6.5. Comparison of Alternative Implementation Procedures

6.5.1 Alternatives of construction methods

The following construction method were considered as practical;

- Mechanical construction by international or local contractors (Method-1)
- Manual construction by local contractors (Method-2)
- Manual construction by contracting societies consisting of landless labour (Method-3)

The comparison of the alternative construction methods above was made taking account of various factors perceived in engineering and socio-economical viewpoints.

(1) Evaluation from engineering aspect

The three methods were examined and evaluated from the engineering aspect as tabulated below;

Technical Item	Method-1	Method-2	Method-3
Executed by	International/local contractors	Local contractors	Contracting society
Tendering procedure	Required	Required	Required (but so set an average rate based on rates from contractors)
Preparatory works	Much (construction road & others in relation with mechanical construction)	A little	Less
Quality of work	Good	Possibly poor but depends on supervision	Possibly poor but depends on supervision
Construction cost	Very costly	Not costly but not so cheap	Cheap
Progress of work	Constant (less affected by availability of labour)	Depends on the number of labours available (no progress during works on farm) & also types of works	Depends on the number of labours available (no progress during works on farm) & also types of works
Construction period	Reasonably short	Long	Long
Time schedule	Certain and reliable	Probably certain but unreliable	Probably certain but unreliable
Special organization for implementation	No need	No need	Required

The method-1 (mechanical construction by international/local contractors) is the most appropriate and recommendable method in the technical items of quality of work, progress of work, construction period and time schedule when the contractors selected through the bidding be reliable and capable. Manual construction methods (Method-2 & 3) are behind the method-1 in those items because of labour intensive type works without use of machineries. Availability of labour depends on work site and work season. Demand of labour at peak time and normal time may not be in conformity with the actual supply. Besides, the Method-3 requires an organization of contracting society to be established in advance of the commencement of works. This will be accomplished with assistance from NGOs or other alternatives. It is reported that some EIP projects have been disturbed due to lack of strong and well-linked NGOs.

For this reason, the Method-2 and/or Method-3 is recommendable for such minor works as excavation of side drain and future maintenance works of slope repair including observational patrol after the completion of construction phase. Those types of works do not require so high quality of construction

output, and delay of the works behind the time schedule will not disturb major construction works as a whole.

But the Method-1 requires a network of construction road which must be distributed over the GIP area due to no access or hard access, while the other alternative methods do not need it. Construction road may likewise require the additional land to be acquired. For this reason, the area subject to the mechanical construction shall be those accessible as much as possible. Since the availability of equipment in the Government is rather poor, the additional equipment shall be prepared by the contractors. When procured and leased by the Government, the appropriate agreement for the lease is necessary. These circumstances might make the project costly.

(2) Evaluation from socio-economic aspect

The three alternative methods are also examined and evaluated from socio-economic aspect as shown below;

Socio-economic Item	Method-1	Method-2	Method-3
Executed by	International/local contractors	Local contractors	Contracting society
Profit or benefit to	Contractors/local people to lesser extent as compared with the Method-2	Contractors/local people	Local people
People's participation	A few	Plenty	Plenty & better for labour
Creation of employment opportunity	Irregular	Seasonal for construction Regular for maintenance	Seasonal for construction Regular for maintenance
Involvement of local community	None or a little	Moderate	Large
Appreciation of the project by people	None or a little	Moderate	Great
Training to local people	None or a little	None or a little	With training program

Above table suggests that the Method-3 is the most appropriate construction method from socio-economic viewpoint, while the Method-1 does not satisfy the items provided above. But there are many assumptions to realize the above conditions of the Method-3, they are;

- A strong organization is necessary to establish a contracting society, which has never existed before the commencement of a project, and the delay of the establishment may induce the substantial delay of the project. A case of no establishment, which means no performance of the project, is expected at the worst.

- It is still unknown factor that a large number of local landless people is ready to undertake construction works simultaneously in accordance with the demand from the project side.

- Contracting society may not essentially be accustomed to a contract system. The performance of construction works is supported by the solidity of the society, but occasional events in personal affairs can easily loosen the foundation of the society. For example, when many labourers, each of whom may have a choice to work as an assigned labourer or as a farmer, cancel their duties on the contract, the society fails to perform the allotted works and the project is eventually unable to proceed for a long time unless alternatives are provided. It is unpractical and unreasonable to impose a penalty because the concept of the penalty does not comply with the policy.

Difference between the Method-2 and Method-3 appears to be a little in need of organizing a contracting society, but it is actually rather different. A contracting society in the Method-3 is not subject to, and not controlled by contractors. A contracting society shall be considered as a contractor consisting of local labourers and beneficiaries landless, and it contributes to their own income-generating activities.

It is reported that local contractors try to make profit in producing low quality work and depriving labourers of their wages. Contractors commonly offer very lower bid than the estimated cost in tendering procedure, and this results in their evil-doing. According to the recent reports, the project done by contracting societies deems better in quality of work than contractors aside from the progress of works. Payment is made rightly therein.

The contracting society is recommendable as far as its formation is available based on the observation in the recent reports, once manual construction method is proposed. But the full coverage of construction works only by contracting societies might be difficult. Content of construction works will be shared with the other methods (Method-1 and Method-2).

(3) Issues to be resolved

It is rather difficult to identify the construction method appropriate for our project for the time being because the bases of considerations and evaluations for both manual construction and mechanical construction are quite different. Manual construction method is likely to have been evaluated only from a socio-economic aspect, while mechanical construction method has been very attractive from a engineering aspect as in the previous discussion. A further study which incorporates engineering, sociological, economical and environmental considerations from the broad standpoints will be necessary to present a due desirable construction method in the project area based on a future development of the country. Further inquiries for the following matters will be clarified for a reasonable conclusion by implementation stage of GIP;

- Flood control and drainage facilities required for the GIP area are firm structures which withstand erosive and scouring action of flood water, and likewise need not frequent maintenance and rehabilitation works. Benefits as well as environmental impacts as might accrue from flood control works will not actually be achieved without provision of the firm structures. Continuous repair and restoration create opportunity of temporary employment for a large number of local landless people, but these works will not contribute to improve their situations. Provision of the firm structures will stabilize people's livelihood and promote people's welfare through a future development expected when the area is free from floods. It is necessary to clarify our situations that we would put emphasis still on keeping or improving people's living, and also put emphasis on creation of employment or provision of facilities through the implementation of GIP.

- Present availability of construction machineries is very poor both in the governmental agencies and most of local contractors, and so capability of contractors for executing mechanical construction is rather low as compared with that for manual construction. But some local contractors own sufficient construction machineries for execution of most of civil works, and those machineries have been procured by the contractors as per the requirement from projects. This implies that an intention of the government to adopt a mechanical construction method be necessary for the growth of technical skills of local contractors. Local contractors shall follow the intention of the government when the use of the machineries is conditional for contracts. The governmental policy for motivating local contractors to execute mechanical construction works is

required for performance of reliable and high quality works by local contractors. It is necessary to clarify whether we promote the growth of technical skills of local contractors or we have no interest on this matter.

- Low quality of work by local contractors are often pointed out by other FAP studies. The root of this unfavourable criticism is deemed to heavily lie upon a rather low engineering estimate which is prepared for tender. Low engineering estimate results in low bidding by many contractors, and a contractor awarded a tender tries to make his profit through a low quality work or deprivation of labour wages, accordingly. Another root of the problem is budgetary constraint of the governmental agencies. The payment for the work by the Government is normally delayed so that local contractors can not run the construction work following an order from the Government. Since most of local contractors are financially not solvent, they are not capable to complete the work in time by their own money. Besides, contractors would not ask the loan from any bank until a sufficient amount for the payment is assured in the Government in order to make the bank interest minimum. Usually the payment is assured before the end of a fiscal year, that is, June or July, and the local contractors can not get enough time for construction due to a coming monsoon period. Those situations result in a substantial delay of construction, a production of low quality work, and poor rates as well as delayed payment to labour. Problem of a low quality work is not solved only by the exclusion of vicious contractors. Proper evaluation of local contractors can not be made without a presentation of reasonable engineering estimate and likewise without a establishment of certain payment process to local contractors. It shall be noted that the execution of construction works by local contractors has been a standard practice in the country for a long time as a better choice. Further investigation would be required to confirm all the possible reason for low quality work by local contractors.

- Labour wages are deemed to be unfairly low, and the cost for manual construction method is a rather low accordingly. The Government may be likely to generate and adopt labour intensive type of works for this reason. Labour wages has eventually not been raised up for a long time. Shadow wage rates as well as the same approach for material and equipment is adopted for the economic assessment of a project. But another approach to evaluate the due wages from a labour side, that is, from viewpoints of people's welfare and livelihood is necessary to get the wage rates reasonable if our consensus for implementation is put on increasing people's standard of living. This may result in the increase of the project cost by manual construction method.

- Formation of contracting society for the implementation is a fruitful method to bring a direct benefit to local landless people. Nevertheless the appropriate approaches in organization and execution have never been established yet as shown in other ongoing projects. It takes a time for the establishment, and special considerations will be necessary in the various phases of the implementation. Besides, this type of project might possibly be disturbed by unexpected events which has never been appeared, because the contracting society has never been a practice in execution of works. It is necessary to clarify that we intend to adopt the contracting society as it is, or to consider only the concept for the implementation.

(4) Construction method preliminarily proposed

Aside from the further study to be followed, the previous discussion so far made leads the following facts;

- Effective as well as reliable performance of such major works as flood embankment and channel excavation can be attained by mechanical construction method. In principle manual construction method is a proper method for minor works during construction phase and maintenance works after the completion.

- Flood embankment for prevention of the project area from external flooding and likewise flooding from major drainage channels is the key flood control facilities. Flood control benefit expected to the project area will be nil once the key facilities are breached, while damage to minor facilities results in local flooding problems only. The key facilities are not allowed to easily be destroyed like other minor facilities.

- Full coverage of the project works by mechanical construction method is costly, and requires land to be acquired in addition to the land in the locations of flood control facilities.

- The Method-3, which adopts the execution by the contracting societies, is unable to cover the full components of the project works not only in types of works but also in quantity of works as per the implementation schedule, while the remaining methods may execute the full components.

- Formation of the contracting societies is still uncertain. This might substantially delay the commencement of the project works due to lacking of available NGOs or other alternatives. Even during construction phase capable and reliable supervisors will be lacking. Adoption of the contracting society is originally deemed to be appropriate for such a project which allows a flexible implementation programme in work components and time schedule. It may take time to establish the strong contracting society adoptable for civil works.

- Project Management Unit (PMU) is necessary in particular for the work by the contracting society. Function of PMU is;

  - to plan and manage the implementation of a project in association with local agencies,
  - to organize establishment and strengthening of LCS (through NGOs),
  - to ensure quality control,
  - to transfer skills (management, construction, etc.).

  PMU will yield varied benefits in institution building, technology transfer and local participation.

Consequently, the following two construction methods are selected for further examination based on the previous discussions;

(i) Manual construction method

It is considered that the adoption of the manual construction method is much more beneficial to the Gaibandha area than the mechanical one from the socio-economical point of view, but it is associated with a lot of unknown factors in connection with the technical quality in earth works, especially compaction works of embankment, as well as the organizational issues on LCS to keep the favourable progress during the construction period. Neverthless, the manual construction method is retained as one of the alternatives on the condition that these issues be resolved before the commencement of implementation;

- The organizational issues are to be improved in line with the Government's guidelines to be set

in relation to the implementation of projects of FAP,

- The construction quality of the compaction works is to be raise up through implementation of the conventional compaction with the rammer or use of equipment locally available (hand-operating roller, agricultural machineries equipped with compaction equipment like the roller)

(ii) Mechanical construction method (the aforesaid Method-1)

This method requires a large amount of fund but most reliable. Execution of the works will be done by international contractors and/or qualified local contractors with ample experience of mechanical construction even as subcontractors. They will be selected following a proper guideline or through an appropriate method for procurement. Although this is a mechanical construction method, some easy earthworks are executed manually by local labour taking the local situations into account. In this respect, the following earthworks are perceived as suitable for the manual works;

- Short distance transportation of excavated earth to the embankment site and structure site including earth filling, and likewise to the spoil bank for disposal,

- Short distance transportation of earth resulted from clearing, grubbing and stripping works including disposal,

- Turfing, and

- other earthworks in narrow area.

