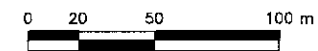
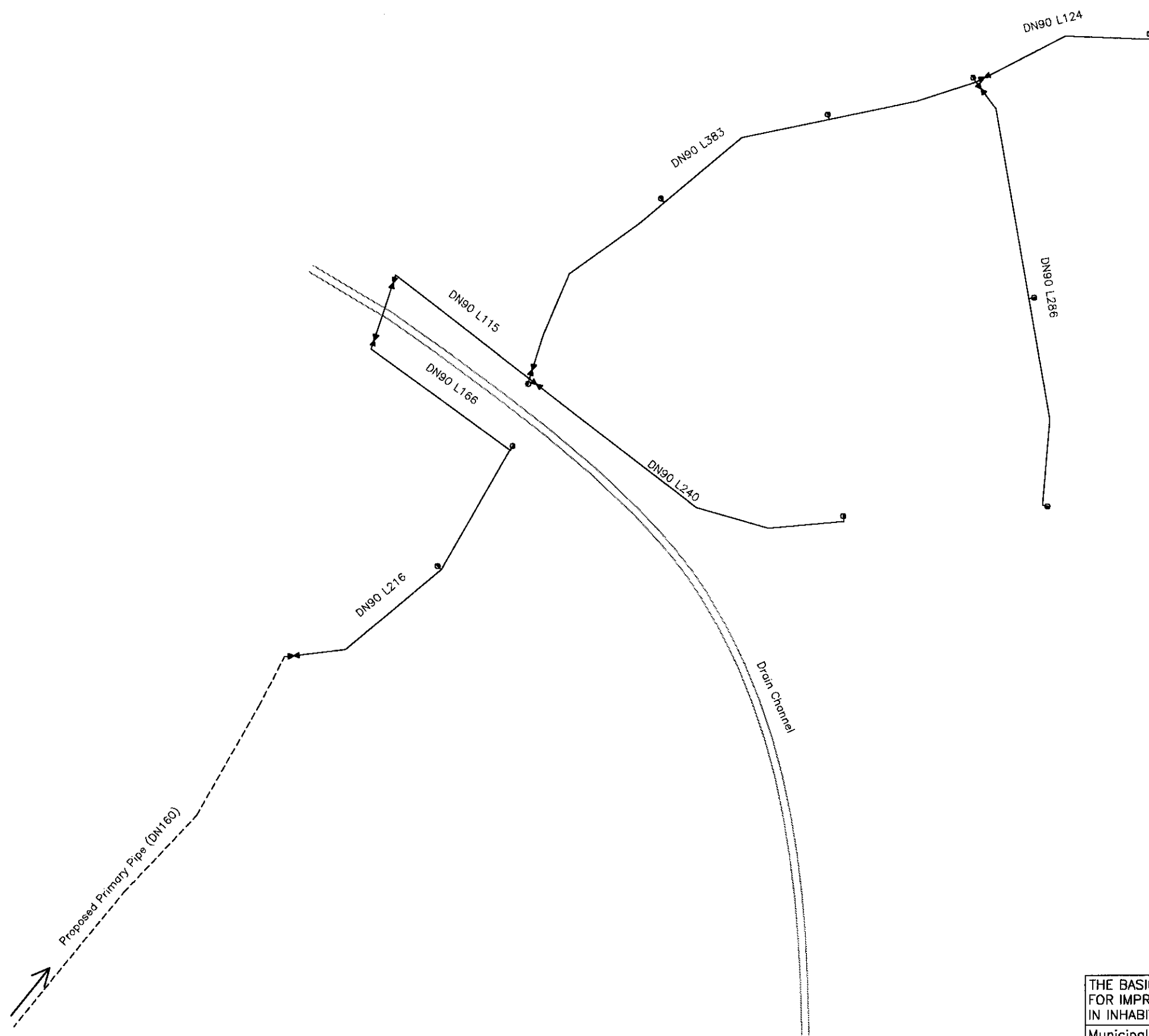
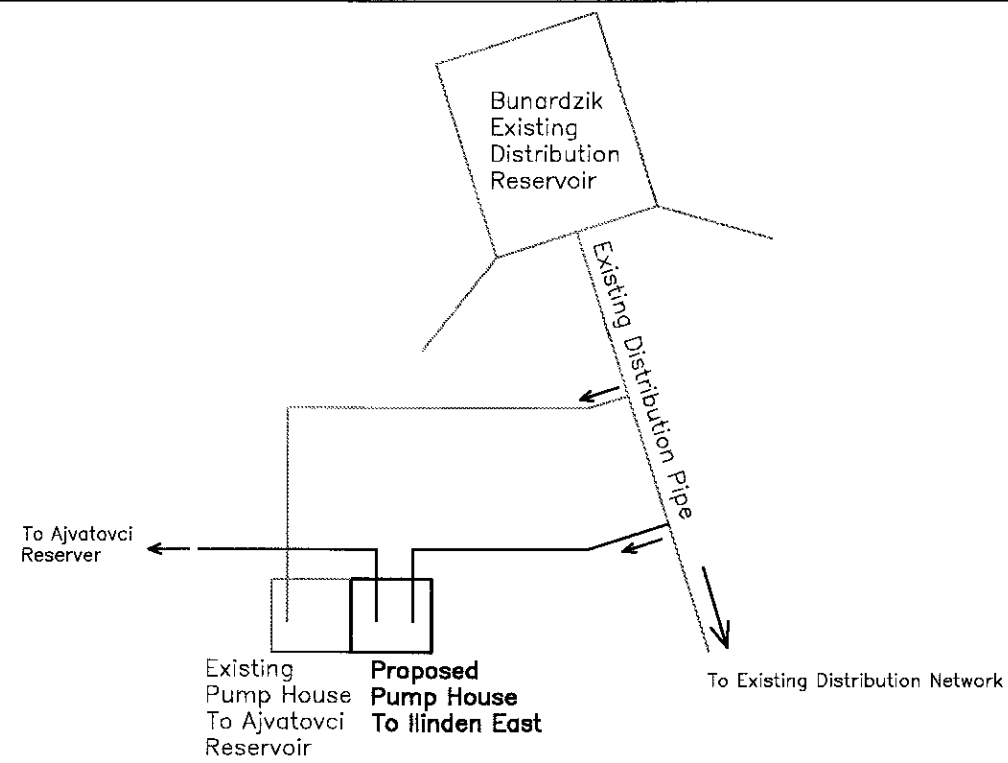


THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SČOPJE OUTSKIRTS	
Municipality : Petrovec	
System : Joint System of Three Municipalities	
Title : Ognanci Secondary Network	Scale : 1:2000
August 2003	Drawing No : 03-11
JAPAN INTERNATIONAL COOPERATION AGENCY	

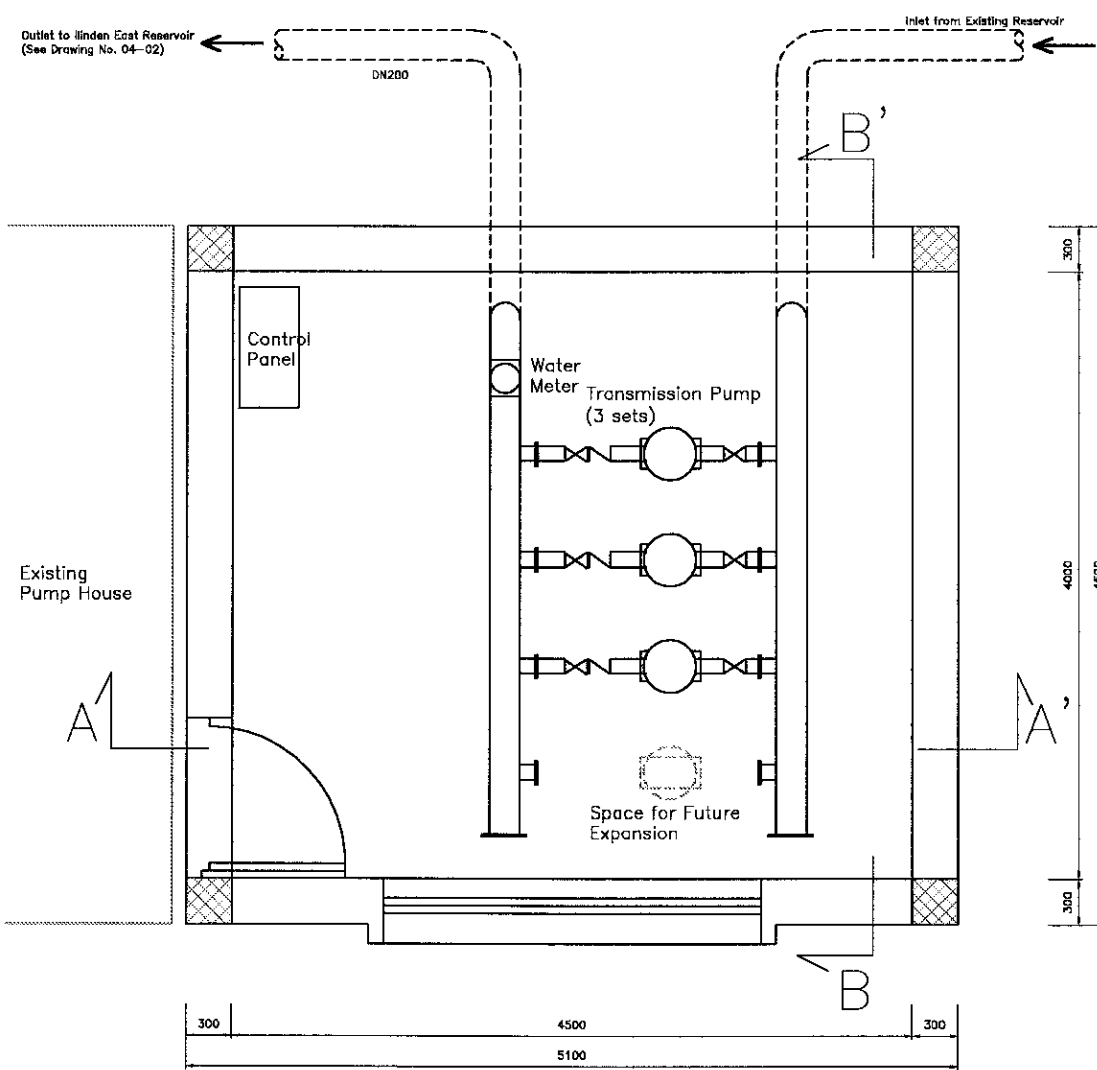


(Note)
Pipe routes, length and diameters are tentatively designed by using available information.
They are to be reviewed and revised in the detail design stage.

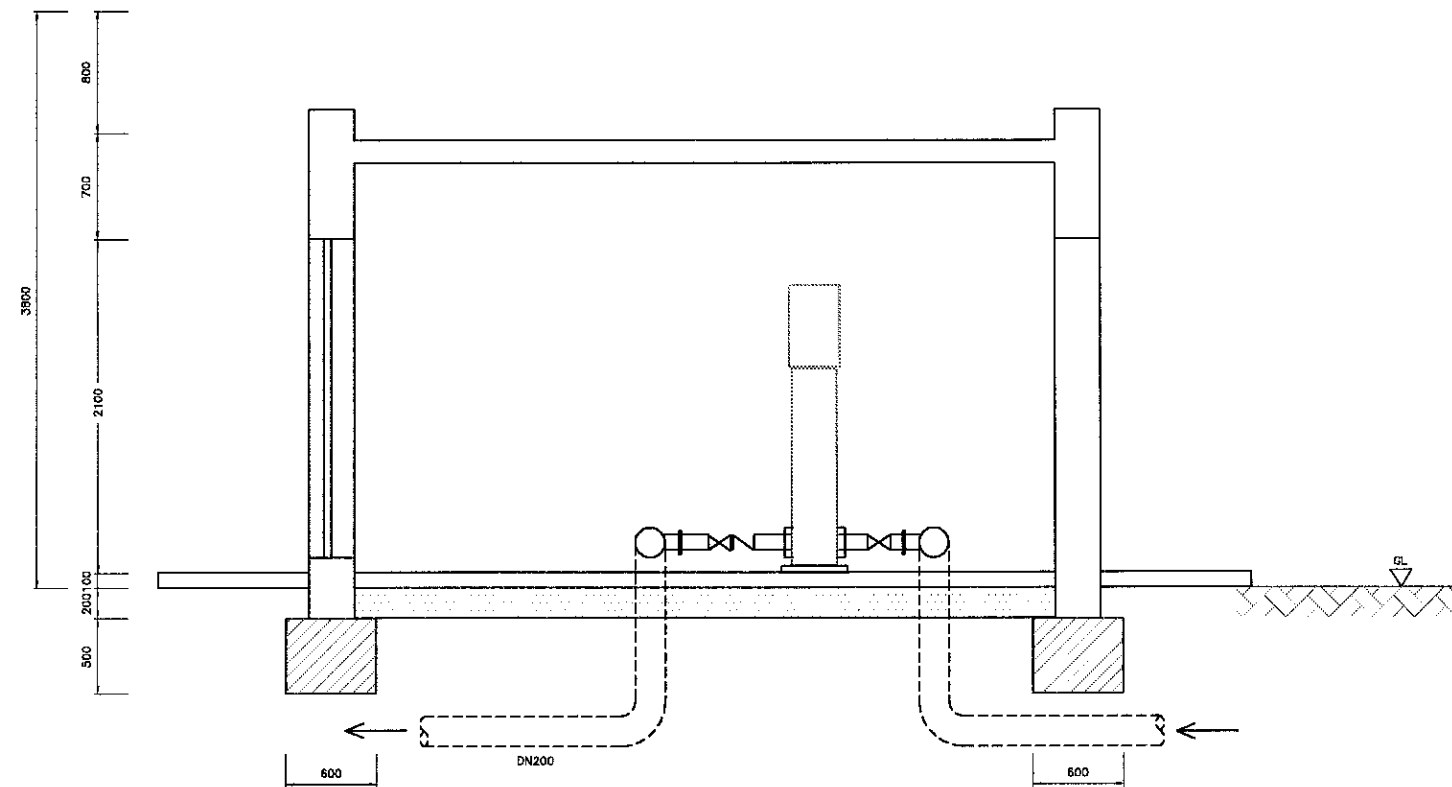
THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPJE OUTSKIRTS	
Municipality : Petrovec	
System : Joint System of Three Municipalities	
Title : Kojlija Secondary Network	Scale :
August 2003	Drawing No : 03-12
JAPAN INTERNATIONAL COOPERATION AGENCY	



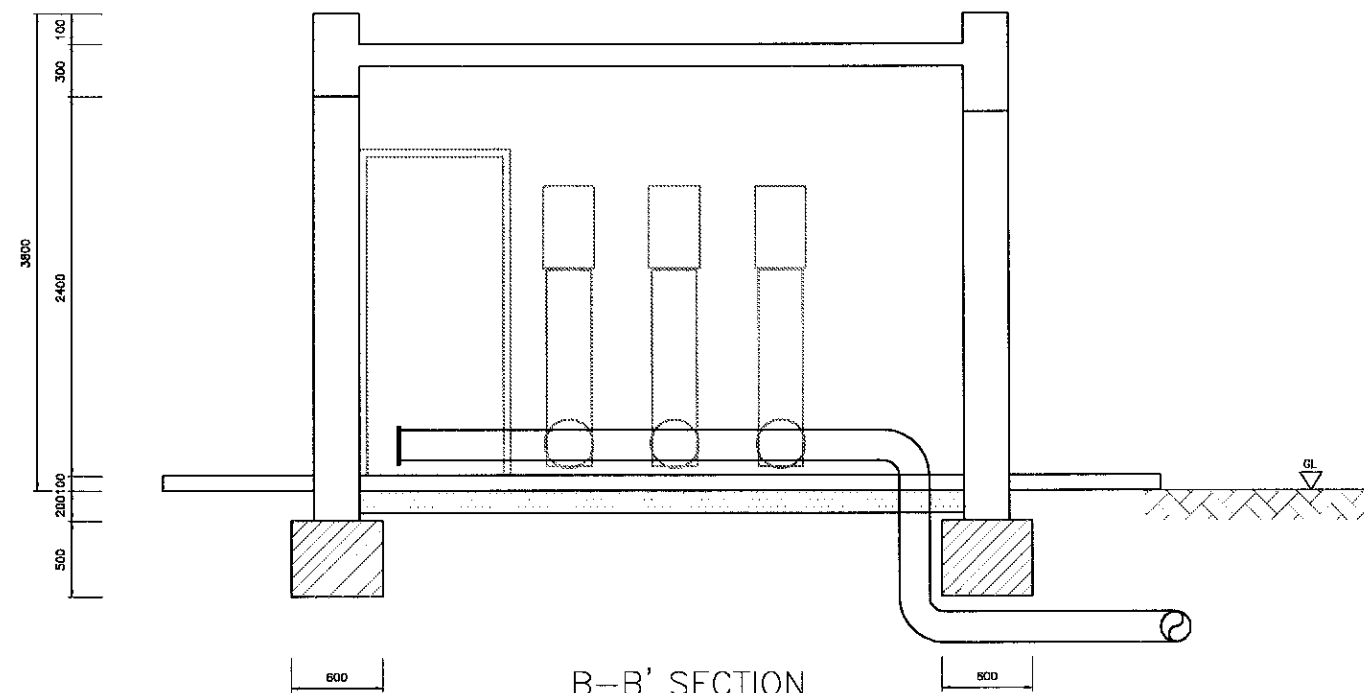
LAYOUT PLAN



PLAN



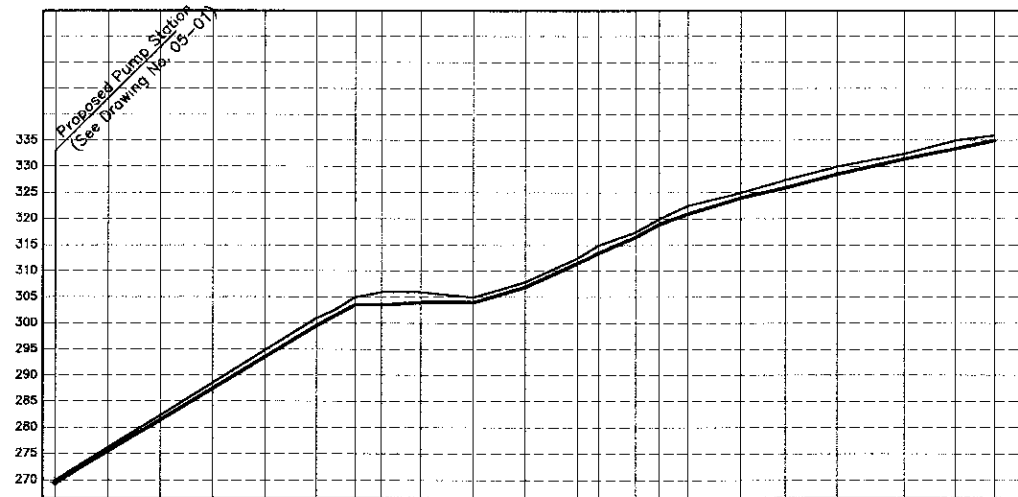
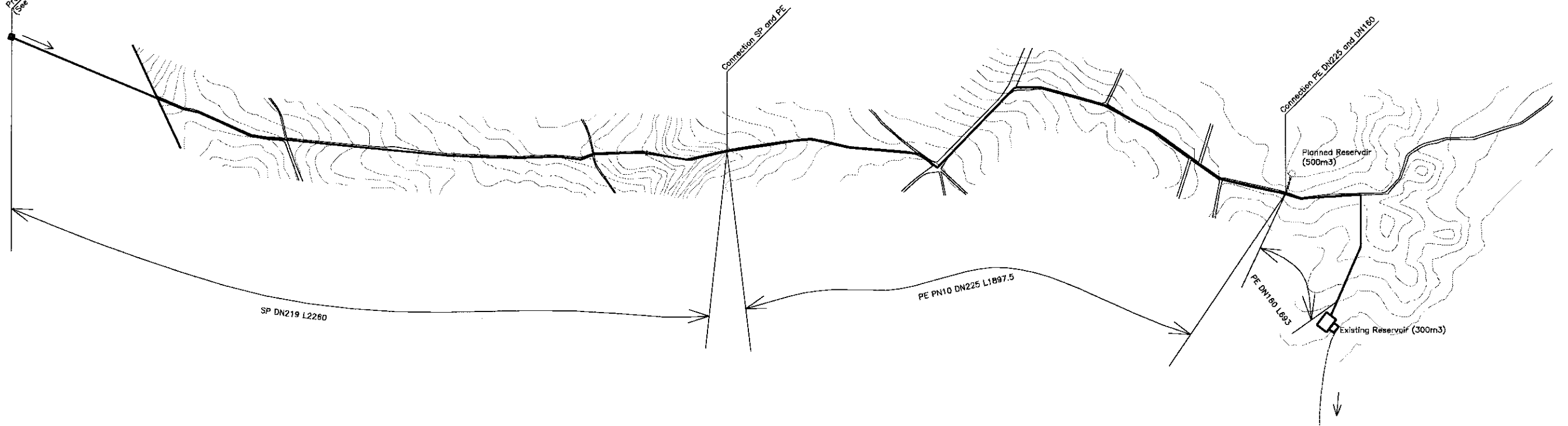
A-A' SECTION



