CHAPTER 6 PROJECT COST

6.1 Composition of Project Cost

Project cost is composed of such items as follows:

Item	Description
Construction Base Cost	Summing up of direct and indirect costs
Engineering Service Cost	Summing up of direct and indirect costs
Compensation Cost	Summing up of compensation costs
Administration Cost	7 % of construction base cost and compensation cost
Physical Contingency	6 % or 10 % of construction base cost, engineering service cost and compensation cost
Price Contingency	Consideration of rises in prices.
Value Added Tax	10 % of construction base cost and engineering service cost including physical and price contingencies.

6.2 Conditions of Project Cost Estimate

The cost estimate is made on the price level as of the end of July 1999, since the cost data of materials, laborers, equipment and other necessary items for the cost estimate are collected in this period. The foreign exchange rate applied to the cost estimate is US$ 1.0 = Rp. 6,885 and ¥1.0 = Rp. 60.39 formally issued by the Bank of Indonesia at that time.

6.3 Result of Project Cost Estimate

The project cost of each component and total amount are shown in the table below.

Cost Item	Unit	Component A West Floodway/ Garang River Improvement	Component B Jatibarang Multipurpose Dam Construction	Component C Urban Drainage System Improvement	Total
Construction Base Cost	Rp.x10^6	208,995	332,533	150,531	692,059
Engineering Service Cost	Rp.x10^6	18,170	33,372	12,019	63,561
Compensation Cost	Rp.x10^6	710	13,500	4,793	19,003
Administration Cost	Rp.x10^6	14,679	24,222	10,873	49,774
Physical Contingency	Rp.x10^6	13,673	37,940	10,041	61,654
Price Contingency	Rp.x10^6	37,489	88,509	31,302	157,300
Value Added Tax	Rp.x10^6	27,554	48,218	20,083	95,855
Total	Rp.x10^6	321,270	578,294	239,642	1,139,206
	Yenx10^6	5,320	9,576	3,968	18,864
	USx10^3$	46,662	83,993	34,806	165,461

CHAPTER 7 PROJECT EVALUATION

7.1 General

Economic analysis appraises a project under study in terms of national and/or regional social economy by comparing and measuring its economic costs and benefits. In other words, economic analysis evaluates a degree of economic impacts on a project under study that would bring about in the national and/or regional social economy.

7.2 Methodology

The Project Evaluation of this time is a review of the evaluation executed in the Feasibility Study conducted by JICA Study Team in 1993. The way of the project evaluation from the viewpoint of economic aspects in this stage of the Project is the same manner applied for the evaluation in the Feasibility Study at that time.

The mesh method is applied for the estimation of inundation damages and the benefit of the Flood Control Sector is the deference of the inundation damages between with- and without-project. The benefit of the Water Resources Development Sector is estimated based on the low water price at an intake of a PDAM purification plant. The benefit of the Hydropower Generation is calculated based on the construction cost and the fuel cost of power production of a thermal power station with power output equivalent to the hydropower station.

A discount rate of 12 % is applied as same as that in similar projects in Indonesia.

7.3 Economic Evaluation

The economic viability of the project is assessed in terms of Economic Internal Rate of Return (EIRR), Benefit Cost Ratio (B/C) and Net Present Value (NPV). The economic evaluation is made for the Flood Control, Water Resources Development, Urban Drainage and Hydropower Generation sectors and the results of the evaluation are summarized in the table below.

Results of Economic Evaluation

Sector	EIRR (%)	B/C	NPV (Rp.x10^6)
Flood Control	19.77	1.78	72,201
Water Resources Development	22.14	2.08	51,963
Urban Drainage	15.13	1.29	15,317
Hydropower Generation	11.66	0.97	-339
Overall Project	18.81	1.68	139,142
Jatibarang Multipurpose Dam *[1]	18.53	1.66	58,938

Note *[1]: Sector of Jatibarang Multipurpose Dam is composed of a part of Flood Control Sector, Water Resources Development Sector and Hydropower Generation Sector.

From the above table, the calculated EIRR of overall Project composed of four (4) sectors is much higher than the used discount rate of 12 % that is adopted as an appraisal standard of the project by the Indonesian Government. It means that the proposed Project is economically sound.

Each EIRR of Flood Control, Water Resources Development and Urban Drainage Sectors is much higher than the used discount rate of 12 %. Accordingly, these sectors are considered economically viable. The calculated EIRR of the hydropower generation sector is lower than one of the others, but approximately equivalent to the used discount rate of 12 %. The hydropower generation sector is economically implemented in accordance with national policy from the viewpoint of basic human needs.

A sensitivity analysis is made taking into account of fluctuation of the benefit and cost. The results are summarized in the table below.

Results of Sensitivity Analysis

Sector	EIRR (%)				
	Cost)	Benefit			
		Base	-10 %	-20 %	-30 %
Flood Control	Base	19.77	18.12	16.40	14.62
	+10 %	18.27	16.72	15.12	13.45
	+20 %	16.98	15.52	14.01	12.44
	+30 %	15.86	14.48	13.05	11.57
Water Resources Development	Base	22.14	20.37	18.52	16.58
	+10 %	20.53	18.86	17.12	15.30
	+20 %	19.14	17.56	15.92	14.20
	+30 %	17.93	16.43	14.87	13.24
Urban Drainage	Base	15.13	13.78	12.38	10.91
	+10 %	13.90	12.63	11.32	9.95
	+20 %	12.85	11.65	10.41	9.12
	+30 %	11.93	10.80	9.62	8.39
Hydropower Generation	Base	11.66	10.40	9.10	7.75
	+10 %	10.52	9.34	8.13	6.85
	+20 %	9.54	8.44	7.28	6.08
	+30 %	8.69	7.64	6.55	5.39
Overall Project	Base	18.81	17.23	15.58	13.86
	+10 %	17.37	15.88	14.34	12.73
	+20 %	16.14	14.73	13.27	11.76
	+30 %	15.06	13.73	12.35	10.92
Jatibarang Multipurpose Dam	Base	18.53	16.99	15.40	13.73
	+10 %	17.13	15.69	14.19	12.63
	+20 %	15.94	14.57	13.16	11.69
	+30 %	14.89	13.60	12.26	10.87

Under the case of 30 % increase in cost with 20 % decrease in benefit and the case of 10 % increase in cost with 30 % decrease in benefit, the EIRR of overall Project is still keeping higher than the discount rate of 12 %.

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CHAPTER 8 ENVIRONMENTAL IMPACT ASSESSMENT

8.1 Clearance of Environmental Issue

Under the Ministry of Public Works (DPU) (presently called as Ministry of Settlement and Regional Development), the study on environmental impact analysis was conducted taking account of the importance for the protection of natural and social environment. During this detailed design (D/D) study, in accordance with the government regulation "PP No.51/1993" and the regulation from the State Minister of Environment No. Kep. 39/MENKLH/8/1996, following reports were duly prepared and submitted to the Central Committee (KOMPUS) for approval.

(1) Terms of Reference of the Environmental Impact Statement (KA-ANDAL)

(2) Environmental Impact Assessment (ANDAL)

(3) Environmental Management Plan (RKL)

(4) Environmental Monitoring Plan (RPL)

The results of ANDAL were discussed in the official meetings organized by both regional and central committees (called KOMDA and KOMPUS, respectively) to evaluate the project from the environmental point of view. Through the several meetings, ANDAL, RKL and RPL documents have been rectified and modified based on the comments and suggestions from the committee members, and were submitted again. Then, the final reports were approved by KOMPUS in August 1999.

8.2 Natural Environment Aspect

The study area covers 204 km^2 as a whole catchment area of Garang River, of which most of the part lie in the jurisdiction of Semarang City (Kotamadya) and the central area of Semarang City, so the area has been already developed in terms of social infrastructure due to the predominant influence of urban environment. In other word, natural forest no longer exists in the study area to provide for wild animals' habitat or refuge. Regenerated woods can be seen instead after natural vegetation covers have been intensively eliminated by cutting trees and fires. Under these circumstances, there is no endangered species of fauna nor protected flora.

In the proposed area of Jatibarang Multipurpose Dam and reservoir, a city park called "Goa Kreo" is situated with a symbolic cave as Moslem's holy place. The park is managed by

Tourism Agency (Dinas Pariwisata) under Municipality and expected to earn Rp.14 million of annual revenue from about 34,000 visitors. People enjoy spending time in weekend in this recreation site. The park environment makes suitable habitat for monkeys, too. It is reported that the number of heads reaches about 200 and they are taken care of by the Agency. Although this park will become isolated when the reservoir is filled up with water, a pedestrian bridge will be constructed to approach the park.

Heavy metal contents have been detected from the bottom deposit of rivers in the urban areas. It should be noted that Asin, Semarang and Baru rivers are characterized by the high concentration of Cu, Cr, Zn and Pb. This undesirable aquatic environment is obviously attributed to the industrial waste discharge. It will be, therefore, necessary to take proper measures in construction stage when dredged material is disposed at the land reclamation site.

8.3 Social Environmental Aspect

Social environment involves numerous factors associated with human relationship and interactions. Land acquisition and resettlement are considered to be the most significant issues in this regard. The required land is scattered as the project is composed of three major components with different characteristics. Urban drainage scheme, for example, needs to consider resettlement plan for affected people resulting from house evacuation. Meanwhile, dam will affect vast area of farmland and woods in and around proposed reservoir site. The area of land acquisition and number of houses to be resettled are summarized as below:

Component	Land Acquisition	House Evacuation
A: West Floodway/Garang River Improvement	2.6 ha	2 units
B: Jatibarang Multipurpose Dam Construction	150.0 ha	-
C: Urban Drainage System Improvement	4.7 ha	3 units
Total	157.3 ha	5 units

Further information is given as follows:

8.3.1 West Floodway/Garang River Improvement

Land acquisition is necessary for construction of the proposed earth dike and drainage by-pass channel on the right river bank in the river stretch between North Ring Road Bridge and the river mouth, and the area at the confluence of Garang River and Kreo Rivers. The area between North Ring Road Bridge and the river mouth is a newly developed land by reclaiming the coastal area in recent years, and the reclamation is still being undertaken. The objective areas belonging to a private land developer and a resident have an area of about 26,000 m^2 in total.

A meeting of which agenda is "Development and Improvement of River Mouth Area" was held at Provincial Public Works Office (DINAS PU) on September 3, 1998 among DINAS PU, JRATUNSELUNA Project Office, Semarang City, land developers and the JICA Study Team. On the occasion, DINAS PU informed the private land developers of the necessary land acquisition area for West Floodway/Garang River improvement works. The developers, basically, accepted the request from the Public Works Office. Therefore, it is expected that the land acquisition will be executed smoothly without any delay after the completion of JICA's detailed design works.

As to the house evacuation, only two (2) units of houses are affected by the project works in the upper reaches of Garang River. Apparently, these houses are placed in the category of semi-permanent house. For the smooth implementation of the Project, it is recommended that the project office takes necessary action for the house evacuation immediately after the detailed design.

8.3.2 Jatibarang Multipurpose Dam Construction

The component of Jatibarang Multipurpose Dam Construction will affect relatively wide area of farmland and woods in and around proposed damsite including the reservoir area. The total required area for the construction of dam and reservoir is estimated at about 150 ha of land which is presently used for paddy, upland, small plantation, woods and so on, and no people are living there so that resettlement work is not required.

Problem during land acquisition will not occur due to its land use pattern. It is confirmed that whole required area is covered with only farm land and unutilized land. Under such circumstances, land acquisition will be smoothly conducted on cash-based compensation, which is supposed to be the most realistic option.

8.3.3 Urban Drainage System Improvement

Land acquisition is necessary for construction of the proposed Asin Retarding Pond, Asin Pumping Station, Baru Retarding Pond, Bandarharjo West Secondary channel and Baru Conveyance Channel. The total area is 47,000 m² belonging to the Semarang Harbor Authority. Presently the area is unused land and the change of land use into drainage facilities was approved by the Mayor of Semarang City. Therefor it is expected that the land acquisition will be executed smoothy without any delay after the completion of JICA's detailed design works.

As to the house evacuation, only three (3) units of house are affected in Asin Drainage System

Improvement (Package-2). The land for relocation is to be prepared in the construction work of Asin Retarding Pond. It is recommended that the project office takes necessary action for the house evacuation immediately after the detailed design.