The number of local landless people supplied depends on the seasonal demand of the implementation schedule unilaterally. All the elements of the work is supervised by the international and/or local contractors, and no NGOs or other equivalent organizations are necessary.

(iii) Combination of manual and mechanical construction method (the combination of the aforesaid Method-1,2 & 3)

This method will be performed by international contractors and/or qualified local contractors for mechanical construction works (first party) and likewise by ordinary local contractors, but limited to class-A, and/or contracting societies for manual construction works (second party). This method may yield two alternatives in allotment of works.

Alternative-a

Alternative-a demarcates the construction works to the mechanical construction component and the manual construction component. Construction reaches allotted to those two parties are completely separated without overlapping. Another demarcation will be necessary in the manual construction component to allot the work appropriately to the ordinary contractors and contracting societies, and the demarcation will be made in consideration of availability as well as capability of the contracting societies to be shared with. Technical supervision will be done by the contractors in the mechanical construction component and also part of manual construction component allotted to the ordinary local contractors, while the remaining manual construction component will be done by the contracting societies, respectively. In the mechanical construction component, some manual works are devised as per the consideration in the aforementioned Method-1. No equipment except simple machineries is used in the manual construction component due to no availability of equipment. Besides, the local landless people

are incapable of operating any types of the machineries necessary for executing the works allotted to the contracting societies.

Alternative-b

Alternative-b does not demarcate the construction works by the above components but divides each work element into mechanical construction part and manual construction part. Consequently no boundary exists between the mechanical and manual construction works along the construction reaches. For example in the performance of flood embankment, the compaction is carried out by the mechanical equipment and required excavation including hauling is accomplished manually. In this alternative the international contractor and/or the qualified local contractors supervise all of the works, and the ordinary local contractors and the contracting societies will be regarded as subcontractors. NGOs or equivalent organization will assist the contracting society not only in the formation of the society but also in settling of problems including negotiation of a contract with the prime contractors. No supervision is necessary by NGOs or equivalent organization.

The alternative-a might be rather attractive from socio-economical viewpoint because the contracting societies are not subject to control of the contractors, while the better technical appropriateness is expected in the alternative-b in respect of quality of works and schedule of implementation. The low quality works and the delay of implementation schedule might be unavoidable in the alternative-a especially in the reaches allotted to the contracting societies even though the contracting societies are allotted only the technically easy works and sites which do not involve problematic factors. Such problems will not arise in the alternative-b due to the availability of capable supervisors and equipment use in all of the work elements. A solution to the problems of the alternative-a in respect of the work quality might be the conclusion of a lease contract of the mechanical equipment from the governmental agencies inclusive of operators and drivers during the construction phase although the equipment is very poor in those agencies. Another solution might be the temporary hire of supervisors from the government agencies or local contractors based on a contract with a contracting society. But these attempts may cause many problems. It is rather recommendable to adopt the alternative-b from a engineering viewpoint. The availability and willingness of local landless people shall be surveyed in advance of the commencement of the project for the formation of the contracting societies and likewise for the estimate of construction works to be allotted to them.

(5) Recommended construction methods preliminarily proposed

Based on the above comparison, the following methods for earth work are retained;

- Manual construction method with the improved compaction
- Combination of mechanical and manual construction method corresponding to the alternative-b (execution by mechanical construction part and manual construction part)

Selection of the above construction methods will be further examined in the project implementation stage.

6.5.2 Implementation Procedures

(1) Phasing of construction work

For implementation of GIP, phased construction is recommendable for the following reasons;

- The project area has been susceptible to both external and internal flooding, out of which the former has caused the significant damage in the GIP area. Substantial reduction of the flood damage is expected by the sealing of TRE and GLE. At the commencement of the implementation, countermeasures for the external flooding will urgently be required than those for the internal flooding,

- Flooding and drainage mechanism in the internal drainage area is rather complex, and the further hydrological investigation might be necessary to know the detailed mechanism before the implementation,

- Land acquisition and resettlement are deemed to be quite difficult. Enough time should be taken to solve it through negotiation, and

- Annual disbursement cost for the implementation period is preferred to be decreased as much as possible taking budgetary constraint of the Government into account.

The proposed major components of GIP are divided into the following sections by rivers or areas;

(a) Teesta river			
- Flood embankment	:	46.6	km
- Revetment	:	4.9	km
- Groyne	:	2,820	m
- Regulator/sluiceway	:	14	nos
(b) Ghagot river			
- Channel excavation	:	1.7	km
(c) Ghagot left bank			
- Flood embankment	:	75.9	km
- Regulator/sluiceway	:	25	nos
(d) Ghagot right bank			
- Flood embankment	:	32.7	km
- Regulator/sluiceway	:	12	nos
(e) Internal drainage area			
- Compartment embankment	:	6.3	km
- Closure of opening	:	12	places
- Drain pipes	:	450	nos
- Regulator	:	1	no (BRE)

Demarcation of construction reaches for the phasing is made from both engineering and socio-economic viewpoints. In principle, the implementation will be set out from the first priority component which reveals rather higher economic viability than other components. Besides, every phase demarcated needs to satisfy the following conditions from the financial and engineering aspects;

- Its construction cost not too high or too low as compared with those of other phases,

- Construction work in the preceded phase shall not worsen flooding and drainage conditions in any other part of the GIP area, and

- All components included therein can function effectively without realization of the following phases.

On the basis of the aforesaid principles, the components of GIP are divided into three phases as summarized below;

Phase-1	Phase2	Phase3
Teesta a) Sealing of TRE by flood embankment (46.6 km) b) Revetments (4.9 km) c) Groynes (2,820 l.m) d) Regulators/sluices (14 nos)	Ghagot a) Construction of backwater embankment (left bank: 25 k to downstream) (right bank: 32.7 k to downstream) b) Channel excavation (1.7 km) c) Regulators/sluices (21 nos)	Ghagot a) Resectioning of Ghagot left embankment (43.0 k to 75.9 k) b) Extension of Ghagot left embankment (43.0 k to 75.9 k) c) Regulators/sluices (16 nos) Compartmentalisation a) Compartment embankment (6.3 km) b) Closure of existing openings (12 places) c) Drain pipes (450 nos) d) Regulator (1 no for BRE) e) Construction of regulator (1 no)

During implementation period, the construction works of each phase will be executed further dividing into certain number of construction packages (lots). The number of the packages may depend on construction methods and work values to be allotted to contractors/contracting societies.

(2) Time schedule of implementation

The implementation time schedule was prepared taking into account quantities of the construction works and the requirement for the detailed design in each phase as explained below;

- Detailed design inclusive of tendering procedure will take two years for each of the three phases,

- Construction will take four years for the Phases-1 and 2, and three years for the Phase-3.

- Erosion to Manas regulator site will be observed before detailed design for the Phase-2 work,

- Hydraulic and hydrological observation will be continued for six years after the commencement of the Phase-1 implementation of GIP for updating the hydraulic analysis for compartmentalisation which constitutes one of major components of Phase-3.

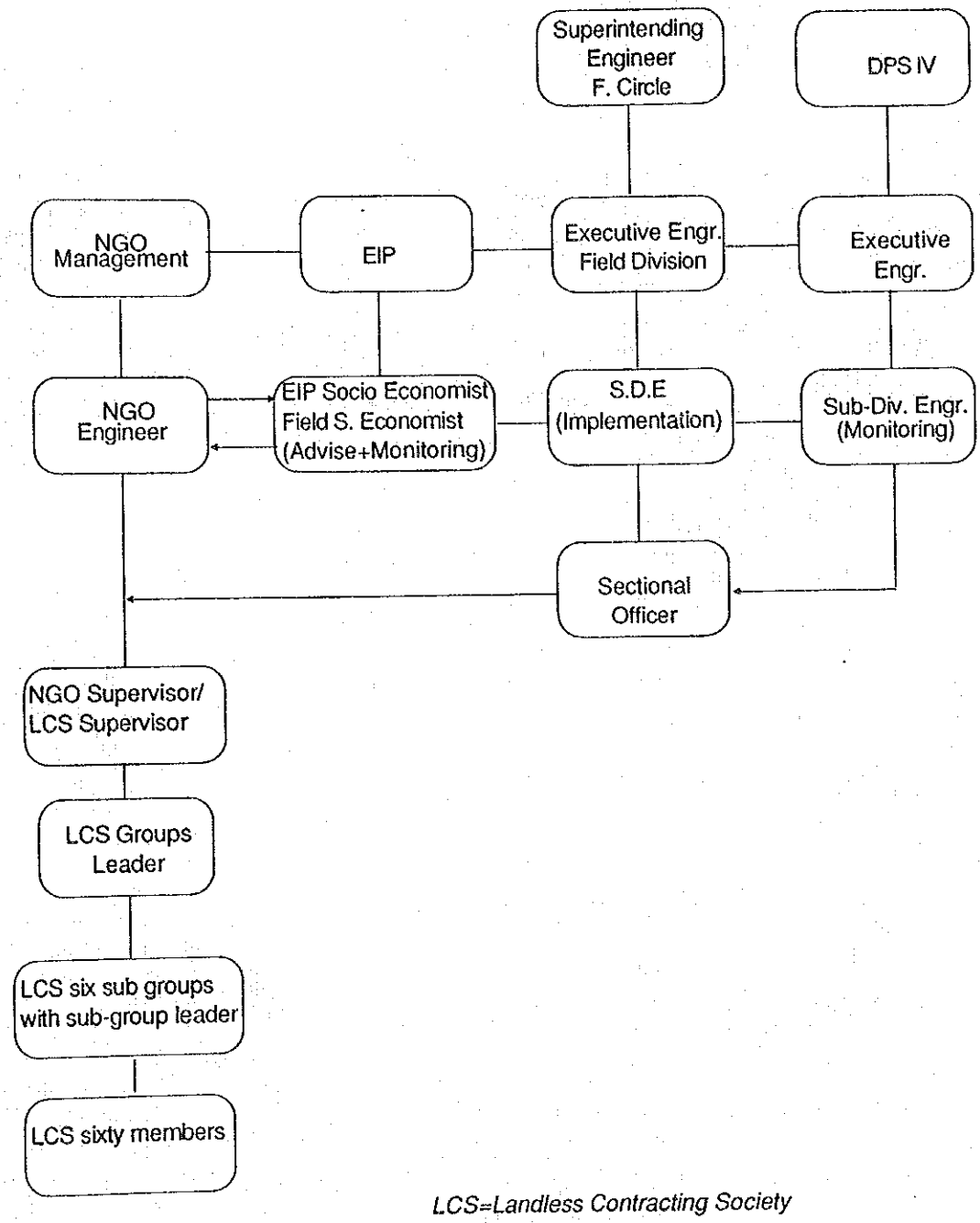
- The strengthening of upstream TRE are proposed to be implemented in parallel with Phase-1 since this work would be indispensable components of GIP as clarified through the hydraulic modelling analysis and engineering study for GIP in the foregoing Chapter 4. However, the study of strengthening of upstream TRE is at the preliminary level and therefore the pre-design study is required to review the current study based on the topographic survey and geotechnical

investigation to be carried out in the study and to prepare a definitive plan for the strengthening of upstream TRE. The construction works and costs are summarized as follows and the layout plan of the proposed structures is shown in Figure 6.3 (refer to Vol.4, "Engineering on Regional Planning Study"):

a)	Strengthening of TRE between the Kaunia bridge and Teesta barrage	:	59.25	km
b)	Provision of impermeable groyne with a crest length of 500 m			
	1. 4 km long bank stretch between Haragacha to Mohipur	:	5	nos
	2. 2 km long bank stretch at Godownerhat	:	3	nos
c)	Land acquisition including borrow area	:	167	ha
d)	Capital cost (unit : million TK)			
	1. Construction cost	:	409	
	2. Administration cost	:	12	
	3. Physical contingency	:	102	
	4. Engineering service cost	:	77	
	4. Land acquisition	:	33	
	5. Total cost	:	633	
	6. O&M cost	:	15	