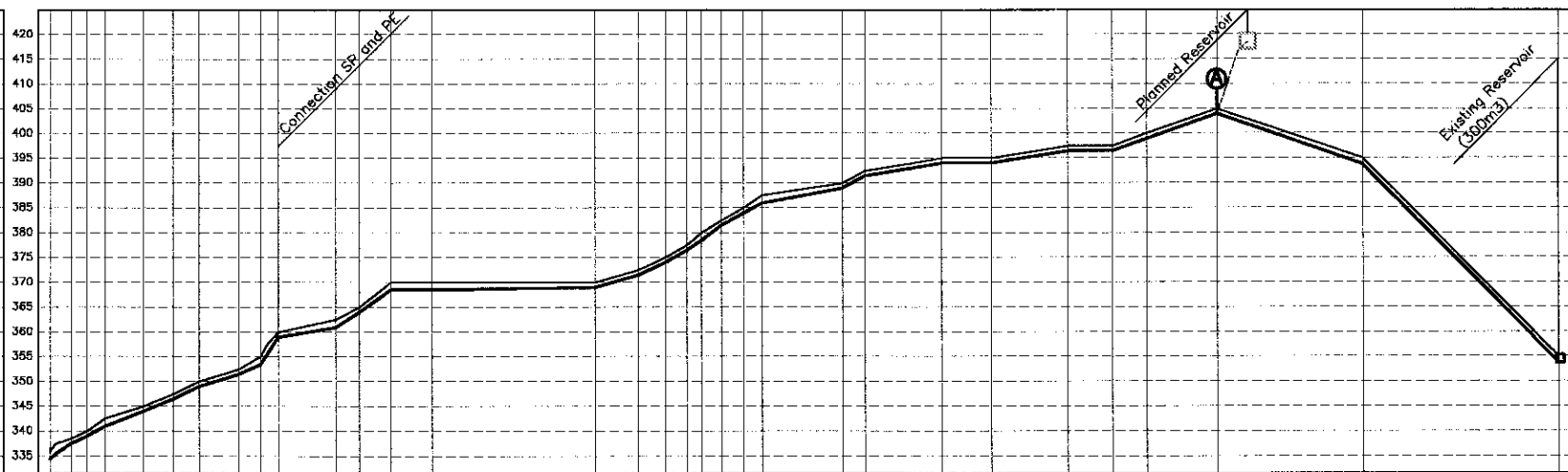
B-B' SECTION

THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPJE OUTSKIRTS	
Municipality : Ilinden	
System : Ilinden East	
Title : Ilinden East Pump Station	Scale : 1:50
August 2003	Drawing No : 04-01
JAPAN INTERNATIONAL COOPERATION AGENCY	

Proposed Pump Station
(See Drawing No. 04-01)



SP DN219 L2260.0	
Ground Elevation (+m)	270.0
Pipe Elevation (+m)	288.0
Covering Depth (m)	18.0
Span Distance (m)	18.0
Accumulated Distance (m)	18.0



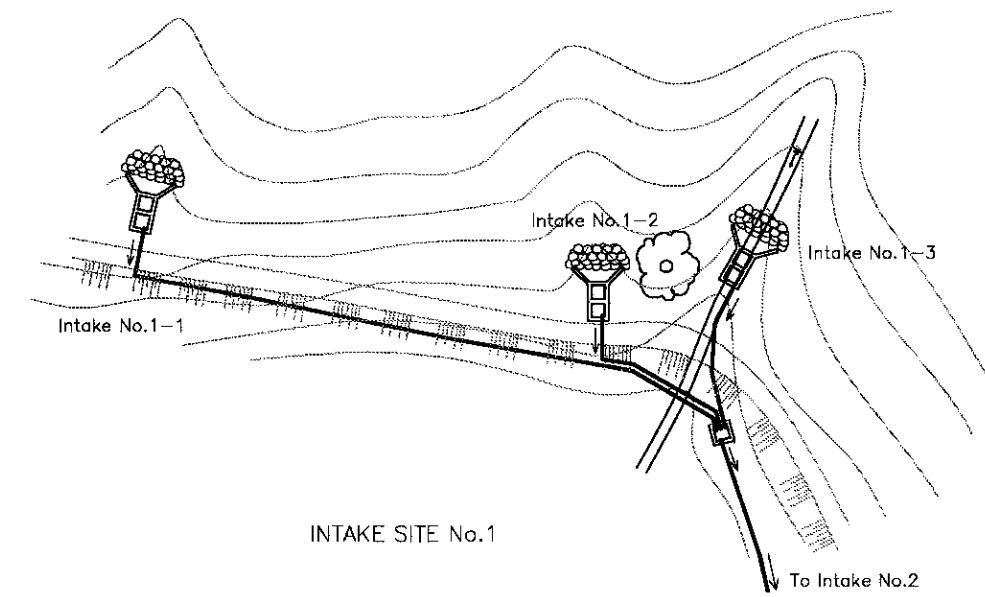
PE PN10 DN225 L1897.5		PE DN160 L693.0	
Ground Elevation (+m)	335.0	405.0	335.0
Pipe Elevation (+m)	354.3	397.5	353.8
Covering Depth (m)	19.3	7.5	18.2
Span Distance (m)	19.3	7.5	18.2
Accumulated Distance (m)	19.3	7.5	18.2

THE BASIC DESIGN STUDY ON THE PROJECT
FOR IMPROVEMENT OF WATER SUPPLY
IN INHABITED PLACES IN SCOPJE OUTSKIRTS

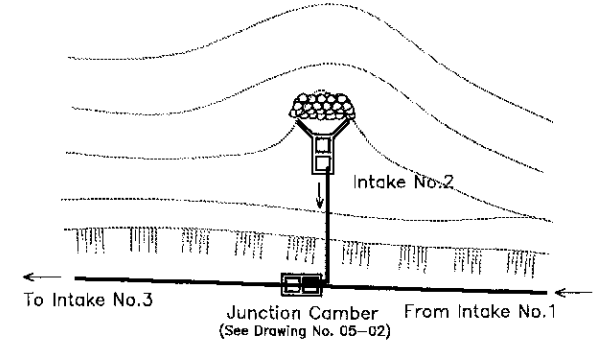
Municipality : Ilinden
System : Ilinden East
Title : Transmission Pipeline
Scale : Non

August 2003 Drawing No : 04-02

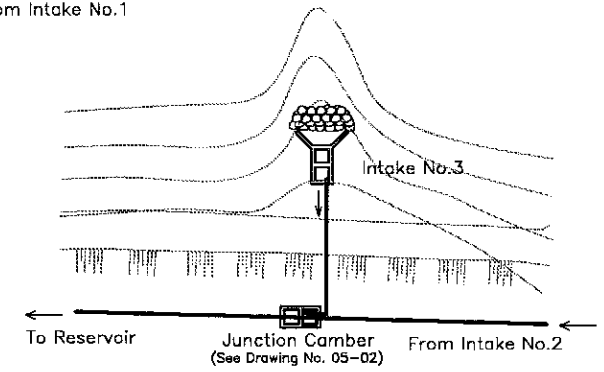
JAPAN INTERNATIONAL COOPERATION AGENCY



INTAKE SITE No. 1

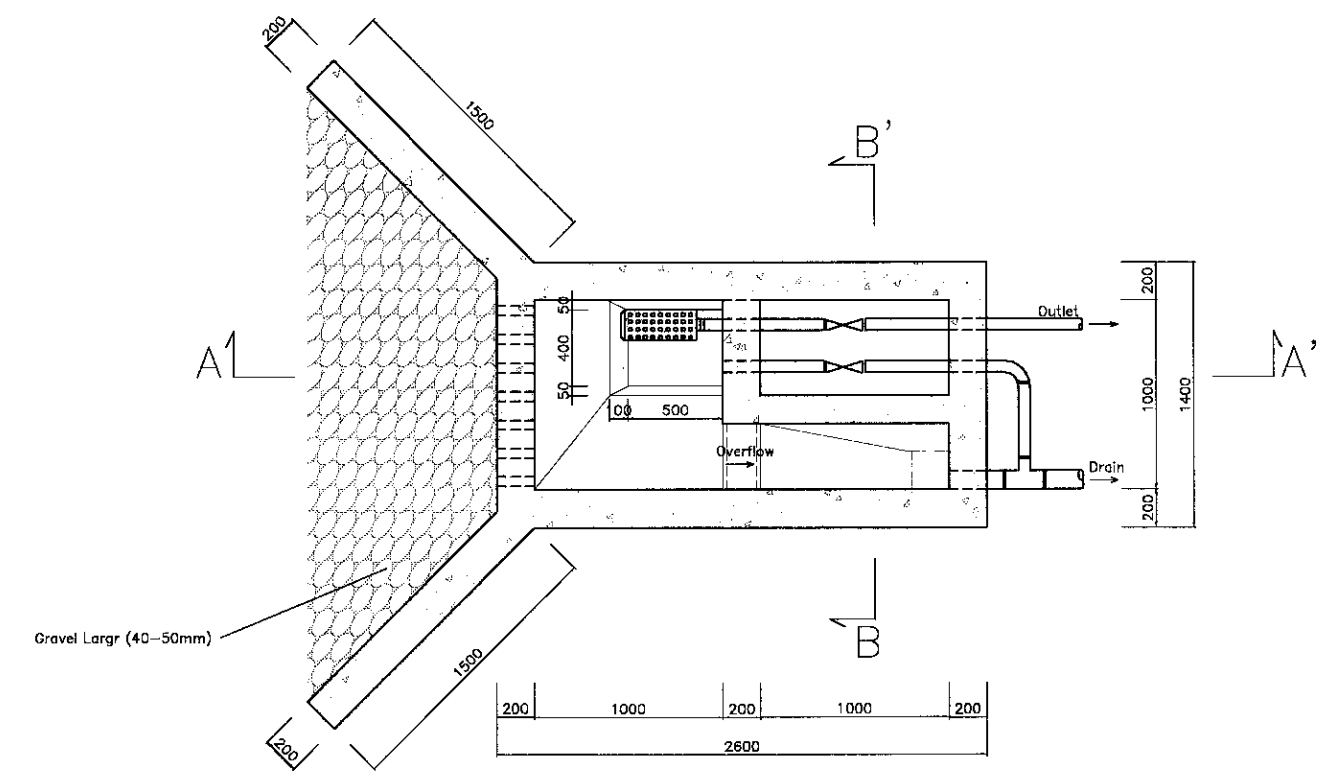


INTAKE SITE No. 2

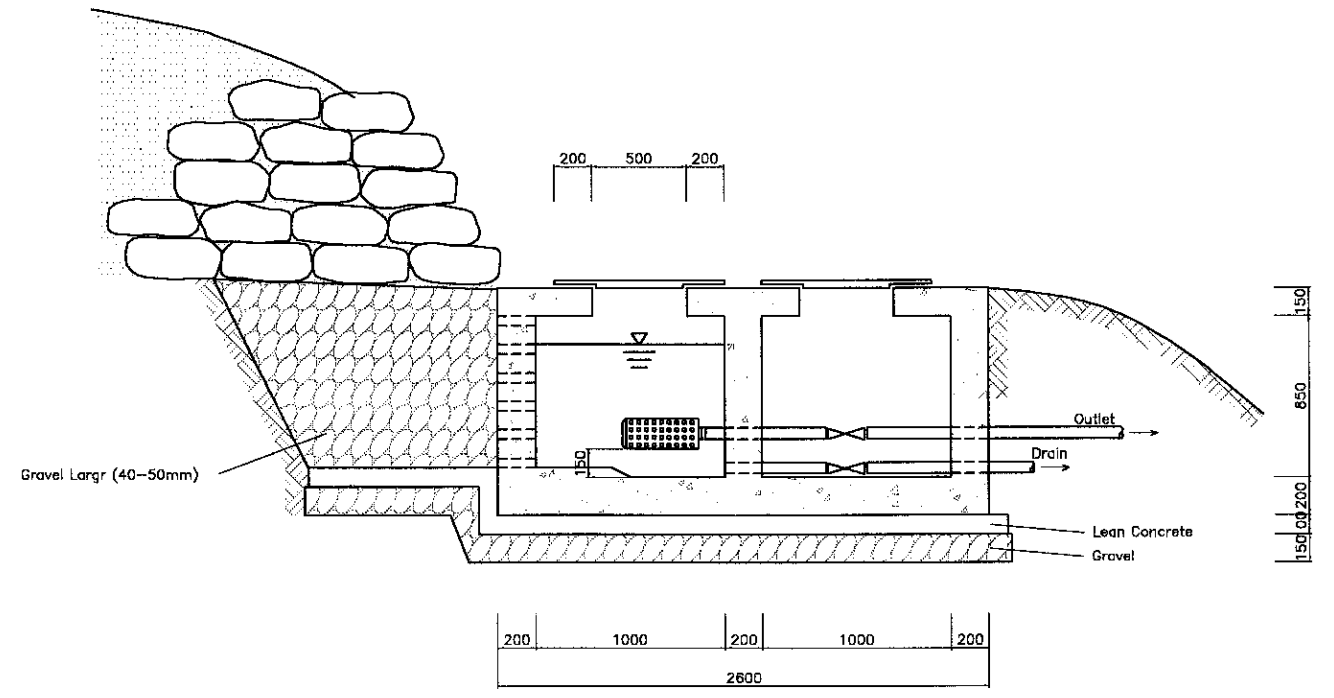


INTAKE SITE No. 3

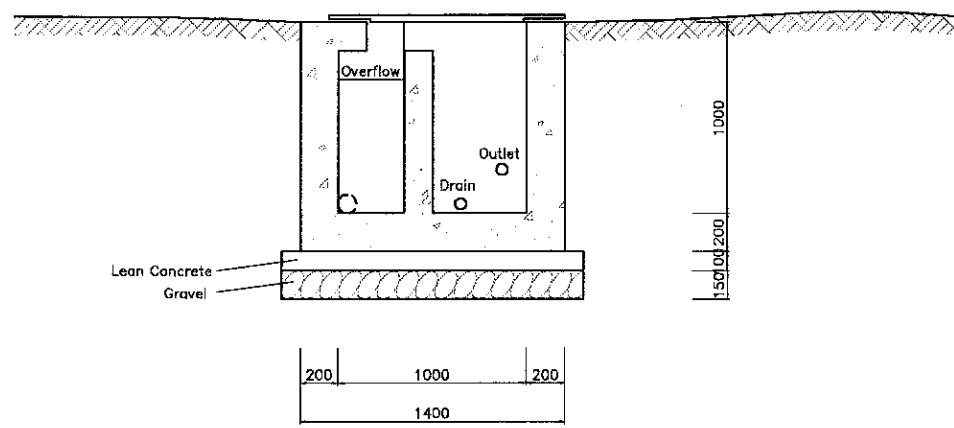
LAYOUT PLAN (See Drawing No. 05-02)



