85	300	6.0-25.0	63	65	19.5
5.22	300	6.0-23.0	63	65	18.5
5.91	300	5.6-17.4	63	65	17.0
6.21	300	-	63	65	15.5
5.12	300	5.5-22.5	63	65	17.5
6.59	300	5.0-21.7	120	60	18.0
3.42	300	3.0-23.0	63	65	18.5
5.59	300	5.4-28.6	63	65	21.5
6.90	300	5.0-22.0	63	65	17.5
5.11	300	4.4-16.0	63	65	15.0
4.79	300	4.2-16.4	25	100	15.0
7.50	300	2.7-17.1	40	60	16.5
4.02	300	5.8-13.2	63	65	19.0
2.62	300	4.0-16.0	63	65	17.0
4.43	300	5.0-17.0	63	65	17.5
4.96	300	5.1-11.4	40	60	9.50
7.02	300	4.7-12.3	25	100	14.5
4.91	300	5.2-11.0	40	60	15.0
3.82	300	-	25	100	15.0
6.05	300	-	25	100	14.5
5.24	300	-	25	100	14.5
5.15	300	-	25	100	14.5
5.20	300	5.0-17.0	10	60	17.0
6.58	300	5.0-17.0	63	65	15.0
3.35	300	5.8-13.2	25	100	16.5
4.43	300	5.0-13.0	25	100	19.0

Table-3 Well Data of Water Source

Industry Water Source								
Well No.	Well Depth (m)	Static Water Level (m)	Dynamic Water Level (m)	Well Casing Dia (mm)	Well Screen Installation (m)	Pump Capacity (m3/hr)	Pump Head (m)	Pump Setting Depth (m)
1	21.6	1.08	2.67	200	7.45-16.65	63	65	15.0
2	27.0	1.70	4.53	200	6.3-18.7	120	60	16.5
3	26.1	3.10	4.92	200	5.22-18.88	120	60	15.5
4	26.4	1.59	2.23	200	5.77-18.23	120	60	15.2
5	25.0	2.10	7.80	200	4.2-18.8	120	60	15.0
6	26.2	2.90	6.56	300	5.62-18.56	160	65	16.2
7	26.0	2.46	6.15	300	5.38-18.42	160	65	21.3
8	53.5	5.34	6.74	300	5.0-43.5	160	65	24.8
9	48.0	4.63	5.99	300	5.0-40.0	No Pump and Motor		21.5
10	50.0	4.08	4.79	300	5.0-40.0	200	75	24.0
11	43.2	2.92	4.05	300	4.3-35.9	120	60	20.5
12	30.0	1.12	7.18	300	5.3-21.7	No Pump and Motor		15.5
13	30.0	0.60	4.31	300	5.0-22.0	No Pump and Motor		15.0
14	32.0	0.64	3.73	300	4.2-24.8	120	60	15.2
15	30.0	2.40	5.10	300	4.2-22.8	No Pump and Motor		15.0
16	30.0	0.16	5.34	300	4.2-22.8	120	60	15.0

Meat Complex Water Source								
Well No.	Well Depth (m)	Static Water Level (m)	Dynamic Water Level (m)	Well Casing Dia (mm)	Well Screen Installation (m)	Pump Capacity (m3/hr)	Pump Head (m)	Pump Setting Depth (m)
1	26.0	1.45	2.98	400	5.28-18.72	120	60	15.0
2	26.2	1.72	2.56	400	5.5-18.7	160	65	15.1
3	26.0	1.8	4.04	400	5.48-18.52	160	65	15.0
4	26.0	1.13	3.79	400	5.71-15.49	120	60	15.0
5	26.1	1.75	2.95	400	5.3-18.83	120	60	15.5
6	40.0	2.25	4.40	400	6.0-32.0	63	65	19.5
7	40.0	3.40	6.87	400	6.0-32.0	63	65	19.5
8	40.0	4.57	6.70	400	6.0-32.0	63	65	19.5
9	32.0	3.58	6.47	400	25.4-29.0	120	60	19.0
10	42.0	4.21	5.75	400	33.4-39.0	110	100	20.0