8.4 Environmental Management Plan

Based on the impact study, the environmental management plan was formulated with a view of preventing and mitigating negative impacts as well as enhancing positive strategic impacts. A wide range of environmental issues was discussed as a basic approach to the establishment of proper management plan. There are three stages in managing approach such as (1) pre-construction, (2) construction, and (3) post-construction. Further details can be referred to Table 8.1.

8.5 Environmental Monitoring Plan

The monitoring work has to be performed periodically for a certain period depending on the subject parameters. The impact source varies according to the project stage. Frequency and duration to mitigate environmental impacts are summarized as follows:

Stage	Monitoring Item	Frequency and Duration
Pre-Construction Stage	Land issues and social unrest	Monthly-based monitoring for as long as problems exist.
	Roadside trees along the west floodway	Weekly-based monitoring for transplanted trees until embankment work is completed.
Construction Stage	Noise and air pollution	Monthly basis for the dam project and twice a month for the river improvement project as well as the urban drainage project.
	Water quality, sedimentation, road damage and aquatic biota	Monthly-based monitoring during the construction period.
	Traffic disturbance, sand quarry operation and dredged material	Weekly-based monitoring during the construction period.
	Water intake facilities, railway bridge and ferry boat service	Daily-based monitoring during the construction period.
Post-Construction Stage	Illegal land use	Bi-monthly (twice a month) basis for minimum two(2) years.
	Water quality (reservoir and river), fish farming and sediment disposal site	Monthly-based monitoring without limit of duration unless otherwise specified.
	Land slide and Goa Kreo park	Monthly-based monitoring for minimum two(2) years.
	Land use pattern, land subsidence and river morphology	Every six(6) months without limit of duration unless otherwise specified.
	Flood mitigation	Every rainy season without limit of duration.
	Water intake facilities	Daily-based monitoring without limit of duration.
	Pump operation	Bi-monthly-based monitoring without limit of duration.

CHAPTER 9 ORGANIZATION FOR MAINTENANCE AND OPERATION

The management and operation of the facilities designed in this project are done by the Provincial Government of Central Java for West Floodway / Garang River and Jatibarang Multipurpose Dam, and by Semarang Municipal Office for Urban Drainage Facilities. The organization for maintenance and operation for each component of the Project are summarized hereinafter.

9.1 West Floodway / Garang River

According to the new Regional Regulation on the organization and procedures of Central Java Province, operation and maintenance of the river facilities are carried out by **Jragung-Tuntang West Water Resources Management Unit**, which is under the Head of Water Resources Development Service, Central Java Province. **West Floodway & Garang River Lower Reaches Operation & Maintenance Office** and **Simongan Weir Operation & Maintenance Management Office** are established anew in the Operational Management Section (refer to Fig. 9.1).

9.2 Jatibarang Multipurpose Dam

According to the new Regional Regulation on the organization and procedures of Central Java Province, operation and maintenance of the river facilities are carried out by **Jragung-Tuntang West Water Resources Management Unit**, which is under the Head of Water Resources Development Service, Central Java Province. **Jatibarang Multipurpose Dam Operation & Maintenance Management Office** is established anew in the Operational Management Section (refer to Fig. 9.1).

9.3 Urban Drainage Facilities

According to the Municipal Regulation on the organization and procedures, **Settlement Environment Sub-Section** under Drainage and Sanitation Technology Section of Municipal Public Works Service is in charge of operation and maintenance of the proposed drainage system (refer to Fig. 9.2).

In order to reduce the financial burden of the Municipal Government and secure daily operation and maintenance, a part of operation and maintenance costs is shared by the

beneficiaries of the proposed pumping system since the budget for the operation and maintenance is limited in the Municipality.

For collecting contributions from the beneficiaries and control the payment, a resident association is established. Here "resident" means not only person who lives in but also person who owns a factory, storehouse or office building which located in the pump drainage area. The resident association should be the cooperatives which is a legal body or a corporation.

CHAPTER 10 RIVER BASIN MANAGEMENT PLAN

10.1 Basic Issues and Problems

The Garang river basin comprises part of Semarang City in the north and two other regencies, Kendal and Semarang in the south. As population of Semarang City, the capital city of Central Java Province, increases by nearly 2.1 % annually, urban area is expanding toward the south. This trend can be seen in the upper basin of Garang River, particularly in Gunungpati and Mijen sub-districts where the phenomenon is proved by annual population growth rate which indicate 3.7 % and 2.9 % respectively.

Under these circumstances, urban environment has not been discussed to cope with development schemes. In fact it has been always left behind urban development issues. As a result the city is now facing many problems as by-products of development. In dealing with these adverse effects, it is important to realize that urban environmental issues are closely concerned with water-related matters. From this point of view scrupulous attention shall be paid to the whole Garang river basin as well as the central area of the city, and all available information have to be collected in an effort to study existing problems therein in terms of river basin management. In this regard, major problems and issues to be further discussed are abstracted as follows:

(1) Land subsidence is developing in the northern central part of the city due to the excess pumping up of groundwater from the coastal plain aquifer by industrial and commercial sectors. The number of deep wells in Semarang City was 300 in 1989 but this number was increased to 700 in 1997. Such uncontrolled development of groundwater resource has caused deterioration of circumstances resulting from brackish water intrusion and land subsidence. Regulation for Water Pollution Control PP20, 1990 covers only surface-water and is not applicable to the groundwater.

(2) Since there is no sewerage system nor treatment plant for the domestic wastes in Semarang City, discharge of such wastewater may result in a great contribution to the total organic load and microbiological concentration in the river water.

(3) Wastewater discharge from manufacturing plants is uncontrolled, regardless of whether they are equipped with treatment plant or not. Industrial wastes in general contain heavy metals or hazardous substances to the human health. According to the information of Environmental Bureau in the Provincial Government, there are 89

industrial plants in Semarang City. Among those companies 18 are located upstream of PDAM water intake.

(4) Solid waste is currently disposed in city's sole landfill site, located at 8.5 km upstream of PDAM water intake, managed by the Municipal Cleaning Agency (Dinas Kebersihan Kotamadya). The volume of refuse properly collected and disposed of is estimated at 1,130 m^3 a day, including not only domestic wastes but also commercial, industrial and even medical wastes as well, so that it is also being used as a hazardous waste disposal site. Although the location is a little way from Kreo River, no protection measure is taken against leach and runoff from the landfill site to the river. This situation may result in serious water pollution unless appropriate measure is taken.

(5) Housing complexes are constructed or going to be developed in the upper river basin to cope with rapidly expanding urban population. A new satellite town is planned to be constructed in sub-district Mijen upstream of the proposed dam site. The project requires 1,220 ha of land, of which about 50 % is to be used for housing area where more than 5,000 families can be accommodated. Housing development is one of the major concerns with impact assessment in terms of river basin management and control. It is, as a matter of course, dependent upon the particular project size and location, but its activity involves topsoil removing which may result in soil erosion, sediment on rivers downstream and massive flood discharge.

(6) As natural vegetation cover has been ripped off by the land development, soil erosion arises over an extensive area of the river basin and as a result the river carries washload as well as bedload downstream. It occurs at intermittent intervals that are related mostly to the rainfall intensity. Soil erosion is the major source of turbidity in surface-water and sedimentation as well in the downstream stretches. Sedimentation, which takes place at an intersection point, results in reduction in passing capacity of the channel and, as a result, causes overtopping in case of flood. Closer monitoring practices on the aggradation at an intersection point is required. Dredging work must be undertaken in case aggradation takes place.

(7) The Municipality officially authorizes 17 small local companies to do sand quarry operation business on Garang and Kreo rivers. Quarry area allocated to each of them ranges from 500 m^2 to 2,000 m^2 but its daily production is not clear. According to the Tax Office, the last year's revenue from the quarry company was Rp.400,000, calculated on the basis of Rp.500/ton. The annual production, therefore, amounts to

800 tons, which is rather skeptical and unreliable figure to show the real situation. The production volume may be reported underestimated. Nearly 70 workers are engaged in this job. They simply scoop the sand with bucket in the river bed and store it up on the banks. The broker comes to the site once in a while to buy the materials. Spot delivery price is Rp.20,000/m^3 for sand, whereas Rp.15,000/m^3 for cobble. However, an excessive quarry operation in the river bed will cause adverse effects to both river structures and aquatic environment.

(8) PDAM is currently taking about 1.0 m^3/sec of water from Garang River and pumping it up to its own treatment plant. Sludge deposits, by-products of water treatment, is discharged back to the river at some 50 m downstream from the intake. This system may result in increased sediment load in the lower basin.

(9) Apart from the administrative initiatives for public services, it is absolutely necessary to enhance public awareness and consciousness of the importance of river environment. This can be a basic policy for overall river basin management, but in fact, many people tend to consider the river or open channel as a waste disposal site.

10.2 Key Ideas and Countermeasures

Problems described above are correlated to each other and may be arisen from the large-scaled human intervention for the last few decades. Basically, countermeasures should be taken in such a way that land management techniques and conservation practices are undertaken in rural areas, whereas structural and hydrological control are conducted in urban areas.

Long term and short term approaches can be considered for effectively and economically viable measures, and strategically the management practice can be split into two types such as structural and nonstructural measures. Setting target years for 2003 for short term and 2008 for long term, measures and practices for the River Basin Management are described as follows:

Short Term Program

Short term program involves various schemes to support and accomplish on-going study and activities. It is important to consider that structural measures would not be achieved successfully without proper coordination and harmony with non-structural measures. For example, solid waste collection and disposal system needs to be improved with a new sanitary landfill site and equipment, but at the same time strict control system is required to protect disposal place from entering hazardous wastes. In this sense penalty law should be established.

Soil conservation scheme should be enhanced as part of environmental campaign emphasizing the need to promote reforestation and soil erosion control. These activities have to be performed in the upper basin associated with control of land and housing development. Installation of septic tanks should also be accelerated in line with PROKASIH. Regarding hydrogeological balance between groundwater abstraction and land subsidence, in-depth information is absolutely necessary in order to provide analytical output and key ideas for future action program. Short term program of structural and nonstructural measures on river basin management are summarized in the table below.

Strategic Approaches and Measures (Short Term)

Structural Measures	Nonstructural Measures
- Installation of septic tanks - Construction of new sanitary land-fill site - Procurement of garbage collection equipment - Reforestation by rapidly growing vegetation - Soil erosion control by runoff collection basin - Improvement of PDAM sediment discharge system	- Inter-institutional coordination and collaboration - Strengthening of solid waste control and management system - Enforcement of monitoring system for both river water quality and industrial waste discharge - Establishment of penalty law for waste disposal - Monitoring of land subsidence and groundwater level - Study on hydrological balance to determine optimum groundwater abstraction - Revision of regulation for Water Pollution Control PP20/1990 to include groundwater - Strict control and management for groundwater development - Control of land/housing development in the upper basin

Long Term program

As ultimate structural measures, surface water resources development and the installation of public sewerage system and industrial wastes treatment plants are highlighted in long term program. The implementation of these projects will require pre-conditions such as huge investment and public consensus. In this respect, new law or regulation should be established and enforced to impose tax for beneficiaries of sewerage system so that revenue can be used for the operation and maintenance of the facilities. It is suggested that the Government provides industries with financial assistance or subsidy for the installation of wastes treatment plant. On the other hand, the regulation must be applicable to those who are identified as polluters. They are liable to pay for penalty based on "Polluter's Pay Principle". Strategic approaches and measures are summarized in the table below.

Strategic Approaches and Measures (Long Term)

Structural Measures	Nonstructural Measures
- Surface water resources development - Installation of public sewerage system and treatment plant - Installation or improvement of treatment plants for industrial wastes - Reforestation and vegetation coverage in developed land - Construction of check dams (Sabo Dam) - Gulley erosion control by means of terracing work	- Enhancement of public awareness of environment - Improvement of raw water quality to clear the standards to full satisfaction - Upraising of garbage collection rate to 90 % - Establishment of law or regulation for "polluter's pay principle" - Government subsidy system for private companies or persons - Prohibition of quarry operation in the river - Dredging Work at an intersection point

10.3 On-going Countermeasures and Practices

(1) Groundwater Monitoring and Control

Environmental Impact Assessment Board (BAPEDAL) under the Ministry of Environment is undertaking groundwater monitoring and control project as part of the national environmental program with a technical assistance from the British Government, so called BAPEDAL-ODA Program. Semarang City was selected as a pilot project since it had been ranked in the highest priority. This project was started in April, 1996 and completed in March, 1998. In this connection the Mining Agency of the Central Java Provincial Government is playing a role as project coordinator and Directorate General of Geology in Bandung is also involved in relative investigations for the project.