PLAN

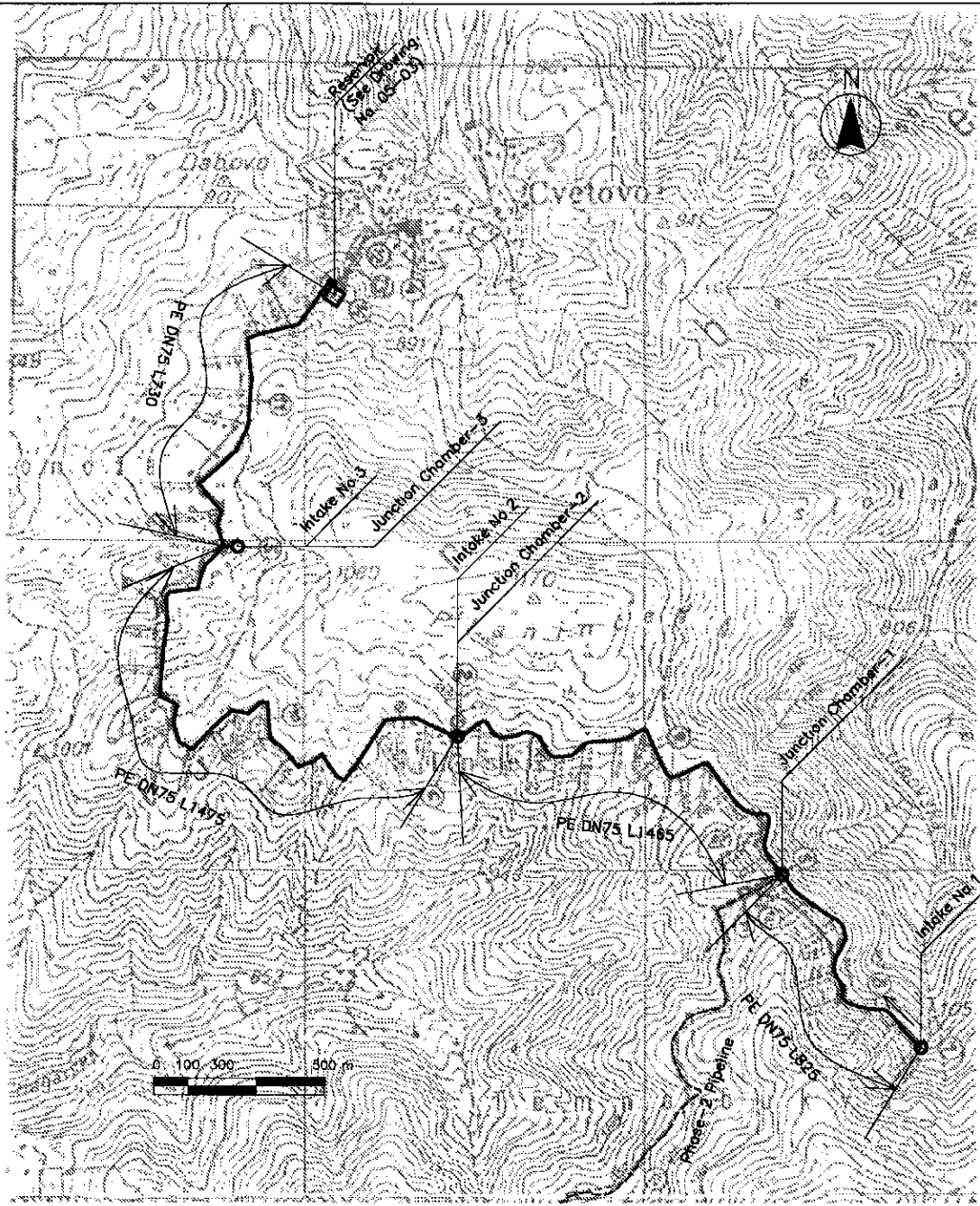


A-A' SECTION

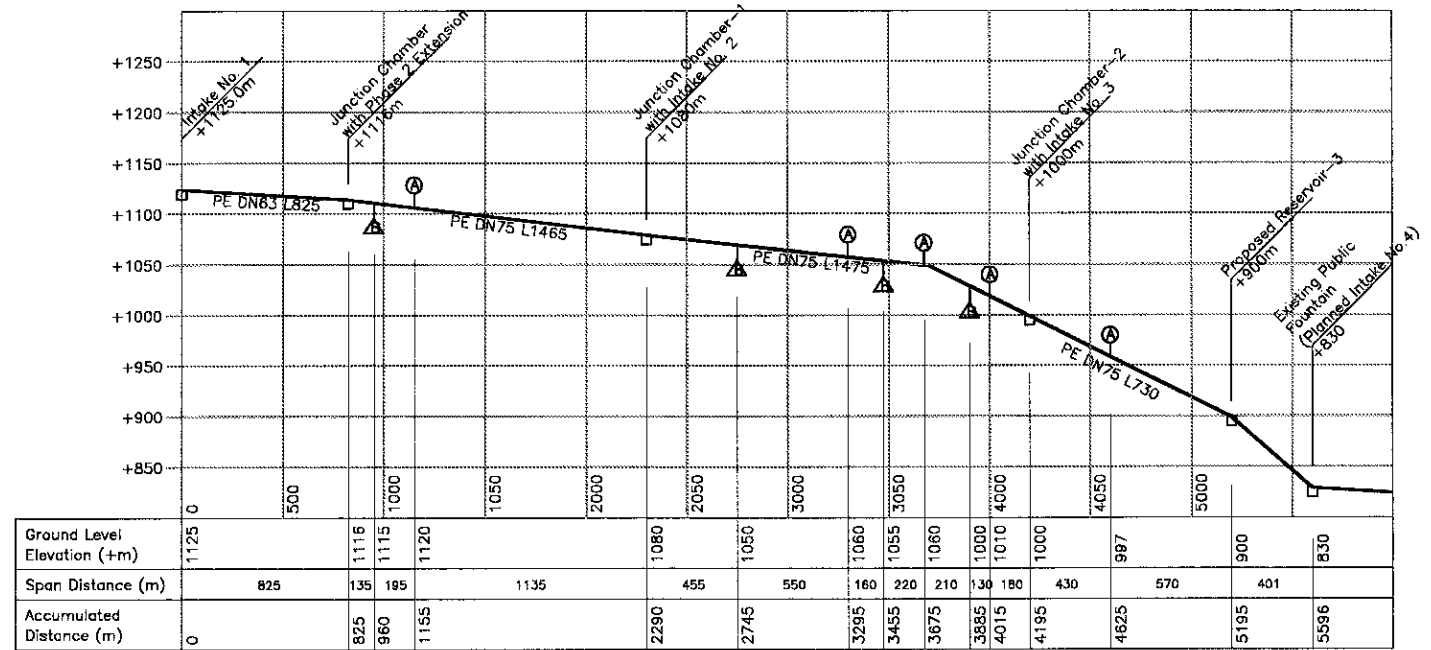


B-B' SECTION

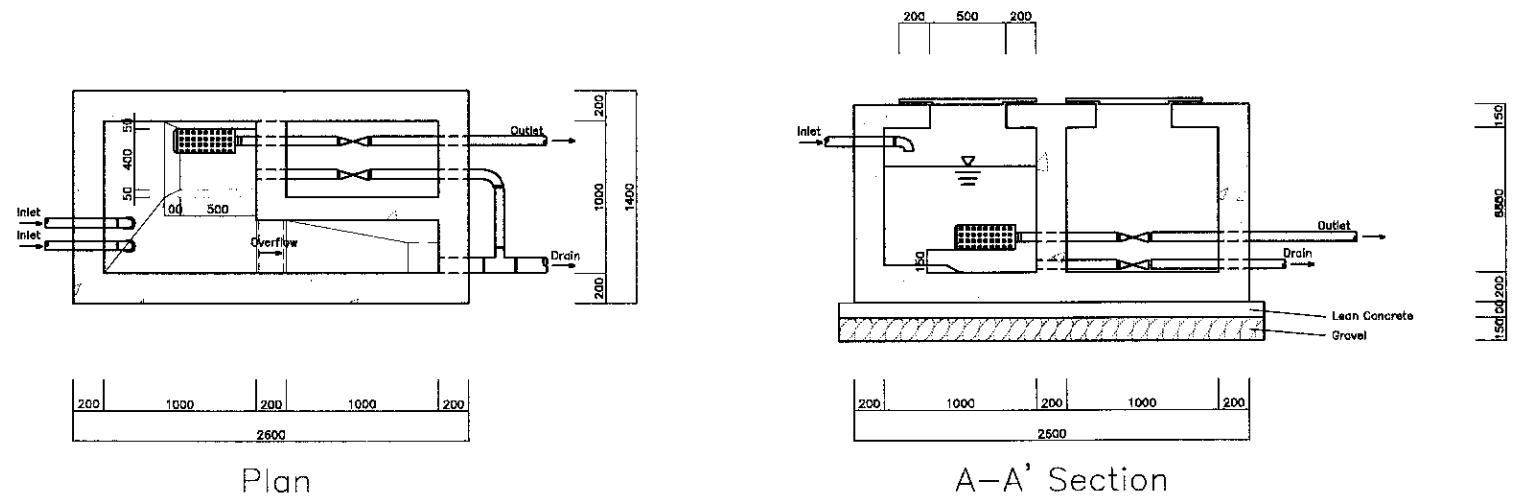
THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPJE OUTSKIRTS	
Municipality : Studenicani	
System : Cvetovo	
Title : Intake Facility	Scale : Non
August 2003	Drawing No : 05-01
JAPAN INTERNATIONAL COOPERATION AGENCY	



GENERAL LAYOUT



LONGITUDINAL PROFILE

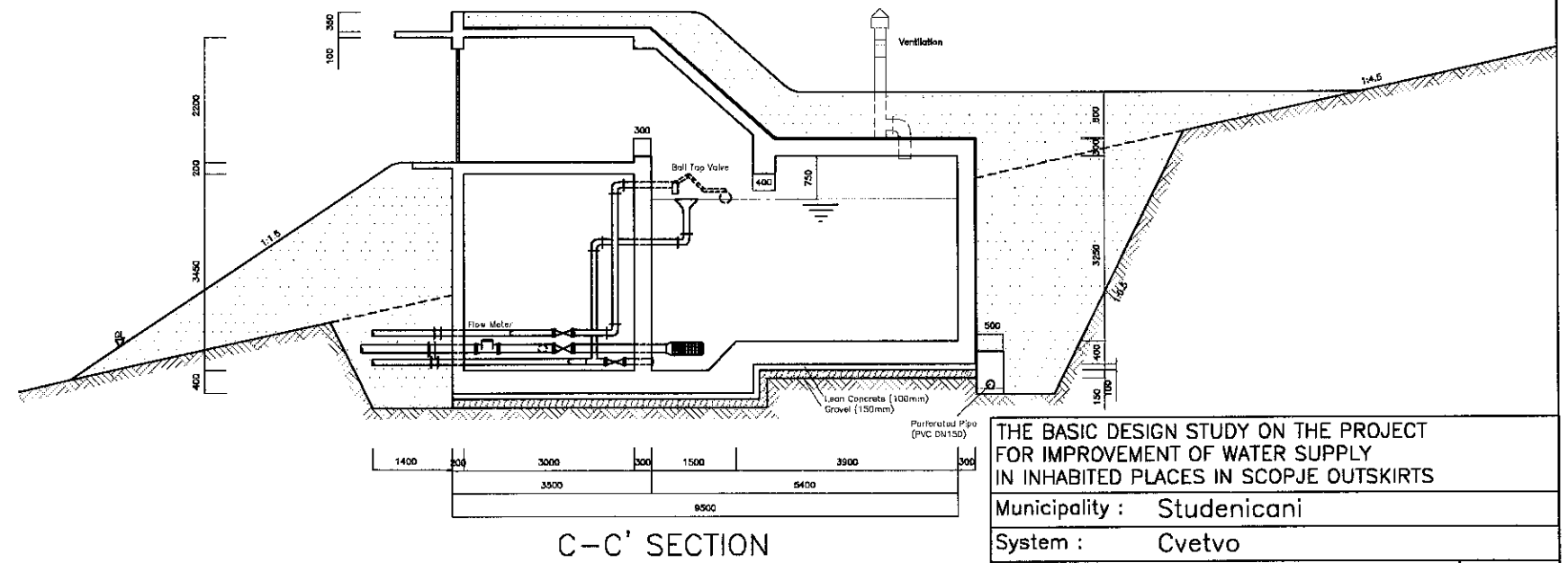
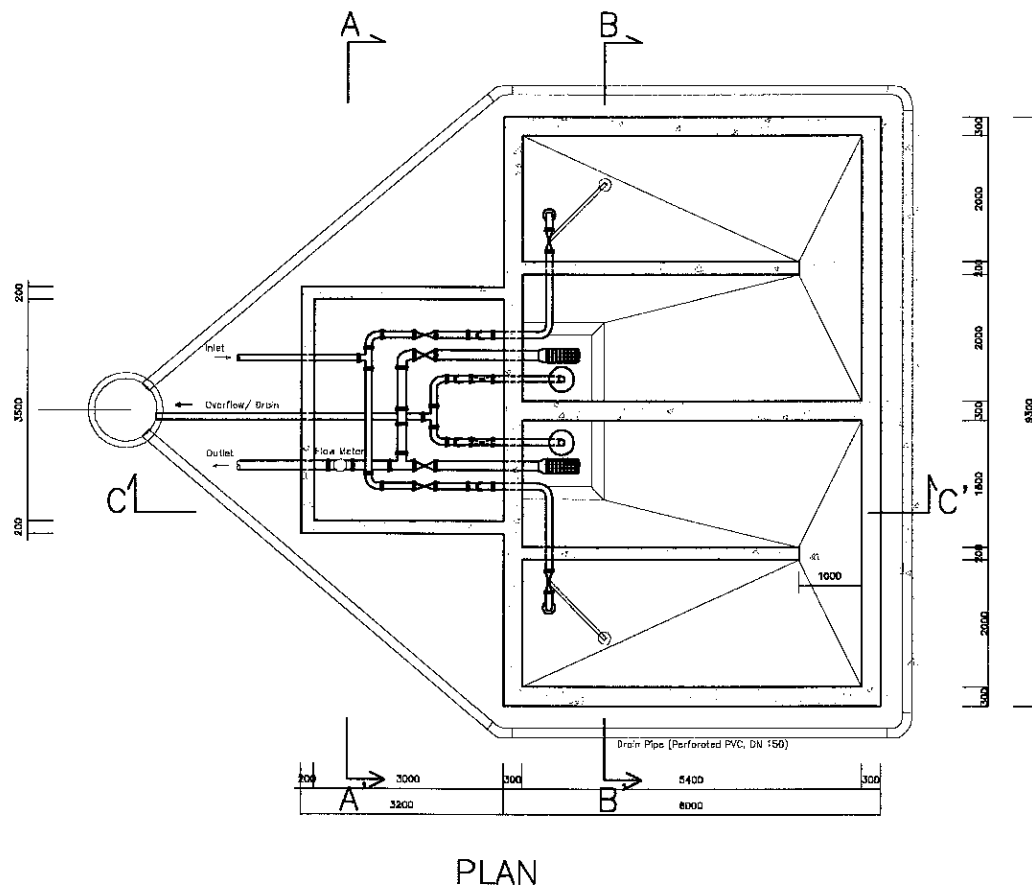
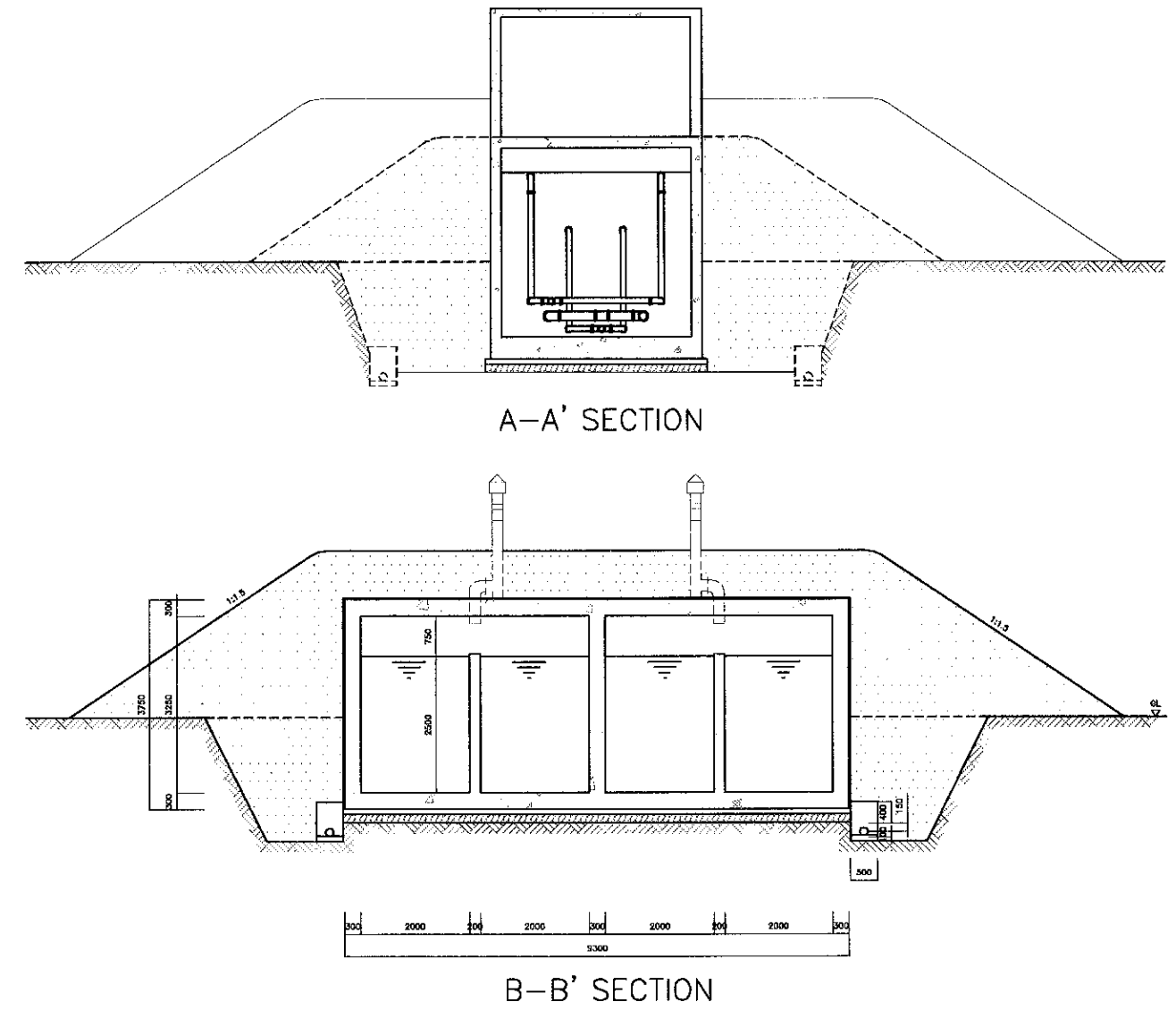
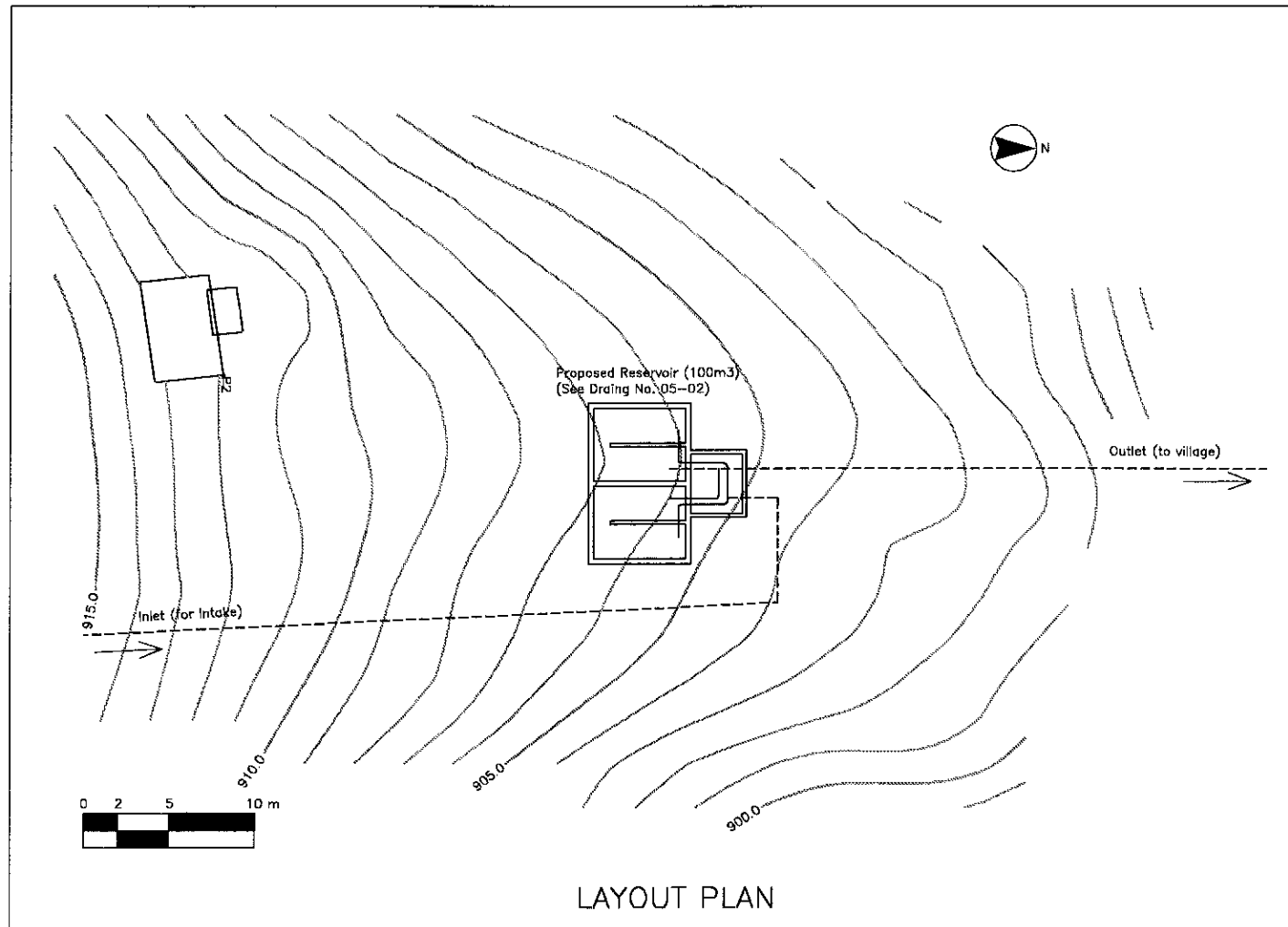


Plan

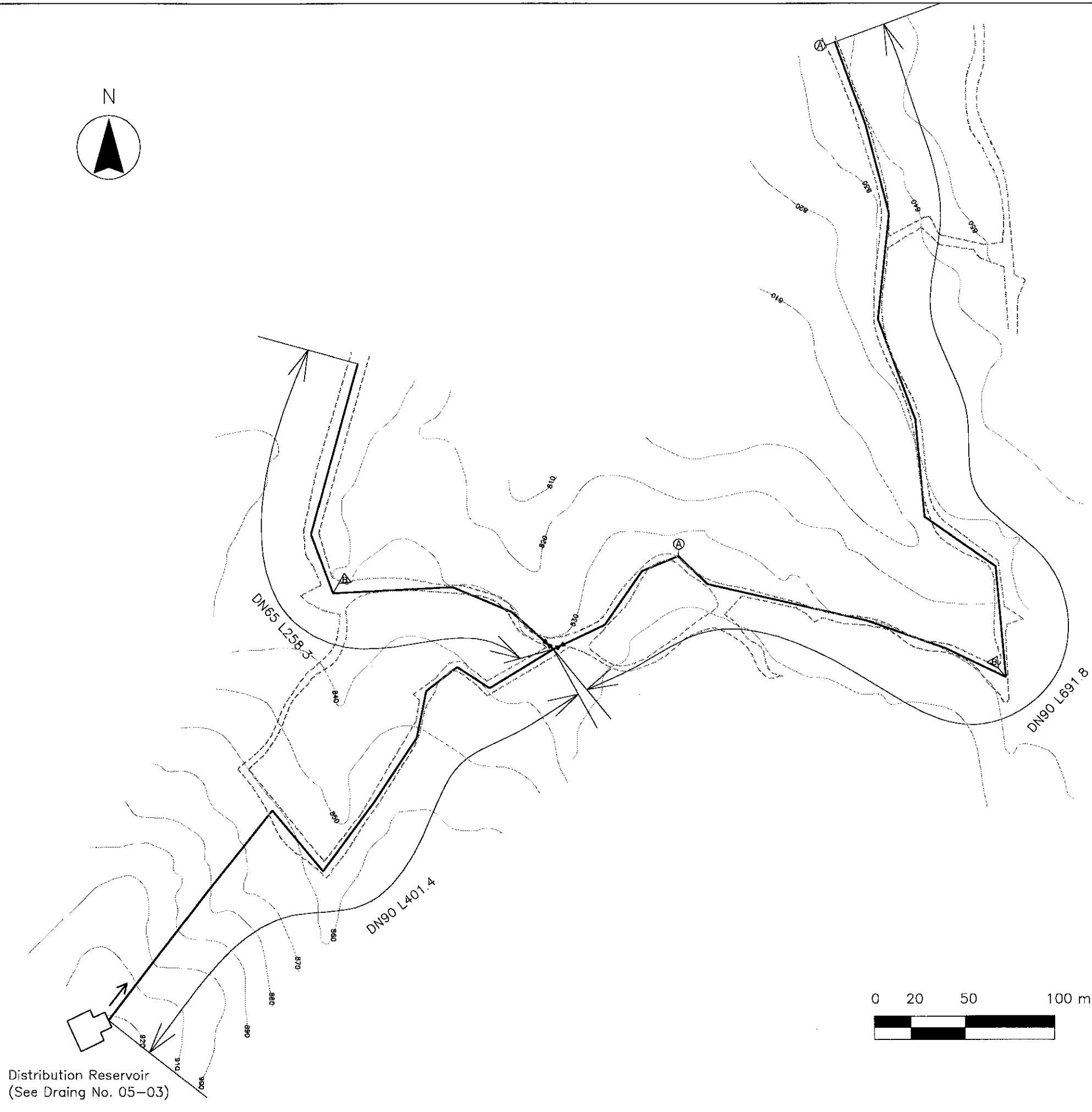
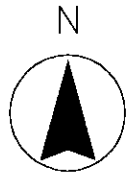
A-A' Section

Junction Chamber (See Drawing No. 05-01)

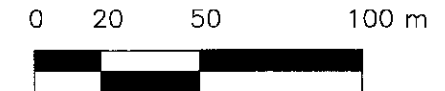
THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPJE OUTSKIRTS	
Municipality : Studenicani	
System : Cvetovo	
Title : Transmission Facility	Scale : Non
August 2003	Drawing No : 05-02
JAPAN INTERNATIONAL COOPERATION AGENCY	