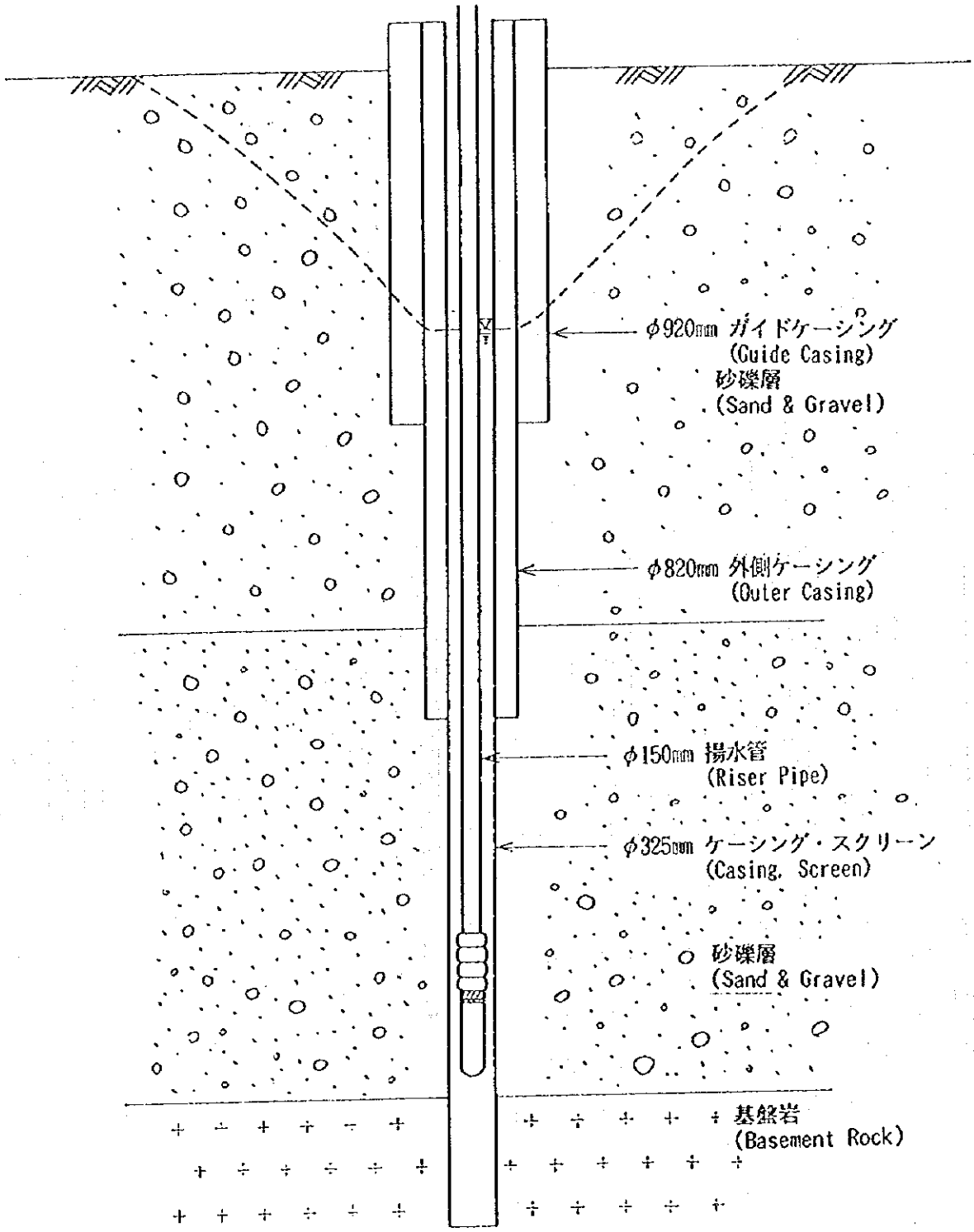


Fig. 3 Typical Structure of Existing Wells

Table-4 Specification of Existing Pump

Central Water Source						
Well No.	Pump				Motor	
	Type	Capacity (m^3/hr)	Head (m)	Riser Pipe Dia.(mm)	Type	Output (kw)
1	ECW-8	40	60	100	PEDW-11-180	11
2	ECW-8	40	60	100	PEDW-11-180	11
3	ECW-8	25	100	100	PEDW-11-180	11
4	ECW-10	63	65	100	PEDW-22-180	22
5	ECW-10	63	65	100	PEDW-22-180	22
6	ECW-10	63	65	100	PEDW-22-180	22
7	ECW-10	63	65	100	PEDW-22-219	22
8	ECW-10	63	65	100	PEDW-22-219	22
9	ECW-10	63	65	100	PEDW-22-219	22
10	ECW-10	63	65	100	PEDW-22-219	22
11	Abandon Well					
12	ECW-10	63	65	100	PEDW-22-219	22
13	ECW-10	63	65	100	PEDW-22-219	22
14	ECW-10	63	65	100	PEDW-22-219	22
15	ECW-10	63	65	100	PEDW-22-219	22
16	ECW-10	120	65	100	PEDW-22-219	22
17	ECW-10	63	65	100	PEDW-22-219	22
18	ECW-10	63	65	100	PEDW-22-219	22
19	ECW-10	63	65	100	PEDW-22-219	22
20	ECW-10	63	65	100	PEDW-22-219	22
21	ECW-10	120	65	100	PEDW-32-219	32
22	ECW-10	63	65	100	PEDW-22-219	22
23	ECW-10	63	65	100	PEDW-22-219	22
24	ECW-10	63	65	100	PEDW-22-219	22
25	ECW-10	120	65	100	PEDW-32-219	32
26	ECW-10	63	65	100	PEDW-22-219	22
27	ECW-10	63	65	100	PEDW-22-219	22
28	ECW-10	63	65	100	PEDW-22-219	22
29	ECW-10	63	150	100	PEDW-32-219	32
30	ECW-10	63	65	100	PEDW-22-219	22
31	ECW-10	63	65	100	PEDW-22-219	22
32	ECW-10	63	65	100	PEDW-22-219	22
33	ECW-10	63	65	100	PEDW-22-219	22
34	ECW-10	63	65	100	PEDW-22-219	22
35	ECW-10	63	65	100	PEDW-22-219	22
36	ECW-10	63	65	100	PEDW-22-219	22
37	ECW-10	63	65	100	PEDW-22-219	22
38	ECW-10	63	65	100	PEDW-22-219	22
39	ECW-10	63	65	100	PEDW-22-219	22
40	ECW-10	63	150	100	PEDW-32-219	32
41	ECW-10	63	65	100	PEDW-22-219	22
42	ECW-10	63	65	100	PEDW-22-219	22
43	ECW-10	63	65	100	PEDW-22-219	22
44	ECW-8	25	100	100	PEDW-11-180	11
45	ECW-8	25	100	100	PEDW-11-180	11
46	ECW-10	63	65	100	PEDW-22-219	22

Table-5 Specification of Existing Pump

Central Water Source						
Well No.	Pump				Motor	
	Type	Capacity (m^3/hr)	Head (m)	Riser Pipe Dia.(mm)	Type	Output (kw)
47	ECW-10	63	65	100	PEDW-22-219	22
48	ECW-10	63	65	100	PEDW-22-219	22
49	ECW-10	63	65	100	PEDW-22-219	22
50	ECW-10	63	65	100	PEDW-22-219	22
51	ECW-10	63	65	100	PEDW-22-219	22
52	ECW-10	120	60	100	PEDW-32-219	32
53	ECW-10	63	65	100	PEDW-22-219	22
54	ECW-10	63	65	100	PEDW-22-219	22
55	ECW-10	63	65	100	PEDW-22-219	22
56	ECW-10	63	65	100	PEDW-22-219	22
57	ECW-8	25	100	80	PEDW-11-180	11
58	ECW-8	40	60	80	PEDW-11-180	11
59	ECW-10	63	65	100	PEDW-22-219	22
60	ECW-10	63	65	100	PEDW-22-219	22
61	ECW-10	63	65	100	PEDW-22-219	22
62	ECW-8	40	60	100	PEDW-11-180	11
63	ECW-8	25	100	80	PEDW-11-180	11
64	ECW-8	40	60	80	PEDW-11-180	11
65	ECW-8	25	100	80	PEDW-11-180	11
66	ECW-8	25	100	80	PEDW-11-180	11
67	ECW-8	25	100	80	PEDW-11-180	11
68	ECW-8	25	100	80	PEDW-11-180	11
69	ECW-6	10	60	80	PEDW-11-180	11
70	ECW-10	63	65	100	PEDW-22-219	22
71	ECW-8	25	100	80	PEDW-11-180	11
72	ECW-8	25	100	80	PEDW-11-180	11