The project includes technical assistance and suggestive approach to the institutional strengthening for the groundwater management and control, focusing on coastal aquifer and Ungaran aquifer which are considered to be the major groundwater reserves in Semarang City. In this pilot project, 28 observation wells were installed in mainly coastal area with the view of monitoring groundwater abstraction and quality.

It indicates that the fall of groundwater levels occur in coastal areas as a result of over-development of groundwater reservoir and land is subsiding subsequently. It also mention that the groundwater table has lowered by 10 m in an extensive area and even by 20 m in eastern section of Semarang City. Consequently, it is warning that land subsidence of 5 m may occur resulting from 20 m down in groundwater levels. This may induce quality degradation due to the brackish water intrusion.

Current groundwater abstraction in Semarang City is still not clear enough in terms of quantity. According to the study report on Groundwater Conservation in Semarang City and Surrounding Areas conducted in 1993 by the Sub-directorate of Hydrogeology in Bandung, daily abstraction was estimated at 100,800 m^3 in the area covering whole Semarang Municipality and Semarang Regency.

Knowing the actual critical conditions of land subsidence and pollution risk over coastal areas, it is planned to relocate present industrial zone into Tugu Regency and Genuk Regency in order to reduce groundwater consumption. It is also necessary to enhance surface-water resources development in line with restriction and control of groundwater abstraction. This is rather long-term plan but the basic concept is to determine optimum use of groundwater resources taking account of hydrogeological balance.

(2) Surface-water Resources Development

Apart from proposed Jatibarang Multipurpose Dam construction, Kedung Ombo reservoir located about 50 km southeast of Semarang City is nearly completed aiming at supplying 2.25 m^3/s domestic and industrial water. The development of this surface-water resource has been long expected for the benefit of Semarang citizen. PDAM, city water supply enterprise, plans to benefit from the water transfer from Kudung Ombo reservoir through Klambu Weir to Kudu located at northeast edge of Semarang City.

The above raw water transmission project is undertaken by JRATUNSELUNA Project Office. The first phase will be completed at the end of 2000 to conduct 1.25 m^3/s of municipal water, however the schedule of the second phase is not clear. PDAM water supply project is designed to take 1.25 m^3/s of water from Kudu for the first phase and 1.00 m^3/s for the second phase. However, the first phase work is behind the schedule due to mainly financial difficulties. It is still on-going process in the hope that all works be achieved by the end of 2000. The first phase is financed by IBRD and the second phase, on the other hand, will be implemented under BOT system.

(3) Soil Conservation

Soil conservation in the upper basin of Garang River is undertaken by two different institutions, National Development Planning Board (BAPPEDA) and Forestry Office of each Regency concerned. Practical works and activities are described as follows:

(a) BAPPEDA

The study on agro-climatology and land characteristics in the Garang river basin is now being conducted as part of watershed management under BAPPEDA in collaboration with Soil Research Center of Bogor, Food Plant Protection Agency (BPTP) and Center for International Cooperation in Agricultural Research for Development (CIRAD) in France.

The study includes establishment of farming system and cropping pattern to be introduced in the deforested areas in terms of erosion control and soil conservation, and bench terrace is enhanced to the local farmers with the aim of selecting suitable cover crops under the technical guidance of the above assisting agencies. Such soil conservation by crop management is currently carried out in three pilot farms such as Pagrsari (3 ha), Gunungpati (4 ha) and Gonoharjo (3 ha), where the land is used for intensive cultivation of such crops as water melon, corn, onion, groundnuts, ginger, green pepper and so on.

So far study results are practically not obtainable as the recording time is too short to analyze the data. Consequently, it can be hardly explained in quantitative way on how much effect the crops may give on soil protection and erosion control.

(b) Semarang Regency

The area of about 80 km^2 in the uppermost basin of Garang River is fallen in the jurisdiction of Semarang Regency and managed by the Forestry Office of Ungaran since its establishment of 1994. This Office is engaged in the practical field work management in relation to soil conservation and water recharging, and its strategic operation consists of two major activities such as reforestation enhancement and structural approach.

According to the last three (3) years record, reforestation has been achieved for about 170 ha of sloped land in mainly sub-district of Ungaran. Although the Office is desirous of planting 400,000 trees a year, this number is far beyond the reality because in real case it reaches only 10 % of the above at the maximum efforts due to the budget constraint.

Structural measures are also taken as part of operation program. This includes

construction of check dams (sabo dams), recharge wells and storage reservoirs and rehabilitation of terrace-shaped land. Well construction seems to be the most frequent case with the aim of obtaining significant effects such as protection of surface runoff and groundwater recharging.

(c) Kendal Regency

Uppermost basin of Kreo River is under the administration of Kendal Regency. It covers about 26 km^2 consisting of two sub-districts, Limbangan and Boja. Forestry Office in Kendal owns 4 ha of nursery garden in 7 different sites in the Regency and is in charge of forest management. There are 18 forest extensionist, of which 2 are assigned for Limbangan and 3 are for Boja.

Operation work started in 1994/95 with reforestation of 25 ha of land in Limbangan in collaboration with local farmers. Since then the operation has continued to cover 25 ha every year, except fiscal year 1997/98 due to the budget cut. So far 75 ha of reforestation and 25 ha of terrace rehabilitation were achieved in the said two sub-districts.

With regard to structural measures, the Office has undertaken the construction of 45 recharge wells together with 42 small storage reservoirs.

(4) Solid Waste Management

Study is being conducted under SSUDP to select a new sanitary landfill site, and the report will be completed in July 1998 . So far six (6) alternative cases are proposed to the Municipality. Final decision will be made after due consideration between local authorities concerned and an early implementation is expected to set up final disposal area because existing site will be no longer used in 2003. This project shall include management system to control both quality and quantity of refuse so that any industrial and medical wastes are not allowed to be brought in.

10.4 Land Subsidence

Among the problems with regards to the river basin management mentioned in 10.1 " Basic Issues and Problems", land subsidence is most serious and urgent matter to be solved. Therefore, the present situation, countermeasures and monitoring which have been taken or shall be taken are mentioned hereafter.

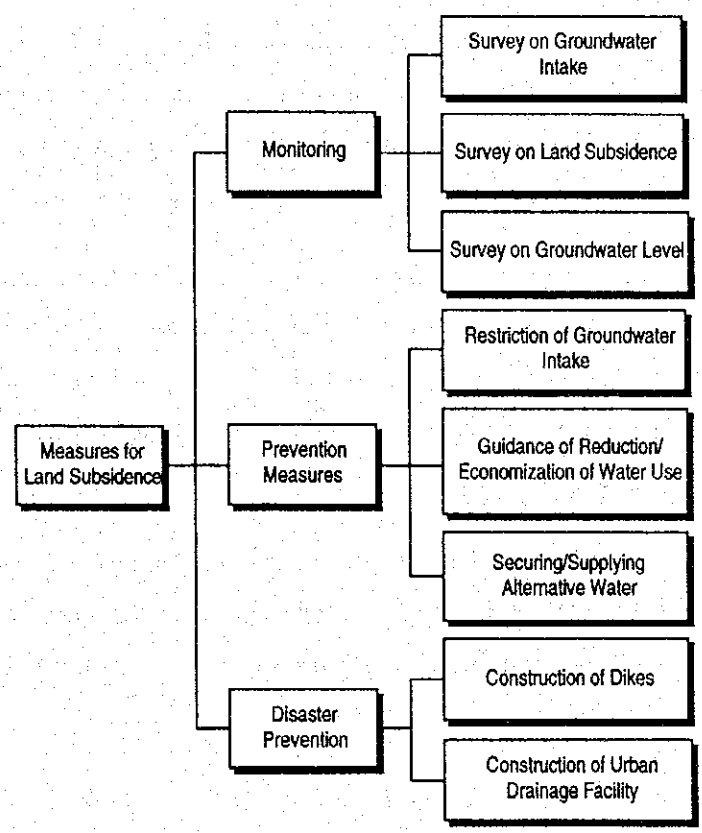
(1) Present Situation

In the past decade, land subsidence was caused in the coastal area of Semarang Municipality due to the excess exploitation of groundwater by the industrial sector and is expanding in terms of area toward the central and eastern areas of Semarang City. As a result of the leveling survey done in August 1997 and 1998 by the JICA Study Team, all of the eight (8) bench marks which were established by the JICA Study Team were found to be subsided 4.0cm on an average with the range of 1.2 cm to 10.0 cm annually.

(2) Countermeasures against Land Subsidence

Since the cost of groundwater use is relatively low, its use is widely ranged from domestic to industrial. On the other hand, groundwater intake is the cause of land subsidence which makes huge loses of assets and activities of the people, its regulation should be planned carefully and comprehensively. Measures against land subsidence can be categorized to (1) Monitoring, (2) Prevention Measures and (3) Disaster Prevention as follows:

Measures against Land Subsidence



Monitoring includes surveys on land subsidence, amount of groundwater intake and groundwater levels. Prevention measures should include not only restriction of groundwater intake but also plans of groundwater reduction/economization and alternative water supply for the effective conversion of water sources. Finally, as structural measures, construction works of a dam whose design are in progress in this Study is necessary for an alternative water sauce.

(3) Present Regulations

Following regulations have been enacted to regulate the groundwater in Semarang City.

Provincial Regulation No. 5/1985 on Groundwater Intake requires the license of the Provincial Government for groundwater drilling and/or use for any purpose. Article 24 of the Regulation provides that Groundwater intake without license results in "violation" in terms of **General Provisions of Penal Code**, which stipulates a maximum of six months in prison. **The Letter of the Governor of the Central Java Province (No. 546.2/029618, dated: October 6th 1993) on Closing of Part of Semarang Municipality and Demak Regency for New Groundwater Intake/Drilling** prohibits issuing new licenses as well as renewal of licenses in almost all the area near the coast in Semarang Municipality except for the purpose of drinking and domestic use. Thus, after the term of all existing licenses are expired (three years), no groundwater intake is permitted except for drinking and domestic use.

The Decision of the Governor of the Central Java Province (No. 546.2/108/1992) on Establishment of Groundwater Control and Supervision Committee stipulates the establishment of organization for the control and supervision of groundwater intake. The Committee consists of Heads of related Services of the Province. The Executive Chairman is the Head of Mining Service, which is in charge of groundwater affairs.

On the other hand, **the Decision of the Mayor of Semarang Municipality (No. 546.2/148/1994) on Obligation to Make Absorption Well** requires new buildings to be equipped with absorption wells, which leads rain water into the groundwater layer. The reason is as follows.

(4) Monitoring on Land Subsidence

There is no data directly surveyed on land subsidence in Semarang City except one, which was surveyed in the period between August 1997 and August 1998 by the JICA Study Team.

To grasp the present situation of land subsidence in Semarang City, to monitor land subsidence by leveling survey is quite important.

JICA Indonesia Office has decided in 2000 to dispatch an expert to Semarang to conduct leveling survey of bench marks, which were established by the JICA Study Team in 1997 and to collect other data related to land subsidence.

(5) Suggestions for Effective Control of Groundwater and Prevention of Land Subsidence

Even though there are some regulations to control the groundwater exploitation, these regulations are not utilized effectively and, as a result, land subsidence is progressing in the coastal and central areas of Semarang City.

Followings are the suggestions to control the groundwater and to prevent further development of land subsidence in Semarang City.

(a) Research/Study for Land Subsidence Prevention

The following should be promoted from the view point of land subsidence prevention: researches/studies including land subsidence, groundwater level, ground level, investigation of subsidence mechanism, moderating groundwater abstraction, fostering groundwater, monitoring including land level survey and groundwater level survey. Responsibilities of related authorities for researches, studies and surveys should be clarified.

(b) Allocation of Personnel and Budget to Violation Detection

Necessary staff for detection of violations should be designated in Exploitation Supervision Section of Mining Supervision Sub-Service in Provincial Mining Service. At the same time enough budget for the detection should be allocated. A part of such budget can be financed by creating new fines for the violation, which is not stipulated in the Regulation (explained below).

(c) Effective Sanctions against Violations

Additional sunctions should be stipulated in the Regulation in order to implement the Regulation effectively and timely. Examples are as follows:

Fine: Groundwater is used mainly because it is cheaper than surface water which should be processed. Fine should be high enough to make the violation costly and users convert to the surface water. In addition, the budget necessary to implement the Regulation can partially financed by the revenue from the fine.