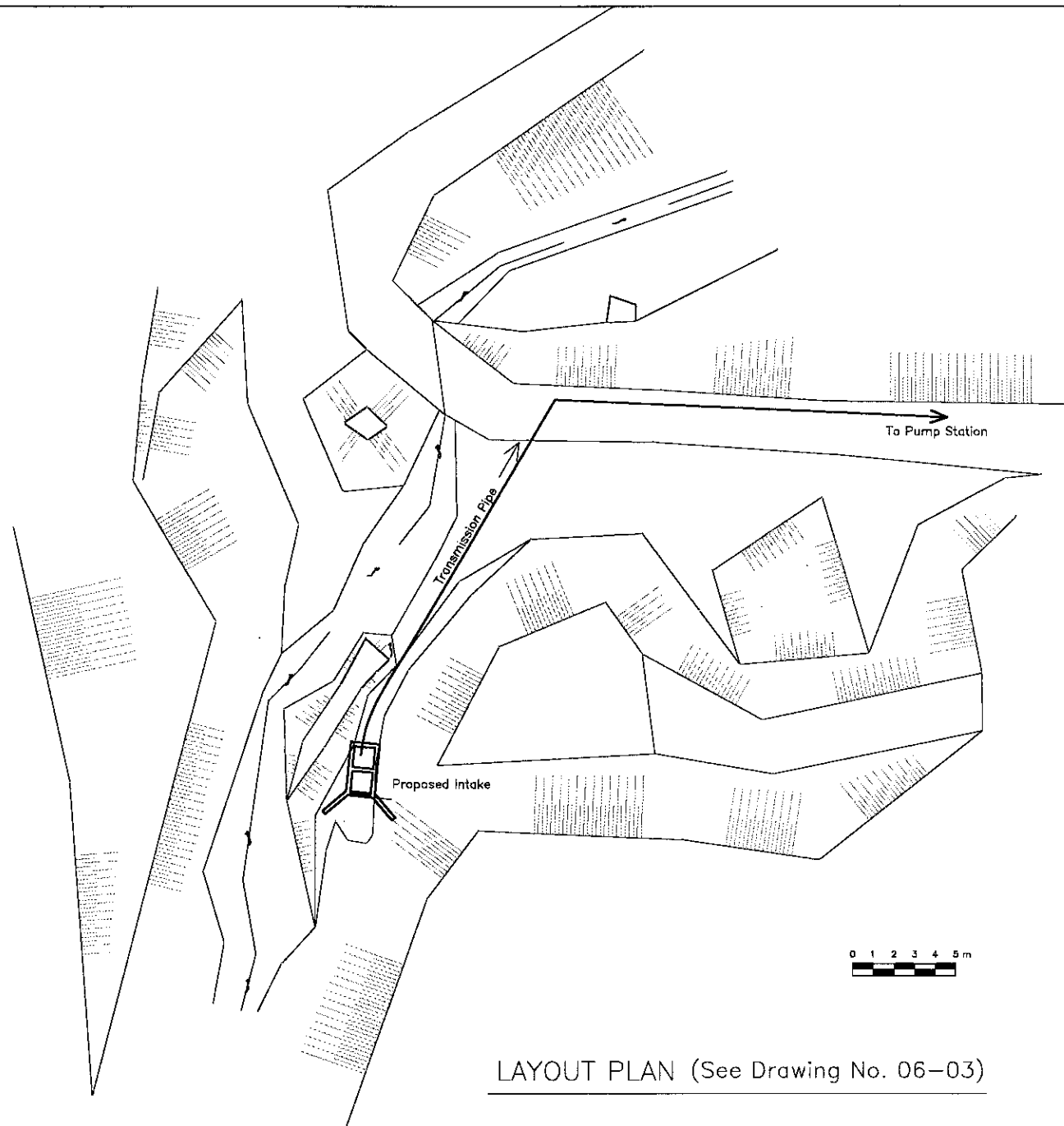
THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPIE OUTSKIRTS	
Municipality : Studenicani	
System : Cvetvo	
Title : Distribution Reservoir (100m ³)	Scale : Non
August 2003	Drawing No : 05-03
JAPAN INTERNATIONAL COOPERATION AGENCY	



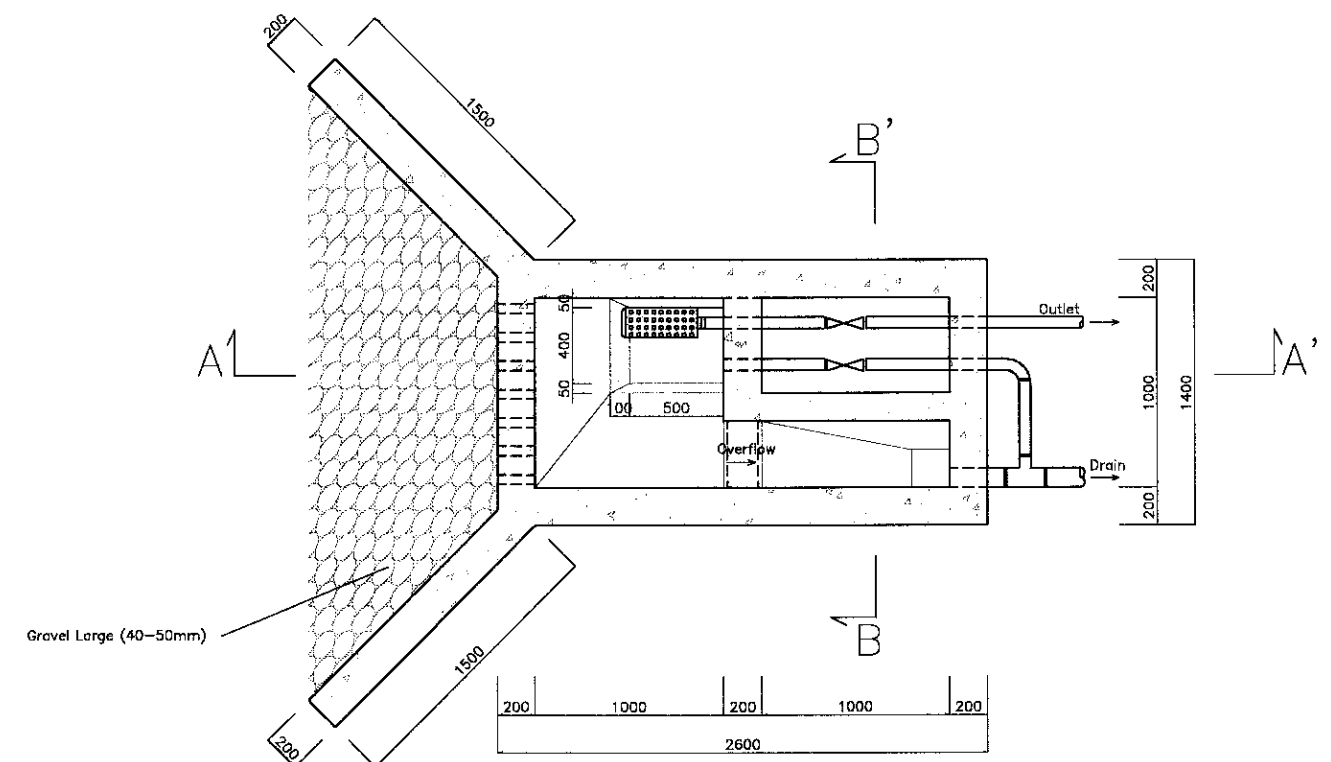
Distribution Reservoir
(See Draing No. 05-03)



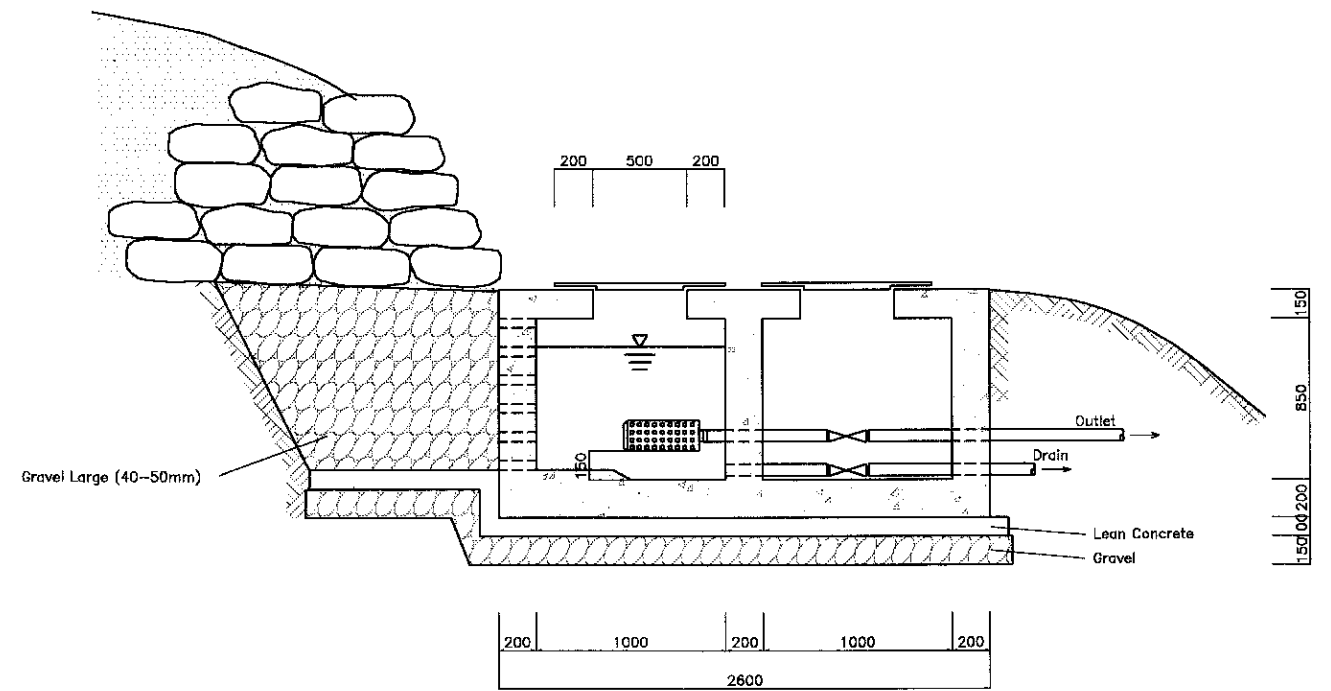
THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPJE OUTSKIRTS	
Municipality : Studenicani	
System : Cvetvo	
Title : Distribution Network	Scale :
August 2003	Drawing No : 05-04
JAPAN INTERNATIONAL COOPERATION AGENCY	



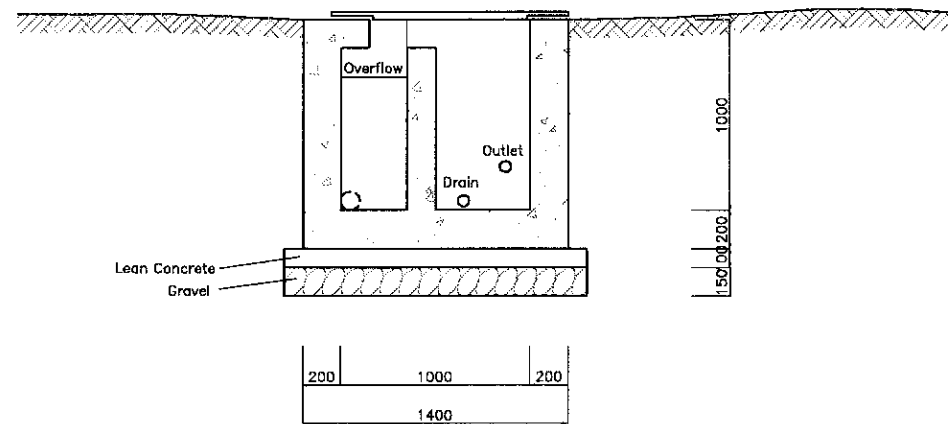
LAYOUT PLAN (See Drawing No. 06-03)



PLAN

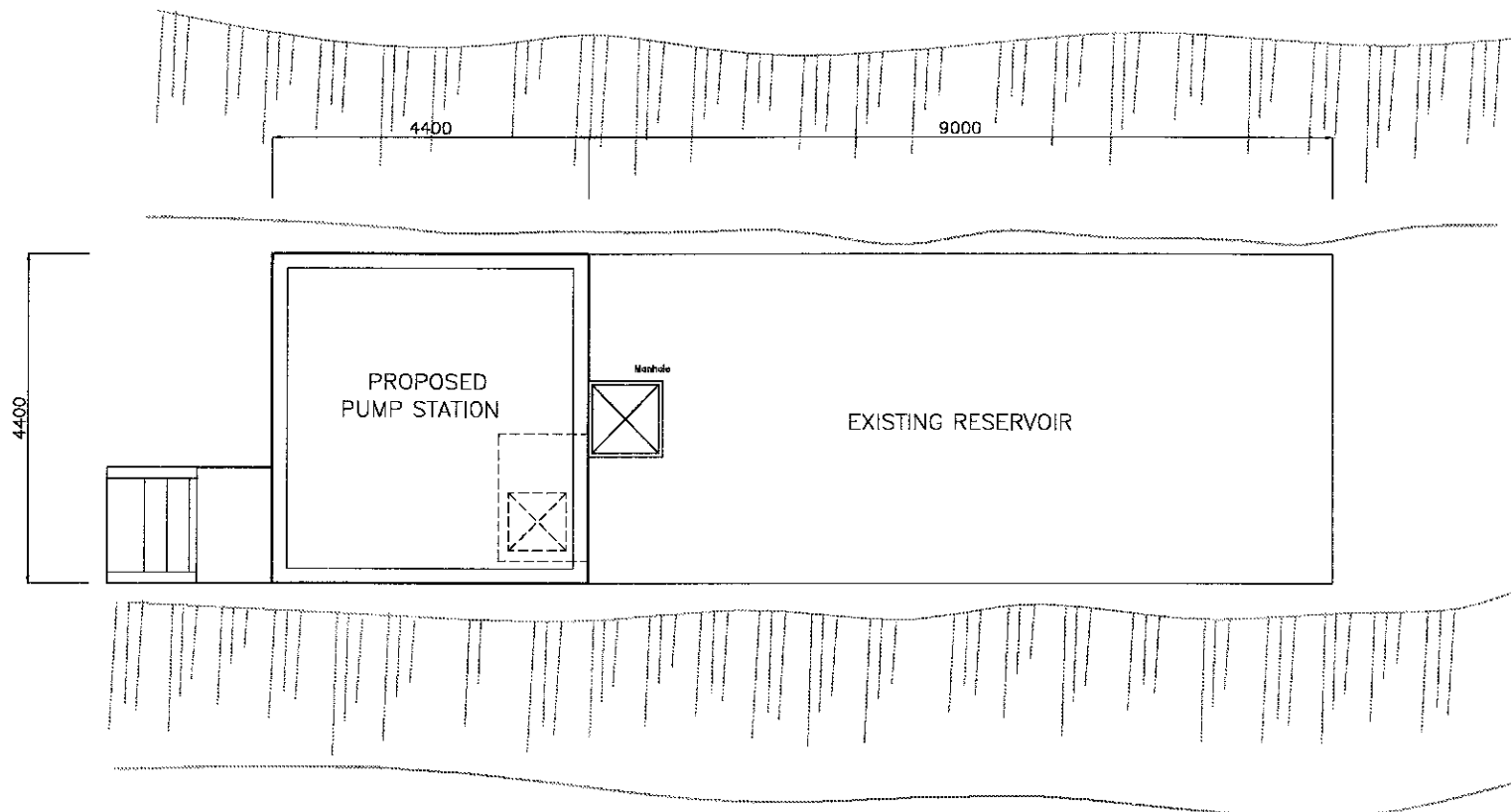


A-A' SECTION

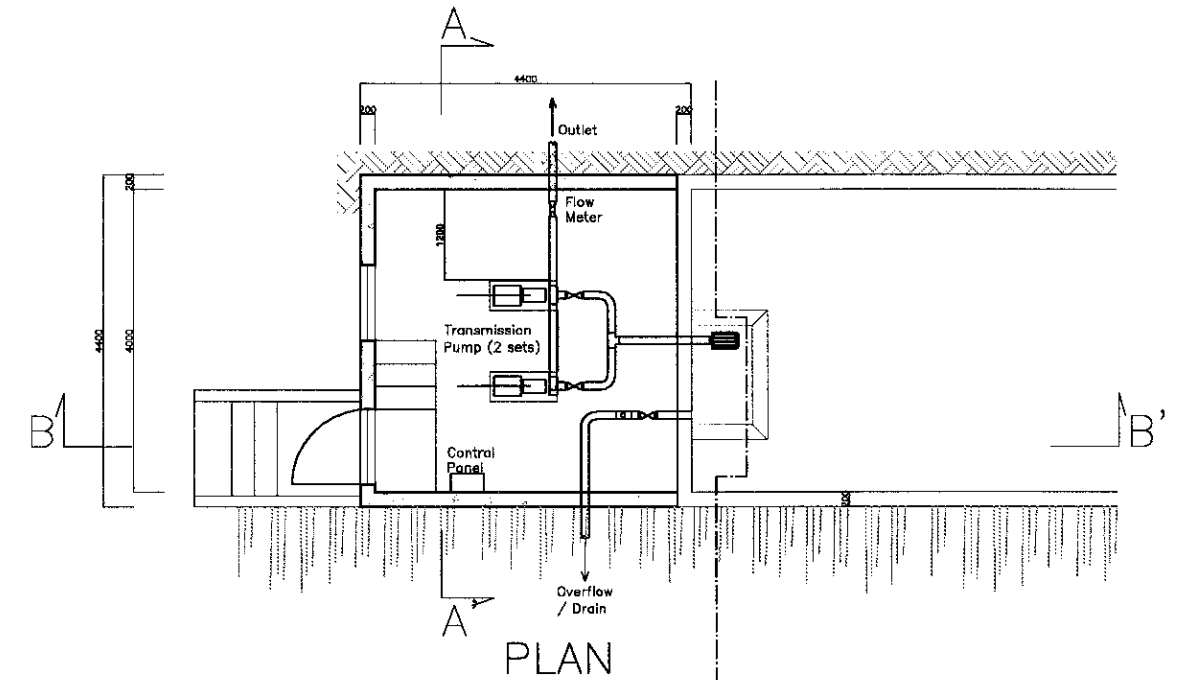


B-B' SECTION

THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SLOVJE OUTSKIRTS	
Municipality : Studenicani	
System : Dolno Kolicani	
Title : Intake Facility	Scale : Non
August 2003	Drawing No : 06-01
JAPAN INTERNATIONAL COOPERATION AGENCY	

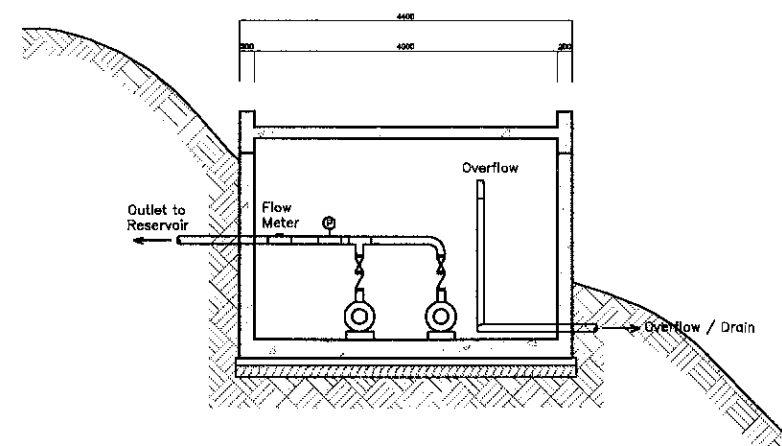


LAYOUT PLAN (See Drawing No. 06-03)

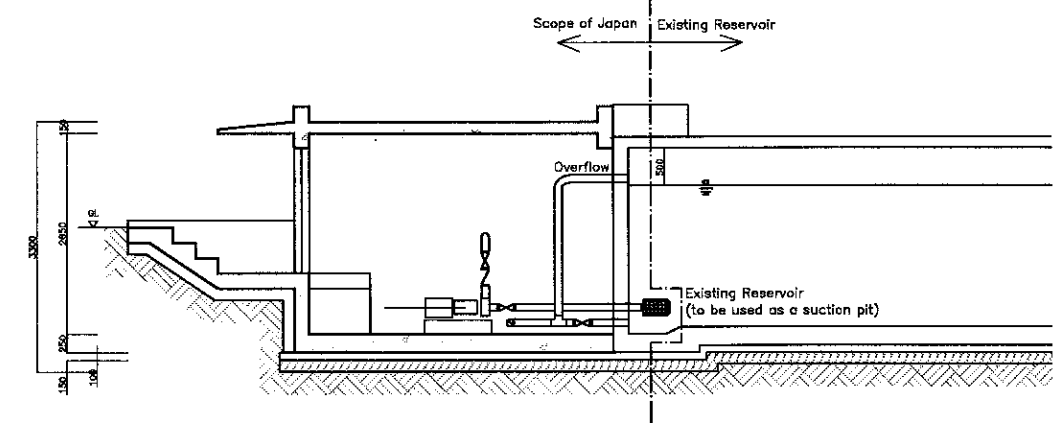


PLAN

Transmission Pump (2 sets)
 Type: Multistage centrifugal pump with motor
 Discharge: 3.45 m³/h
 Operation: On/Off control by reservoir water level