Table-6 Specification of Existing Pump

Industry Water Source						
Well No.	Pump				Motor	
	Type	Capacity (m^3/hr)	Head (m)	Riser Pipe Dia.(mm)	Type	Output (kw)
1	ECW-10	63	65	100	PEDW-22-219	22
2	ECW-10	120	60	100	PEDW-32-219	32
3	ECW-10	120	60	100	PEDW-32-219	32
4	ECW-10	120	60	100	PEDW-32-219	32
5	ECW-10	120	60	100	PEDW-32-219	32
6	ECW-12	160	65	100	PEDW-45-219	45
7	ECW-12	160	65	100	PEDW-45-219	45
8	ECW-12	160	65	100	PEDW-45-219	45
9						
10	ATN14-13	200	75	200	ABS-55	55
11	ECW-10	120	120	100	PEDW-45-219	45
12						
13						
14	ECW-10	120	60	100	PEDW-45-219	45
15						
16	ECW-10	120	60	100	PEDW-45-219	45

Meat Industry Water Source						
Well No.	Pump				Motor	
	Type	Capacity (m^3/hr)	Head (m)	Riser Pipe Dia.(mm)	Type	Output (kw)
1	ECW-10	120	60	100	PEDW-32-219	32
2	ECW-12	160	65	100	PEDW-45-219	45
3	ECW-12	160	65	100	PEDW-45-219	45
4	ECW-10	120	60	100	PEDW-32-219	32
5	ECW-10	120	60	100	PEDW-32-219	32
6	ECW-10	63	65	100	PEDW-22-219	22
7	ECW-10	63	65	100	PEDW-22-219	22
8	ECW-10	63	65	100	PEDW-22-219	22
9	ECW-10	120	60	100	PEDW-32-219	32
10	ECW-10	63	110	100	PEDW-32-219	32

Table-7 Water Quality Analysis Data in Existing Wells (Sampling: September, 1995)

No.	Sample Wells	Color	EC	Tu.	Temp.	Total Hardness (mg/l)	Cu (mg/l)	Mn (mg/l)	Pb (mg/l)	Cr (mg/l)	NO2 (mg/l)	NO3 (mg/l)	pH	Alk. (mg/l)	Fe (mg/l)	As (mg/l)	F (mg/l)	Cd (mg/l)	Organic Substance	Coli.
1	Central W. S. Well No.17	0	70	0	12	1.1	0.00	0.0	0.06	0.00	0.003	3.9	6.6	71	0.03	0.01	0.03	0.01	+	0
2	Central W. S. Well No.32	0	130	0	8	1.2	0.07	0.1	0.03	0.01	0.002	0.5	6.4	41	0.00	0.01	0.45	0.01	+	0
3	Industrial W. S. Well No.3	13	370	2	13	2.7	0.01	0.1	0.13	0.01	0.004	1.1	6.3	88	0.22	0.02	1.52	0.01	+	1
4	Industrial W. S. Well No.12	3	110	0	12	1.5	0.08	0.0	0.06	0.01	0.009	0.4	6.7	27	0.00	0.02	0.51	0.02	+	2
5	Meat Complex W. S. Well No.3	0	420	0	9	2.9	0.00	0.1	0.09	0.01	0.022	2.9	6.7	94	0.00	0.01	0.35	0.02	+	0
6	Meat Complex W. S. Well No.6	0	450	0	9	5.4	0.01	0.0	0.11	0.01	0.002	3.5	6.3	117	0.01	0.01	0.23	0.01	+	3
7	Meat Complex W. S. Well No.7	1	440	0	9	3.7	0.00	0.0	0.16	0.00	0.001	0.5	6.6	95	0.02	0.01	0.38	0.03	+	0

No	Sampled Well	Total Coliform	Hg (mg/l)	Organo Mercury (mg/l)	Organo Phosphate (mg/l)
1	Central W. S. Well No.17	0	Not found	Not found	Not found
2	Central W. S. Well No.32	2	Not found	Not found	Not found
3	Industrial W. S. Well No.3	31	Not found	Not found	Not found
4	Industrial W. S. Well No.12	5	Not found	Not found	0.012
5	Meat Complex W. S. Well No.3	10	Not found	Not found	0.025
6	Meat Complex W. S. Well No.6	1	Not found	Not found	Not found
7	Meat Complex W. S. Well No.7	0	Not found	Not found	Not found

Note: screen marks indicate the values higher than Mongole's drinking standard ones

Table-8 Water Quality Analysis Data in Existing Wells

(Sampling:Nov,1995)

Upper Water Source							
No.	Sample Wells	Cu (mg/l)	Mn (mg/l)	Pb (mg/l)	Cr (mg/l)	F (mg/l)	Cd (mg/l)
1	Well No.16	0.00	0.0	0.01	0.00	0.17	0.001
2	Well No.36	0.00	0.0	0.01	0.00	0.10	0.001

(Sampling:Nov, 1995)