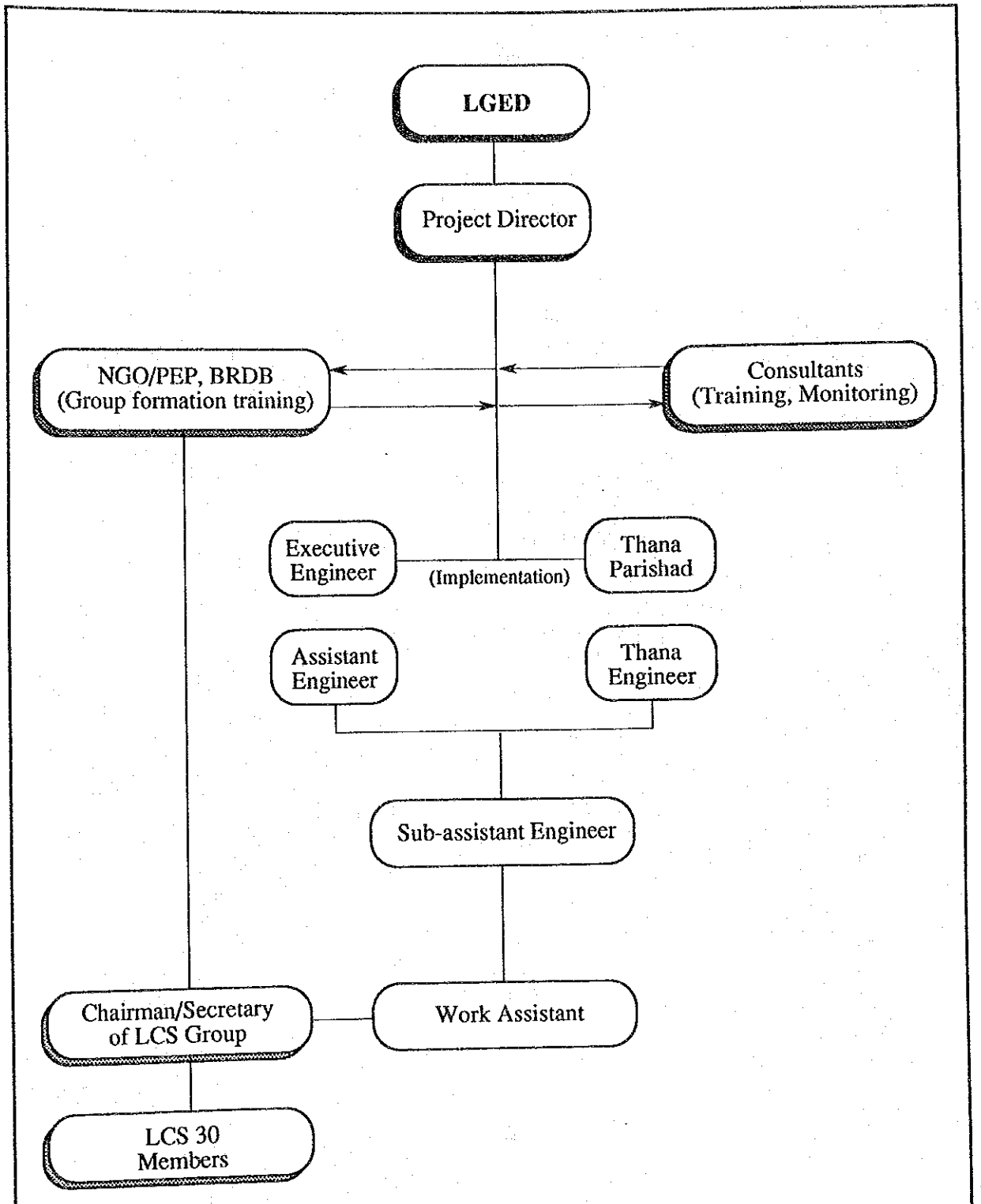
The implementation time schedule thus established is shown in Figure 6.4.

Figure 6.1 ORGANIZATION FOR LCS ACTIVITIES UNDER BWDB-EARLY IMPLEMENTATION PROJECT (EIP)



LCS=Landless Contracting Society
DPS=Director Planning Scheme

Figure 6.2 ORGANIZATION FOR LCS ACTIVITIES UNDER LGED RESP PROJECT



Note

PEP : Production and Employment Project
LCS : Labour Contracting System
BRDB : Bangladesh Rural Development Board

Figure 6.3 GENERAL LAYOUT OF TEESTA RIGHT BANK (PLANNING UNIT NO.3)

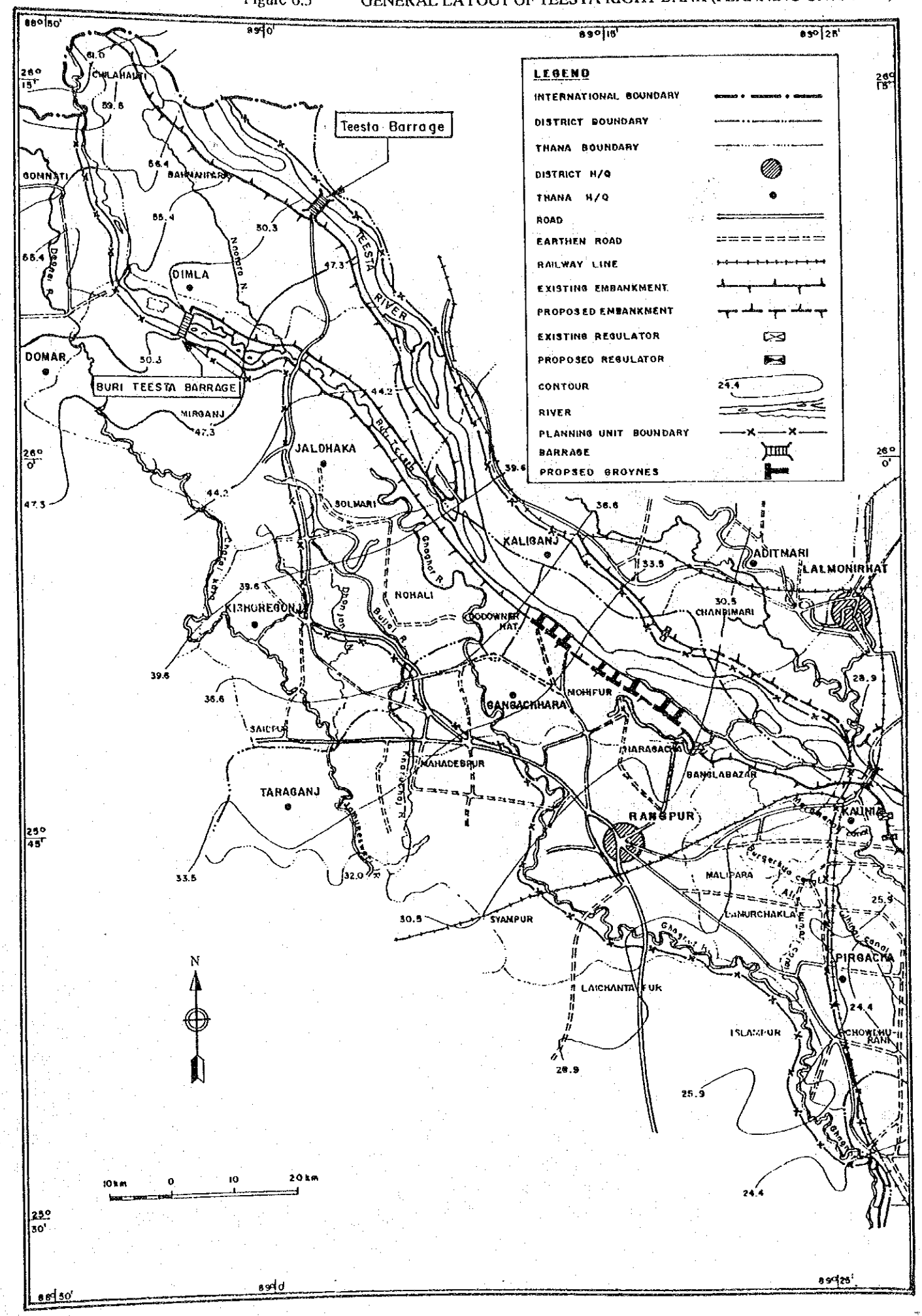
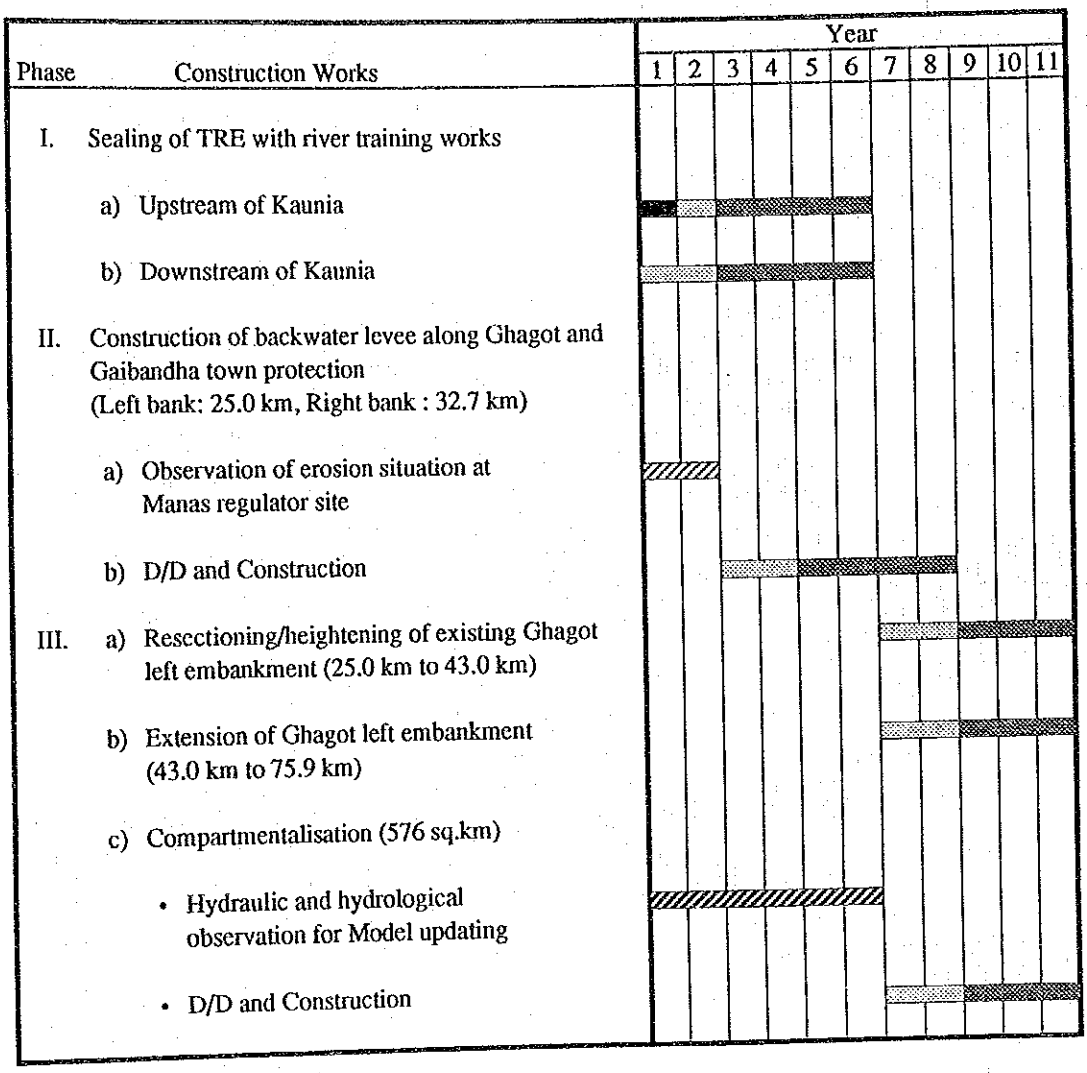


Figure 6.4 IMPLEMENTATION SCHEDULE



7. COST ESTIMATE AND CONSTRUCTION PLAN

7.1 General

This chapter deals with a construction plan and cost estimate for the whole works involved in the Gaibandha Improvement Project (GIP), which are scheduled to be implemented in the three Phases as discussed in the foregoing Chapter 6. Besides, a variety of construction methods for earth works such as manual and mechanical construction methods and combined one of these are taken up in Chapter 6 in order to examine and compare them from engineering and sociological point of views. Since it is not still mature to determine the optimum construction method in this study stage, the cost estimate for embankment works was made for each of the two alternatives for earth works, namely; manual construction method and combination of manual and mechanical ones.