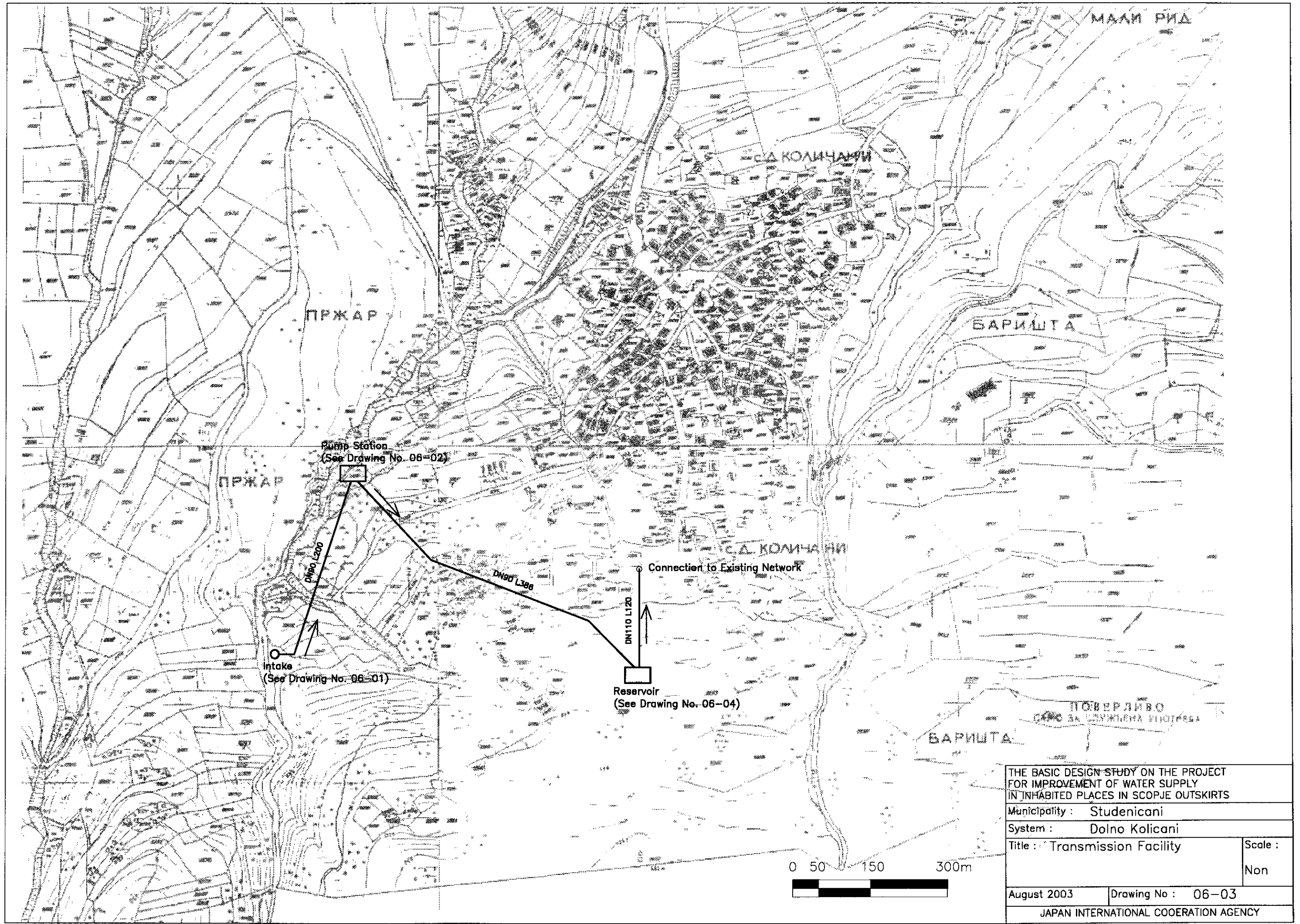


A-A' SECTION

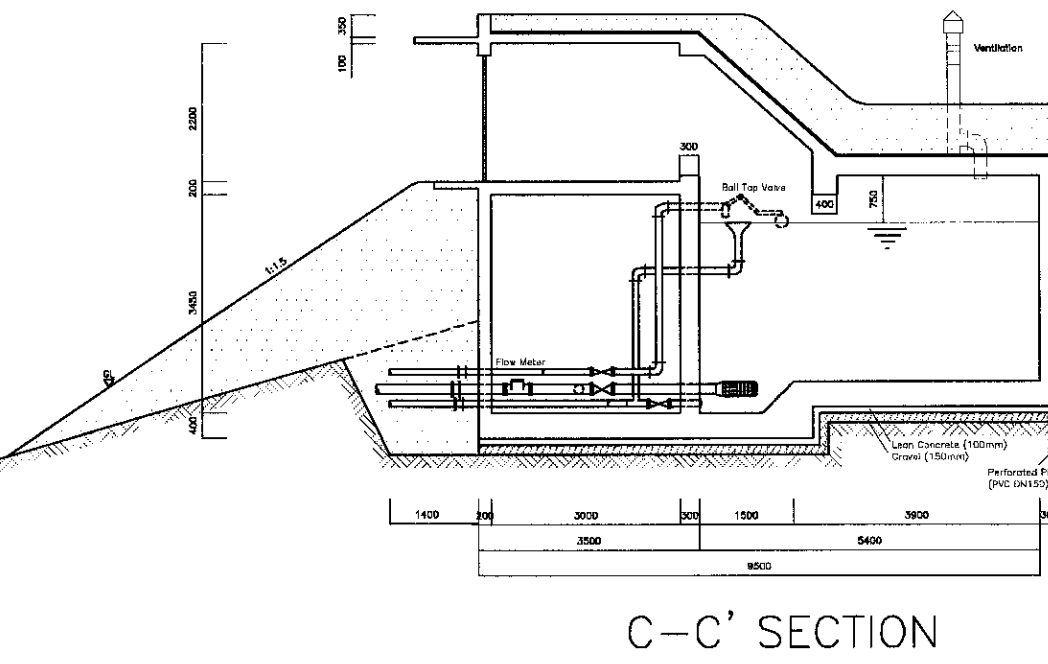
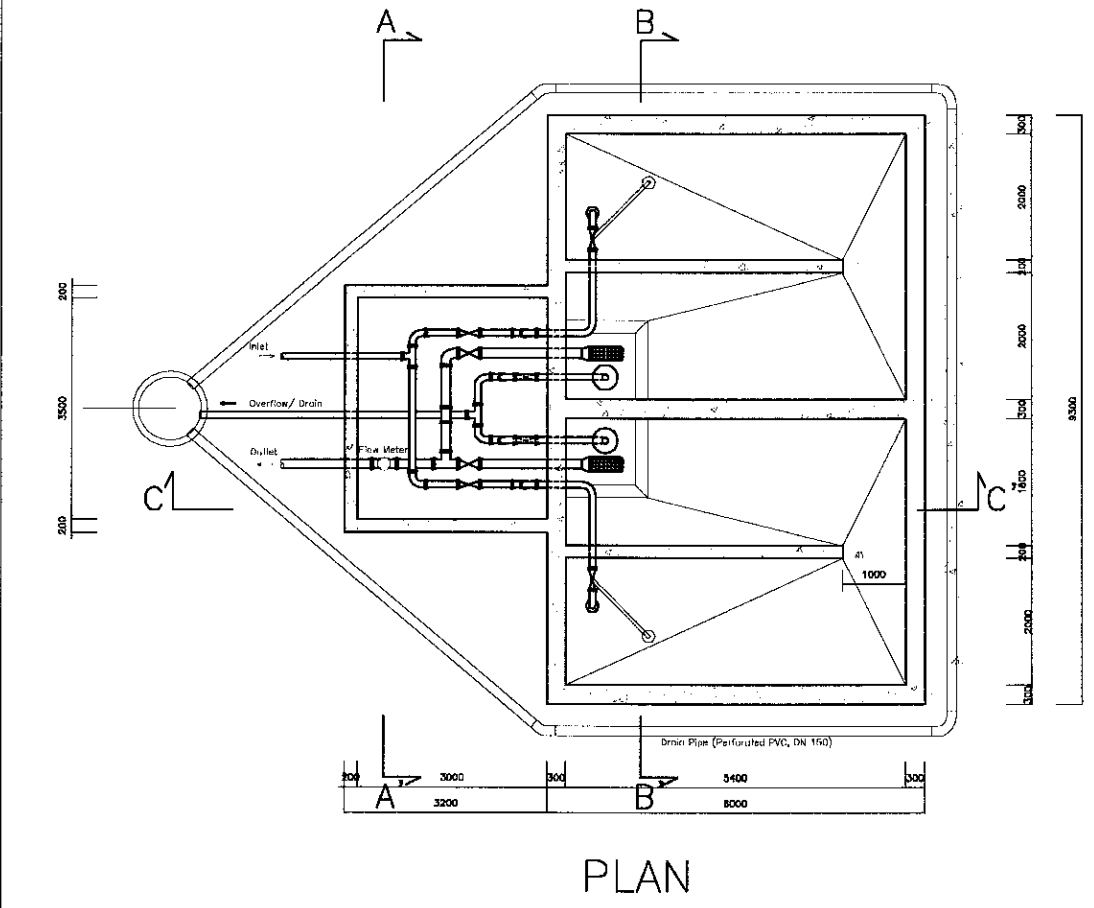
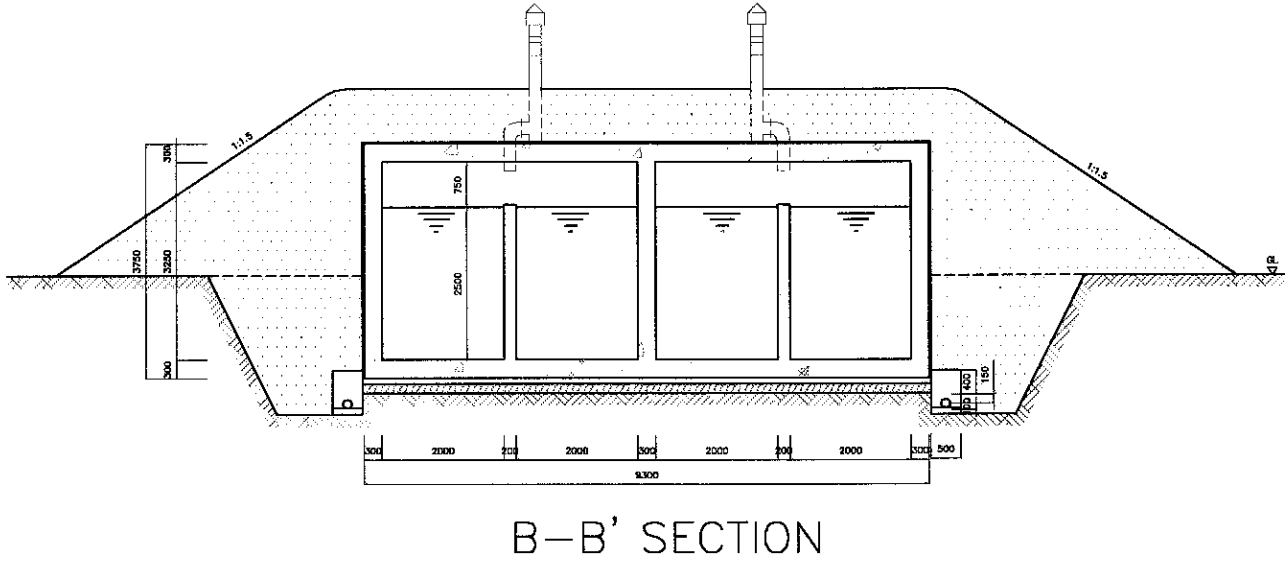
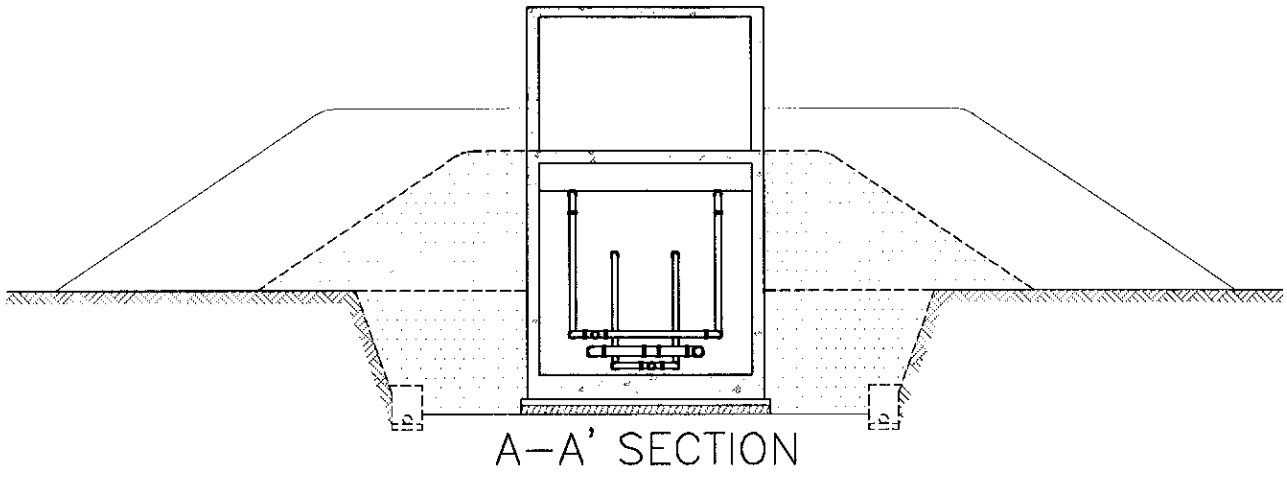
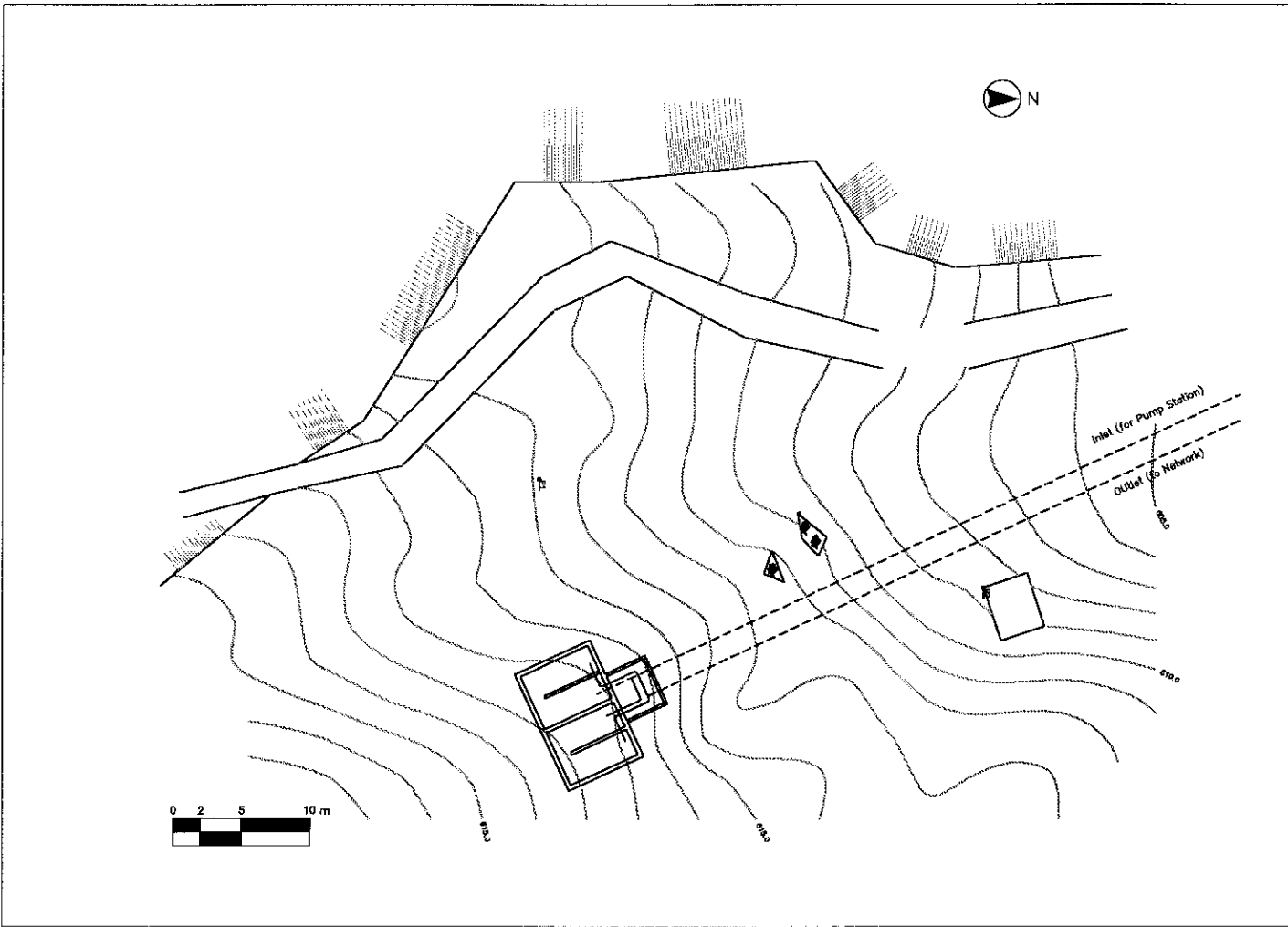


B-B' SECTION

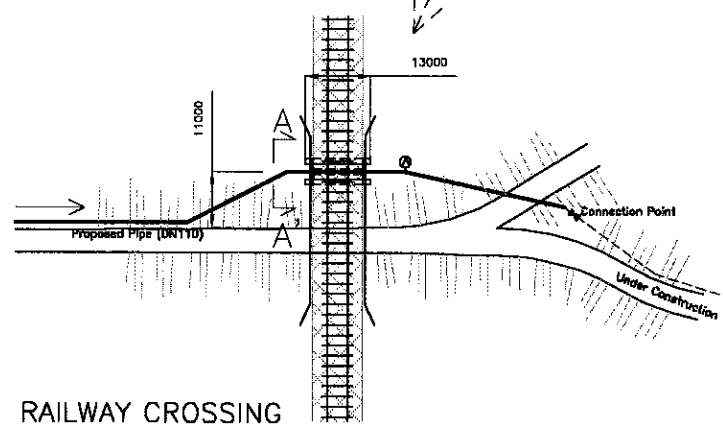
THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPE OUTSKIRTS	
Municipality : Studenicani	
System : Dolno Kolicani	
Title : Pump Station	Scale : Non
August 2003	Drawing No : 06-02
JAPAN INTERNATIONAL COOPERATION AGENCY	



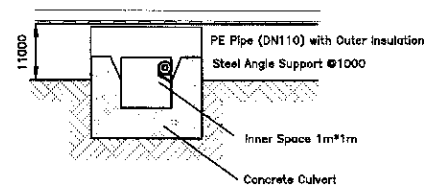
THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPJE OUTSKIRTS	
Municipality : Studeniciani	
System : Dolno Kolicani	
Title : Transmission Facility	Scale : Non
August 2003	Drawing No : 06-03
JAPAN INTERNATIONAL COOPERATION AGENCY	



THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPJE OUTSKIRTS	
Municipality : Studenicani	
System : Dolno Kolicani	
Title : Distribution Reservoir	Scale : Non
August 2003	Drawing No : 06-04
JAPAN INTERNATIONAL COOPERATION AGENCY	