Central Water Source							
No.	Sample Wells	Cu (mg/l)	Mn (mg/l)	Pb (mg/l)	Cr (mg/l)	F (mg/l)	Cd (mg/l)
1	Well No.4	0.02	0.1	0.02	0.00	0.12	0.001
2	Well No.9	0.00	0.1	0.02	0.00	0.15	0.001
3	Well No.12	0.00	0.0	0.01	0.01	0.13	0.001
4	Well No.17	0.00	0.0	0.02	0.01	0.09	0.001
5	Well No.21	0.01	0.1	0.02	0.01	0.15	0.000
6	Well No.24	0.01	0.0	0.01	0.01	0.22	0.000
7	Well No.27	0.00	0.0	0.02	0.01	0.16	0.001
8	Well No.28	0.00	0.0	0.03	0.01	0.16	0.001
9	Well No.32	0.00	0.0	0.02	0.00	0.56	0.000
10	Well No.38	0.01	0.1	0.02	0.01	0.11	0.001
11	Well No.40	0.01	0.1	0.02	0.01	0.12	0.001
12	Well No.41	0.00	0.0	0.02	0.00	0.13	0.001
13	Well No.42	0.01	0.0	0.02	0.00	0.15	0.001
14	Well No.43	0.01	0.1	0.02	0.01	0.09	0.001
15	Well No.49	0.01	0.1	0.02	0.01	0.17	0.001
16	Well No.52	0.00	0.0	0.02	0.00	0.22	0.001
17	Well No.54	0.00	0.0	0.02	0.00	0.10	0.001
18	Well No.56	0.00	0.0	0.01	0.00	0.09	0.001
19	Well No.58	0.00	0.0	0.02	0.00	0.19	0.001
20	Well No.59	0.00	0.0	0.02	0.00	0.12	0.001
21	Well No.62	0.00	0.0	0.02	0.00	0.16	0.001
22	Well No.64	0.00	0.0	0.01	0.00	0.18	0.001
23	Well No.66	0.00	0.0	0.01	0.00	0.20	0.001
24	Well No.68	0.00	0.0	0.02	0.01	0.03	0.001
25	Well No.70	0.00	0.0	0.02	0.00	0.06	0.001
26	Storage Tank 1	0.01	0.0	0.02	0.01	0.10	0.000
27	Storage Tank 2	0.01	0.1	0.02	0.01	0.13	0.001
28	Storage Tank 3	0.01	0.0	0.02	0.00	0.12	0.000
29	Storage Tank 4	0.00	0.0	0.02	0.01	0.13	0.001

(Sampling:Nov, 1995)

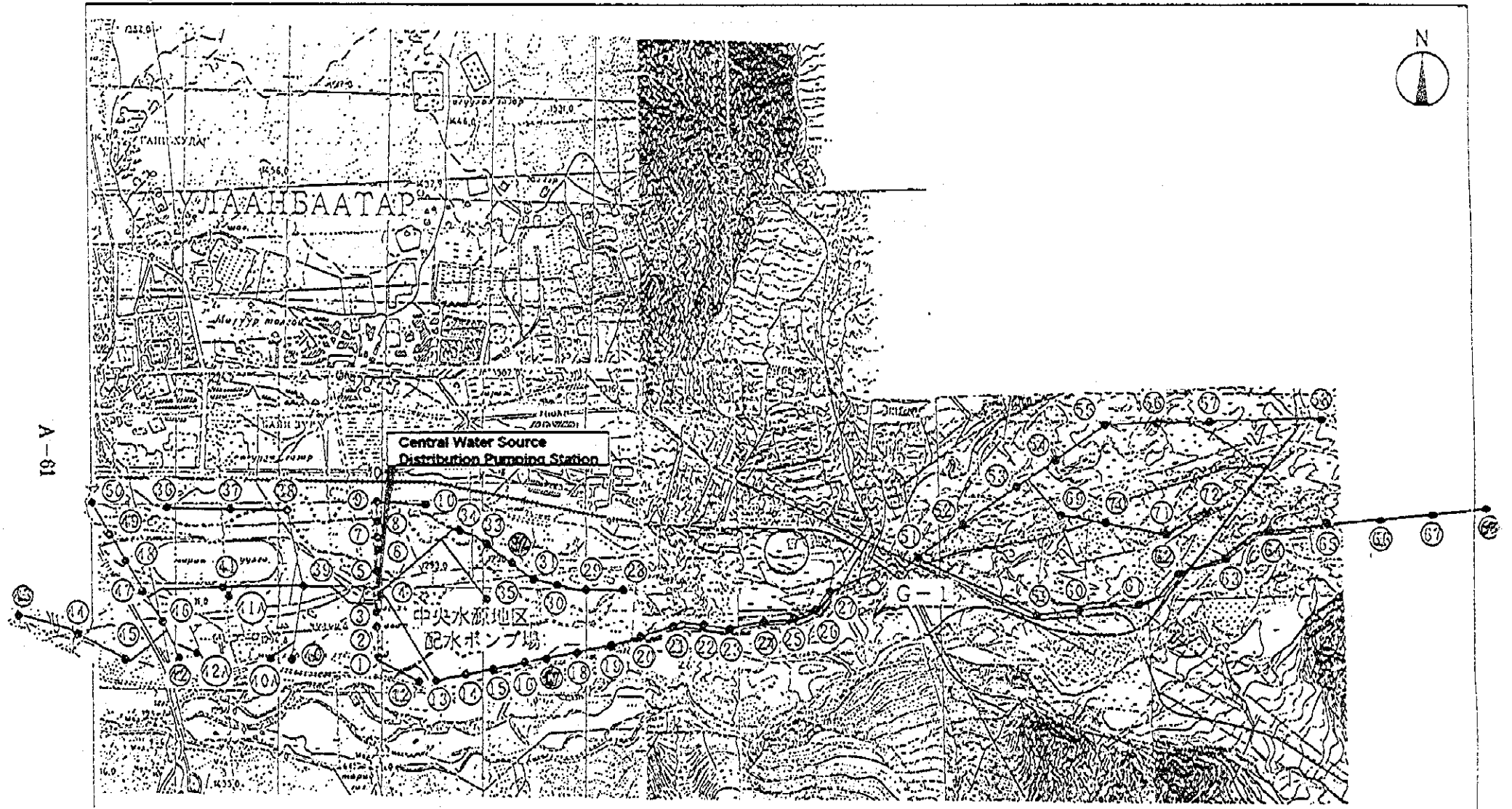
Industry Water Source							
No.	Sample Wells	Cu (mg/l)	Mn (mg/l)	Pb (mg/l)	Cr (mg/l)	F (mg/l)	Cd (mg/l)
1	Well No.3	0.04	0.0	0.03	0.01	0.39	0.001
2	Well No.12	0.04	0.1	0.02	0.01	0.47	0.001
3	Storage Tank 1	0.04	0.1	0.02	0.01	1.10	0.001
4	Storage Tank 2	0.04	0.1	0.02	0.01	0.77	0.001

(Sampling:Nov, 1995)