7.2. Work Items and Quantities

Items of construction works proposed by the engineering studies in the foregoing Chapter 5 and their quantities are summarized below;

Configuration of the above construction works is summarized by the subject rivers or areas. They are as follows;

Item	Phase-1	Phase-2	Phase-3
Location	Teesta	Ghgaot downstream of Sadullapur (left and right banks)	Ghagot upstream of Sadullapur (left bank) and whole GIP area
Work item			
1. Flood embankment	46.6 km	57.7 km	50.9 km
- New embankment	13.2 km	Left bank : 1.2 km Right bank : 26.3 km	14.5 km
- Resectioning/heightening of existing flood embankment	33.4 km	Left bank : 23.8 km Right bank : 6.4 km	36.4 km
2. Revetment (concrete blocks w/ jute mat)	4.9 km	-	-
3. Groynes (jute embankment & compacted embankment)	2,920 m	-	-
4. Regulators (1.52 m x 1.83 m)			
- New regulator	3 nos	Left bank : 5 nos Right bank : 1 nos	3 nos
- Rehabilitation of regulator	5 nos	Left bank : 2 nos Right bank: -	-
- Additional provision of vent for regulator	1 no	Left bank : 2 nos Right bank : -	2nos
5. New sluiceway (1.0 m x 1.0 m)	5 nos	Left bank : 2 nos Right bank: 11 nos	11 nos
6. Channel excavation	-	Outfall : 1.2 km Gaibandha : 0.5 km	-
7. New road bridge at Gaibandha		1 no	
8. Compartmentalisation	-	-	5 nos
- Sluiceway			450 nos
- Drain pipe			6.3 km
- New embankment			1 no
- Regulator at u/s of Sreepur on BRE			

7.3 Construction Planning

7.3.1 Basic conditions for construction planning

(1) Workable days

Annual workable days are estimated to be 150 days for earthwork and 210 days for concrete and other works, respectively as shown in Table 7.1. The construction conditions applied to the estimate is as follows;

- In principle, earthwork is suspended if daily rainfall depths exceeds 10 mm, but no work is executed in a duration of five (5) months from the beginning of June to the end of October since it is very difficult to keep on the construction quality during the monsoon season,

- Likewise, concrete and other structural works are suspended in case rainfall depth of more than 20 mm takes place, but no work is executed for 2.5 months from the beginning of July through the middle of September,

- No work is executed on regular Fridays and the following national holidays,

1) Shab-e-Barat (Feb.20),
2) Shaheed Dibash (Feb.21)
3) Independence day (Mar.26)
4) Shab-e-Qudar (Apr.1)
5) Jumat-ul-Bida (Apr.3)
6) Bengali new year's day (Apr.14)
7) Buddha purnima (Apr.18)
8) May Day (May.1)
9) Muharram (July 12)
10) Eid-e-Milad-un-Nabi (Sept.11)
11) Durgapuja (Oct.7)
12) Biplab Dibash (Nov.7)
13) Bijoy Dibash (Dec.16)
14) X-mas Day (Dec.25)
15) Eid-ul-Fitr (3 days) & Eid-ul-Azha (3 days)

(2) Labour source and working hours

Skilled and unskilled labour will be recruited in and around the GIP area. Daily working hours are eight (8) hours for every type of works. Actual operation time of construction equipment is assumed to be 6.5 hours a day.

(3) Construction material

Earth material for flood embankment will be procured from borrow area near the embankment site. Where suitable earth material is not obtainable, earth will be transported by dump trucks from the nearby other borrow areas. The construction material for concrete placement such as cement, fine and coarse aggregates and timber for the form works, and bricks, bamboo and other wooden material are procured in and around the GIP area. Such material as structural steel and steel pipe will be produced in Dhaka and/or Chittagone or imported since they are not available in the local market.

(4) Construction equipment

Earthwork is the major work element as well as river training work and provision of such drainage facilities as regulators and sluiceways. Those works will be accomplished by use of heavy construction

equipment to keep the required quality and progress of work output. But the use of manpower will also be considered for all phases of construction as much as possible even in the combined construction method from the socioeconomic aspect. The following construction equipments are recommendable to carry out the construction works proposed;

No.	Equipment	Capacity
1	Bulldozer	11 t, 15 t, 21 t
2	Backhoe	0.35 cu.m
3	Backhoe	0.6 cu.m
4	Dump truck	11 t
5	Ordinary truck	6 t
6	Tire roller	10 t
7	Compaction roller	10 t
8	Crawler crane	30 t
9	Truck crane	10 t
10	Crawler pile driver	35 t
11	Diesel pile hammer	3.5 t
12	Vibration hammer	30 kw
13	Submersible pump	4 in.
14	Vibration compactor	80 kg
15	Concrete mixer	0.5 cu.m
16	Concrete vibrator	45 mm
17	Diesel generator	125 kvA
18	Diesel generator	30 kvA

(5) Mode of construction

Construction work will practically be executed by international and/or local contractors. Contractors will be selected following the guidelines of the Government/Donor. A competitive bidding is preferable for selecting the contractor who will undertake a main part of the construction works.

(6) Utilization of local contracting society

The local contracting society is recommended to be organized and employed for execution of earth work following other ongoing projects, where appropriate.

(7) Access to site

Among the existing roads that link the GIP area with Bogra-Rangpur highway, there are four major roads through which it is accessible to the GIP area by vehicle for the time being. There are, from south to north, the Palashbari-Gaibandha, Mithapukur-Sadullapur, Rangpur-Kaunia and Rangpur-Pirgacha roads. Out of them, the Palashbari-Gaibandha and Rangpur-Kaunia roads are metalled and well maintained. While, in case of other two roads, the worse surface condition of road was observed during the site reconnaissance, especially in the Mithapukur-Sadullapur road.

There is a national road connecting Dhaka and Rangpur although there is no bridge to cross the Brahmaputra river where ferry service is available connecting Aricha and Nagarbari . From the national road provincial road is linked to the project area, but they are not all-weather type roads. In Saidpur there is an airport, and daily flight service is available.

On the commencement of the construction works, the heavy construction equipment will be carried into the project site through road network and ferry service. Since in general it is hard to access from the existing metal roads inside the GIP area to the surrounding rivers such as the Teesta and Ghagot because of the insufficient road network as well as the deterioration of existing rural roads therein, construction road for the equipment will be required in the stage of preparatory work.

(8) Others

Electric power supply is normally poor, and generator is requisite for stable operation of construction equipment. Water required for construction works and other uses will be supplied from deep wells to be constructed. Communication with telephone is possible only in the town area of Gaibandha. Therefore, the wireless communication system needs to be installed at the construction sites in case the present communication system is not likely to be improved until the implementation stage.

7.3.2 Construction method

(1) A combination of manual and mechanical ones

The key structure is flood embankment, of the components of GIP. Therefore, an emphasis is paid to construction of flood embankment in devising the combined construction method, but also the manual one which is discussed in the following Sub-section 7.3.3. The combined construction method for flood embankment and those for other related facilities are outlined below;

a) Flood embankment and compartment banks

Earth material for embankment is planned to be obtained through excavation at borrow areas located adjacent to the embankment site. The borrow areas needs to be designated in river side of the proposed flood embankment to ensure the stability thereof. Besides, the borrow areas will be spotted individually as much as possible, since much flood and rain water might concentrate at the construction site so that the construction works would be suspended due to the difficulty in the quality control. Excavation as well as hauling of earth material will be performed by construction equipment such as backhoes, bulldozers, and manpower. Dump trucks will be used for transportation of earth material from borrow areas to the embankment site where suitable material is not available in the neighborhood of the embankment site.

Earth material will be placed layer by layer in thickness of about 30 cm or less. Best quality of flood embankment will be accomplished by mechanical compaction using bulldozers. Moisture content of earth will be carefully controlled to meet the requirement on the optimum moisture content. After covering the entire process for a certain layer, the subsequent layer will be created in the same manner until the crest level is reached. Crest level shall include an allowance for settlement of embankment body and foundation. Extra embanking for this purpose is necessary, and height of the extra embanking will be equivalent to about 10 % of the design height of the flood embankment based on our geotechnical investigation.

In addition to the compaction of horizontal layers, slopes of embankment shall also be compacted. Since slopes of the proposed flood embankment are comparatively gentle, mechanical compaction by bulldozers or backhoes is recommendable. Manual compaction with hand-operated equipment or conventional rammer will be adopted where it is not adequate to use such heavy compaction equipment because of the limited construction space (for instance, the portion adjacent to the drainage structure provided into the embankment.). Slopes of about 30 cm wide will be subject to compaction.

In resectioning the existing embankment, first, the deteriorated portions will be removed or compacted with the heavy compaction equipment. In succession, earthwork for raising the height or increasing the

width will be executed. The existing embankment will be bench-cut with several steps using backhoes, before additional earth material will be filled thereon in accordance with the design cross section.

Embankment for compartmentalisation will be constructed applying the same construction methods and procedures with above.

b) Channel excavation

The shortcut channels for the Ghagot are proposed to be constructed, out of which one is aligned to branch off downstream of the confluence with the Manas, while the other is to shortcut the meander of the Ghagot near the Gaibandha town. Channel excavation for this purpose will be executed by backhoes and bulldozers and also by means of the manual methods. The earth material to be produced through excavation of the shortcut channels will be utilized as embankment material for flood embankment near the location. No coffering will not be required except at the both ends of the new alignment, but dewatering might be necessary.

c) Groynes

The groyne body is planned to be made of jute bags fixed with steel bars to be driven into, compacted earth fill and concrete blocks with wire netting crates to be placed on the surface of the groynes. Since the groynes are constructed on the existing river bed, earth coffering, bypassing of the channel and dewatering by pumps will be required. Placing of jute bags and concrete blocks will be carried out manually, while bulldozers will be mobilized for earth filling with compaction.

d) Revetment work

The revetment works will be mainly executed by manpower with mobilization of heavy equipment for transportation of construction material where appropriate. The revetment works consist of slope protection and foot protection. All of these works shall be performed in the dry condition.

Concrete blocks will be manufactured at each construction site due to the poor accessibility thereto. Jute mat will first be laid on well compacted slopes, and concrete blocks will then be placed on the jute mat. Voids between concrete blocks will be filled with mortar. Back of revetment will be filled with gravel material for stability and drainage, and will also be well compacted.

The foot protection works consisting of placement of concrete blocks will be provided around toe of the revetment. During the construction thereof, the construction area will be made dry through provision of coffering as well as installation of submersible pumps.

e) Regulators and drainage sluices

Excavation and backfill with compaction for regulators and sluices will be carried out by bulldozers and backhoes or manually hand operated equipment. The construction works for the foundation of the regulator will be conducted in the driest season in order to avoid provision of dewatering works. Diesel pile hammers or vibration hammers will be mobilized for driving of RC piles to be provided for supporting the regulator.

Bending and cutting of reinforcement bars will be carried out at each construction site. Truck cranes will be used for arrangement of reinforcement bars and form work. Concrete will be mixed at work site

by concrete mixers and concrete vibrators will be used for placing.