Publication of Violators: Sometimes fines are not enough to prevent violations. Names of recidivists or extreme/repeating violators should be published. Bad reputation is sometimes very costly for those who does not care the fine.

Closing of Wells: New well drilling can be detected easily. But intake from existing wells in secret is very difficult to be found. Thus, wells except shallow wells should be closed or sealed not to be used after the expiration of licenses.

(d) Securing/Supplying Alternative Water Source and Economizing Water Use

New water sources should be developed to secure stable supply of alternative water, and efficient use of groundwater should be promoted to appropriate excess water to alternative use.

(e) Leveling Survey of Bench Marks

Leveling survey of bench marks established by the JICA Study Team in 1997 shall be continued at least once a year to collect data on land subsidence.

CHAPTER 11 IMPLEMENTATION OF THE PROJECT

11.1 Project Component

The Project consists of three (3) components, (a) West Floodway / Garang River Improvement, (b) Jatibarang Multipurpose Dam Construction and (c) Urban Drainage System Improvement. Since the implementation of the Project is different at each component, the description for the implementation is made component by component.

11.2 Executing Office

The organization of the Central Government of Indonesia was drastically changed in October 1999. As of August 2000, the responsible offices for the implementation of the Project would be the Directorate General of Rural Development for components "A" and "B", and the Directorate General of Urban Development for component "C", Ministry of Settlement and Regional Development (KIMBANGWIL).

11.3 Executing Method

The detailed engineering design for the Project was conducted under the JICA Development Assistance Program. It is expected that construction of the Project will be carried out immediately after this D/D. The implementation of the Project is expected to be undertaken under the financial assistance by a foreign developed country. Therefore, the procedure of the implementation will follow to a guideline of a financial assistance agency of the country as well as the laws and regulations of the Government of Indonesia.

11.4 Implementation of Component (a) West Floodway / Garang River Improvement

Packaging

The whole construction works of component (a) are divided into three (3) packages as follows:

Package 1: West Floodway/Garang River Improvement Works
(River mouth to the confluence with Kreo River, L = 9.76 km)
Package 2: Reconstruction of Simongan Weir
Package 3: Raising of Railway Bridge

Implementation Schedule

The major process and its presumed schedule for the implementation is tabulated as below:

Major Work Item	Period
1. Detailed Design	
1-1. Detailed Design including Tender Documents	Aug. 1997 - Mar. 2000
1-2. Approval on ANDAL and RKL/RPL	Aug. 1999
2. Construction of the Project	
2-1. Package 1	Apr. 2001 - Nov. 2003
2-2. Package 2	Feb. 2001 - Oct. 2003
2-3. Package 3	Apr. 2001 - Oct. 2002

11.5 Implementation of Component (b) Jatibarang Multipurpose Dam Construction

Packaging

The whole construction works of component (b) are divided into two (2) packages as follows:

Package 1: Jatibarang Multipurpose Dam including Appurtenant Structures
Package 2: Operation and Maintenance Buildings and Goa Kreo Bridge

Implementation Schedule

The major process and its presumed schedule for the implementation is tabulated as below:

Major Process	Period
1. Detailed Design	
1-1. Detailed Design including Tender Documents	Aug. 1997 - Aug. 2000
1-2. Approval on ANDAL and RKL/RPL	Aug. 1999
2. Construction of the Project	
2-1. Package 1	Apr. 2001 - Dec. 2004
2-2. Package 2	Apr. 2002 - Apr. 2004

11.6 Implementation of Component (c) Urban Drainage System Improvement

Packaging

The whole construction works of component (c) are divided into three (3) packages as follows:

Package 1: Semarang River Drainage System Improvement
Package 2: Asin River Drainage System Improvement
Package 3: Bandarharjo Drainage System Improvement

Implementation Schedule

The major process and its presumed schedule for the implementation is tabulated as below:

Major Work Item	Period
1. Detailed Design	
1-1. Detailed Design including Tender Documents	Aug. 1997 - Aug. 2000
1-2. Approval on ANDAL and RKL/RPL	Aug. 1999
2. Construction of the Project	
2-1. Package 1	Jan. 2002 - Oct. 2003
2-2. Package 2	Jan. 2001 - Apr. 2004
2-3. Package 3	Jan. 2001 - Apr. 2004

11.7 Fund Requirement

Project Cost and Eligible Cost

The project cost consists of following items:

1. Construction Base Cost
2. Compensation Cost
3. Administration Cost
4. Engineering Service Cost
5. Price Contingency
6. Physical Contingency
7. Value Added Cost

On the other hand, the eligible cost is considered to be included in the amount of a loan from a foreign funding agency. The eligible cost consists of 1) Construction Base Cost, 2) Engineering Service Cost, 3) Price Contingency and 4) Physical Contingency. The project cost and the eligible cost of three (3) components are summarized as below:

Component	Project Cost		Eligible Cost		
	(million Rp)	(million ¥)	(million Rp)	(million ¥)	%
(a) West Floodway/Garang River Improvement	321,270	5,320	275,544	4,562	85.8
(b) Jatibarang Multipurpose Dam Construction	578,294	9,576	482,180	7,984	83.4
(c) Urban Drainage System Improvement	239,642	3,968	200,835	3,325	83.8
Total	1,139,206	18,864	958,559	15,871	84.1

Disbursement Schedule

The disbursement schedule is prepared as discussed below.

(1) Annual Disbursement Schedule

Annual disbursement schedule for the Project is prepared in accordance with the implementation schedule as presented in the following tables:

(million Rp)

Component	2000	2001	2002	2003	2004	Total
(a) West Floodway/Garang River Improvement	1,109	107,602	127,572	84,987	0	321,270
(b) Jatibarang Multipurpose Dam Construction	838	83,451	100,328	161,850	231,827	578,294
(c) Urban Drainage System Improvement	440	43,019	123,195	72,988	0	239,642
Total	2,387	234,072	351,095	319,825	231,827	1,139,206

(million ¥)

Component	2000	2001	2002	2003	2004	Total
(a) West Floodway/Garang River Improvement	18	1,782	2,112	1,408	0	5,320
(b) Jatibarang Multipurpose Dam Construction	14	1,381	1,662	2,680	3,839	9,576
(c) Urban Drainage System Improvement	7	712	2,040	1,209	0	3,968
Total	39	3,875	5,814	5,297	3,839	18,864

(2) Operation, Maintenance and Replacement Cost

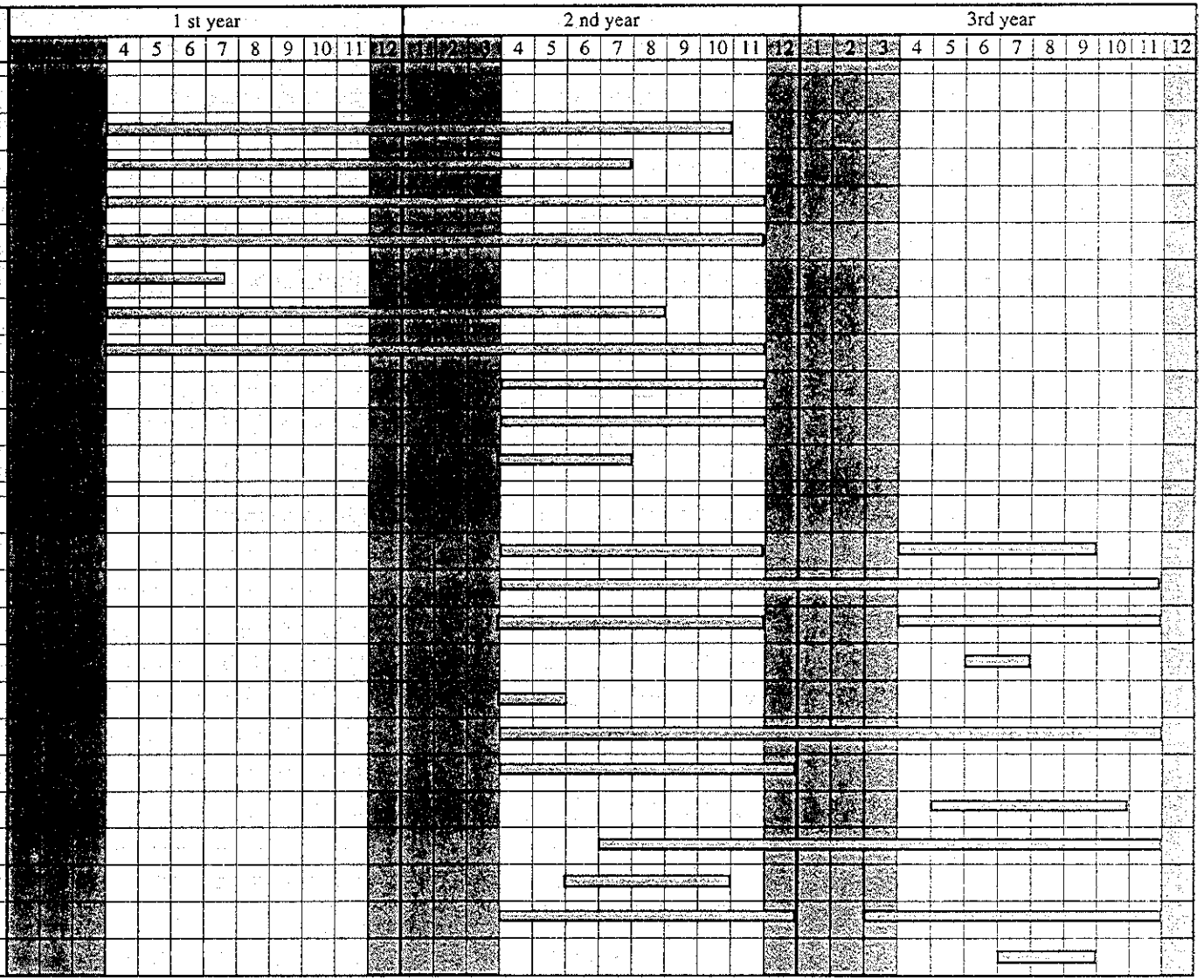
Operation, maintenance and replacement cost are summarized as below.

Component	(a) West Floodway/Garang River Improvement	(b) Jatibarang Multipurpose Dam Construction	(c) Urban Drainage System Improvement
Annual OMR Cost	Rp. 578 million	Rp. 1,040 million	Rp. 366 million
Construction Base Cost	Rp. 208,995 million	Rp. 332,533 million	Rp. 150,531 million
Percentage to Total Construction Base Cost	0.28 %	0.31 %	0.24 %

TABLES

Table 3.1 **CONSTRUCTION TIME SCHEDULE OF WEST FLOODWAY/ GARANG RIVER IMPROVEMENT**

Work Item	Unit	Quantity
1. West Floodway Improvement		
Clearing and Grubbing	m^2	105,900
Dredging	m^3	163,000
Excavation	m^3	694,000
Filling on Floodplain	m^3	36,300
Earth Dike Embankment	m^3	20,900
Raising of Existing Floodwall	m	4,970
Revetment	m	4,000
Waterfront Facilities	L.S	1
Drainage Outlet	L.S	1
Protection Works for Bridge Pier	L.S	1
2. Garang River Improvement		
Clearing and Grubbing	m^2	17,100
Excavation	m^3	395,000
Filling of Channel and Floodplain	m^3	5,800
Earth Dike Embankment	m^3	5,800
Floodwall	m	160
Revetment	m	2,500
Ground Sill (WF 124)	L.S	1
Ground Sill (WF 176)	L.S	1
Waterfront Facilities	L.S	1
Sluiceway	L.S	1
Drainage Outlet	L.S	1
Protection Works for Bridge Pier	L.S	1



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Filling of Channel and Floodplain	m^3	5,800
Earth Dike Embankment	m^3	5,800
Floodwall	m	160
Revetment	m	2,500
Ground Sill (WF 124)	L.S	1
Ground Sill (WF 176)	L.S	1
Waterfront Facilities	L.S	1
Sluiceway	L.S	1
Drainage Outlet	L.S	1
Protection Works for Bridge Pier	L.S	1