Veat Complex Water Source							
No.	Sample Wells	Cu (mg/l)	Mn (mg/l)	Pb (mg/l)	Cr (mg/l)	F (mg/l)	Cd (mg/l)
1	Well No.3	0.03	0.1	0.03	0.00	0.17	0.001
2	Well No.6	0.04	0.0	0.03	0.01	0.20	0.001
3	Well No.7	0.05	0.0	0.03	0.01	0.24	0.001
4	Storage Tank 1	0.02	0.1	0.03	0.01	0.27	0.001
5	Storage Tank 2	0.03	0.1	0.03	0.00	0.24	0.001

Table-9 Drinking Water Standard

		Standard (Maximum Level)	
Item	unit	Mongolia	WHO
Color	TCU	20	15
Odour		2	-
Taste		2	-
Perspective	cm	>30	-
Ca^{++}	mg/l	100	-
Mg^{++}	mg/l	30	-
Hardness	mg/l	-	-
Cl^-	mg/l	350	250
NH_4	mg/l	-	1.5
NO_2	mg/l	-	3
NO_3	mg/l	10	50
pH		6.5 - 8.5	-
Fe	mg/l	0.3	0.3
SO_4	mg/l	500	250
TDS	mg/l	1,000	1,000
PO_4	mg/l	3.5	-
Mn	mg/l	0.1	0.1
Cu	mg/l	1.0	1.0
Pb	mg/l	0.03	0.01
F	mg/l	0.7 - 1.5	1.5
Mo	mg/l	0.25	0.07
Zn	mg/l	5.0	3.0
Residual Cl_2	mg/l	-	-
Coliform	Number/l	3	**
Be	mg/l	0.0002	-
Cd	mg/l	0.01	0.003
Ag	mg/l	0.05	-
Se	mg/l	0.001	0.01
St	mg/l	2.0	-
Cr	mg/l	0.05	0.05
Al	mg/l	0.5	0.2
As	mg/l	0.05	0.01
CN	mg/l	0.01	0.07
Phenol	mg/l	1.5	-
Turbidity	NTU	-	5

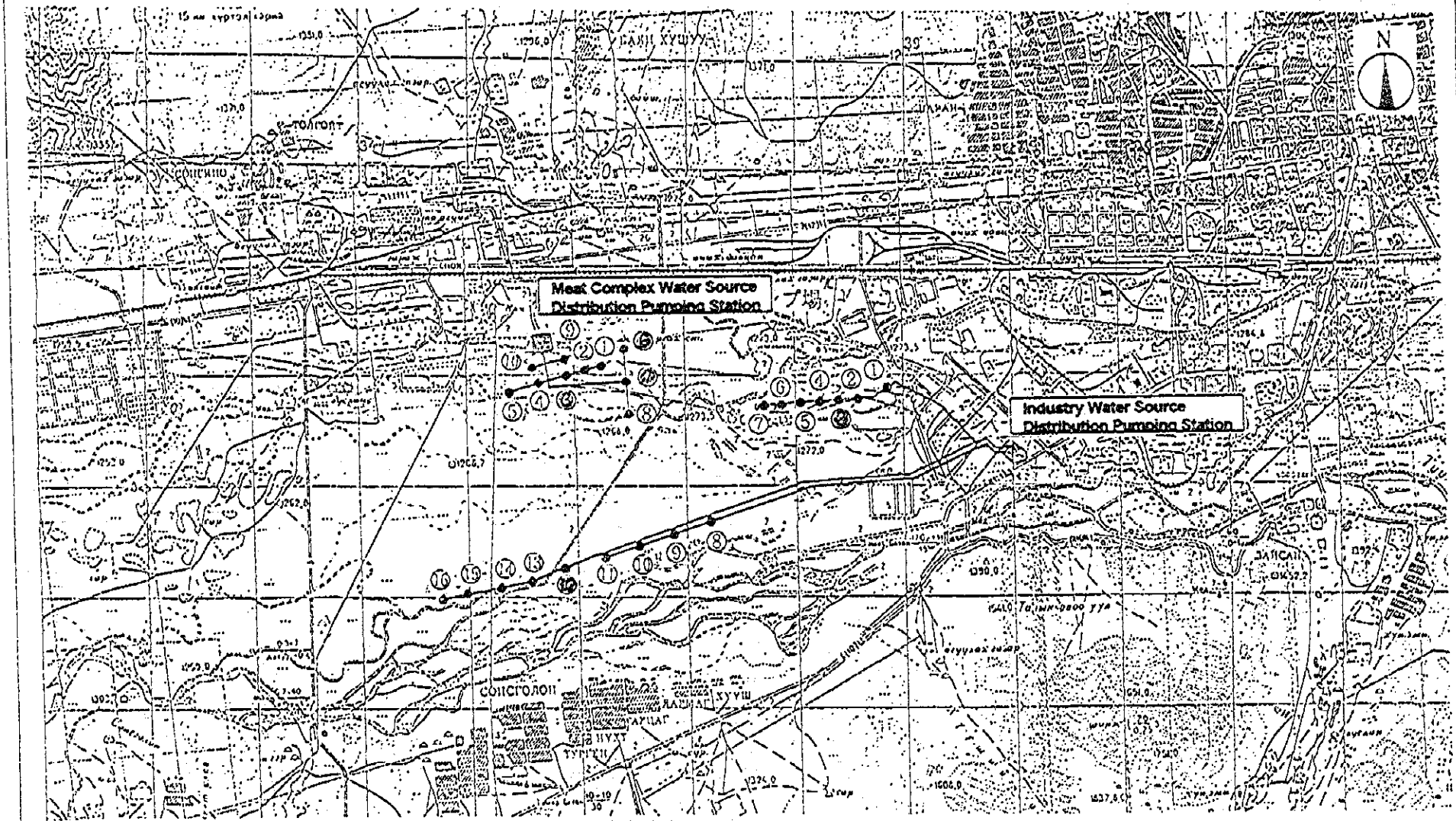


Legend ① : Well Number

⊙ First Survey: (Sampling Date: September, 1995)

⊖ Second Survey: (Sampling Date: November, 1995)