Installation of gate and appurtenances will be performed using truck cranes and welding machine with generators.

f) Drain pipes

Drain pipes to be buried into road embankment for the improvement of local inundation will be installed by using truck crane.

g) Road bridge

Since the bridge is constructed over the shortcut channel to be newly excavated near Gaibandha town, no coffering work will be required. Substructures of piers and abutments will first be constructed. PC girders will be manufactured at the construction site. Thus, arrangement of reinforcement bars, form work, concreting, pre-stressing, grouting, etc. will be made on the substructures with scaffolding. After completion of all works, the girder will be shifted to the proper position by hydraulic jacks. No crane will be required for construction.

h) Others

Coffering will be made with earth material. Dewatering will be carried out by submersible pumps. For effective dewatering, the pumps will be installed in a cell of the earth coffer.

(2) Manual construction method

Concerning other construction works than earthwork, there is no difference between the manual construction method and the aforesaid combined one of manual and mechanical method. In case the flood embankment is constructed by means of the manual method, a great attention needs to be paid to the compaction works. There are many cases in the existing embankment that the specifications of compaction works in the conventional method which are described in the foregoing Section 6.2 have not been followed in the construction stage. As explained in the foregoing Chapter 6, one of the major causes is the unreasonably low bid price. Thus, the unit rate has to be set up to allow the sufficient compaction works. It is considered that, if the specification are strictly observed during the construction, the existing embankments would not be deteriorated to the present state. The compaction method preliminarily applied is that thickness of spreading in each embankment layer is limited to 15 cm (22.5 cm in the conventional practice), which is compacted for earth material to come to about 85 % of its maximum dry density through intensive input of common labours. The compaction works will be done under the strict quality control in accordance with the specifications to be prepared in the detailed design stage.

7.3.3 Production rates of construction equipment

Work output of different construction equipment depends on site condition and capacities and types of equipment. Hourly production rates of major construction equipment are worked out as follows;

(1) Backhoe (capacity:0.6 cu.m)

$$Q = (3600 \cdot q \cdot E / C_m) = (3600 \cdot 0.59 \cdot 0.65 / 31) = 44.5$$

where, Q : Hourly production (cu.m/hr.)
q : Production volume during a cycle time (=0.6 • 0.98)
E : Working efficiency (=0.65)
C_m : Cycle time (=31 sec.for swing angle of 135 degrees)

(2) Bulldozer (capacity:11 ton)

a) Compaction for embankment

$Q = V \cdot W\ D\ E / N = 3500 \cdot 0.7\ 0.25\ 0.6 / 5 = 73.5$

where, Q : Hourly production (cu.m/hr.)
V : Working velocity (=3,500 m/hr.)
W : Effective width of compaction work (=0.7 m)
D : Thickness of a layer to be compacted (=0.25 m)
E : Working efficiency (=0.6)
N : Number of times for compaction of a layer (=5)

b) Spreading for embankment

$Q = 10 \cdot E \cdot (11 \cdot D + 8) = 10 \cdot 0.6 \cdot (11 \cdot 0.25 + 8) = 64.5$

where, Q : Hourly production (cu.m/hr.)
E : Working efficiency (=0.6)
D : Thickness of a spread layer (=0.25 m)

c) Compaction & spreading for embankment

$Q = (Q_1 \cdot Q_2) / (Q_1 + Q_2) = (73.5 \cdot 64.5) / (73.5 + 64.5) = 34.4$

where, Q : Hourly production of compaction and spreading (cu.m/hr.)
Q_1 : Hourly production of compaction (cu.m/hr.)
Q_2 : Hourly production of spreading (cu.m/hr.)

d) Shaping of embankment slope

$Q = V \cdot W \cdot E / N = 3500 \cdot 0.7 \cdot 0.35 / 5 = 171.5$

where, Q : Hourly production (sq.m/hr.)
V : Working velocity (=3,500 m/hr.)
W : Effective width of work (=0.7 m)
E : Working efficiency (=0.35)
N : Number of times for slope compaction (=5)

(3) Dump truck (11 ton)

$Q = 60 \cdot q \cdot E / C_m$

where, Q : Hourly production (cu.m/hr.)
q : Loading capacity (=6.1 cu.m)
E : Working efficiency (=0.9)
C_m : Cycle time (=b*L+a)
L : Hauling distance (km)
b : Coefficient of traffic condition (=4.6)
a : Loading and unloading time (=18 min., loaded by backhoe)

Hauling distance (km)	Cycle time (min.)	Hourly production (cu.m/hr.)
0.5	20.3	16.3
1.0	22.6	14.6
2.0	27.2	12.1
3.0	31.8	10.4
4.0	36.4	9.0
5.0	41.0	8.0

7.4 Construction Cost Estimate

7.4.1 Basic conditions for costing

For costing, the following conditions and assumptions are taken into consideration;

(1) Components of cost

The following costs will be required for performing the project;

a) Direct construction cost covers preparatory work, civil work, and procurement and installation of equipment. The construction cost accords to a contract price. Estimation of the cost is made on the unit price or lump sum basis.

b) Administration cost covers the cost of construction and maintenance of project office, technical staff, departmental overhead, and of other activities in relation to the project. The administration cost is estimated to be 3 % of the direct construction cost.

c) Physical contingencies cover cost for unforeseen works and events during construction phases. The physical contingencies are estimated to be 15 % of the direct construction cost.

d) Engineering cost covers cost of survey, investigation, design, preparation of tender documents, supervision of construction, etc. The engineering service cost is estimated to be 10 % of the construction cost plus physical contingencies.

e) Land acquisition cost covers the cost of land required for construction, and of other properties to be acquired in association with construction. Unit rate of land is determined based on prevailing prices in and around the GIP area.

f) O & M cost comprises cost for the following activities and items after completion of construction;

- Cost of technical staff,
- Departmental overheads,

- Labour and materials,
- Operation and maintenance of equipment, and
- Annual repair and periodic replacement of FCD facilities.

(2) Reference source of cost estimate

In estimating the above costs, the following is referred to;

- Schedule of Rates for Bogra O & M Circle, 1988, BWDB, Bogra
- Schedule of Rates for Comilla O & M Circle, 1988, BWDB, Comilla
- Schedule of Rates for Project-IV, 1989, BWDB, Rangpur
- Schedule of Rates for Road & Bridge Works, 1990, RHD, Dhaka Zone
- Schedule of Rates prepared by World Bank Resident Mission in Bangladesh, Sept.1991
- FAP5 & FAP8A reports (1991), FAP1, FAP7 & FAP9A reports (1992)

Besides, those rates adopted in recent projects in Bangladesh are also referred to. Our own estimate derived from the sources is adjusted and finalized through a rigorous check with those from ongoing projects.

(3) Price level and exchange rate

Prevailing market prices of labour, materials, and construction equipment as of September 1992 are adopted for cost estimate. The official exchange rate as of first of September, 1992 (US$ 1.0 = Tk 38.9 = Yen 123) is adopted as the exchange rate for costing purpose.

(4) Currencies of cost estimate

Cost is estimated dividing into local currency portion and foreign currency portion, which cover the following cost items respectively;

Foreign currency portion	Local currency portion
- Imported construction equipment and materials - Overhead for foreign contractor - Expense to foreign consultant	- Local materials - Land acquisition and resettlement - Administration - Overhead for local contractor - Expense to local consultant - Salary and labour wages for local employee - Taxes

(5) Mode of contract

Construction will mainly be executed by contractor(s). The contractor will be selected through the competitive bidding, and a contract value will be negotiated with the successful contractor after the tendering. Where appropriate, contracting society will be employed for the execution of GIP. The procedures to select contracting society will be devised in line with the Government policy before the commencement of construction works, separately from the Tender.

(6) Unit rate of construction work

Unit rate of construction work consists of unit rates of labour wages, materials and construction equipment for operation of unit work elements such as embankment and excavation. In estimating the

unit rate of each work item, cost of miscellaneous work is estimated to be 5 % of the unit rate for executing unit work element, and overhead of contractor is counted at 20 % of the unit rate inclusive of the cost of miscellaneous work.

7.4.2 Cost estimate

(1) Unit rates

Unit rates of labour, materials and construction equipment are shown in Tables 7.2 to 7.4. Unit rates of construction works are estimated based on the construction plan proposed. In the estimation, it is envisaged that the two alternatives in terms of the construction method, namely; manual/mechanical and manual construction, are separately costed to provide a proper basis for comparison.

In the combined construction method, the construction work is executed by use of mechanical equipment/machineries for major part of works which require high quality output and certain time schedule without delay. But manual work is employed in every element of construction work where appropriate in order to motivate people's employment opportunity. In this context, manpower will be adopted in the following work items;

- hauling earth in excavation and embankment,
- hauling materials for structures,
- backfilling without compaction,
- spreading of stone materials for pavement work and foundation of structures,
- slope protection work and turfing,
- assistance in use of heavy equipment, and
- other works in narrow space where heavy equipment can not be operated.

On the other hand, the manual construction method puts priority on increase of people's employment. Earthwork including that for structures is executed manually without use of any heavy equipment but with hand-operated machineries or conventional equipment. The other construction works are executed in combination of manpower and mechanical equipment/machineries as same as the aforesaid combined construction method. Consequently, the following work items will be done by manpower in addition to those in the combined construction method;

- Clearing and stripping,
- Excavation of channel or structure site,
- Compaction and shaping of flood embankment, and
- Compaction of backfill materials.

Unit rates for these manual and combined construction methods are shown in Table 7.5.

(2) Direct construction cost

The construction cost for the GIP is worked out based on the unit rates of construction works and their quantities and on the lump sum basis. They are shown in Tables 7.6 to 7.8.

Construction cost is also worked out under the assumption that construction work be executed in the three phases as practical as discussed in the Chapter 6. Summary of construction cost for phased construction is shown in Table 7.9. A total of the construction cost by phase is as follows;

(Unit: 1,000 Tk)

Phase	Combination of Manual and Mechanical Construction Methods			Manual Construction Method		
	F.C	L.C	Total	F.C	L.C	Total
Phase-1	313,283	286,941	600,224	161,864	303,544	465,408
Phase-2	190,840	131,727	322,567	27,289	149,143	176,432
Phase-3	76,977	60,897	137,874	24,962	68,286	93,248
Total	581,100	479,565	1,060,665	214,115	520,973	735,088

(3) Administration cost

Administration cost for the project is calculated to be 3 % of the construction cost showing the following breakdown;

(Unit: 1,000 Tk)

Phase	Combination of Manual and Mechanical Construction Methods			Manual Construction Method		
	F.C	L.C	Total	F.C	L.C	Total
Phase-1	-	18,007	18,007	-	13,962	13,962
Phase-2	-	9,677	9,677	-	5,293	5,293
Phase-3	-	4,136	4,136	-	2,798	2,798
Total	-	31,820	31,820	-	22,053	22,053

(4) Physical contingencies

Physical contingencies to cover unforeseen works and events are calculated to be 15 % of the construction cost. A breakdown is as follows;

(Unit: 1,000 Tk)

Phase	Combination of Manual and Mechanical Construction Methods			Manual Construction Method		
	F.C	L.C	Total	F.C	L.C	Total
Phase-1	46,993	43,041	90,034	24,280	45,531	69,811
Phase-2	28,626	19,759	48,385	4,093	22,372	26,465
Phase-3	11,547	9,134	20,681	3,744	10,243	13,987
Total	87,166	71,934	159,100	32,117	78,146	110,263

(5) Engineering service cost

The engineering service cost to cover detailed design, supervision and other related activities during the project preparation and construction phases is calculated to be 10 % of a sum of the construction cost and the physical contingency. It is calculated for each phase as shown below;

(Unit: 1,000 Tk)

Phase	Combination of Manual and Mechanical Construction Methods			Manual Construction Method		
	F.C	L.C	Total	F.C	L.C	Total
Phase-1	36,028	32,998	69,026	18,614	34,908	53,522
Phase-2	21,947	15,148	37,095	3,138	17,152	20,290
Phase-3	8,853	7,003	15,856	2,871	7,853	10,724
Total	66,828	55,149	121,977	24,623	59,913	84,536

(6) Land acquisition cost

Cost to acquire land required for the construction is estimated based on the prevailing market prices.