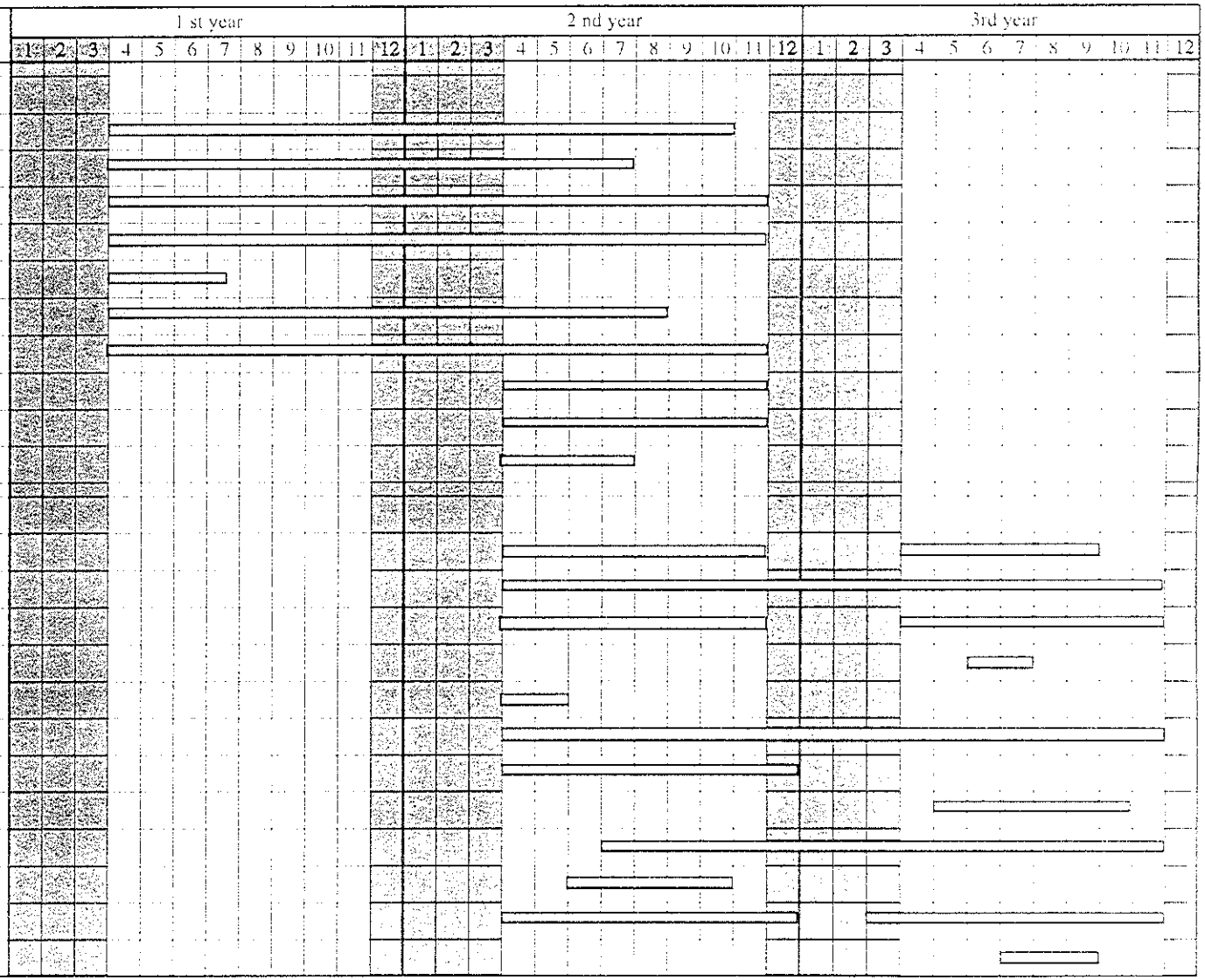
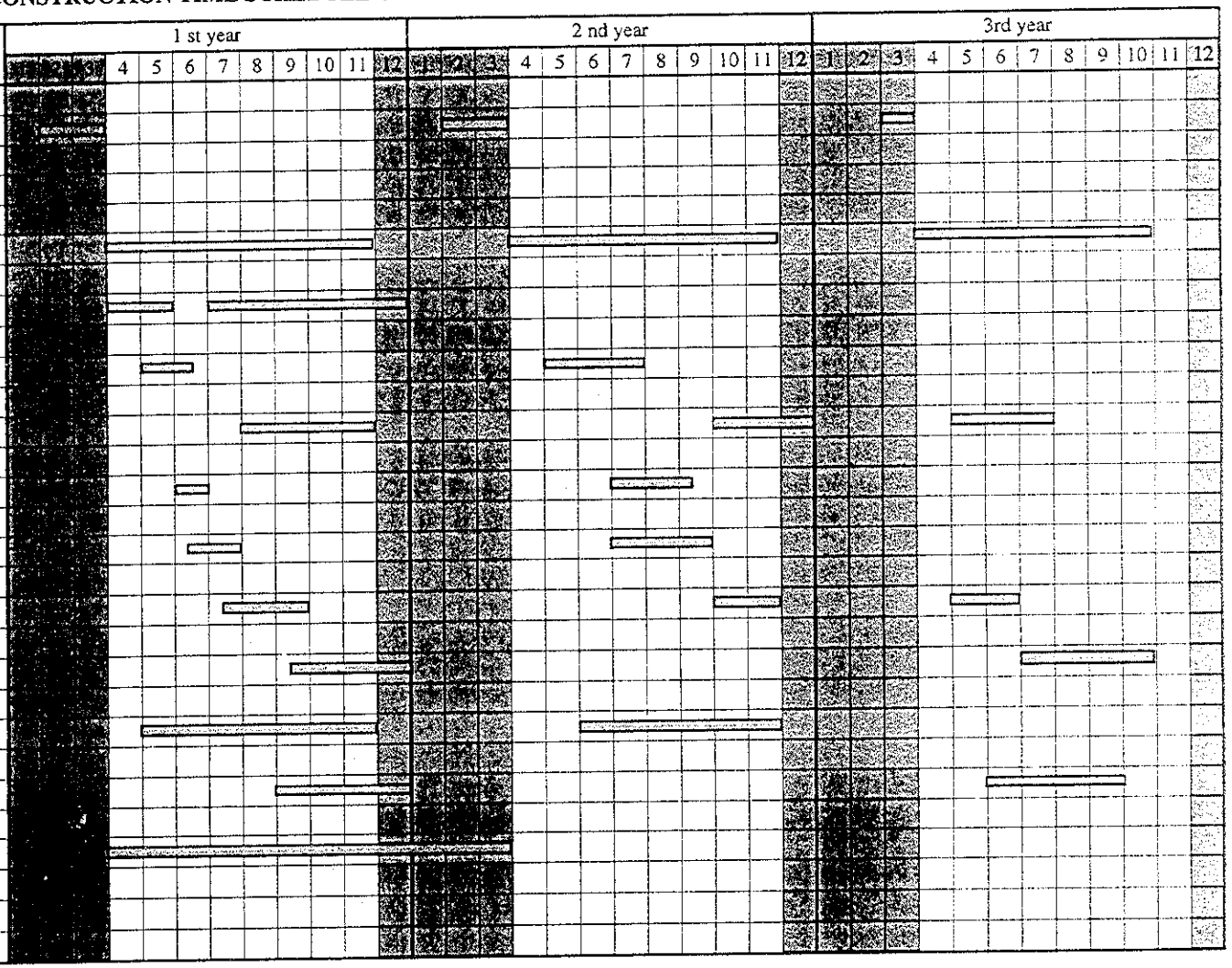


Table 3.2 **CONSTRUCTION TIME SCHEDULE OF RECONSTRUCTION OF SIMONGAN WEIR**

Work Item	Unit	Quantity
1. Preparation Works	L.S	1
2. Simongang Weir		
Coffering and Dewatering	L.S	1
Relocation of Parts of Existing Weir	L.S	1
Demolition and Excavation	m^3	66,400
Filling and Embankment	m^3	14,200
Foundation (P.C.Pile, L=12m)	pcs	680
Steel Sheet Pile anc P.C. Sheet Pile	m	8,100
Concrete	m^3	11,700
Gate Works	L.S	1
Retaining Wall and Revetment	L.S	1
Bridge	L.S	1
Control House	L.S	1



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Work Item	Unit	Quantity
1. Preparation Works	L.S	1
2. Simongang Weir		
Cofferring and Dewatering	L.S	1
Relocation of Parts of Existing Weir	L.S	1
Demolition and Excavation	m^3	66,400
Filling and Embankment	m^3	14,200
Foundation (P.C.Pile, L=12m)	pcs	680
Steel Sheet Pile and P.C. Sheet Pile	m	8,100
Concrete	m^3	11,700
Gate Works	L.S	1
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Bridge	L.S	1
Control House	L.S	1

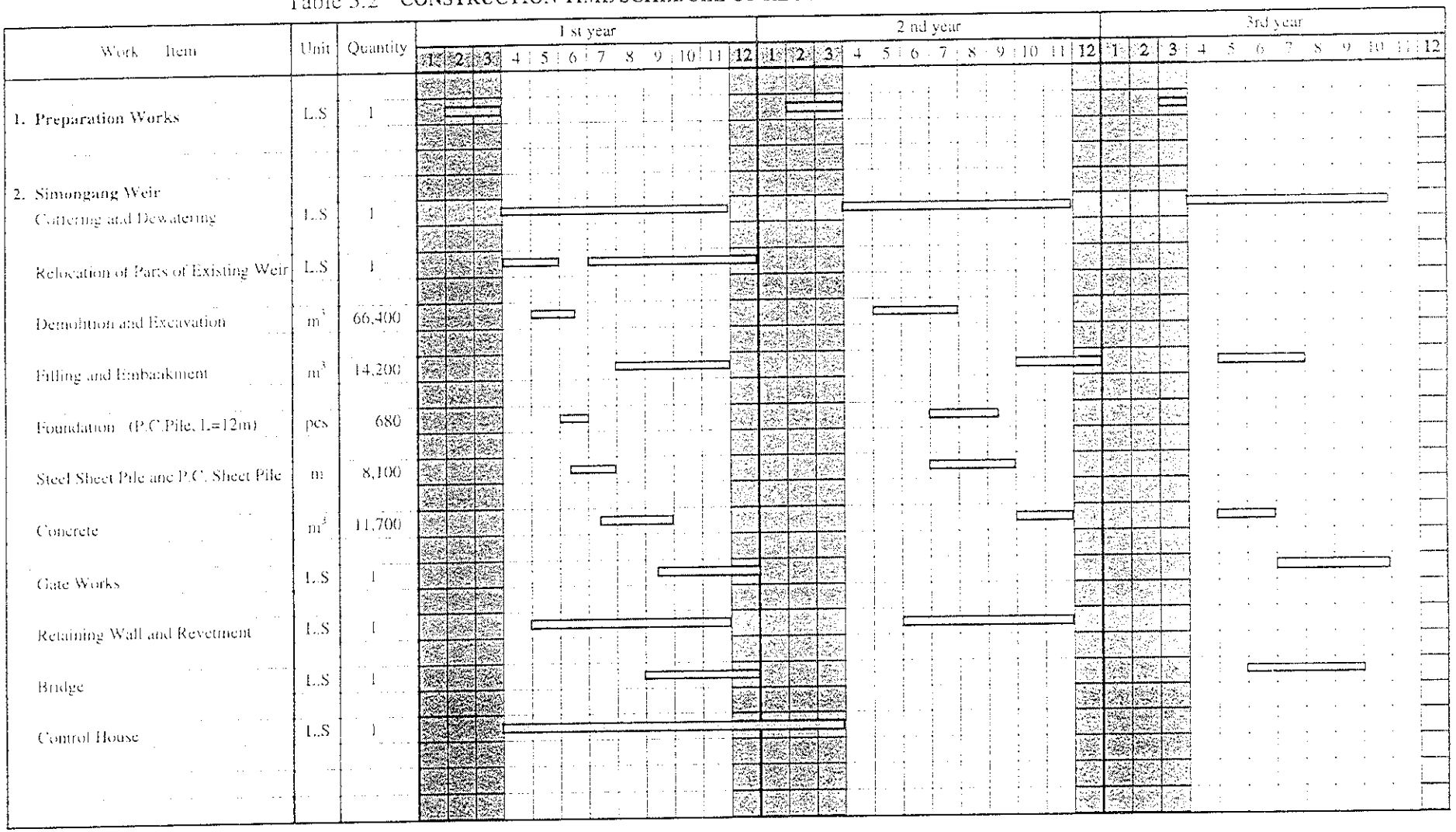
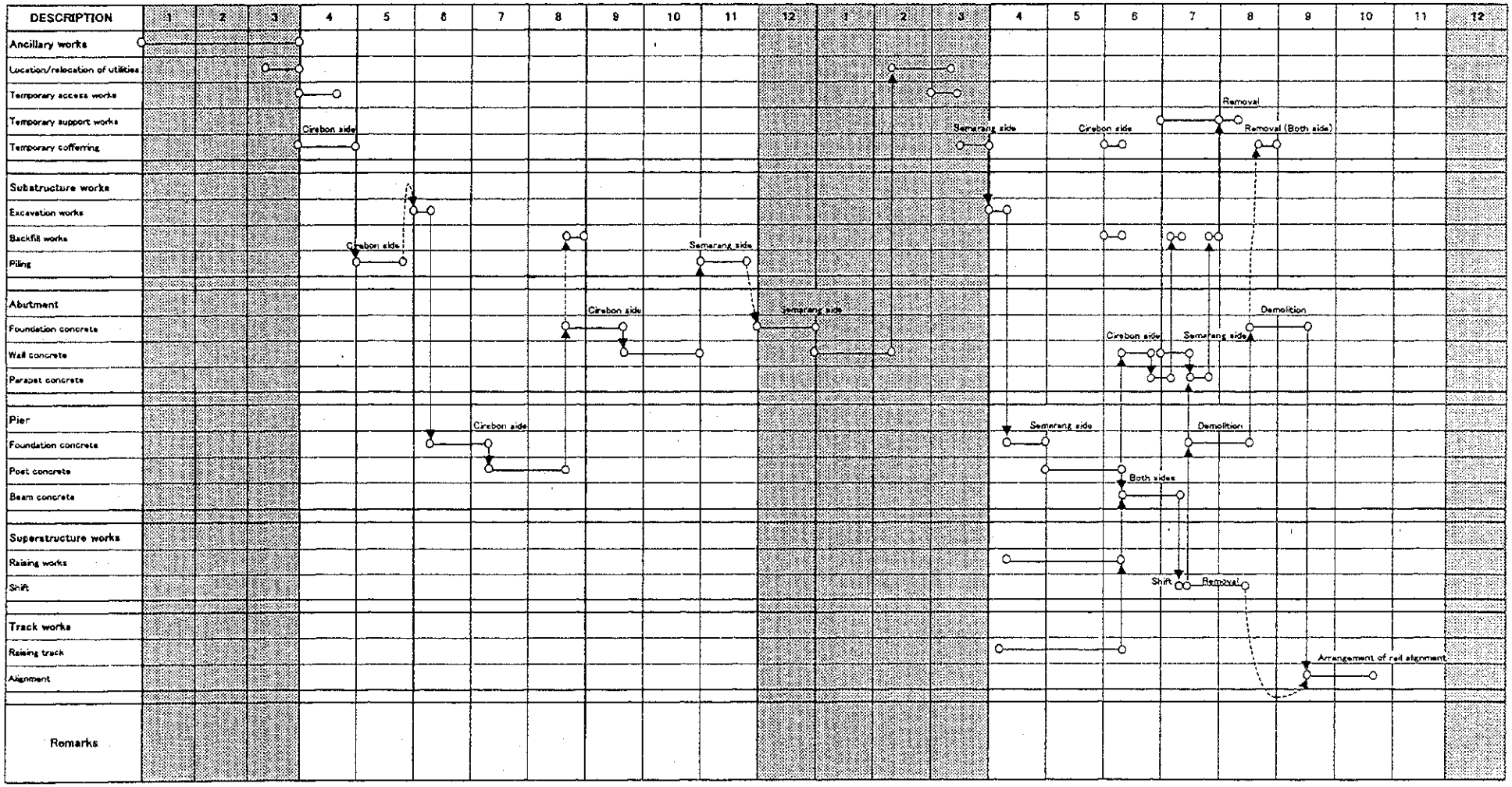