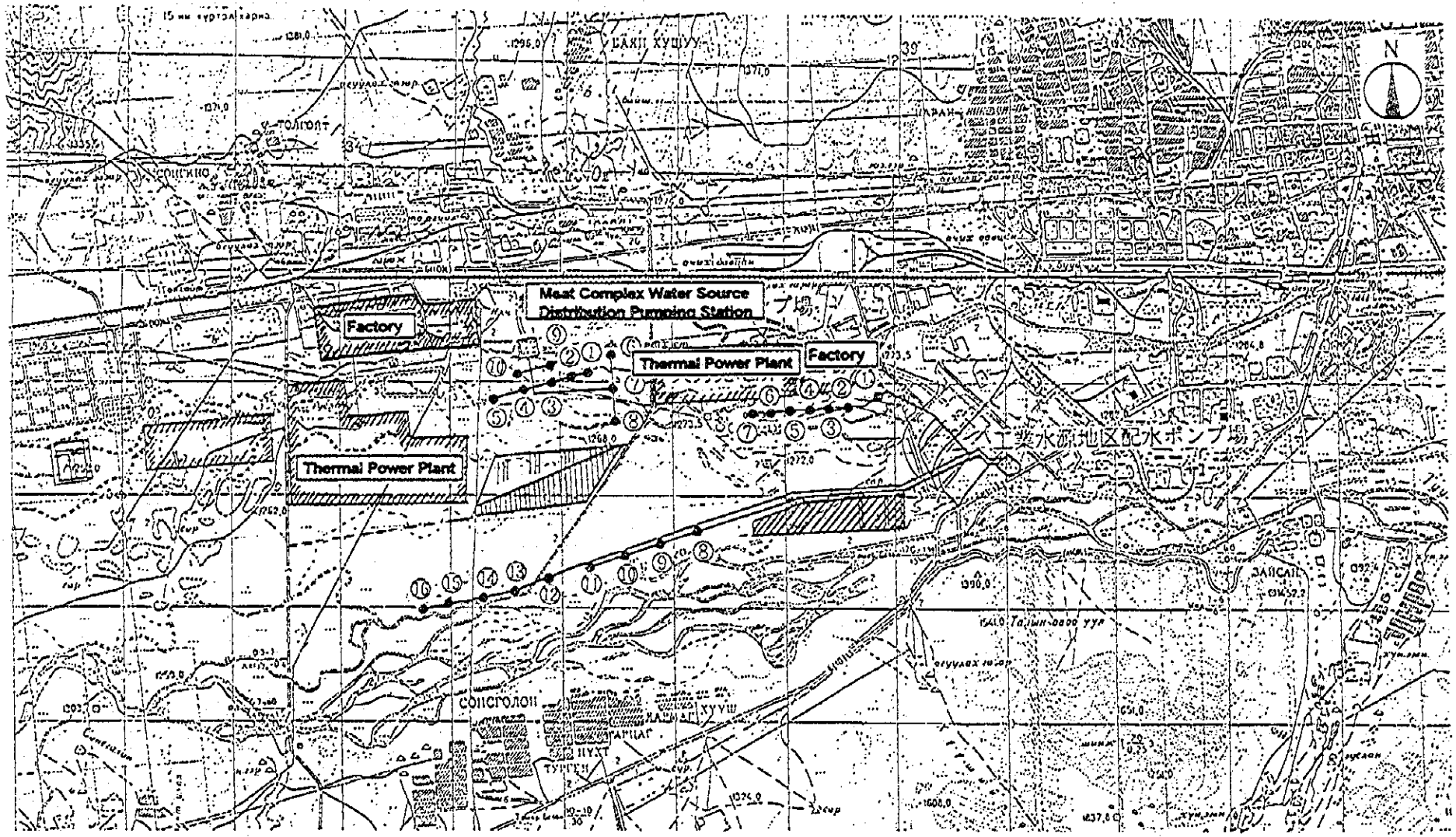
Fig. 4 Water Quality Sampling Points
(Central Water Source)



Legend ① : Well Number ⊙ First Survey: (Sampling Date: September, 1995)

⊙ Second Survey: (Sampling Date: November, 1995)

Fig. 5 Water Quality Sampling Points
(Industry Water Source and Meat Complex Water Source)



Dumping Site (full)

Dumping Site (not full)

Fig. 6 Dumping Site

(Industry Water Source, /Meat Complex Water Source)

Table-10 Water Quality Analysis Results of the Wells Surrounding of the Golf Course

Well No.	Thiram	Simazine	Isoxathion	Diazinon	Fenitrothion	Dichlorobose	Isoprothiolane	Chlorothial	Propyzamid
41	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
43	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
49	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
G-1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Standard	<0.006	<0.003	<0.008	<0.005	<0.003	<0.01	<0.04	<0.04	<0.008

Notes : 1) Unit in mg/l

2) Standard shows Drinking Water Standard stipulated in the Japan's Water Law.