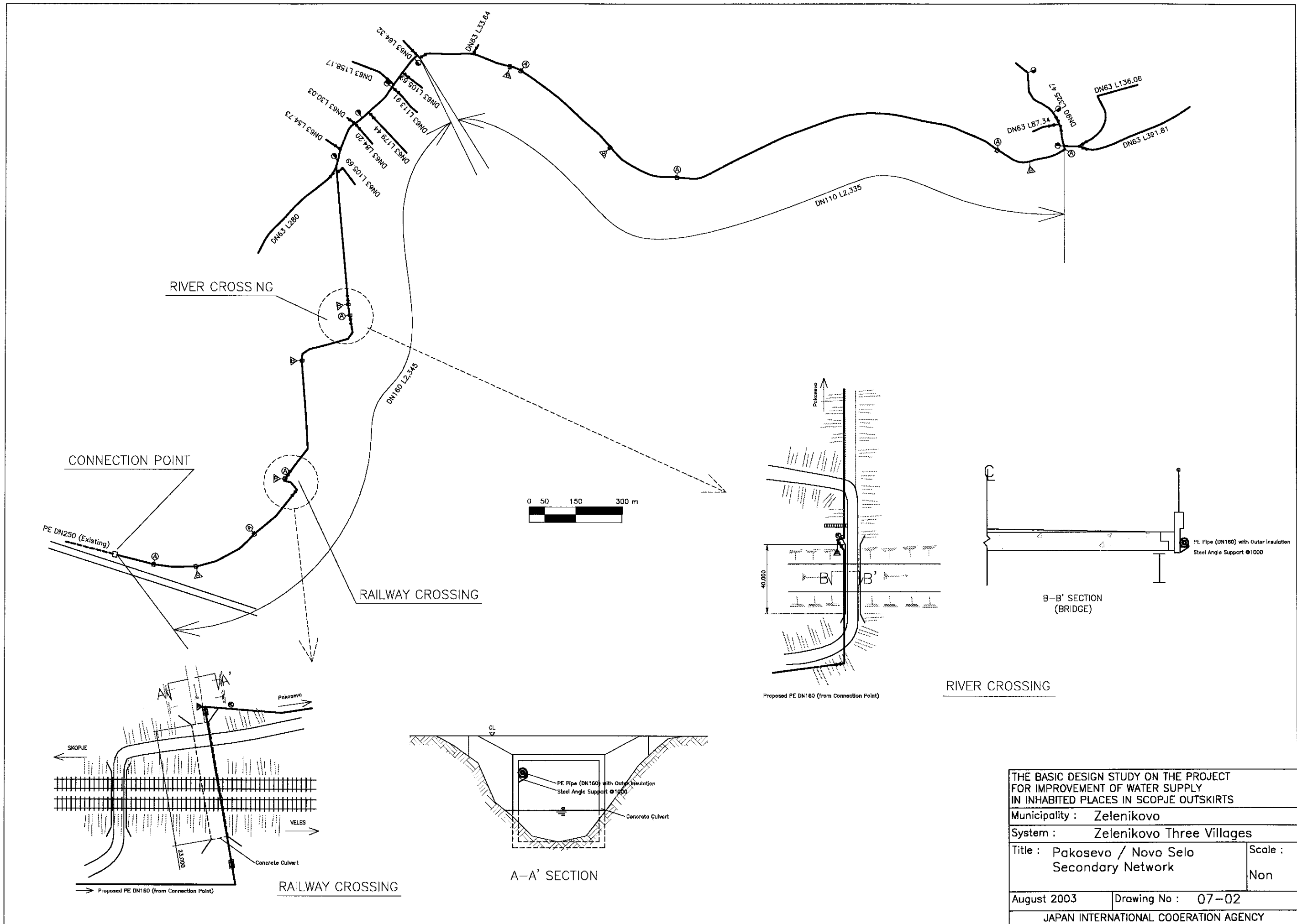


RAILWAY CROSSING

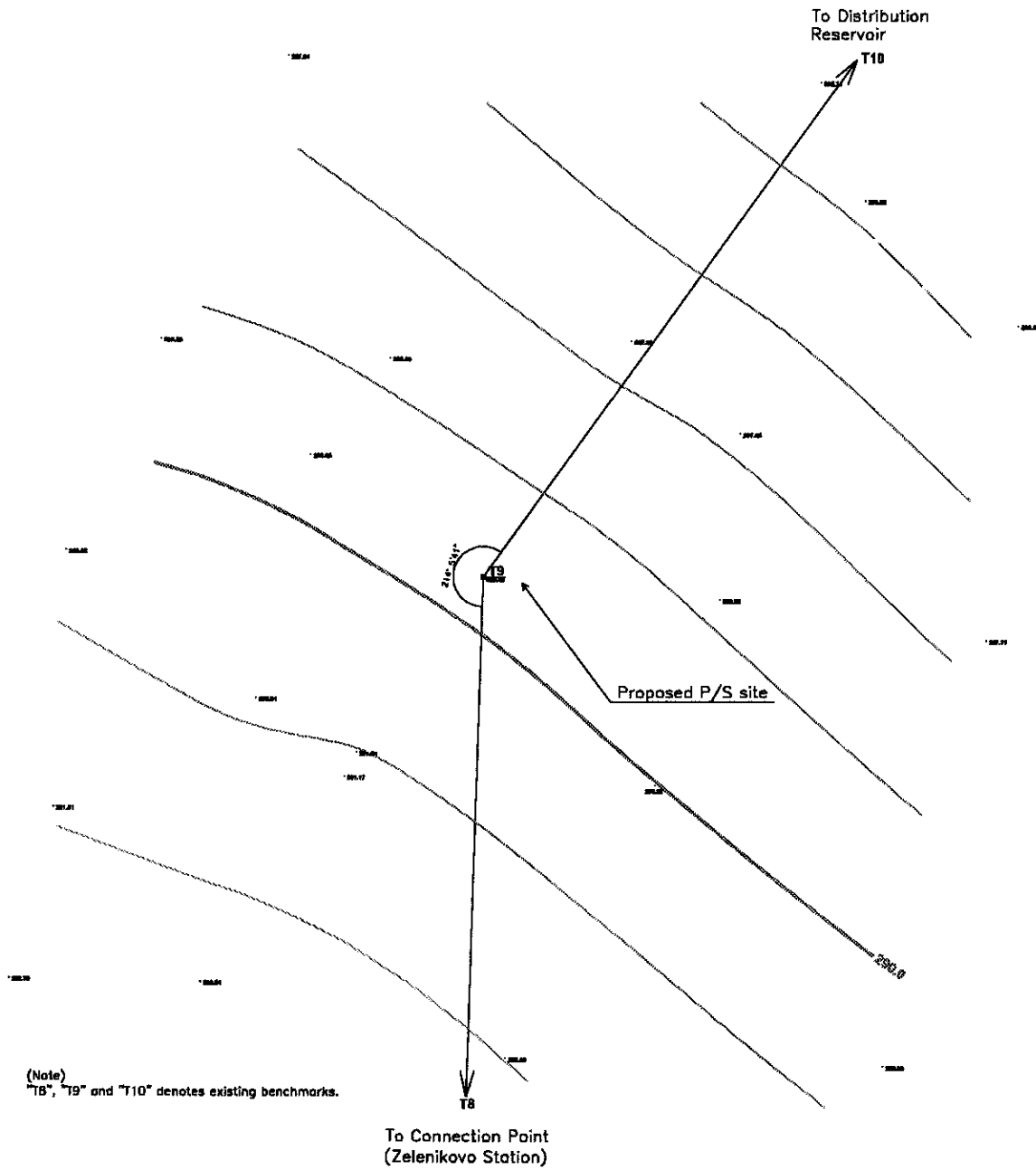


A-A' SECTION

THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPJE OUTSKIRTS	
Municipality : Zelenikovo	
System : Zelenikovo Three Villages	
Title : Taor Secondary Network	Scale : Non
August 2003	Drawing No : 07-01
JAPAN INTERNATIONAL COOPERATION AGENCY	

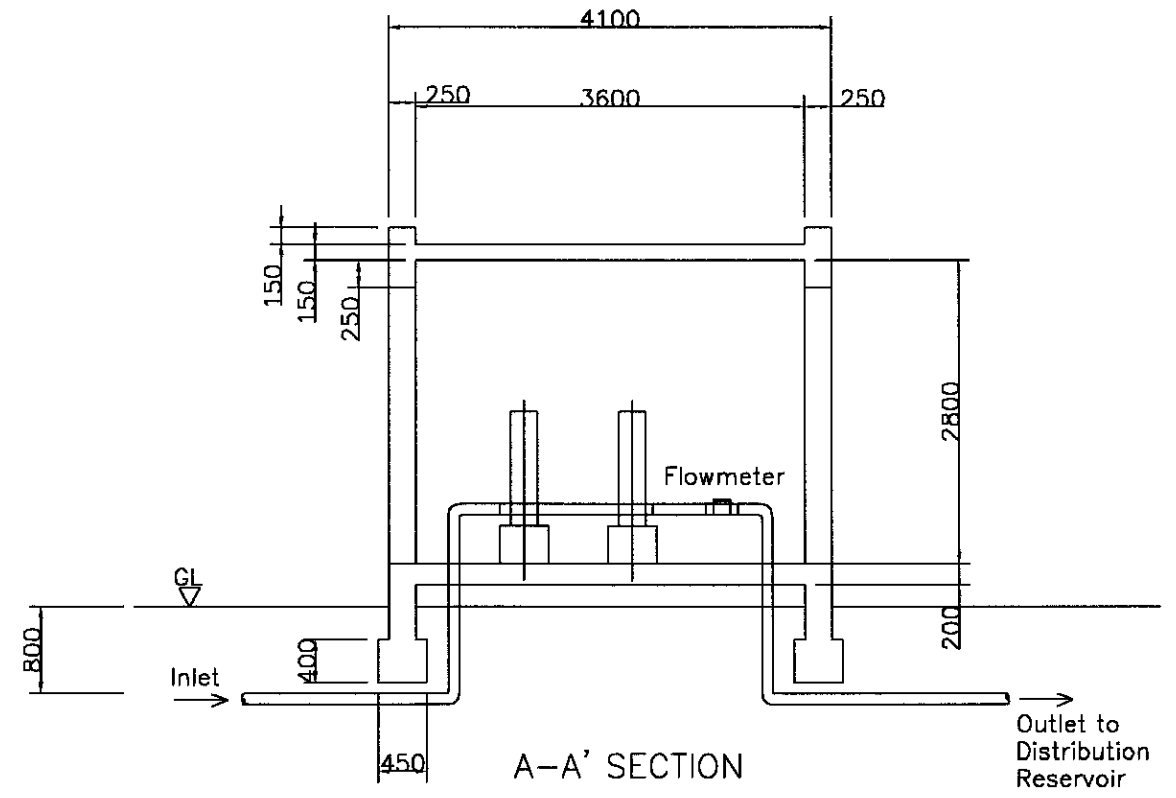
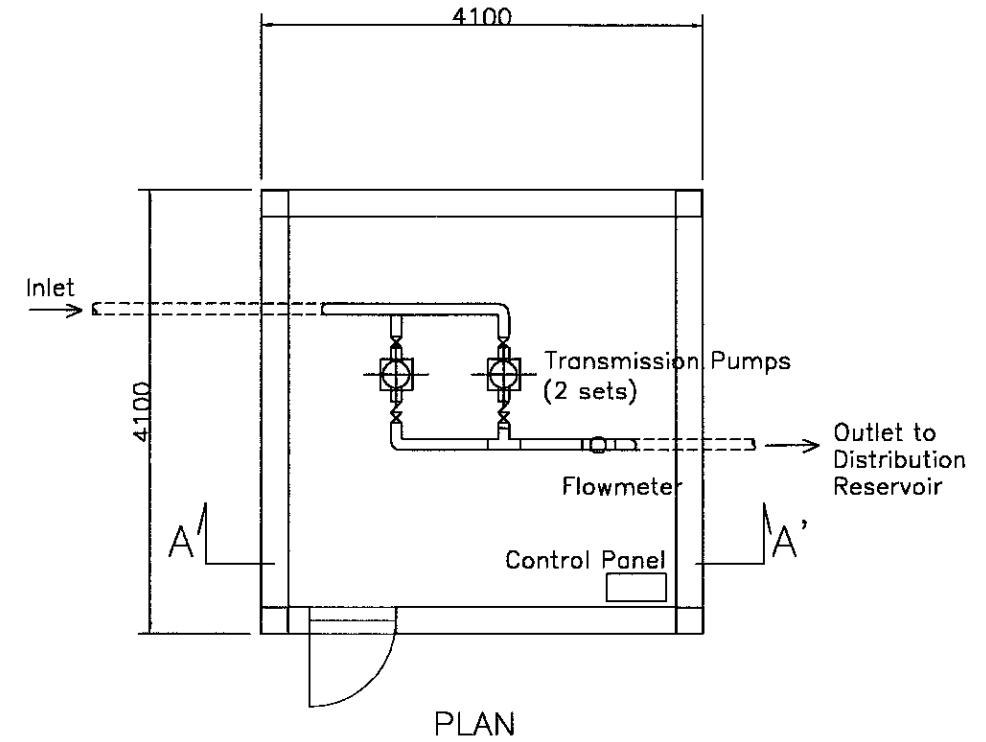


THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SKOPJE OUTSKIRTS	
Municipality : Zelenikovo	
System : Zelenikovo Three Villages	
Title : Pakosevo / Novo Selo Secondary Network	Scale : Non
August 2003	Drawing No : 07-02
JAPAN INTERNATIONAL COOPERATION AGENCY	

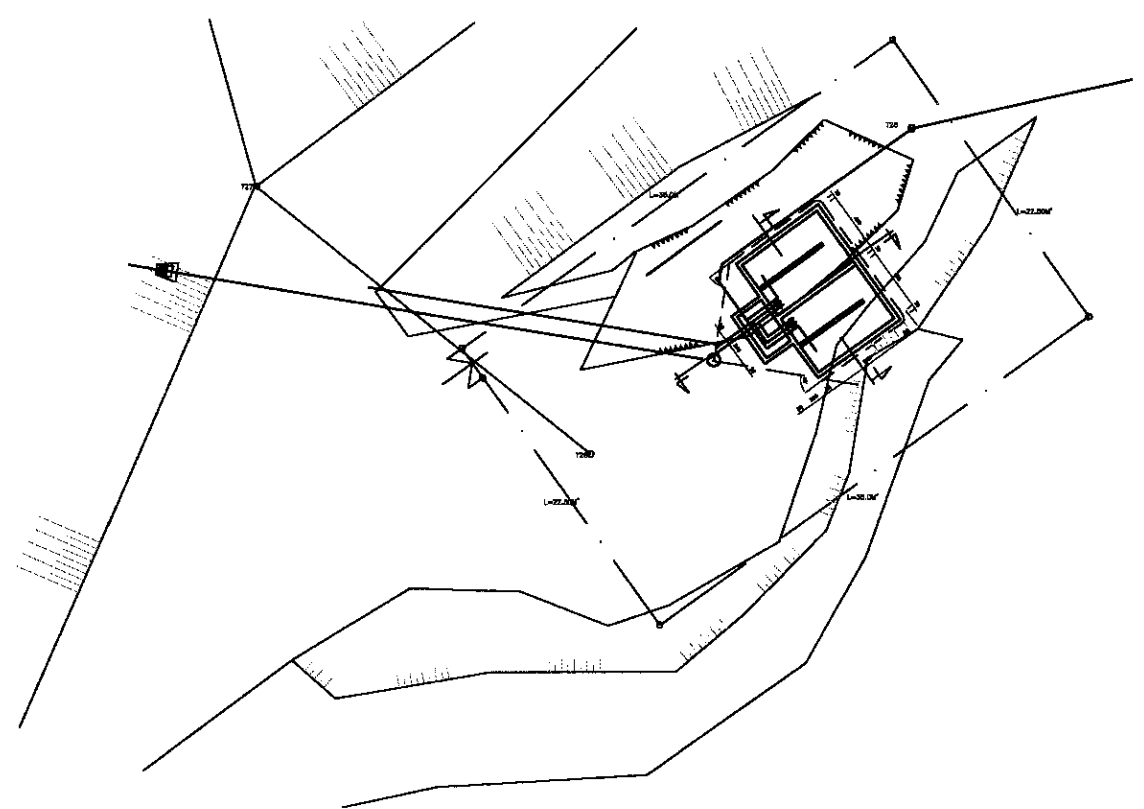


LOCATION (See Drawing No. 08-02)

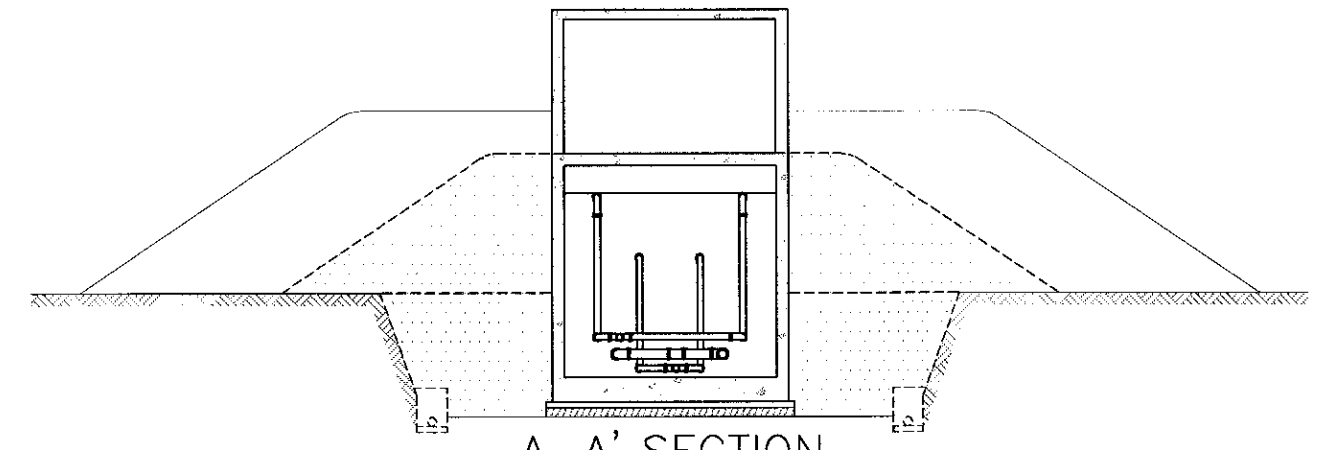
Transmission Pump (2 sets)
 Type: Multistage Centrifugal Pump
 Discharge: 4.6 m³/h
 Head: 128 m
 Control: Auto-On/Off by Water Level of the Reservoir, Auto-Stop by Pressure Detector



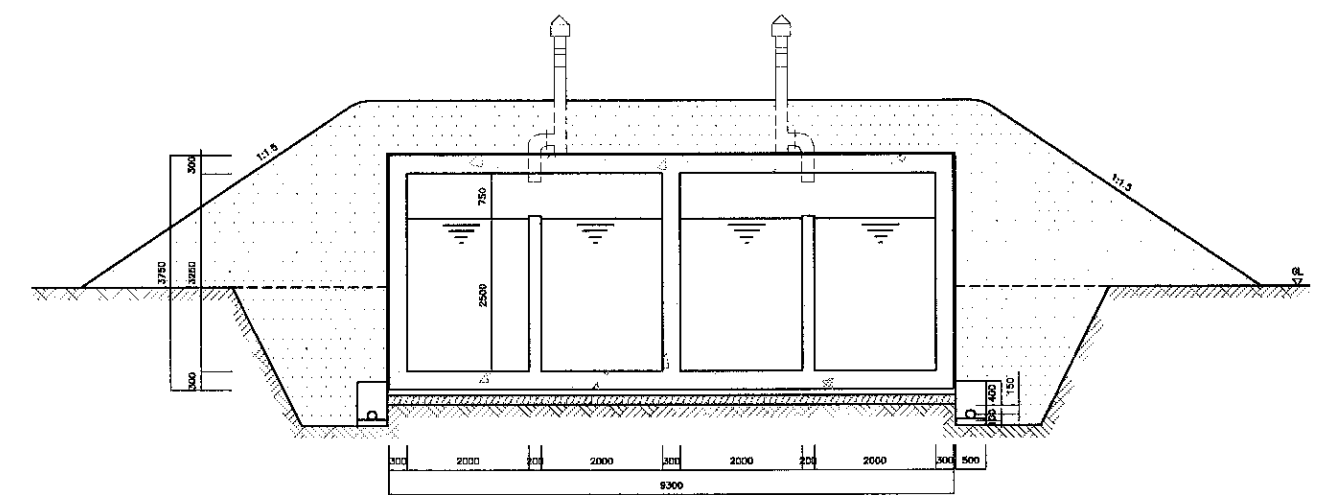
THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SLOPJE OUTSKIRTS	
Municipality : Zelenikovo	
System : Strahojadica	
Title : Booster Pump Station	Scale : Non
August 2003	Drawing No : 08-01
JAPAN INTERNATIONAL COOPERATION AGENCY	