Table 3.3 **CONSTRUCTION TIME SCHEDULE OF RAISING OF THE EXISTING RAILWAY BRIDGE**



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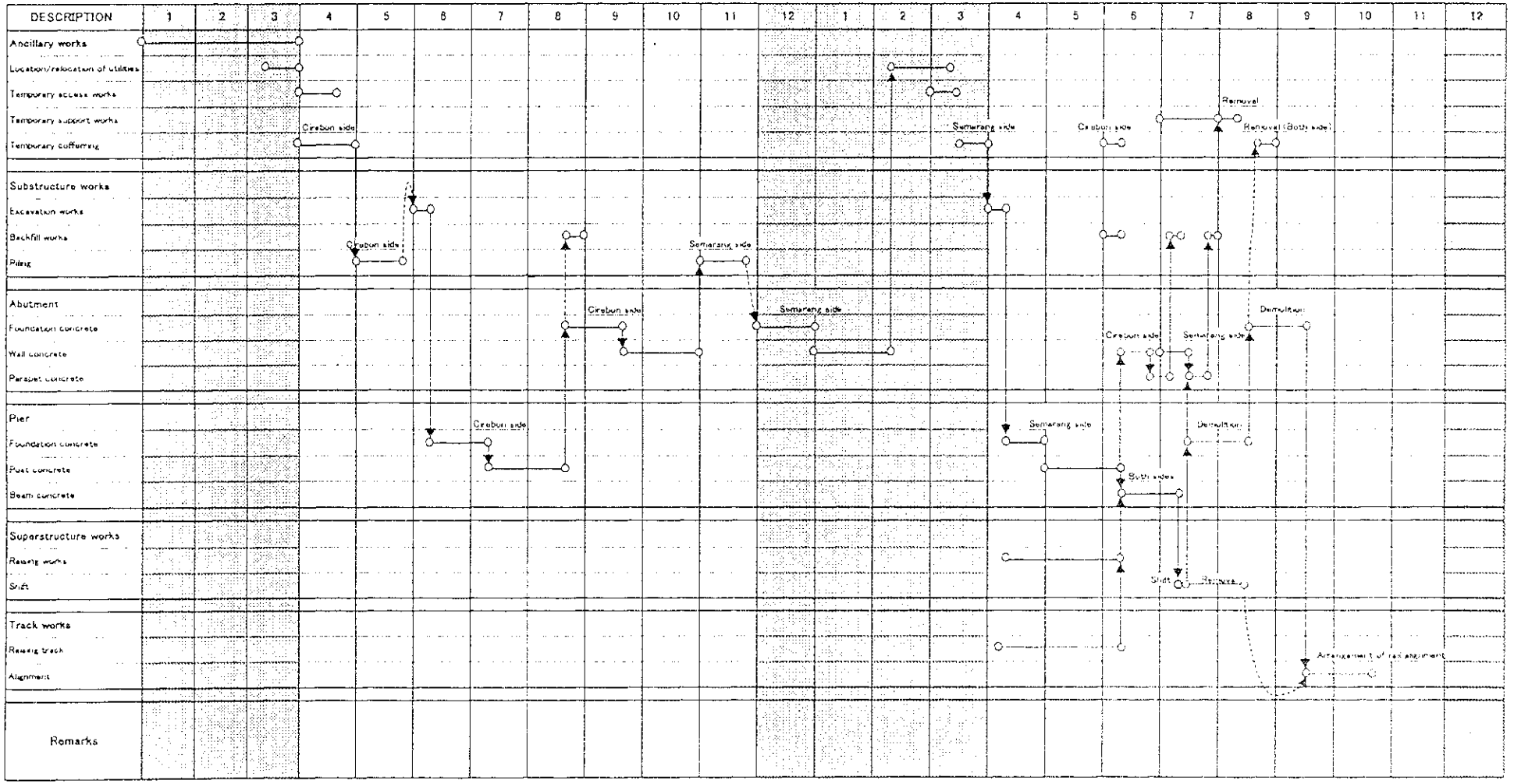

Table 4.1 JATIBARANG MULTIPURPOSE DAM CONSTRUCTION SCHEDULE OF PACKAGE 1
(JATIBARANG MULTIPURPOSE DAM INCLUDING APPURTENANT STRUCTURES)

□ : Dry season (April-November)
■ : Rainy season (December-March)

Item	Unit	Quantity
1. Preparation Works		
Temporary Construction Road	m	5,670
Aggregate and Batcher Plant	L.S.	1
Other Temporary Facilities	L.S.	1
2. River Diversion		
Diversion Tunnel (2r = 5.60m)	m	441
Inlet & Outlet Excavation & Concrete	L.S.	1
Up/Downstream Cofferdam	L.S.	1
3. Zoned Rockfill Dam		
Excavation	m^3	174,000
Foundation Treatment		
Dental Concrete	L.S.	1
Blanket Grouting	m	2,000
Curtain Grouting	m	16,200
Embankment	m^3	802,000
Impervious Zone	m^3	119,000
Semi-pervious Zone	m^3	82,000
Pervious Zone	m^3	601,000
4. Gallery		
Excavation	m^3	7,000
Concrete	m^3	5,700
5. Spillway		
Excavation & Embankment	m^3	453,500
Contact Grouting	m	400
Concrete	m^3	52,000
6. Outlet Facilities		
Outlet Tunnel		
Tunnel Excavation	m	393
Steel Outlet Pipe (ϕ =1.40m) & Concrete	L.S.	1
Intake Structure		
Excavation	m^3	11,000
Concrete	m^3	900
Gates & Trash Rack Installation	L.S.	1
7. Plug Work (Concrete & Contact Grouting)		
Diversion Tunnel	L.S.	1
Outlet Tunnel	L.S.	1
8. Powerhouse		
Excavation & Embankment	m^3	
Concrete	m^3	
Plant Installation	L.S.	1
Transmission Line (Foundation)	m	14,000
Operation Tests	L.S.	1
9. Quarry Development & Operation		
Preparation	month	6
Development & Operation	month	32
10. Batcher and Aggregate Plant		
Batcher Plant Operation	month	31
Aggregate Plant Operation	month	32

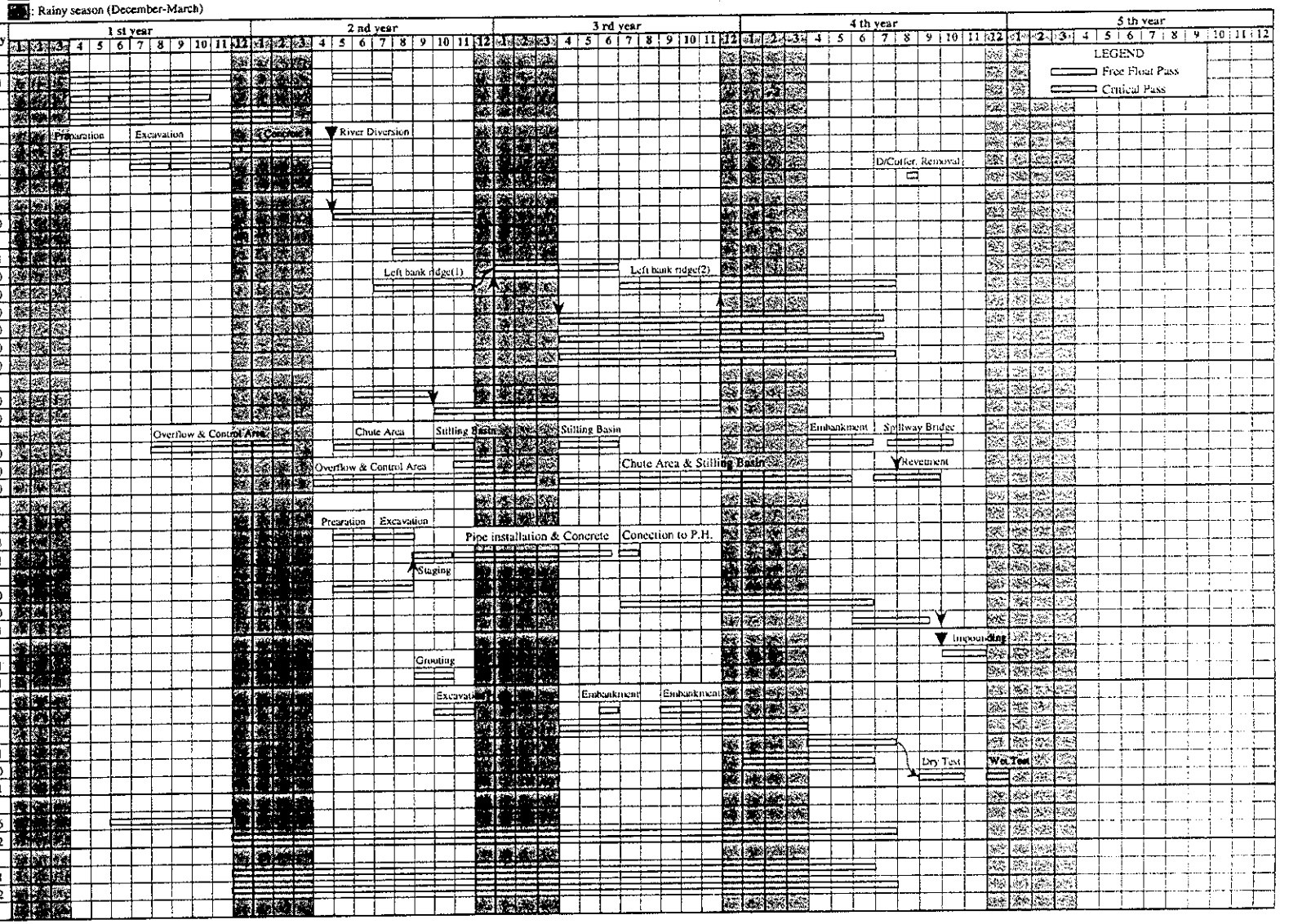

Table 4.1 JATIBARANG MULTIPURPOSE DAM CONSTRUCTION SCHEDULE OF PACKAGE 1

(JATIBARANG MULTIPURPOSE DAM INCLUDING APPURTENANT STRUCTURES)