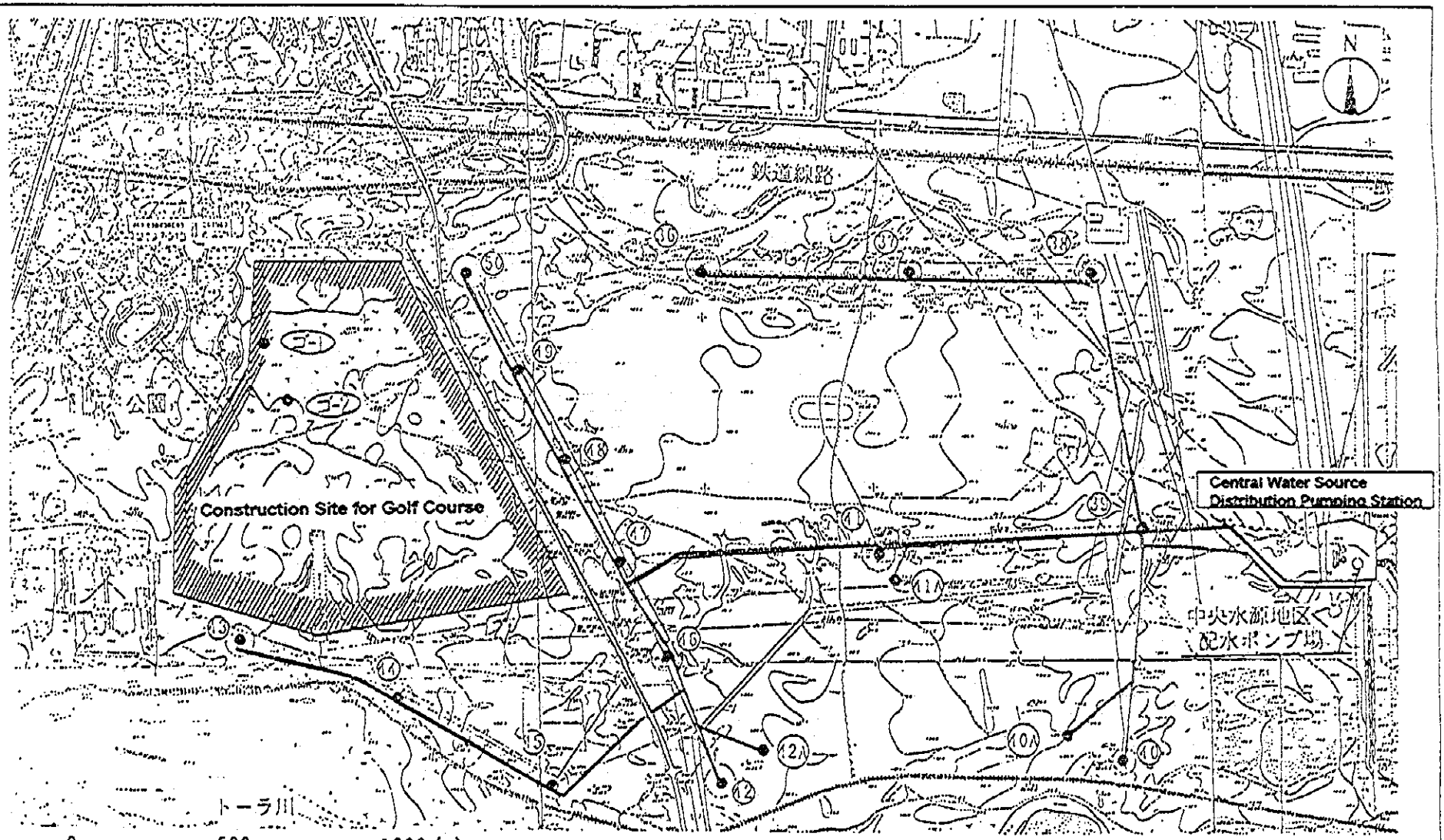


Fig.7 Construction Site for Golf Course

Table-11 Specification of Distribution Pump and Motor

Name of P/S	Pump No.	Pump Specification				Motor Specification			Operational Conditions
		Dia (mm)	Rate (m^3/hr)	Head(m)	Year	Voltage(V)	O/P (kW)	Year	
Central	1	300x250	630	90	1990	Removed for repair			Turbine coil breakdown(unstable voltage)
	2	300x250	630	90	1988	380	200	1988	Operational
	3	300x250	630	90	1987	380	250	1987	Operational(Bearing breakdown. repaired)
	4	300x250	630	90	1987	380	250	1987	Stand-by(Connection error in motor cable)
	5	500x300	2.000	100	1985	6.000	800	1985	Repairing(Bearing breakdown by overheat)
	6	500x300	2.000	100	1985	6.000	800	1985	Stand-by(Turbine coil breakdown)
	7	500x300	2.000	100	1985	6.000	800	1985	Operational
Tasgan	1	300x250	630	90	1984	380	250	1969	Stand-by(No.2.4 have enough capacity)
	2	300x250	630	90	1981	380	160	1981	Operational
	3	300x250	630	90	1984	380	160	1984	Stand-by(No.2.4 have enough capacity)
	4	300x250	630	90	1984	380	160	1984	Operational
Industrial	1	400x300	1.250	60	1973	380	200	1973	Malfunctional(Axis shall be exchanged)
	2	300x250	1.050	90	1987	380	200	1987	Operational(Control system out of order)
	3	300x250	1.050	90	1987	380	200	1987	Suspended(Bearing shall be replaced)
	4	400x300	1.250	60	1961	380	200	1961	Malfunctional(Axis shall be exchanged)
Meat Complex	1	300x250	500	65	1985	380	160	1985	Suspended(1985 made pump was installed)
	2	300x250	630	90	1990	380	260	1990	Operational(Alternative operation w/ No.1
	3	300x250	500	65	1988	380	160	1988	Stand-by
	4	300x250	500	65	1985	380	160	1985	Suspended(Impeller shall be replaced)
Upper	1	400x300	1.000	180	1989	6.000	630	1989	Stand-by(Alternative operation w/ No.6)
	2	400x300	1.000	180	1987	6.000	500	1987	Suspended(Bearing shall be repaired)
	3	400x300	1.000	180	1987	6.000	500	1987	Operational
	4	400x300	1.000	180	1987	6.000	500	1987	Suspended(Bearing shall be repaired)
	5	400x300	1.000	180	1987	6.000	500	1987	Suspended(Cylinder breakdown)
	6	400x300	1.000	180	1989	6.000	630	1989	Stand-by(Alternative operation w/ No.1)
Total	25								

Note 1) O/P=Out Put. Note 2) [ ] Proposed pumps for replacement(Regarding pumps of Industrial D/P/S. No. and specification of pumps to be replaced will be determined after the pipeline analysis)

Table-12 Pump Capacity after Replacement

Central Water Source					
Well No.	Existing Pump Cap.		Pump Cap. after Replacement		
	Capacity (m3/hr)	Head (m)	Replace-ment	Capacity (m3/hr)	Head (m)
1	40	60		40	60
2	40	60		40	60
3	25	100	○	60	65
4	63	65		63	65
5	63	65		63	65
6	63	65		63	65
7	63	65		63	65
8	63	65	○	60	65
9	63	65	○	60	65
10	63	65	○	60	65
11	Abandon Well				
12	63	65	○	60	65
13	63	65	○	60	65
14	63	65	△	63	65
15	63	65	○	60	65
16	120	65		120	65
17	63	65	△	63	65
18	63	65	○	60	65
19	63	65	△	63	65
20	63	65		63	65
21	120	65		120	65
22	63	65		63	65
23	63	65	△	63	65
24	63	65	△	63	65
25	120	65	△	120	65
26	63	65	△	63	65
27	63	65	△	63	65
28	63	65	△	63	65
29	63	150		63	150
30	63	65		63	65
31	63	65	○	60	65
32	63	65		63	65
33	63	65		63	65
34	63	65		63	65
35	63	65		63	65
36	63	65		63	65
37	63	65	○	60	65
38	63	65		63	65
39	63	65	○	60	65
40	63	150		63	150
41	63	65		63	65
42	63	65		63	65
43	63	65	○	60	65
44	25	100	◎	60	65