There is no difference of unit rates for land acquisition over the GIP area according to our survey, and it is 20 Tk/sq.m (= equivalent to 200,000 Tk/ha.). Land acquisition cost amounts to 85,032,000 Tk in total as shown in Table 7.10, accordingly. They are summarized as follows;

Phase	Land Acquisition Cost (TK)
Phase-1	30,464,000
Phase-2	34,432,000
Phase-3	20,136,000
Total	85,032,000

(7) Project cost

Project cost totalling up the above costs is summarized below;

(Unit: 1,000 Tk)

Phase	Combination of Manual and Mechanical Construction Methods			Manual Construction Method		
	F.C	L.C	Total	F.C	L.C	Total
Phase-1	396,304	411,451	807,755	204,758	428,409	633,167
Phase-2	241,413	210,743	452,156	34,520	228,392	262,912
Phase-3	97,377	101,306	198,683	31,577	109,316	140,893
Total	735,094	723,500	1,458,594	270,855	766,117	1,036,972

(8) O & M cost

O & M cost is assumed to be proportional to the construction cost. O & M cost is estimated to be 5 % of construction cost for earthwork plus 3 % of construction cost for other work. Estimated annual O&M cost is as follows;

- Manual and mechanical construction : 43,734,000 Tk/year
- Manual construction : 27,623,000 Tk/year

7.4.3 Disbursement of project cost

In accordance with the implementation schedule for GIP which is set up in the foregoing Chapter 6, a time schedule of construction is worked out as shown in Figure 7.1. Annual disbursement schedule is prepared as shown in Table 7.11 as per the time schedule of construction.

Table 7.1 ESTIMATE OF WORKABLE DAYS

Rainy days (Rangpur'86-'90)				Cal.	Suspension by rain (a)				Holidays	Holidays	Workable days (d)	
Month	0-10mm	10-20mm	20mm-	days	Earth w.	:(adopted)	Conc.w.	:(adopted)	fixed(b)	movable(c)	Earth w.	Conc.w.
Jan	31.0	0.0	0.0	31	0.0	0.0	0.0	0.0	4.4		26.6	26.6
Feb	27.2	0.6	0.4	28	1.0	1.0	0.4	0.4	6.0		21.0	21.6
Mar	30.0	0.0	1.0	31	1.0	1.0	1.0	1.0	5.4		24.6	24.6
Apr	26.2	2.0	1.8	30	3.8	3.8	1.8	1.8	8.3		17.9	19.9
May	22.2	2.8	6.0	31	8.8	8.8	6.0	6.0	5.4		16.8	19.6
Jun	21.0	3.0	6.0	30	9.0	30.0	6.0	6.0	4.3		0.0	19.7
Jul	19.0	3.8	8.2	31	12.0	31.0	8.2	31.0	5.4		0.0	0.0
Aug	23.6	1.6	5.8	31	7.4	31.0	5.8	31.0	4.4		0.0	0.0
Sep	20.2	2.4	7.4	30	9.8	30.0	7.4	15.0	5.3		0.0	12.4
Oct	27.8	1.0	2.2	31	3.2	31.0	2.2	2.2	5.4		0.0	23.4
Nov	29.4	0.4	0.2	30	0.6	0.6	0.2	0.2	5.3		24.1	24.5
Dec	31.0	0.0	0.0	31	0.0	0.0	0.0	0.0	6.4		24.6	24.6
Sum	308.6	17.6	39.0	365	56.6	168.2	39.0	94.6	66.1	6	155.5	216.8
Total workable days excl. rainy days, sundays & every national holiday (assumed at)											149.5	210.8
											150.0	210.0

Note:

(a) Earth work (more than 10 mm), Concrete work (more than 20 mm)
But no earth work during 5 months (June-October), and no concrete work during 2.5 months (July-September)

(b) Regular holidays = (Regular Sundays) + (National holidays fixed)
Regular Sundays = (days in each month)/7
National holidays fixed(or almost fixed) are: Shab-e-Barat(Feb.20), Shaheed Dibash(Feb.21), Independence day(Mar.26), Shab-e-Qudar(Apr.1), Jumat-ul-Bida(Apr.3), Bengali New year's day(Apr.14), Buddha purnima(Apr.18), May Day(May.1), Muharram(Jul.12), Eid-e-Milad-un-Nabi(Sep.11), Durgapuja(Oct.7), Biplab Dibash(Nov.7), Bijoy Dibash(Dec.16), X-mas day(Dec.25)

(c) National holidays movable are: Eid-ul-Fitr(3days) and Eid-ul-Azha(3days)

(d) Workable days incl.movable national holidays

Table 7.2 LABOUR WAGES

(Unit: Taka)

	Type of labour	Labour wages (8 hours a day)
1	Foreman	170
2	Skilled labour	75
3	Common labour	55
4	Operator for heavy equipment	85
5	Driver	85
6	Mechanic	100
7	Welder	85
8	Electrician	85
9	Concrete worker	75
10	Carpenter	110
11	Mason/Plasterer	110
12	Steel worker	110
13	Painter	110
14	Plumber	110
15	Pavement worker	110
16	Surveyor	115

Source;
- "Schedule of Rates for Bogra O&M Circle, 1988", BWDB, Bogra
- "Schedule of Rates for Comilla O&M Circle, 1988", BWDB, Comilla
- "Schedule of Rates for Project-IV, 1989", BWDB, Rangpur
- "Schedule of Rates for Road & Bridge Works, 1990", RHD, Dhaka Zone
- FAP8A Reports, May 1992, JICA

Table 7.3 UNIT RATES OF MATERIALS

(Unit: Taka)

Type of materials	Unit	F.C	(%)	L.C	(%)	Total
1. Cement, aggregates & stones						
Portland cement	kg.	3	60	2	40	5
Sand	cu.m	68	15	383	85	450
Gravel	cu.m	158	15	893	85	1,050
Unscreened gravel	cu.m	158	15	893	85	1,050
Cobble stone	cu.m	171	15	969	85	1,140
Brick	1000pcs	420	20	1,680	80	2,100
Brick chips	cu.m	113	15	638	85	750
2. Steel materials						
Reinforcement bar	ton	13,000	50	13,000	50	26,000
Structural steel	ton	32,000	100	0	-	32,000
Steel sheet pile	ton	40,000	100	0	-	40,000
Steel pipe handrail	l.m	810	90	90	10	900
Expansion joint	l.m	10,800	90	1,200	10	12,000
Steel wire net	sq.m	55	50	55	50	110
3. Concrete products						
R.C pile (250 x 250)	l.m	257	33	523	67	780
R.C pile (300 x 300)	l.m	354	34	686	66	1,040
R.C pile (350 x 350)	l.m	469	35	871	65	1,340
R.C pile (400 x 400)	l.m	605	36	1,075	64	1,680
R.C pipe (d=700, l=2.43m)	nos.	3,400	40	5,100	60	8,500
4. Others						
Wooden pile (d=100, l=3m)	nos.	60	10	540	90	600
Timber (class-a)	cu.m	5,000	20	20,000	80	25,000
Timber (class-b)	cu.m	0	-	15,000	100	15,000
Wooden plank (t=380)	sheet	40	20	160	80	200
Mortar (1:2)	cu.m	2,160	60	1,440	40	3,600
Bitumen	ton	6,600	60	4,400	40	11,000
Rubber bearing shoe (450 x 350)	sq.m	53,100	90	5,900	10	59,000
PVC pipe (diameter : 50)	l.m	35	50	35	50	70
PVC water stop (b=200)	l.m	250	50	250	50	500
Jute bag	pc.	0	-	15	100	15
Jute mat	sq.m	0	-	50	100	50
Bamboo	pc.	0	-	100	100	100
Gasoline	l	13.5	90	1.5	10	15
Diesel oil	l	13.05	90	1.5	10	14.5

Source;

- "Schedule of Rates for Bogra O&M Circle, 1988", BWDB, Bogra
- "Schedule of Rates for Comilla O&M Circle, 1988", BWDB, Comilla
- "Schedule of Rates for Project-IV, 1989", BWDB, Rangpur
- "Schedule of Rates for Road & Bridge Works, 1990", RHD, Dhaka Zone
- FAP8A Reports, May 1992, JICA

Table 7.4 UNIT RATES FOR OPERATION OF CONSTRUCTION EQUIPMENT

No.	Equipment	Capacity	CIF site delivery cost (1000Tk)	Life year	Operation of equip. (hr./yr.)	Operation of equip. (d./yr.)	Depreciation cost (Tk/hr.)	Maintenance & repair		Management		Total cost (Tk/hr)		
								rate (%)	cost (Tk/hr.)	rate (%)	cost (Tk/hr.)	F.C (*)	L.C (*)	Total
1	Bulldozer	11 t	4,748	6	975	150	730	65	528	7	341	1,153	446	1,599
2	Bulldozer	15 t	6,045	6	975	150	930	65	672	7	434	1,467	568	2,036
3	Bulldozer	21 t	9,389	6	975	150	1,444	65	1,043	7	674	2,279	883	3,162
4	Backhoe	0.35 cu.m	3,627	5	1,365	210	478	50	266	7	186	691	239	930
5	Backhoe	0.6 cu.m	5,991	5	1,365	210	790	50	439	7	307	1,141	395	1,536
6	Dump truck	11 t	4,251	4	1,365	210	701	60	467	10	311	1,074	405	1,479
7	Ordinary truck	6 t	2,191	4	1,365	210	361	55	221	10	161	538	205	742
8	Compaction roller	10 t	3,013	6	975	150	464	50	258	7	216	670	268	937
9	Crawler crane	30 t	10,360	7	975	150	1,366	70	1,063	7	744	2,216	956	3,173
10	Truck crane	10 t	6,084	7	1,365	210	573	35	223	7	312	751	357	1,108
11	Crawler pile driver	35 t	20,567	5	1,365	210	2,712	50	1,507	7	1,055	3,918	1,356	5,274
12	Diesel pile hammer	3.5 t	3,740	4	975	150	863	60	575	7	269	1,323	384	1,707
13	Vibration hammer	30 kw	1,643	4	975	150	379	60	253	7	118	581	169	750
14	Submersible pump	4 in.	69	5	1,365	210	9	110	11	5	3	18	5	23
15	Vibration compactor	80 kg	65	3	1,365	210	14	45	7	5	2	20	4	24
16	Concrete mixer	0.5 cu.m	811	5	1,365	210	107	70	83	5	30	173	46	220
17	Concrete vibrator	45 mm	48	3	1,365	210	11	35	4	5	2	14	3	16
18	Diesel generator	125 kVA	1,531	6	1,365	210	168	35	65	5	56	221	69	290
19	Diesel generator	30 kVA	690	6	1,365	210	76	35	29	5	25	99	31	131

Note:
- Salvage value is 10 %.
- Life time as well as rates of maintenance & management are based on data from Ministry of construction, Japan.
- For the estimate of annual operation hours/days, Japanese standard, other projects in overseas as well as rates from BWDB are referred to.
- Foreign currency portion (F.C) covers depreciation cost and 80 % of a sum of maintenance & repair cost
- Local currency portion (L.C) covers management cost and 20 % of a sum of maintenance & repair cost

Table 7.5 UNIT RATES OF CONSTRUCTION WORKS

(Unit: Tk)