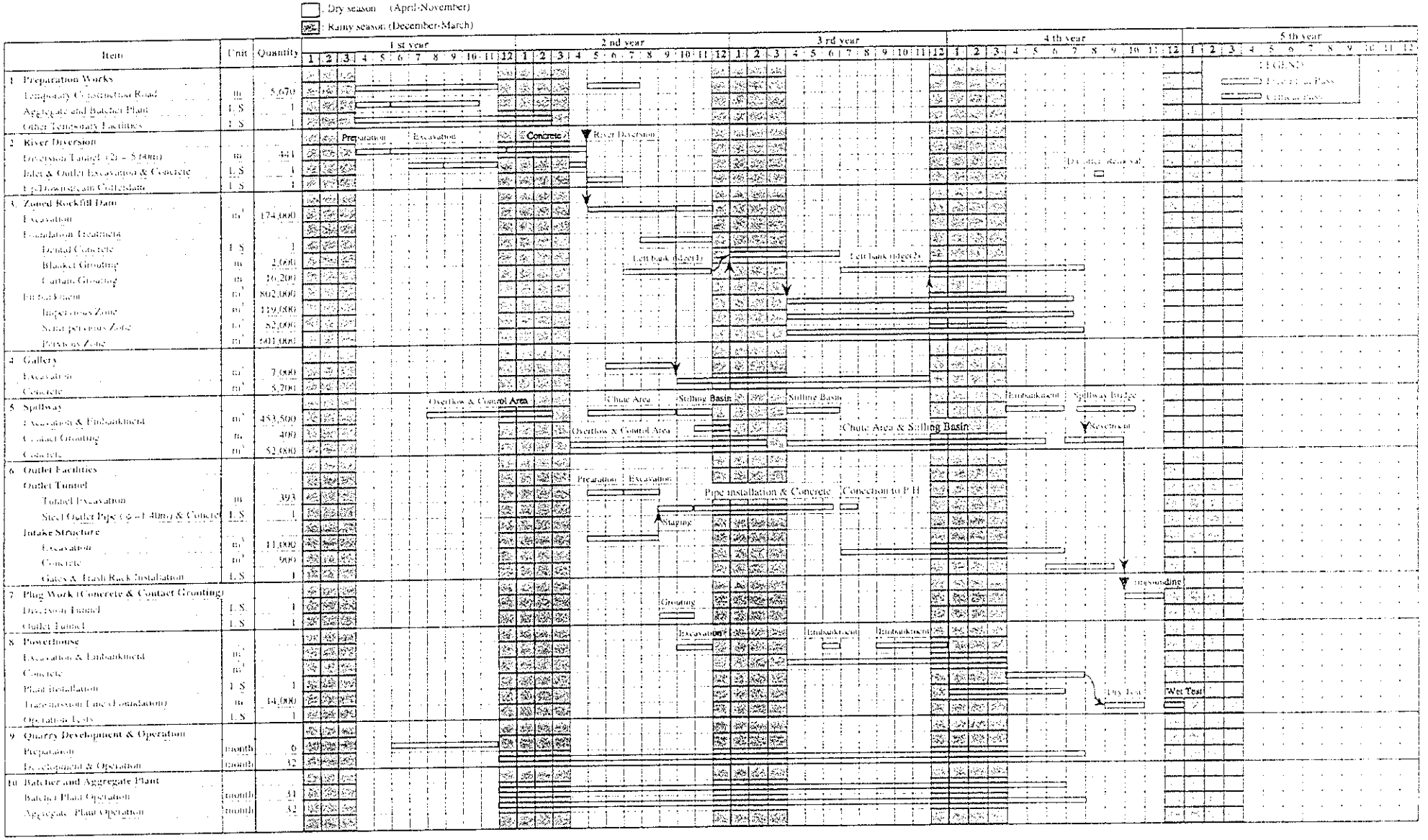

Table 4.2 JATIBARANG MULTIPURPOSE DAM CONSTRUCTION SCHEDULE OF PACKAGE 2

(OPERATION AND MAINTENANCE BUILDINGS AND GOA KREO BRIDGE)

Work Item	Unit	Quantity
1. Preparation Works		
Access Road	L.S	1
2. Pedestrian Bridge		
2-1 Substructure		
Excavation	m^3	1,280
Scaffolding	L.S	1
Concrete	m^3	163
Wet Stone Masonry	m^3	150
Backilling anb Embankment	m^3	967
2-2 Superstructure		
Support	L.S	1
Concrete	m^3	104
Bearing Shoe Installing	nos.	16
2-3 Gate Reconstruction		
Removal		
Reconstruction		
3. Dam Management Complex		
Administration Building	L.S	1
Stuff House	L.S	5
Mushola	L.S	1
External Works	L.S	1

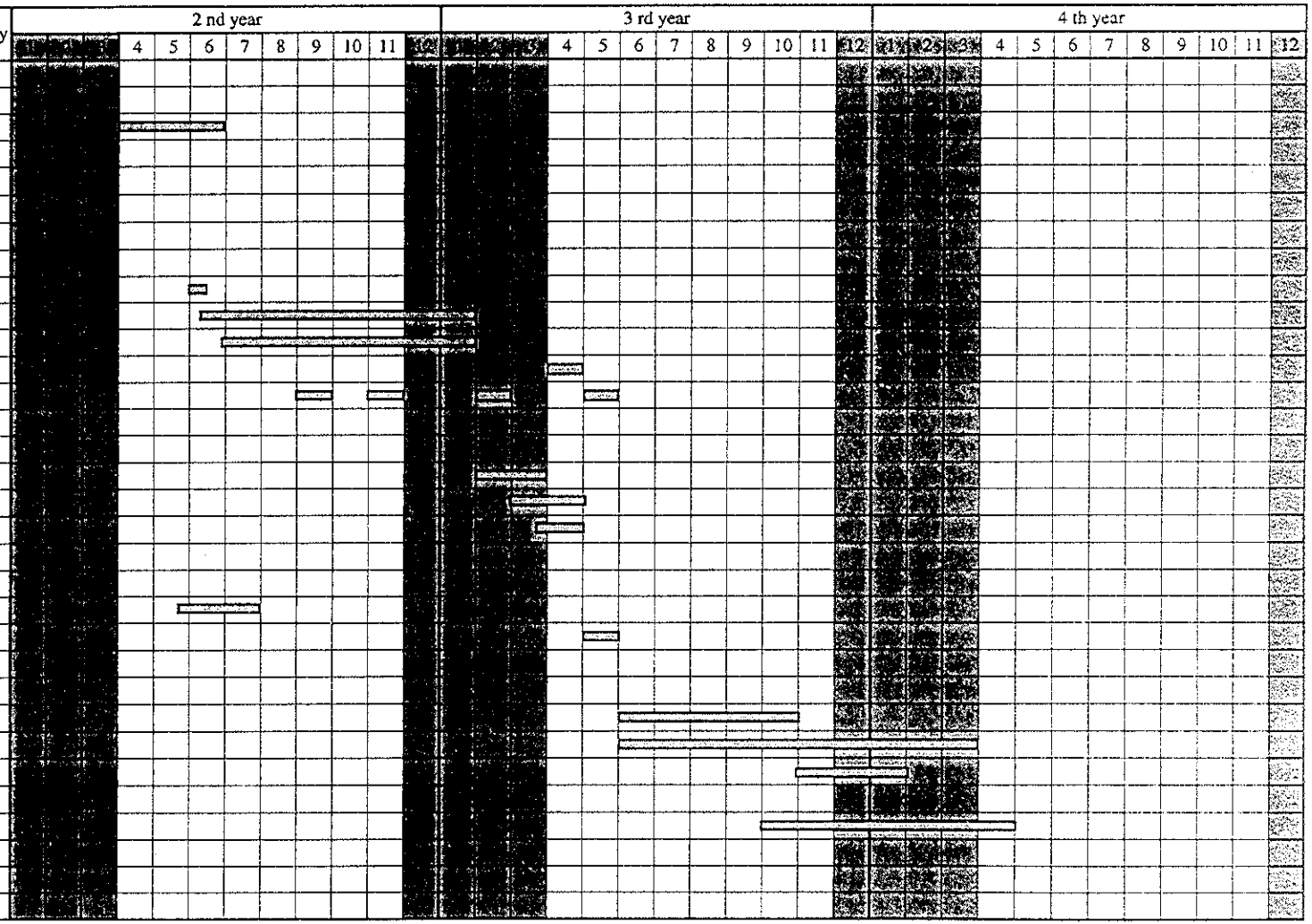

Table 4.2 JATIBARANG MULTIPURPOSE DAM CONSTRUCTION SCHEDULE OF PACKAGE 2

(OPERATION AND MAINTENANCE BUILDINGS AND GOA KREO BRIDGE)

Work Item	Unit	Quantity
1. Preparation Works		
Access Road	L.S	1
2. Pedestrian Bridge		
2-1 Substructure		
Excavation	m^3	1,280
Scaffolding	L.S	1
Concrete	m^3	163
Wet Stone Masonry	m^3	150
Backilling anb Embankment	m^3	967
2-2 Superstructure		
Support	L.S	1
Concrete	m^3	104
Bearing Shoe Installing	nos.	16
2-3 Gate Reconstruction		
Removal		
Reconstruction		
3. Dam Management Complex		
Administration Building	L.S	1
Staff House	L.S	5
Mushola	L.S	1
External Works	L.S	1