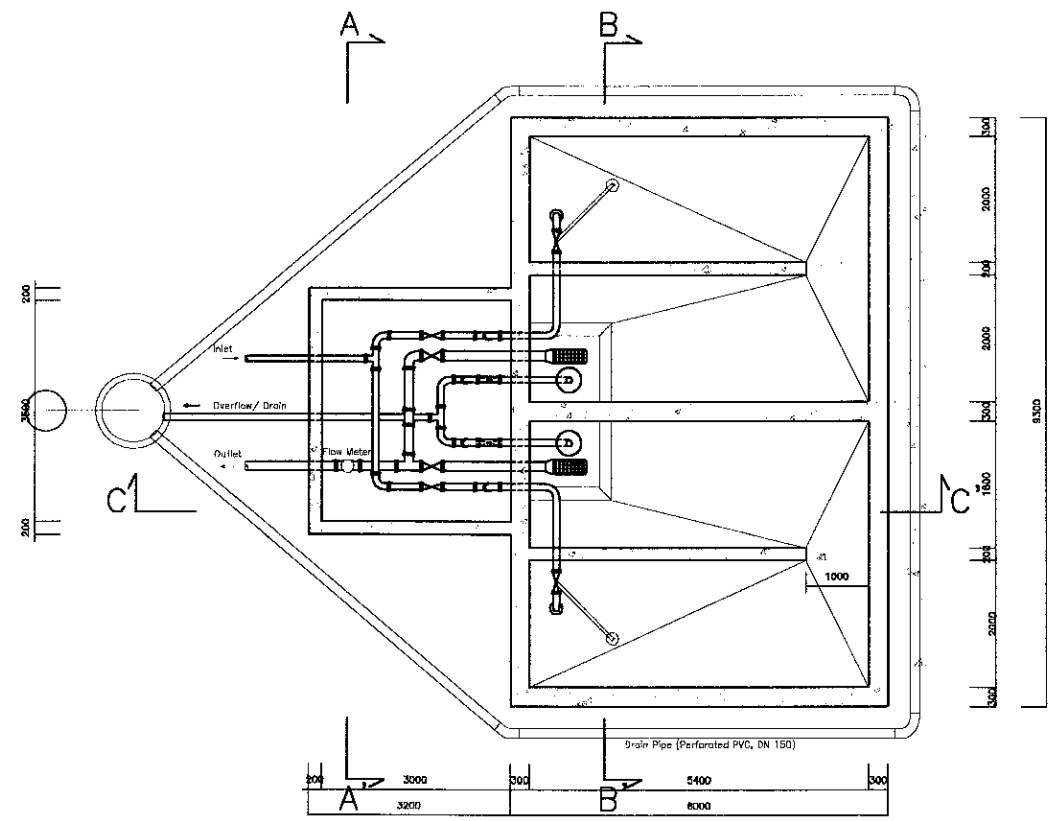
LAYOUT PLAN



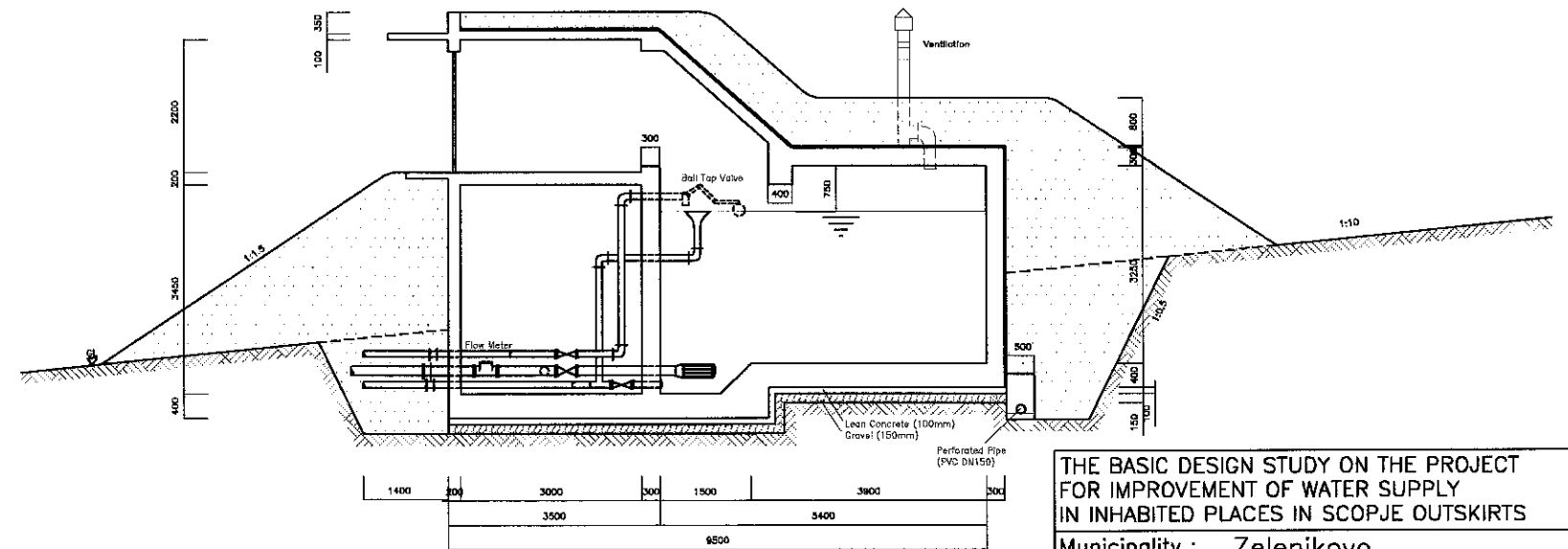
A-A' SECTION



B-B' SECTION



PLAN



C-C' SECTION

THE BASIC DESIGN STUDY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY IN INHABITED PLACES IN SCOPJE OUTSKIRTS	
Municipality : Zelenikovo	
System : Strahojadica	
Title : Distribution Reservoir	Scale : Non
August 2003	Drawing No : 08-03
JAPAN INTERNATIONAL COOPERATION AGENCY	

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Basic Items for Project Implementation

The items of construction and responsibilities agreed upon for the project are shown in Table 2-34.

Table 2-34 Items of Construction and Responsibilities

Responsible Side	Municipality	Village	Item of Construction		
			Facility	Detail	
Japan	Cucer Sandevo	Kuceviste	Intake	Expansion of intake facility	
			Disinfections	Construction of disinfections	
			Transmission and distribution	Construction of reservoir (100 m3) Rehabilitation of reservoir (100 m3) Construction of transmission and distribution (Approx. 9.2km)	
	Cair	Radisani	Transmission and distribution	Construction of pump station Transmission and distribution (for low pressure area, approx.7.4km) Transmission and distribution (for high pressure area, approx.13.2km)	
	Gazi Baba / Ilinden / Petrovec		Intake	Construction of wells (2wells) Rehabilitation of existing well	
			Disinfections	Construction of disinfections	
			Transmission and distribution	Construction of transmission and distribution (approx. 5.6km)	
	Gazi Baba	Goce Delcev	Transmission and distribution	Construction of distribution (approx. 6.6km)	
		Jurumleri	Transmission and distribution	Construction of distribution (approx. 11.5km)	
		Kolonie Idrizovo	Transmission and distribution	Construction of distribution (approx. 4.5km)	
	Ilinden		Idrizovo	Transmission and distribution	Construction of distribution (approx. 8.0km)
			Mralino	Transmission and distribution	Construction of distribution (approx. 3.3km)
			Petrovec	Transmission and distribution	Construction of distribution (approx. 12.6km)
	Petrovec		Rzanicino	Transmission and distribution	Construction of distribution (approx. 5.7km)
			Ognjanci	Transmission and distribution	Construction of distribution (approx. 4.3km)
			Kjojlja	Transmission and distribution	Construction of distribution (approx. 1.5km)
			Ilinden	Ilinden East	Transmission and distribution
	Studenicani	Cvetovo	Intake	Construction of intake	
			Disinfections	Construction of disinfections	
			Transmission and distribution	Construction of reservoir (100 m3) Transmission and distribution (approx. 5.7 km)	
Dolno Kolicani		Intake	Rehabilitation of intake		
		Disinfections	Construction of disinfections		
		Transmission and distribution	Construction of pump station Construction of reservoir (100 m3) Construction of transmission and distribution (approx.0.7km)		
Zelenikovo	Taor / Pakosevo / Novo Selo	Transmission and distribution	Construction of transmission and distribution (approx. 8.4km)		
	Strahojadica	Transmission and distribution	Construction of pump station Construction of reservoir (100 m3) Construction of transmission and distribution (approx. 4.0km)		
Macedonia	Cair	Radisani	Transmission and distribution	Construction of 2 distribution reservoir tanks Construction of transmission and distribution pipes (approx. 600 m)	
	Gazi Baba / Ilinden / Petrovec		Transmission and distribution	Construction of transmission and distribution (approx. 9,412 m)	

(2) Items to be considered for the employment of local contractor

There are many local construction companies in Skopje city. Major companies have satisfactory construction machines, staff and experience in construction of water supply facilities, bridges, roads, tall buildings, and other structures. However, their quality control as well as schedule control seems insufficient compared to Japanese construction firms. In order to bring up the quality of work to that of Japan, Japanese side shall provide sufficient instructions and supervision of the construction work.

(3) Necessity of dispatching engineers

Japanese contractor will provide necessary technical instructions in operation and maintenance of facilities to the staff of PE through on-the Job training throughout the construction period.

(4) Implementation organization of Macedonia

Executing agency concerned is Ministry of Transport and Communication (MTC) and implementing agency is each municipality and municipality PE. MTC will establish Project Implementation Unit (PIU) within the Ministry and a Project Management Unit (PMU) will be established within each municipality for construction period.

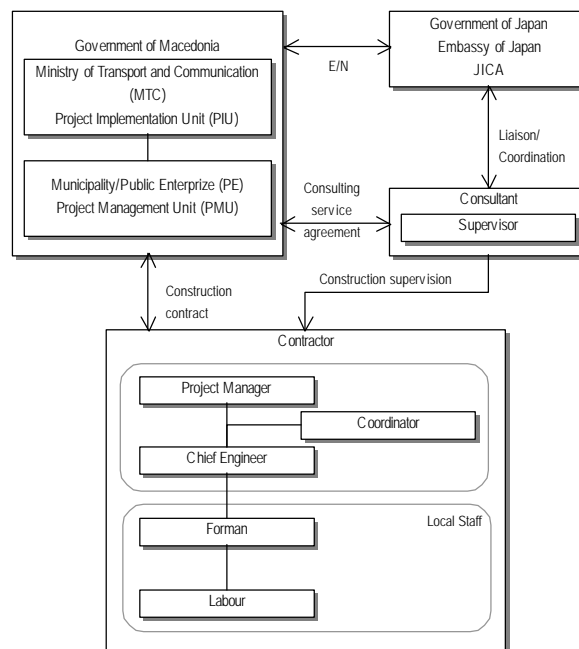


Figure 2-3 Conceptual Structure of Project Implementation

2-2-4-2 Implementation Conditions

(1) Natural Conditions

1) Climate

The climate of the project area is a continental climate that is characterized by remarkable change in temperature throughout the year. In the meteorological data of 2001, the maximum temperature reached 39.6°C in August and that the minimum temperature reached minus 16.6°C in February. According to the local construction companies, construction works cannot be carried out when the temperature is lower than -5°C and designate the two cold months of December and January as non-workable period. According to an Austrian consultants that has the working experience in Macedonia, it was difficult to carry out construction works outdoors during the winter months of December to February. In this project, the two months of December and January are excluded from the construction schedule.

2) Precipitation

The precipitation in the Project area (outskirts of Skopje) is quite low with an annual precipitation of 400 mm to 500 mm. According to the data from 1996 to 2000, the maximum monthly precipitation is only 59.3 mm. In the construction scheduling of this Project, the influence of rainfall will not be taken into the account.

(2) Related laws and regulations

There is no written document of national standards for the construction of water supply facilities and they are designed in accordance with the former Yugoslavian standards. The standards for equipment and materials are being switched from JUS of the former Yugoslavia to EU standards or to ISO. In this project, ISO standards will be applied to pipes and EU standards to other materials.

2-2-4-3 Scope of Work

Table 2-35 Scope of Work by Both Countries

Work Item	Macedonia	Japan
Land acquisition		
Installation of fence around the completed facilities		
House connection and procurement and installation of water meter		
Provision of information on underground structures and presence at the digging site		
Cooperation in jointing new and existing pipes (public announcement of service interruption and presence to give advice at the construction site)		
Provision of flashing water for pipe (free of charge)		
Electric cable wiring work to the facilities		
Test boring for confirming groundwater level and underground structure		
Construction of water supply facilities (Plan, preparation of materials and construction)		
Flashing of the distribution pipes		
Hydrostatic tests for distribution pipes		
Disinfections for the distribution pipes		
Water-tight test for the reservoir tanks		

2-2-4-4 Consultant Supervision

(1) Policy for Detailed design

- As necessary field survey and site investigation, topographic survey, test drilling, site reconnaissance along the planned pipelines routes, investigation on underground structures and obstacles (Electricity pillars, telephone cables, etc.), investigation on existing water pipelines will be carried out.
- Based on the results of the field survey, the basic design will be reviewed.
- The construction plan will be reviewed with due examination of the construction methods and structures of planned and temporary facilities by comparing them with possible alternatives.
- Structural calculations for planned and temporary facilities will be carried out.
- Drawings, such as location maps, plans, longitudinal profile, detailed plans (ground plan, longitudinal and cross section), and structural drawings are prepared.
- Quantity calculation document containing all materials needed for the construction will be prepared.

- The contents of the design will be examined by confirming the basic conditions, comparison results, validity of design plan, consistency between drawings and calculations, and details of calculation.
- The project cost of the basic design will be reviewed on the basis of the quantity and scale of the facilities proposed by the detailed design.
- Tender documents will be prepared in conformity with the guideline of Japanese Grant Aid.
- On the stage of selection of contractors, the consultants will support the implementing organization of Macedonia (Ministry of Transport and Communication) so that the tendering procedure will proceed in line with the guideline of Japanese Grant Aid.

(2) Policy for construction supervision

- Promote close coordination between both Macedonia and Japan and their representatives in order to complete the project in accordance with the planned construction schedule.
- Give appropriate and timely advice to the contractor and its staff so that they can construct the facilities in conformity with the design.
- Give proper advice and instructions to the staff concerned on the appropriate operation and maintenance (O&M) work of the constructed facilities.
- Promote due coordination among municipalities, PE, and villages in order to minimize the influence (such as interruption of water supply) over the daily life of the residents during the pipe laying works.
- The consultants will prepare a comprehensive O&M manual for the constructed facilities. Specific manuals for each equipment or facility should be prepared by the contractor or manufacturer. The consultants will combine them into a comprehensive O&M manual.

The following are the major items of construction supervision.

- i. Schedule control and quality control (approval and inspection of materials and equipment, and inspection at the construction site)
- ii. Consideration and application of design alterations, if necessary
- iii. Reporting of progress (monthly progress report, certificate of payment, completion report, etc.)
- iv. Thorough inspection of security control of the contractor
- v. Final inspection on the occasion of the completion

The above services should be performed continuously from the commencement to the completion of the Project. Therefore, supervisor of the project will be performed by an assigned resident engineer. The supervisor should be sufficiently experienced and be capable of managing the entire construction works. In addition, an engineer of facilities and equipment plan and a

mechanical engineer will be dispatched for a short time for the pipe laying works and the construction works of the reservoirs. Likewise, a mechanical engineer and electrical engineer for the installation works of pumps and chlorine dosing equipment will be dispatched. Dispatch of these engineers will be programmed to assure smooth implementation of the plan in such a way that necessary measures will be taken in case of unexpected events as well as confirmation of progress and quality. Furthermore, those construction planning, machinery planning, and electrical engineers will undertake the knowledge transfer on planning and management of facilities such as leakage control, water flow control, etc. before handing over the facilities.

2-2-4-5 Procurement Plan

(1) Labor

Local construction companies have enough number of workers with enough capability. Foremen, engineer, skilled labor and general labor will be employed in Macedonia.

(2) Construction materials

Cement

Normal Portland cement produced in Macedonia will be employed.

Aggregate

Since aggregate is produced by crusher plants in Skopje city, Macedonian product will be employed.

Reinforcement bars and general/special steel

Reinforcement bar is not produced in Macedonia. Products of Serbia and Russia are available in the market. Every lot of reinforcement bar imported is inspected of its quality by a public institute when imported. The certificate of the test as well as manufacturer's mil sheet is available.

Materials for formwork and wooden materials for construction

Materials for formwork and wooden materials for construction are not produced in Macedonia. They are imported mainly from Bulgaria, Serbia, Bosnia, and Slovenia and available in local markets.

Fuel

Gasoline and diesel are available in the market.

Ready-mixed concrete

There is a ready-mixed concrete plant in Skopje city, which produces fine quality concrete. Ready-mixed concrete will be purchased in Skopje city. As for the concrete for intake facility in Cvetovo, concrete will be mixed at site because of difficult access to the site for concrete mixers.

(3) Major Equipment

Intake facility

Submersible pumps and materials for well are not produced in Macedonia. They will be imported from the third countries such as Italy and Denmark.

Chlorine dosing equipment

Chlorine dosing equipment is not produced in Macedonia. It will be imported from the third countries such as Germany, Italy and Romania.

Transmission pumps

Transmission pumps and related equipment are not produced in Macedonia. They will be imported from the third countries such as Germany, Italy, Serbia, Romania, Denmark and Greece.

Pipe

In the Project, polyethylene (PE) pipe, ductile cast iron pipe and steel pipe will be procured.

As for PE pipe, there is a manufacturer in Macedonia. The factory produces fine quality PE pipes of ISO standard and they even export the products to other countries. For this reason, Macedonian products will be employed.

Steel pipes and ductile iron pipes are not produced in Macedonia. Ductile iron pipes are imported from Austria, France, Croatia and Bosnia while steel pipes are imported from Bulgaria, Serbia, etc. They are always available in the local market. The products of the third countries will be employed.

Table 2-36 Procurement Plan of Material and Equipment

Item	Macedonia	Third country	Japan	Remarks
1. Intake				
Submersible pump				
Material for well construction				
2. Disinfections				
3. Transmission pump				
4. Pipe				
PE pipe				
Steel pipe				
Ductile Iron pipe				
5. Material				
Cement				
Aggregate (Gravel and sand)				
Steel Bar				
Form				
Fuel				

Third country: Croatia, Slovenia, Italy, Burglaries, Denmark, Germany, Greece, Austria, etc.

(3) Construction machinery

There are construction companies and lease companies with relatively enough number of construction machines in Skopje city. Common construction machines are available in Skopje city. Construction machinery will be procured in Skopje city and transported to the site.

2-2-4-6 Quality Control Plan

The compression test of concrete will be entrusted to a public institute or laboratory. Necessary tests such as slump test, air content test will be conducted. For the materials for filling used for earthwork, density test will be conducted at site if necessary. Leakage test will be also carried out for reservoirs and pressure test for pipelines.

2-2-4-7 Implementation Schedule

Tentative schedule is shown in Figure 2-4. The entire period of the Project is to be 22.5 months consisting of 4.5 months for the detailed design, 2.5 months for preparation of tendering and 15.5 months of construction.

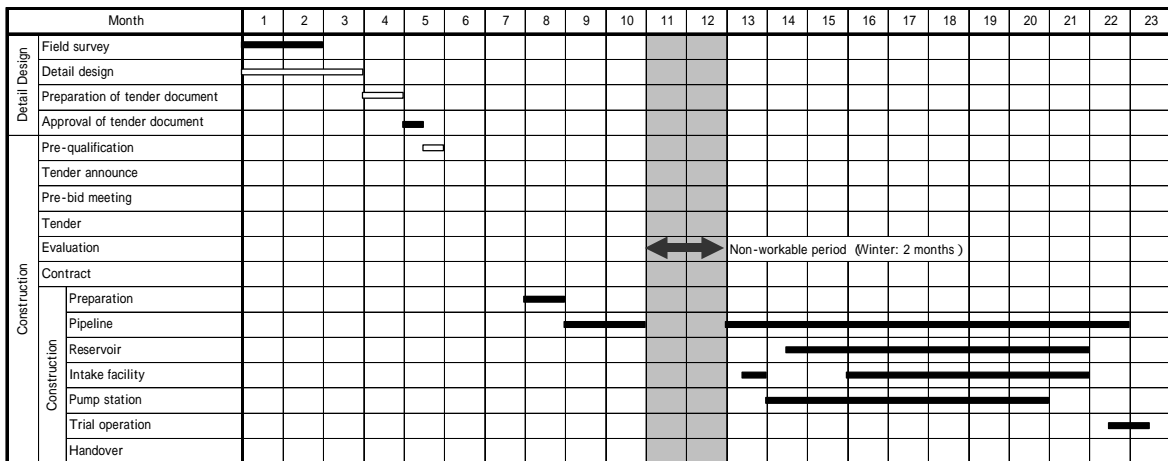


Figure 2-4 Implementation Schedule

2-3 Obligations of the Recipient Country

2-3-1 Administrative Procedures for Execution of the Project

Documents necessary for construction approval issued by MTC are described below. In case of delay in approval of these documents, MTC shall take necessary measures to help the municipality to complete the process.

(1) Water right

At present, villages of Cvetovo and Dolno Kolicani in Studenicani municipality have not obtained approval of water right.

Municipality of Zelenikovo will receive water from Skopje city water supply system by connecting its system with existing city water pipes. Skopje city water and sewerage PE has water right and Zelenikovo will share the right with the city. Therefore, Zelenikovo should receive an agreement of water right sharing from the city under the condition that the water will be distributed with sufficient pressure and volume.

(2) EIA

Items of EIA for the Project are protection of water source, relocation of residents regarding reservoir and pipeline construction, and protection of natural parks. In the Project area, first, the municipality consults with Ministry of Environment and Physical Planning (MOEn) about the necessity of EIA. If it is found necessary, the municipality together with MOEn and

environmental experts will study measures of environment protection in relation to the construction of water supply facilities. They will finally compile an EIA report. Municipalities should contact MOEn to complete the required procedure of EIA as soon as possible.