Notes : ○ Replacement due to the pump damage
◎ Replacement due to the appropriate pumping rate
△ Replaceme due to the pasted pump life

Table-13 Pump Capacity after Replacement

Central Water Source					
Well No.	Existing Pump		Pump Cap. after Replacement		
	Capacity (m3/hr)	Head (m)	Replace-ment	Capacity (m3/hr)	Head (m)
45	25	100	◎	60	65
46	63	65		63	65
47	63	65		63	65
48	63	65		63	65
49	63	65		63	65
50	63	65	○	60	65
51	63	65		63	65
52	120	60	○	60	65
53	63	65	△	63	65
54	63	65		63	65
55	63	65	△	63	65
56	63	65	△	63	65
57	25	100	◎	60	65
58	40	60		40	60
59	63	65	△	63	65
60	63	65		63	65
61	63	65		63	65
62	40	60	○	60	65
63	25	100	◎	60	65
64	40	60	○	60	65
65	25	100	◎	60	65
66	25	100	◎	60	65
67	25	100	○	60	65
68	25	100	◎	60	65
69	10	60	○	60	65
70	63	65	△	63	65
71	25	100	◎	60	65
72	25	100	◎	60	65
N-1			○	60	65
N-2			○	60	65
N-3			○	60	65
N-4			○	60	65
N-5			○	60	65
N-6			○	60	65
N-7			○	60	65
N-8			○	60	65
Total	4, 115	(m^3/h)		4, 974	(m^3/h)
	98, 760	(m^3/d)		119, 376	(m^3/d)

Notes: ○ Replacement due to the pump damage
◎ Replacement due to the appropriate pumping rate
△ Replaceme due to the pasted pump life

Table-14 Pump Capacity after Replacement

Industry Water Source					
Well No	Existing Pump		Replacement Pump		
	Capacity (m3/hr)	Head (m)	Replace-ment	Capacity (m3/hr)	Head (m)
1	63	65	No	63	65
2	120	60	No	120	60
3	120	60	No	120	60
4	120	60	No	120	60
5	120	60	No	120	60
6	160	65	No	160	65
7	160	65	No	160	65
8	160	65	No	160	65
9	No Pump & Motor		No	No Pump & Motor	
10	200	75	No	200	75
11	120	60	No	120	60
12	No Pump & Motor		No	No Pump & Motor	
13	No Pump & Motor		No	No Pump & Motor	
14	120	60	No	120	60
15	No Pump & Motor		No	No Pump & Motor	
16	120	60	No	120	60
T.Amount	1,583	(m3/hr)		1,583	(m3/hr)
	37,992	(m3/day)		37,992	(m3/day)

Meat Complex Water Source					
Well No	Existing Pump		Replacement Pump		
	Capacity (m3/hr)	Head (m)	Replace-ment	Capacity (m3/hr)	Head (m)
1	120	60	No	120	60
2	160	65	No	160	65
3	120	60	No	120	60
4	120	60	No	120	60
5	120	60	No	120	60
6	63	65	No	63	65
7	63	65	No	63	65
8	63	65	No	63	65
9	120	60	No	120	60
10	110	100	No	110	100
T.Amount	1,059	(m3/hr)		1,059	(m3/hr)
	25,416	(m3/day)		25,416	(m3/day)

Table-15 List of Storage Tank at Distribution Pumping Station

Name of P/S	Upper	Central	Industrial	Meat Complex
Capacity	1,000m³×2units =2,000m³	6,000m³×1unit 3,000m³×1unit 500m³×2units Total 10,000 m³	2,000m³×2units =4,000m³	2,000m³×2units =4,000m³
Dimensions	14mx15mx4.8m x2units	36mx36mx4.8mx1unit φ25m x4.8mx1unit φ10.5mx4.8mx1unit	18mx24mx4.8m x2units	18mx24mx4.8m x2units
Completion Year	1991	1959(φ10.5m) 1972	1963	1966
Water Level	HWL=+1,430.00m LWL=+1,425.20m	HWL=+1,299.95m LWL=+1,295.15m	HWL=+1,283.80m LWL=+1,279.00m	HWL=+1,271.88m LWL=+1,267.08m
Water Source	Upper : 39 wells	Central : 70 wells	Industrial 16 Well	精肉工場水源 8井
Service Area	Ulaanbaatar City	Ulaanbaatar City, Tasgan Booster P/S	Ulaanbaatar City, Industrial Area	Ulaanbaatar City, Meat Complex Planned to connect to North-West Res. (not completed)

Table-16 List of Reservoir

Name	North-East	Tasgan	3/4 District	North-West	Zavsariin
Capacity	6,000m³ ×2units =12,000m³	6,000m³ ×3units =18,000m³	3,000m³ ×2units =6,000 m³	3,000m³ ×2units =6,000 m³	3,000m³ ×2units =6,000 m³
Dimensions	36mx36mx4.8m x2units	36mx36mx4.8m x3units	24mx27mx4.8m x2units	24mx27mx4.8m x2units	24mx27mx4.8m x2units
Completion Year	1985	1977(2units) 1986(1unit)	1985	Not Completed	1987
Water Level	HWL=+1,386.86m LWL=+1,382.06m	HWL=+1,334.80m LWL=+1,330.00m	HWL=+1,374.80m LWL=+1,370.00m	HWL=+1,346.80m LWL=+1,342.00m	HWL=+1,429.80m LWL=+1,425.00m
Water Source	Upper D/P/S	Central D/P/S	Tasgan Booster P/S	Meat Complex D/P/S	Upper D/P/S
Service Area	Ulaanbaatar City(Gravity)	Ulaanbaatar City(Gravity) 3/4 District Res. (Pressure)	Ulaanbaatar City(Gravity)	Ulaanbaatar City(Gravity)	Ulaanbaatar City(Gravity)
Remarks	Not utilised, since existing facilities have enough capacity	Operational	Operational	Not Completed	Not utilised due to failure in pressure control