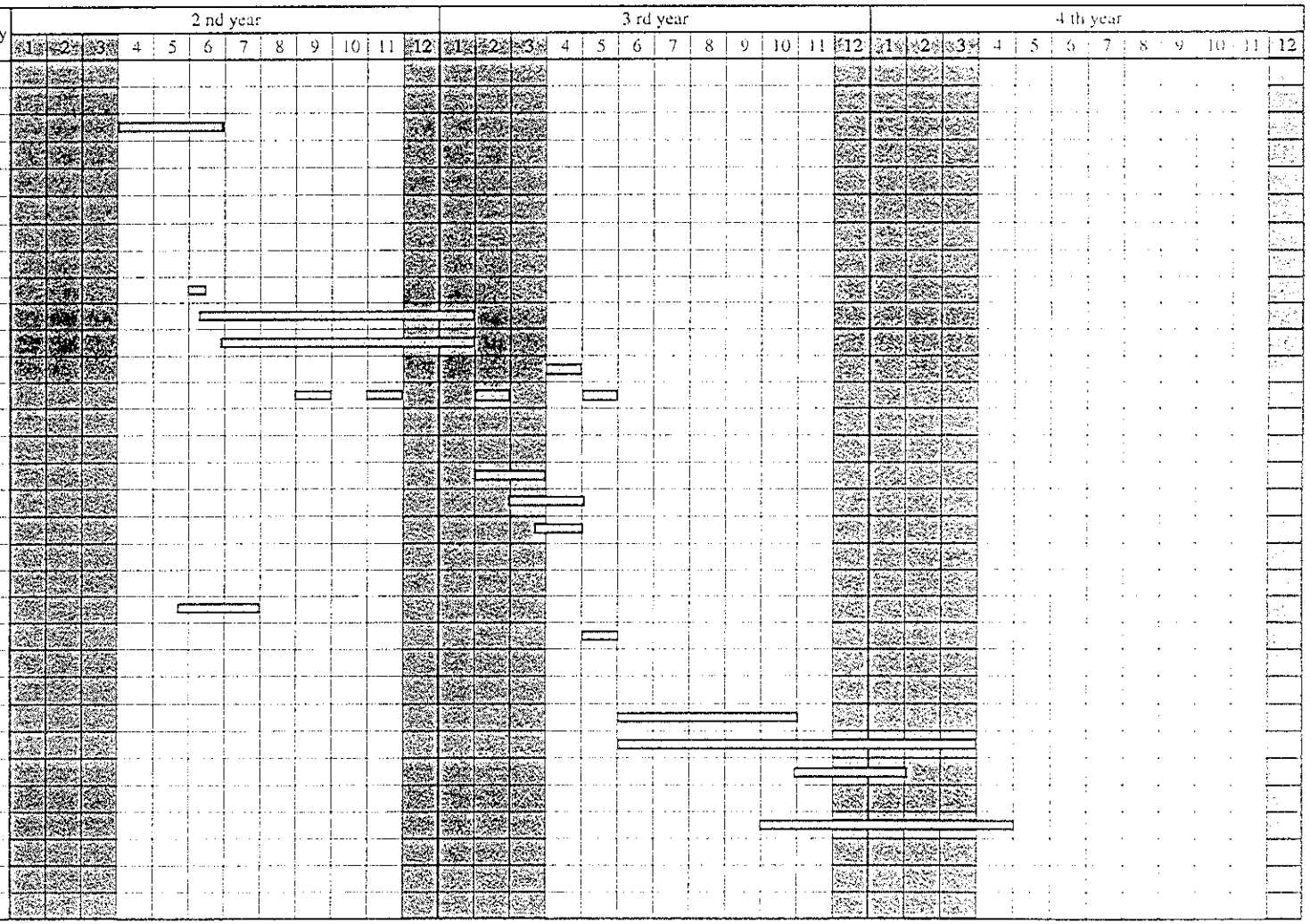

Table 5.1 **CONSTRUCTION TIME SCHEDULE OF SEMARANG RIVER DRAINAGE SYSTEM IMPROVEMENT (PACKAGE 1)**

Work Item	Unit	Quantity	1 st year												2 nd year												3 rd year											
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1. Preparation																																						
Office,Others																																						
2. River Improvement																																						
Dredging	m^3	58,400																																				
3. Dike Raising																																						
Earth works	L.S.	1																																				
Wet Stone Masonry	m^3	1,670																																				
4. Closure of All Drainage Outlets																																						
into Semarang River	nos.	56																																				
5. Inspection Road																																						
Pavement	m^2	58,700																																				

Table 5.2 **CONSTRUCTION TIME SCHEDULE OF ASIN RIVER DRAINAGE SYSTEM IMPROVEMENT (PACKAGE 2)**

Work Item	Unit	Quantity	1 st year												2 nd year												3 rd year												4 th year					
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
1. Preparation																																											
Treatment Facilities	L.S.	1																																									
2. Relocation of Semarang River																																											
Coffering	L.S.	1																																									
Earth Works	L.S.	1																																									
Revetment	m																																										
3. River Improvement																																											
Coffering	L.S.	1																																									
Dredging and Excavation	m^3	68,300																																									
Revetment	m	2,330																																									
Box Culvert	m	194																																									
Bridges	L.S.	2																																									
Relocation	L.S.	2																																									
4. Asin Pump Station																																											
Excavation	m^3	1,260																																									
PC piles and Sheet piles	L.S.	1																																									
Embankment	m^3	1,020																																									
Concrete	m^3	1,320																																									
Pump installation	L.S.	1																																									
Gate works	L.S.	1																																									
Management Office Compound	L.S.	1																																									
Operation Test	L.S.	1																																									
5. Asin Retarding Pond																																											
Excavation	m^3	31,000																																									
Revetment	L.S.	1																																									
6. Inspection Road	m^2	3,560																																									

Table 5.3 **CONSTRUCTION TIME SCHEDULE OF BANDARHARJO DRAINAGE SYSTEM IMPROVEMENT (PACKAGE 3)**

Work Item	Unit	Quantity
1. Preparation		
2. River Improvement		
Dredging and Excavation	m^3	30,100
Revetment	m	1,810
Closure of Diversion Gate	L.S.	1
3. Baru Pump Station		
Excavation	m^3	860
PC piles and Sheet piles	L.S.	1
Concrete	m^3	1,070
Embankment	m^3	1,030
Pump installation	L.S.	1
Gate works	L.S.	1
Management Office Compound	L.S.	1
Operation Test	L.S.	1
4. Baru Retarding Pond		
Excavation	m^3	30,400
Revetment	m	
5. Baru Conveyance Channel	m	690
6. West Secondary Channel	m	580
7. East Secondary Channel	m	120
8. Inspection Road	m^2	15,000

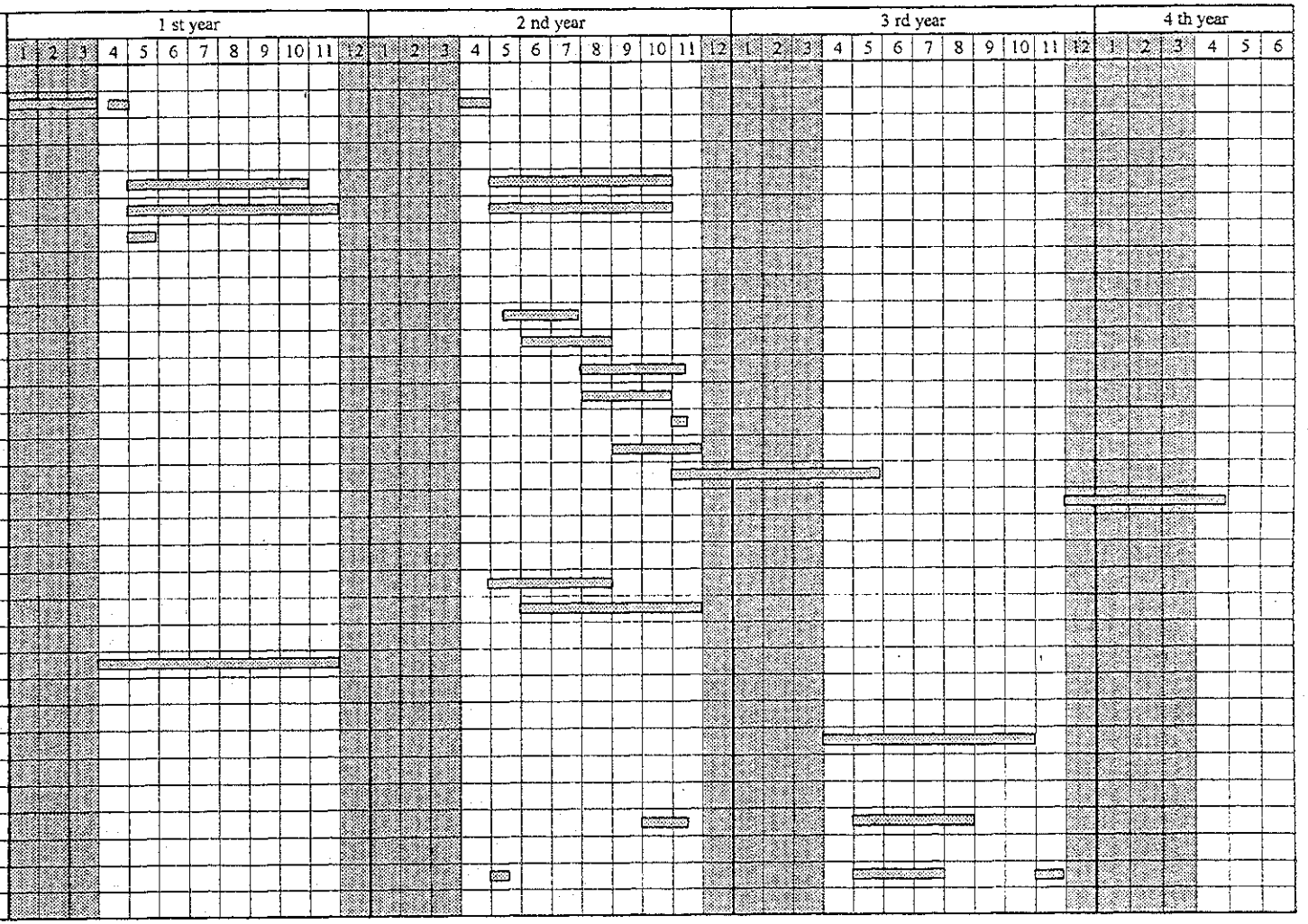

Table 8.1 ENVIRONMENTAL MANAGEMENT PLAN

Pre-Construction Stage

Managing Item	Managing Approach
Land ownership	Restrictions of private property transaction are required to control land speculation around the dam and reservoir areas.
Social unrest	Respecting Presidential decree No.55/1993, Tough nego-tiation is expected to reach agreement with project-affected families on land acquisition. Reasonable assets evaluation should be considered for the compensation.
Roadside trees	Trees are to be transplanted temporarily in flood plain during the dike embankment works. Proper care needs to be taken under the guidance of specialist in this field.
Illegal land use	Acquired land should be fenced up to protect the proposed site of Asin retarding pond from being intruded by squatters.

Construction Stage

Managing Item	Managing Approach
Noise	Control of speed of vehicles and equipment is absolutely necessary to keep the noise level below 60 dBA. Working hours should be limited to daytime.
Air pollution	Particularly dust control is required in this regard. Access road needs to be watered from time to time and materials should be covered with sheet. Air quality standard KEP decree No.02/MENLH/I/1988 is applicable in this regard.
Traffic disturbance	Schedule adjustment may be necessary for equipment mobilization, and traffic control is required at the project site with construction sign board.
Sedimentation	Installation of sand settling pond or protection fence may be required in an effort to keep soil suspended level at 100 to 250 mg/l in river water. Dredging work should be carried out from the downstream portion.
Road damage	Regular check and inspection is required for the maintenance of village road as well as access road, and damaged portion is to be repaired if necessary.
Water quality	Every effort needs to be made for the protection against spilt soil and concrete into the river. Protection fence may be necessary at the downstream direction. Government regulation No.20/1990 is applicable to the water quality.
Aquatic biota	Base camp sanitary conditions must be well managed against river water pollution. Sediment control should also be taken into account for aquatic environment.
Water intake facilities	For Garang river improvement, temporary cofferdam is to be constructed to maintain water level for the intake. During dredging work, protection fence should be set around PDAM intake facility.
Sand quarry operation	Restrictions need to be imposed on sand quarry activities at the downstream section from Tugu Suharto.
Railway bridge	Bridges over west floodway and Asin river are to be reconstructed due to the rise of river banks.
Ferry boat service	Schedule control is required during the dredging work in both Garang river and west floodway.
Dredged material	Due to the concentration of heavy metals, use of water-proof sheet is required for the transportation of dredged material from Asin, Semarang and Baru rivers. It should be treated with cement to protect against leachate and disposed in designated land reclamation site.

Post-Construction Stage

Managing Item	Managing Approach
Reservoir water quality	Complete land clearance is expected before impounding, and domestic waste discharge into the reservoir should be strictly controlled.
Land slide	Slope stabilization or protection may be required for reservoir surrounding areas to mitigate land slide due to the fluctuation of water level.
Land use pattern	Future land use plan should be reviewed in collaboration with other agencies concerned. EIA must be conducted for any project in upper river basin to assess impacts on dam reservoir and its surrounding areas.
Fish farming	Restrictions need to be imposed on any fish farming activities in reservoir in terms of water pollution control.
River water quality	Occasional flush out may be necessary at Simongan weir to improve water quality of floodway. Control of domestic waste discharge should also be considered as a long-term measure.
Water intake facilities	Water level can be adjusted by the gate operation in order to facilitate existing water intake facilities.
River morphology	Sand quarry operations should be prohibited in the downstream portion from Tugu Suharto in order to maintain stable river bed. River mouth morphological survey may be required to figure out environmental changes on estuary due to the pump drainage system.
Pump operation	Garbage cleaning is frequently required in retarding pond as well as pumping station so as not to suspend pump operation.
Retarding pond	Periodical dredging will be necessary to maintain design capacity of retarding pond, and dredged material should be well treated before being disposed.
Land subsidence	Monitoring on land elevation needs to be conducted periodically for the proposed urban area. In this connection, the base station for BM must be carefully selected in the stable site.