An area in the municipality of Studenicani will be designated as Natural Park in future. Therefore, it will be necessary to prepare an EIA report for the purpose of achieving construction while protecting the local animals and plants.

(3) Evaluation of T/D

All the Project area has submitted their T/D to MTC and evaluation has finished. However, Cair municipality, that is supplied with water from Skopje city water system and whose system will be managed by Skopje city water and sewerage PE, have to receive technical review of T/D from Skopje city water and sewerage PE as well.

(4) Land acquisition and the right to use land

The municipalities own the land for main planned structures (such as intake facility and reservoir tank) in all the project areas. However, in the case of the private land where pipeline route runs, the municipalities (mainly Gazi Baba) shall obtain agreement of the right to use the land during the construction period

2-3-2 Consideration of Environmental Impact Posed by Increased Wastewater

As a result of implementation of the Project, adverse environmental impact will be posed by domestic wastewater to be increased. Currently, in the Project area there is no sewerage system and septic tank is applied for whole sewage from house or only for human waste separately from sewages of kitchen/ bath etc. which are discharged to water channels designed for rainwater and eventually outflow to rivers. This type of existing waste water disposal system poses threat to public health and to the pollution of ground waters and river waters. Pollution of river water has become serious in this country. The estimated waste water quantity resulted from the Project is shown in Table 2-39. On top of the factor regarding quantity, the quality of waste water to be reached at the level of 200 - 250 mg/L in BOD, will contribute to worsen the pollution of ground and/or river waters.

Table 2-37 Quantity of Sewage from Each Village

Municipality	Village	Daily Average Discharge (m ³ /d)	Municipality	Village	Daily Average Discharge (m ³ /d)
Cucer Sandevo	Kuceviste	284	Cair	Radisani	1,883
Gazi Baba	Goce Delcev	293	Petrovec	Ognjanci	251
	Jurumleri	672		Petrovec	518
	Kolonie Idrizovo	261		Kjojlja	74
	Idrizovo	483		Rzanicino	188
Ilinden	Bujkovci	134	Studenicani	Cvetovo	78
	Mrsevci	140		Dolno Kolicani	37
	Miladinovci	300	Zelenikovo	Taor	35
	Mralino	166		Pakosevo	54
	Existing area	2,299		Novo Selo	36
	Future expansion area	198		Strahojadica	55

In order not only to control the breeding of fly and mosquito for preventing the infectious disease caused by pathogenic micro-organisms but also to protect river water from pollution due to waste water to be increased qualitatively and quantitatively, the development of sewerage system or any other proper waste water disposal method is urgently required in the Project area.

And also, the contamination risk of groundwater as drinking water source become higher due to swollen wastewater. Under the condition in which the quantitative problem of water shortage has regionally been emerged in summer season, the qualitative problem with the name of groundwater pollution will impose multiplier grave impact on drinking water resource management strategy. The establishment of proper wastewater disposal system in the Project area, therefore, is acute and fundamental requirement. Presently the program of sewerage system is promoted together with water supply system in Macedonia. The planning or construction of sewerage system is being executed for existing piped water service areas in seven municipalities related to the Project as is shown in Table 2-38. In Gazi Baba its sewerage system, under construction, includes a part of area to be covered by the Project. In Ilinden and Petrovec the sewerage plans established encircle most of or a part of the Project area respectively. With the background mentioned above, it seems to be apparent that the principle of setting up of sewerage system is must-do for areas already having been served by water supply system, is seriously recognized as indispensable criteria of environmental protection and is surely reflected to the currently promoted sewerage program.

Table 2-38 Sewerage Program of Municipalities

Municipality	Sewerage Program
Cucer Sandevo	There is T/D of sewerage system for Gruvo and Brazda and implementation is now under discussion with Austria Government. The bit tender for an existing service area will be held soon. As the Project implementation, selection of treatment system as well as preparation of T/D will be enlightened.
Cair	The urbanized areas have been totally served by sewerage system. There is no existing system or plan in the Project area. As the Project implementation, selection of treatment system as well as preparation of T/D will be enlightened.

Municipality	Sewerage Program
Gazi Baba	The sewerage system under construction covers a part of the Project area. For the rest of the Project area, the sewerage plan will be established afterwards, however at the moment the preparation of T/D has not been started yet. As the Project implementation, selection of treatment system as well as preparation of T/D will be enlightened.
Petrovec	There is sewerage system plan including a part of the Project area. The T/D has been submitted to MTC and Petrovec is also trying to find financial aid agency. Although the area is inundation prone zone, there is no plan for mitigation program for flood.
Ilinden	There is a sewerage plan and T/D has been submitted to MTC. The area considered includes most of the Project area. The rest area is relatively small and it is expected that in future those areas would be connected.
Studenicani	The construction for Studenicani has been contracted. For Batinti, T/D of sewerage system is now under preparation. After the implementation of the Project, sewerage plans will be established for the areas.
Zelenikovo	Zelenikovo Station area has been furnished with collection system, but because of ethnic conflict in 2001, treatment plans have not been constructed, and the system is not currently in service. A 70% of Zelenikovo and a 20% of Oresani have been already furnished with collection pipes and the constructions have still been continued. There is no sewerage system plan for the area of the Project; however, it is the municipality's policy to set up sewerage system after construction of water supply system.

“The New Water Law of Macedonia” has now been drafted in compliance with “EU Water Framework Directive” and it will be enforced in 2004. The Directive puts one of its priorities to water protection, declaring that the new policy will have to get polluted waters clean again, and ensure clean waters are kept clean. In order to achieve the objective, River Basin Management is mentioned as the best model for a single system of water management.

For addressing pollution from urban wastewater, the Urban Waste Water Treatment Directive has been adopted together with the text about sewerage system. One of the main measures of the text is the principle of agglomerations, to set up a system for collecting wastewater that must be associated with wastewater treatment plants. The text declares that nevertheless, where the establishment of a collecting system is not justified either because it would produce no environmental benefit or because it would involve excessive cost, the directive allows individual systems or other appropriate systems which achieve the same level of environmental protection to be used.

It is recommended for each municipality to establish proper wastewater disposal program hopefully in parallel with water supply system scheme, through comparative study between collecting system with treatment plants and individual systems or other appropriate systems in accordance with EU standard. However, it must be kept in mind that in case of individual systems being able to be operated and maintained by each user, there is tendency in which the maintenance would supposedly be abandoned or neglected, eventually be resulted in pollution problems of living environment in the vicinity. Therefore, it is recommended to apply maintenance system carried out by public sector. The individual municipality should prepare T/D of the selected proper wastewater disposal system and to ask MTC to support the promotion of the program. MTC is recommended

to promote implementation of relevant municipality's sewerage program in such a way that planning it in the Government budget and/or searching for financial sources.

2-3-3 The Progress of on-going Project Implemented by Macedonia

There are two relevant projects implemented by Macedonia in the Project area. These works shall be completed on schedule. The detailed schedule is shown in Table 2-39.

Table 2-39 The progress and Due Date of Projects by Macedonia

Village	Project detail and Completion Date
Radisani	Reservoir tank x 2 tanks, (completed) Primary pipe x Total 600m, (completed)
Ilinden PE	Primary pipe, by end of Dec. 2003

2-3-4 Item to be Managed by Macedonian Government

The budget for construction works by the Macedonian side is to be secured by MTC. The following work items are responsibilities of Macedonia.

- 1) To install primary wiring to supply electric power under low voltage (five villages: Jurumleri, Ilinden East, Dolno Kolicani, Strahojadica, Radisani)
- 2) To construct fences (village: reservoir tank of Kuceviste, reservoir tank of Radisani, intake and reservoir tank of Cvetovo, pump station, intake and reservoir tank of Dolno Kolicani, pump station and reservoir tank of Strahojadica)
- 3) To construct pipes for house connection

The residents should make a contract with PE and, pay construction fee for the house connection of the portion from the saddle on the secondary pipe and PE will construct up to water meter. Installation of house connection pipes is requested to local construction companies. The average construction fee is around EUR100 per house and payment in installments is available. According to the result of the interview survey, household income of some villages (Strahojadica, Cvetovo, Petrovec, Kolonie Idrizovo) is EUR 100 - 150 /month. There are ethnic minorities in such villages and some of them are not economically affluent. For these households with low income, PEs is planning to take consideration of payment in installments and also to apply subsidies from the municipality through discussions with the residents as has been done in Cucer Sandevo.

Above items 1) and 2) will be paid from the budget of MTC. MTC is capable to prepare and allocate the budget for the items because only 1% of annual budget (2.5 to 3.0 million euro) of

MTC is expected to be needed. As for item 3) mentioned above, most municipalities have the experience in individual house connections that are mainly paid by customers. Following these precedents, each PE should make sure to enforce the principle of payment by beneficiary.

2-4 Project Operation Plan

After the Project's completion, the operation and maintenance (O&M) of the water supply systems will be undertaken by PE. As can be seen from the available financial data, the all PEs currently yield profit. Municipalities covered by the Project, except Cair, already have their own PE. In the case of Gazi Baba, Petrovec, and Ilinden municipalities, they have established the unified PE in Ilinden (Ilinden PE).

The water supply system provided by the Project in Cair will be operated and maintained by Skopje city water and sewerage PE. The PE is in sound financial condition, with its 1,185 employees, 94,672,000 m³/year water production, 750 million MKD total income in 2002 fiscal year, and about 10 million MKD profit after tax. The PE, as a responsible institute for metropolitan water supply, already provides maintenance for the existing water supply systems in Cair. It is expected that the operation of the new system by the Project will surely be secured.

Zelenikovo, Cucer Sandevo, and Ilinden PE currently operate their own water supply systems, so that the existing facilities are considered to be properly managed by them. Yet, the expansion of the system in those areas will require additional manpower as shown in Table 2-40.

Table 2-40 Additional Operation Staff

	Operator (operation of facilities)	Technician (response to emergence, maintenance)	Total
Cucer Sandevo PE	1 persons	1 person	2 persons
Ilinden PE	3 persons	1 person	4 persons
Zelenikovo PE	1 person	0 persons	1 person
Studenicani PE	1 person	1 person	2 persons

The operational capability of Cucer Sandevo and Ilinden PEs will be and have been strengthened through institutional strengthening programs sponsored by Austria and Germany respectively. The management capability of those PE has been upgraded and with increased number of staff members recommended in the table above, they can maintain the sound management.

Cucer Sandevo PE

The program of “ Water Supply of Cucer Sandevo, Phase 1 (June 2000-March 2003)” was implemented by Austrian Aid with a total fund of EUR 661,323. The program included in its

scheme the construction of water supply facilities, training in house connection, formulation of contract between PE and user, and support for PE establishment. The strengthening program of PE is to be included in Phase 2 (2003 start) of the program and the training scheme is now under preparation.

Ilinden PE

The program of “Commercialization of Municipal Public Enterprises (2000-2007)” is implemented by GTZ of Germany for 15 PE throughout the country, with a total fund of EUR 2.5 million. The following component is included in the scheme. Ilinden PE in the Project area is involved in the training program.

- (i) Regionalization of water supply system
- (ii) Introduction of public advertisement to promote customers’ understanding of the water charge system and motivation of willingness to pay.
- (iii) Introduction of international accounting system and supply of computer needed for accounting.

Zelenikovo PE

Zelenikovo PE receives water from Skopje city water and sewerage PE and provides water supply service to the areas of Zelenikovo, Zelenikovo Station, and Oresani. Zelenikovo PE has four employees: a director (engineer), one technician and two operators. Since their task is to distribute the water received from Skopje city water and sewerage PE, required maintenance work is minimal. The O&M of the existing facilities is adequately conducted with a moderate level of technology. From the financial statements, it can be said that the PE presently earns profit and has a healthy finance. However, one more operator is required to cope with expansion of the water supply system under the Project.

During the construction period of the Project, the Japanese Consultant and Contractor assigned to the Project will transfer necessary technology for upgrading and securing maintenance work, to the staff of the PE through OJT (on the job training). The contents of technology transfer from Japanese side are as follows:

- (i) “O&M technique for the water supply system (mainly for operation and response to emergency)” training period: 7 days
- (ii) “Basic method of leakage prevention (estimation of total leakage volume and response to emergency)” training period : 7 days

Zelenikovo PE have conducted O&M for the existing water supply system. O&M activities are mainly led by the experienced staff who has engaged in water works for 25 years. Contract with local contractors, billing system using bank transfer system, recruiting new staff, etc. have been well managed by PE. The facilities to be constructed under the Project are basically as same as the existing facilities. Therefore, O&M for proposed facilities by the Project can be managed by recruiting additional staff.

Zelenikovo PE has relationship with Skopje city water and sewerage PE for bulk water supply. Necessary technical supports from Skopje city water and sewerage PE is also probable on requirement from Zelenikovo PE.

Studenicani PE

Studenicani PE has no experience of O&M work of water supply system. The Batinti system in Studenicani, which has been constructed recently, is to be supplied with water and operated by Skopje city water and sewerage PE. Studenicani PE has five members and it currently undertakes solid waste disposal. The water supply system to be provided under the Project has its own water source and the PE will have to carry out the O&M on its own. To cope with the operation of the new system, the PE has to employ one additional technician and one operator. The PE is considering employment of persons with experience.

The new water supply system consists of gravity type (Cvetovo) and pump boosting type (Dolno Kolicani). The necessary technology of the O&M will be transferred from Japanese Contractor during the construction period. The contents of the technology transfer are as follows:

- (i) “O&M technique for the water supply system (mainly for operation and response to emergency)” training period : 7 days
- (ii) “O&M procedure of pumping station” training period 14 days
- (iii) “Basic method of leakage prevention (estimation procedure of total leakage volume and emergency response measures)” training period : 14 days

Through negotiation about the O&M contract for Batinti water supply system, Studenicani municipality has become in close relationship with Skopje city water and sewerage PE. It is probable for Studenicani to receive technical assistance from Skopje city water and sewerage PE, such as contract and installation for house connection, establishment of water charge collection system, training of staff, etc.

Financial management of the Studenicani PE has been audit by local unit of Ministry of Finance at the end of every year. In order to pass the audit, Studenicani municipality also supports

3-3) Execution period: Detailed design and construction period is as shown in implementation schedule.

3-4) Others: The project will be implemented in compliance with Japan's Grant Aid scheme

2-5-2 Operation and Maintenance Costs

(1) Production Costs

The production costs predicted are as follows:

- (A) Cost of water purchase: Cost of water purchased from Skopje city water and sewerage PE
 (B) Electric power cost: Electric power for pumping and disinfection facilities
 (C) Chemical cost: Cost of sodium hypochlorite used for disinfection. No cost is required for Cair and Zelenikovo that is supplied with water by Skopje city water and sewerage PE .
 (D) Manpower cost: Cost of additional employment required for new system provided by the Project
 (E) Repair cost: Annual cost of spare parts. The cost is estimated to be 5 % of total expenditure for electricity and chemical.

The estimated operation and maintenance costs of the newly constructed facilities (water production cost) for each item mentioned above are shown in Table 2-42

Table 2-42 Annual Operation and Maintenance Costs

unit: MKD/year

Name of PE	(A) Water purchase	(B) Electricity	(C) Chemical	(D) Personnel	(E) Repair (B+C)X 0.05	Total
Cucer Sandevo PE	-	22,566	12,743	408,000	1,765	445,074
Ilinden PE	-	6,990,449	268,111	768,000	362,928	8,389,488
Studenicani PE	-	68,779	4,379	408,000	3,672	484,815
Zelenikovo PE	586,920	125,052	-	180,000	6,253	898,225
Skopje PE (Cair)	3,590,542	2,425,349	-	180,000	121,146	6,317,158

(2) Comparison between production cost and revenue from water tariff

If the expected revenue from water charge is larger than the production cost, it is considered that the PE is financially sustainable. Relationship between the production cost and revenue is shown in Table 2-43.

Table 2-43 Production Cost and Water Tariff

Name of PE	Production Cost (MKD/yr)	Water Production #1 (m ³ /yr)	Unit Production cost (MKD/m ³)	Revenue		Water Tariff #3 (MKD/m ³)
				Rate of Accounted-for water #2	Income (MKD/yr)	
Cucer Sandevo PE	445,074	129,575	3	80%	1,554,900	15
Ilinden PE	8,389,488	2,726,550	3	70%	20,040,143	10.5
Studenicani PE	484,815	44,530	11	70%	498,736	16
Zelenikovo PE	898,225	73,365	12	75%	990,428	18
Skopje PE (Cair)	6,317,158	763,945	8	78%	7,842,934	Domes.: 8.71 ^{#4} Others: 23.55

Note: #1 Leakage is included in water volume produced

#2 The mentioned accounted-for rate is the current value of each PE, except Studenicani,.

#3 Unit water tariff is the present value of relevant PE. However, for Studenicani the value 70% of countable rate is applied.

#4 Domes.: Water tariff for domestic use, Others: Large consumers including commercial and industrial use

(3) Analysis of Water Tariff

The average payable tariff was calculated from the result of field survey carried out under the Project as shown in Table 2-44. The survey also revealed that electric power cost occupies more than 10% of the total household income while that of water tariff accounts for only 3 - 4%.

Table 2-44 Average Payable Tariff

Municipality	Payable Tariff per Household (MKD/house)	Average Water Consumption		Unit Payable Tariff (MKD/m ³)
		Family Size (persons)	Water Use (m ³ /house/month)	
Cucer Sandevo	336	5.6	18.5	18
Ilinden	404	6.9	30.0	13
Studenicani	390	9.5	22.8	17
Zelenikovo	445	6.0	27.0	18
Cair	404	4.7	21.2	19

(Source: Result of questionnaire survey for residents)

In Cucer Sandevo, Ilinden and Cair, the water tariff is smaller than payable amount and the present tariffs, less than 15 MKD/m³, in these PE are within reasonable range. Financially, the O&M of the new water supply systems under the Project in these areas will be sustained soundly.

In existing water supply area of Zelenikovo, revenue and expenditure is balanced with a water tariff of 18 MKD/m³. It is estimated that the accounted-for rate is 75%. The unaccounted-for rate of 25% consists of 10% of leakage and 15% of unpaid water. The same rate is applied for the financial analysis of the Project. According to the questionnaire survey, the payable water tariff is 18MKD/m³, thus it is hard to raise water tariff more than that. In order to maintain sound financial status without raising the water tariff, the rate of unaccounted-for water should be

lowered. If the rate is fixed at 10%, the expected revenue from water charge will be about 1,056,000 MKD/year, which is considerably larger than estimated expenditure, thus management bases would become eventually stable.

If the rate of accounted-for water in Studenicani is assumed to be 70%, water tariff for sustainable management will be estimated to be 16 MKD/m³. This value is lower than the residents' payable tariff of 17 MKD/m³. If the rate of accounted-for water is improved, the financial status of PE will be further improved.

Chapter 3 Project Evaluation and Recommendations

Chapter 3 Project Evaluation and Recommendations

3-1 Project Effect

Expected direct and indirect project effects are summarized in Table 3-1.

Table 3-1 Expected Project Effects

Present Status and Problem		Action of the Project	Project Effect
Direct effect			
1.	In the target villages, the rate of population served remains low and most residents obtain drinking water from wells or public fountains in villages. Particularly, water from wells is poor in quality and unstable in quantity.	Construction of water supply facilities; transmission and distribution pipeline (approx. 116 km), reservoirs, intake facilities and pump stations	The rate of population served will improved to 100% at all 20 villages. Population of 32,435 will be provided with sufficient water of fine quality. Water fetching work will be alleviated as a consequence of the provision of water through individual house connections.
Indirect effect			
1.	In many of the target villages, well are contaminated by wastewater so that some of residents are suffering from water-borne disease such as diarrhea.	Provision of fine quality water	Number of patients will be decreased.
2.	In the target villages, construction of water supply facilities is behind that of other infrastructures such as telecommunication, transport, electricity, etc.	Construction of water supply facilities	Improvement of living conditions

3-2 Recommendations

In order to utilize constructed facilities under the Project efficiently and to realize the project objective “Stable water supply with fine quality to residents of the target villages”, it is indispensable for Macedonian side to ensure the following:

- 1) Individual house connection will be borne by residents, though distribution networks or pipeline will be constructed by the Project. MTC, municipalities and PEs shall promote the individual house connections to the networks, by means of any measures such as subsidy for recipients of public assistance.
- 2) PEs shall learn and maintain the technology and knowledge on operation and maintenance works that would be transferred by Japanese side on handing over the facilities to be constructed under the Project.

- 3) Municipalities and PEs shall sustain the organization for the operation and maintenance of water supply facilities. In order to improve the administrative ability of PEs, e.g. stabilizing water revenue, thorough waterworks management by self-accounting system, etc. it is desirable to share and positively utilize the outcome of the training program by Germany or Austrian projects and the knowledge and experiences of Skopje city water and sewerage PE.
- 4) Improvement of water supply will inevitably bring about the increase of wastewater. In the course of the Project, municipalities should consider the plan of wastewater removal or treatment and should put it into action.