Work item	Remarks	Unit	F.C	(%)	L.C	(%)	Total
(Earth works)							
Clearing, grubbing & stripping incl.disposal	manual	sq.m	-	0	9	100	9
Clearing, grubbing & stripping incl.disposal	manual(disposal)/mechanical	sq.m	11	73	4	27	15
Channel excavation (transport.l=50m)	manual	cu.m	-	0	46	100	46
Channel excavation (transport.l=100m)	manual	cu.m	-	0	74	100	74
Channel excavation (transport.l=200m)	manual	cu.m	-	0	130	100	130
Channel excavation (transport.l=50m)	manual(transport.)/mecha.	cu.m	38	49	40	51	78
Channel excavation (transport.l=100m)	manual(transport.)/mecha.	cu.m	38	36	68	64	106
Channel excavation (transport.l=200m)	manual(transport.)/mecha.	cu.m	38	24	123	76	161
Channel excavation (transport.l=500m)	mechanical	cu.m	135	75	46	25	181
Channel excavation (transport.l=1km)	mechanical	cu.m	147	75	50	25	197
Channel excavation (transport.l=2km)	mechanical	cu.m	170	75	58	25	228
Channel excavation (transport.l=5km)	mechanical	cu.m	237	75	81	25	318
Embankment (compaction & shaping)	manual	cu.m	-	0	23	100	23
Embankment (compaction & shaping)	mechanical	cu.m	61	73	22	27	83
Turfing	manual	sq.m	-	0	5	100	5
Structural excavation (transport.l=50m)	manual	cu.m	-	0	55	100	55
Structural excavation (transport.l=100m)	manual	cu.m	-	0	83	100	83
Structural excavation (transport.l=200m)	manual	cu.m	-	0	138	100	138
Structural excavation (transport.l=50m)	manual(transport.)/mecha.	cu.m	42	51	41	49	83
Structural excavation (transport.l=100m)	manual(transport.)/mecha.	cu.m	42	38	69	62	111
Structural excavation (transport.l=200m)	manual(transport.)/mecha.	cu.m	42	25	124	75	166
Structural excavation (transport.l=500m)	mechanical	cu.m	139	75	47	25	186
Structural excavation (transport.l=1km)	mechanical	cu.m	150	75	51	25	201
Backfilling of structure by local earth	manual(filling)/mechanical	cu.m	6	17	29	83	35
Backfilling of structure by local earth	mechanical	cu.m	42	74	15	26	57
Backfilling of structure by brick chips	manual(filling)/mechanical	cu.m	154	15	873	85	1,027
Backfilling of structure by imported earth (gravels)	manual(filling)/mechanical	cu.m	215	15	1,209	85	1,424
Backfilling of structure by imported earth (gravels)	mechanical	cu.m	253	17	1,196	83	1,449
Dewatering (d=4 in., 3.7 kW, head=10m)	per work cell	day	1,561	68	738	32	2,299
(Structural works)							
Base gravels for structure	manual	cu.m	209	15	1,194	85	1,403
Base sands for structure	manual	cu.m	90	15	519	85	609
Slope protection (concrete blocks)	300x300x300, manual	cu.m	1,589	59	1,122	41	2,711
Slope protection (concrete tiles)	200x300x100, manual	cu.m	1,589	59	1,122	41	2,711
Slope protection (brick masonry)	for drain pipes, manual	cu.m	694	32	1,506	68	2,200
Slope protection (concrete blocks mattress)	for groynes, 2 layers (t=600)	sq.m	1,245	56	964	44	2,209
Slope protection (jute mat placing)	for groynes & revetments	sq.m	-	0	71	100	71
Foot protection (cobble stones for footing cover)	for bridge footing, mecha.	cu.m	210	31	476	69	686
Jute bag embankment	for groynes, manual	cu.m	-	0	886	100	886
Structural concrete (210 kg/sq.cm) for regulators	incl.scaffold & support & form	cu.m	1,685	34	3,236	66	4,921
Structural concrete (210 kg/sq.cm) for bridges	incl.scaffold & support & form	cu.m	1,566	37	2,674	63	4,240
Structural concrete (210 kg/sq.cm) for sluices	incl.scaffold & support & form	cu.m	1,733	33	3,463	67	5,196
Structural concrete (160 kg/sq.cm) for revetments	incl.scaffold & support & form	cu.m	1,376	32	2,923	68	4,299
Lean concrete (100 kg/sq.cm)	manual	cu.m	734	40	1,124	60	1,858
Reinforcement bar	manual	ton	16,900	49	17,700	51	34,600
R.C pipe (d=700) with collar	mechanical(placing)	l.m	2,121	43	2,828	57	4,949
Foundation work (R.C pile, 400x400)	material & driving(mecha.)	l.m	782	43	1,032	57	1,814
Post tension P.C girder (span 30m)	Fabrication & build, mecha.	nos	240,345	48	255,780	52	496,125
Expansion joint	manual	l.m	14,016	90	1,585	10	15,601
Rubber bearing shoe	manual	nos	10,854	90	1,254	10	12,108
Asphalt joint filler	manual	cu.m	1,298	55	1,048	45	2,346
PVC drain pipes (d=50, l=400)	manual	l.m	44	49	46	51	90
PVC water stops (b=200)	manual	l.m	315	49	327	51	642
Steel pipe handrail	for regulator, manual	l.m	1,021	89	128	11	1,149
Metal works for gate	incl.spindle & hoist, mecha.	ton	522,500	95	27,500	5	550,000
Removal of structures	R.C structures(mechanical)	cu.m	1,103	73	401	27	1,504
Base course of road pavement (brick chips, t=250)	manual(spreading) & mecha.	cu.m	191	16	999	84	1,190
Road pavement (double layer bricks, t=140)	manual(spreading) & mecha.	sq.m	109	32	235	68	344
Road pavement (asphalt, t=50)	manual(spreading) & mecha.	sq.m	613	57	471	43	1,084

Table 7.6 CONSTRUCTION COST OF TRE (1/8)

(manual + mechanical)

	Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
A.	Flood Embankment							
	1 Stripping	m2	1,177,900	11	4	12,956,900	4,711,600	17,668,500
	2 Embankment	m3	1,214,800	99	62	120,265,200	75,317,600	195,582,800
	3 Turfing	m2	990,100	0	5	0	4,950,500	4,950,500
	Total of Item A.					133,222,100	84,979,700	218,201,800
B.	Revetment by Concrete Block							
	1 Horipur (3,200 m)							
	a) Excavation	m3	51,200	38	40	1,945,600	2,048,000	3,993,600
	b) Concrete block (300 x 300 x 300)	m2	19,200	1,589	1,122	30,508,800	21,542,400	52,051,200
	c) Structural concrete	m3	3,200	1,685	3,236	5,392,000	10,355,200	15,747,200
	d) Jute mat	m2	32,000	0	71	0	2,272,000	2,272,000
	e) Base gravel	m3	960	209	1,194	200,640	1,146,240	1,346,880
	Total of Item 1.					38,047,040	37,383,840	75,410,880
	2 Sundarganj (300 m)							
	a) Excavation	m3	2,400	38	40	91,200	96,000	187,200
	b) Concrete block (300 x 300 x 300)	m2	1,500	1,589	1,122	2,383,500	1,683,000	4,066,500
	c) Structural concrete	m3	300	1,685	3,236	505,500	970,800	1,476,300
	d) Jute mat	m2	4,200	0	71	0	298,200	298,200
	e) Base gravel	m3	90	209	1,194	18,810	107,460	126,270
	Total of Item 2.					2,999,010	3,155,460	6,154,470
	3 Tambulpur (700 m)							
	a) Excavation	m3	6,300	38	40	239,400	252,000	491,400
	b) Concrete block (300 x 300 x 300)	m2	3,500	1,589	1,122	5,561,500	3,927,000	9,488,500
	c) Structural concrete	m3	700	1,685	3,236	1,179,500	2,265,200	3,444,700
	d) Jute mat	m2	4,900	0	71	0	347,900	347,900
	e) Base gravel	m3	210	209	1,194	43,890	250,740	294,630
	Total of Item 3.					7,024,290	7,042,840	14,067,130
	Total of Item B.					48,070,340	47,562,140	95,632,480
C.	Groyne							
	1 Belka (5 nos.,1050 m)							
	a) Excavation	m3	8,800	38	40	334,400	352,000	686,400
	b) Jute bag embankment	m3	14,800	0	886	0	13,112,800	13,112,800
	c) Compaction and shaping	m3	8,000	61	22	488,000	176,000	664,000
	d) Concrete block mattress	m2	23,100	1,245	964	28,759,500	22,268,400	51,027,900
	e) Jute mat	m2	12,800	0	71	0	908,800	908,800
	f) Steel bar (D9, 50 cm/no. @2,000)	ton	1.3	13,000	13,000	16,900	16,900	33,800
	Total of Item 1					29,598,800	36,834,900	66,433,700
	2 Sundarganj (6 nos., 700 m)							
	a) Excavation	m3	7,700	38	40	292,600	308,000	600,600
	b) Jute bag embankment	m3	12,950	0	886	0	11,473,700	11,473,700
	c) Compaction and shaping	m3	7,000	61	22	427,000	154,000	581,000
	d) Concrete block mattress	m2	15,400	1,245	964	19,173,000	14,845,600	34,018,600
	e) Jute mat	m2	11,200	0	71	0	795,200	795,200
	f) Steel bar (D9, 50 cm/no. @2,000)	ton	1.2	13,000	13,000	15,600	15,600	31,200
	Total of Item 2					19,908,200	27,592,100	47,500,300
	3 Painalghat (13 nos., 1420 m)							
	a) Excavation	m3	15,620	38	40	593,560	624,800	1,218,360
	b) Jute bag embankment	m3	26,270	0	886	0	23,275,220	23,275,220
	c) Compaction and shaping	m3	14,200	61	22	866,200	312,400	1,178,600
	d) Concrete block mattress	m2	31,240	1,245	964	38,893,800	30,115,380	69,009,180
	e) Jute mat	m2	22,720	0	71	0	1,613,120	1,613,120
	f) Steel bar (D9, 50 cm/no. @2,000)	ton	2.3	13,000	13,000	29,900	29,900	59,800
	Total of Item 3.					40,383,460	55,970,800	96,354,260
	Total of Item C.					89,890,460	120,397,800	210,288,260

Table 7.6 CONSTRUCTION COST OF TRE (2/8)

(manual + mechanical)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
D. Regulator							
1 Additional regulator at Mirgan] (Additional 2 vents)							
a) Excavation for structure	m3	554	38	40	21,052	22,160	43,212
b) Base gravel	m3	10	209	1,194	2,090	11,940	14,030
c) Lean concrete	m3	3	734	1,124	2,202	3,372	5,574
d) Structural concrete	m3	145	1,685	3,236	244,325	469,220	713,545
e) Reinforcing bar	ton	10.8	16,900	17,700	182,520	191,160	373,680
f) Concrete tile (200 x 300 x 100)	m3	29	1,589	1,122	46,081	32,538	78,619
g) Concrete block (300 x 300 x 300)	m3	8	1,589	1,122	12,119	8,557	20,676
h) Brick chip	m3	22	154	873	3,368	19,090	22,457
i) PVC drain pipe (D50,400 in length)	m	32	44	46	1,417	1,481	2,898
j) PVC water stop (200 in width)	m	37	315	327	11,654	12,098	23,752
k) Steel slide gate (1.9m x 1.6m)	ton	1.4	522,500	27,500	731,500	38,500	770,000
l) Steel pipe hand rail	m	101	1,021	128	103,121	12,928	116,049
m) RC-Precast concrete pile (400 x 400)	m	90	782	1,032	70,380	92,880	163,260
n) Pavement (brick)	m2	33	109	235	3,597	7,755	11,352
Total of Item 1.					1,435,425	923,679	2,359,104
2 New regulator (G-7 basin : 3 vents)							
a) Excavation for structure	m3	713	38	40	27,094	28,520	55,614
b) Base gravel	m3	14	209	1,194	2,926	16,716	19,642
c) Lean concrete	m3	5	734	1,124	3,670	5,620	9,290
d) Structural concrete	m3	147	1,685	3,236	247,695	475,692	723,387
e) Reinforcing bar	ton	11.3	16,900	17,700	190,970	200,010	390,980
f) Concrete tile (200 x 300 x 100)	m3	6	1,589	1,122	9,534	6,732	16,266
g) Concrete block (300 x 300 x 300)	m3	32	1,589	1,122	50,848	35,904	86,752
h) Brick chip	m3	27	154	873	4,158	23,571	27,729
i) PVC drain pipe (D50,400 in length)	m	31	44	46	1,384	1,426	2,790
j) PVC water stop (200 in width)	m	37	315	327	11,655	12,099	23,754
k) Steel slide gate (1.9m x 1.6m)	ton	2.1	522,500	27,500	1,097,250	57,750	1,155,000
l) Steel pipe hand rail	m	102	1,021	128	104,142	13,056	117,198
m) RC-Precast concrete pile (400 x 400)	m	120	782	1,032	93,840	123,840	217,680
n) Pavement (brick)	m2	34	109	235	3,706	7,990	11,696
Total of Item 2.					1,848,852	1,008,926	2,857,778
3 New regulator (G-6 basin : 3 vents)							
a) Excavation for structure	m3	713	38	40	27,094	28,520	55,614
b) Base gravel	m3	14	209	1,194	2,926	16,716	19,642
c) Lean concrete	m3	5	734	1,124	3,670	5,620	9,290
d) Structural concrete	m3	139	1,685	3,236	234,215	449,804	684,019
e) Reinforcing bar	ton	10.7	16,900	17,700	180,830	189,390	370,220
f) Concrete tile (200 x 300 x 100)	m3	5	1,589	1,122	7,945	5,610	13,555
g) Concrete block (300 x 300 x 300)	m3	32	1,589	1,122	50,848	35,904	86,752
h) Brick chip	m3	24	154	873	3,696	20,952	24,648
i) PVC drain pipe (D50,400 in length)	m	29	44	46	1,276	1,334	2,610
j) PVC water stop (200 in width)	m	36	315	327	11,340	11,772	23,112
k) Steel slide gate (1.9m x 1.6m)	ton	2.1	522,500	27,500	1,097,250	57,750	1,155,000
l) Steel pipe hand rail	m	100	1,021	128	102,100	12,800	114,900
m) RC-Precast concrete pile (400 x 400)	m	120	782	1,032	93,840	123,840	217,680
n) Pavement (brick)	m2	33	109	235	3,597	7,755	11,352
Total of Item 3.					1,820,627	967,767	2,788,394
4 Rehabilitation of Kasiabari regulator							
a) Cocrete removal	m3	74	1,103	401	81,622	29,674	111,296
b) Base gravel	m3	3	209	1,194	627	3,582	4,209
c) Lean concrete	m3	1	734	1,124	734	1,124	1,858
d) Structural concrete	m3	74	1,685	3,236	124,690	239,464	364,154
e) Reinforcing bar	ton	2.6	16,900	17,700	43,940	46,020	89,960
f) Concrete tile (200 x 300 x 100)	m3	5	1,589	1,122	7,945	5,610	13,555
g) Concrete block (300 x 300 x 300)	m3	10	1,589	1,122	15,890	11,220	27,110
h) Brick Chip	m3	28	154	873	4,312	24,444	28,756
i) PVC drain pipe (D50,400 in length)	m	28	44	46	1,232	1,288	2,520
j) PVC water stop (200 in width)	m	35	315	327	11,025	11,445	22,470
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of Item 4.					657,767	393,121	1,050,888

Table 7.6 CONSTRUCTION COST OF TRE (3/8)

(manual + mechanical)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
5 Rehabilitation of Narayanpur regulator							
a) Cocrete removal	m3	18	1,103	401	19,854	7,218	27,072
b) Base gravel	m3	3	209	1,194	627	3,582	4,209
c) Lean concrete	m3	1	734	1,124	734	1,124	1,858
d) Structural concrete	m3	10	1,685	3,236	16,850	32,360	49,210
e) Reinforcing bar	ton	0.4	16,900	17,700	6,760	7,080	13,840
f) Concrete tile (200 x 300 x 100)	m3	0	1,589	1,122	0	0	0
g) Concrete block (300 x 300 x 300)	m3	7	1,589	1,122	11,123	7,854	18,977
h) Brick Chip	m3	0	154	873	0	0	0
i) PVC drain pipe (D50,400 in length)	m	0	44	46	0	0	0
j) PVC water stop (200 in width)	m	17	315	327	5,355	5,559	10,914
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of Item 5.					427,053	84,027	511,080
6 New regulator (G-2 basin : 6 vents)							
a) Channel excavation (400 m)	m3	5,600	38	40	212,800	224,000	436,800
b) Excavation for structure	m3	1,190	38	40	45,220	47,600	92,820
c) Base gravel	m3	28	209	1,194	5,852	33,432	39,284
d) Lean concrete	m3	9	734	1,124	6,606	10,116	16,722
e) Structural concrete	m3	203	1,685	3,236	342,055	656,908	998,963
f) Reinforcing bar	ton	15.6	16,900	17,700	263,640	276,120	539,760
g) Concrete tile (200 x 300 x 100)	m3	4	1,589	1,122	6,356	4,488	10,844
h) Concrete block (300 x 300 x 300)	m3	62	1,589	1,122	98,518	69,564	168,082
i) Brick chip	m3	26	154	873	4,004	22,698	26,702
j) PVC drain pipe (D50,400 in length)	m	31	44	46	1,364	1,426	2,790
k) PVC water stop (200 in width)	m	46	315	327	14,490	15,042	29,532
l) Steel slide gate (1.9m x 1.6m)	ton	4.2	522,500	27,500	2,194,500	115,500	2,310,000
m) Steel pipe hand rail	m	121	1,021	128	123,541	15,488	139,029
n) RC-Precast concrete pile (400 x 400)	m	210	782	1,032	164,220	216,720	380,940
o) Pavement (brick)	m2	44	109	235	4,796	10,340	15,136
Total of Item 6.					3,487,962	1,719,442	5,207,404
7 Rehabilitation of Bhairhat regulator							
a) Cocrete removal	m3	59	1,103	401	65,077	23,659	88,736
b) Base gravel	m3	5	209	1,194	1,045	5,970	7,015
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	59	1,685	3,236	99,415	190,924	290,339
e) Reinforcing bar	ton	2.1	16,900	17,700	35,490	37,170	72,660
f) Concrete tile (200 x 300 x 100)	m3	1	1,589	1,122	1,589	1,122	2,711
g) Concrete block (300 x 300 x 300)	m3	3	1,589	1,122	4,767	3,366	8,133
h) Brick Chip	m3	18	154	873	2,772	15,714	18,486
i) PVC drain pipe (D50,400 in length)	m	18	44	46	792	828	1,620
j) PVC water stop (200 in width)	m	27	315	327	8,505	8,829	17,334
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of Item 7.					588,670	309,080	895,750
8 Rehabilitation of Rajib regulator							
a) Cocrete removal	m3	17	1,103	401	18,751	6,817	25,568
b) Base gravel	m3	7	209	1,194	1,463	8,358	9,821
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	17	1,685	3,236	28,645	55,012	83,657
e) Reinforcing bar	ton	0.6	16,900	17,700	10,140	10,620	20,760
f) Concrete tile (200 x 300 x 100)	m3	0	1,589	1,122	0	0	0
g) Concrete block (300 x 300 x 300)	m3	3	1,589	1,122	4,767	3,366	8,133
h) Brick Chip	m3	0	154	873	0	0	0
i) PVC drain pipe (D50,400 in length)	m	0	44	46	0	0	0
j) PVC water stop (200 in width)	m	17	315	327	5,355	5,559	10,914
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of Item 8.					436,339	111,230	547,569

Table 7.6 CONSTRUCTION COST OF TRE (4/8)

(manual + mechanical)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
9 Rehabilitation of Kalirhat regulator							
a) Cocrete removal	m3	70	1,103	401	77,210	28,070	105,280
b) Base gravel	m3	7	209	1,184	1,463	8,358	9,821
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	70	1,685	3,238	117,950	226,520	344,470
e) Reinforcing bar	ton	2.5	16,900	17,700	42,250	44,250	86,500
f) Concrete tile (200 x 300 x 100)	m3	0	1,589	1,122	0	0	0
g) Concrete block (300 x 300 x 300)	m3	0	1,589	1,122	0	0	0
h) Brick Chip	m3	19	154	873	2,926	16,587	19,513
i) PVC drain pipe (D50,400 in length)	m	19	44	46	836	874	1,710
j) PVC water stop (200 in width)	m	28	315	327	8,820	9,158	17,978
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of liem 9.					618,673	355,313	973,986
Total of Item D.					11,319,368	5,872,585	17,191,953
E. Sluiceway (5 nos.) Including drain ditch and approach channel							
1 Excavation	m3	15,810	38	40	600,780	632,400	1,233,180
2 Base gravel	m3	50	209	1,184	10,368	59,222	69,589
3 Lean concrete	m3	19	734	1,124	13,652	20,906	34,559
4 Structural concrete	m3	229	1,733	3,463	397,550	794,412	1,191,962
5 Reinforcing bar	ton	21.7	16,900	17,700	366,730	384,090	750,820
6 Concrete tile (200 x 300 x 100)	m3	19	1,589	1,122	29,555	20,869	50,425
7 Concrete block (300 x 300 x 300)	m3	37	1,589	1,122	59,111	41,738	100,849
8 Brick chip	m3	12	154	873	1,910	10,825	12,735
9 PVC drain pipe (D50,400 in length)	m	31	44	46	1,364	1,426	2,790
** PVC water stop (200 in width)	m	112	315	327	35,154	36,493	71,647
** Steel flap gate (1.2m x 1.2m)	ton	1.5	522,500	27,500	783,750	41,250	825,000
Total of Item E.					2,299,923	2,043,633	4,343,556
F. Total Construction Cost of TRE (Items A to E)					284,802,191	260,855,858	545,658,049

Table 7.6 CONSTRUCTION COST OF TRE (5/8)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
A. Flood Embankment							
1 Stripping	m2	1,177,900	0	9	0	10,601,100	10,601,100
2 Embankment	m3	1,214,800	0	69	0	83,821,200	83,821,200
3 Turfing	m2	990,100	0	5	0	4,950,500	4,950,500
Total of Item A.					0	99,372,800	99,372,800
B. Revetment by Concrete Block							
1 Horipur (3,200 m)							
a) Excavation	m3	51,200	0	46	0	2,355,200	2,355,200
b) Concrete block (300 x 300 x 300)	m2	19,200	1,589	1,122	30,508,800	21,542,400	52,051,200
c) Structural concrete	m3	3,200	1,685	3,236	5,392,000	10,355,200	15,747,200
d) Jute mat	m2	32,000	0	71	0	2,272,000	2,272,000
e) Base gravel	m3	960	209	1,194	200,640	1,146,240	1,346,880
Total of Item 1.					36,101,440	37,671,040	73,772,480
2 Sundarganj (300 m)							
a) Excavation	m3	2,400	0	46	0	110,400	110,400
b) Concrete block (300 x 300 x 300)	m2	1,500	1,589	1,122	2,383,500	1,683,000	4,066,500
c) Structural concrete	m3	300	1,685	3,236	505,500	970,800	1,476,300
d) Jute mat	m2	4,200	0	71	0	298,200	298,200
e) Base gravel	m3	90	209	1,194	18,810	107,460	126,270
Total of Item 2.					2,907,810	3,169,860	6,077,670
3 Tambulpur (700 m)							
a) Excavation	m3	6,300	0	46	0	289,800	289,800
b) Concrete block (300 x 300 x 300)	m2	3,500	1,589	1,122	5,561,500	3,927,000	9,488,500
c) Structural concrete	m3	700	1,685	3,236	1,179,500	2,265,200	3,444,700
d) Jute mat	m2	4,900	0	71	0	347,900	347,900
e) Base gravel	m3	210	209	1,194	43,890	250,740	294,630
Total of Item 3.					6,784,890	7,080,640	13,865,530
Total of Item B.					45,794,140	47,921,540	93,715,680
C. Groyne							
1 Belka (5 nos.,1050 m)							
a) Excavation	m3	3,800	0	46	0	404,800	404,800
b) Jute bag embankment	m3	14,800	0	886	0	13,112,800	13,112,800
c) Compaction and shaping	m3	8,000	61	22	488,000	176,000	664,000
d) Concrete block mattress	m2	23,100	1,245	964	28,759,500	22,268,400	51,027,900
e) Jute mat	m2	12,800	0	71	0	908,800	908,800
f) Steel bar (D9, 50 cm/no. @2,000)	ton	1.3	13,000	13,000	16,900	16,900	33,800
Total of Item 1.					29,264,400	36,887,700	66,152,100
2 Sundarganj (8 nos., 700 m)							
a) Excavation	m3	7,700	0	46	0	354,200	354,200
b) Jute bag embankment	m3	12,950	0	886	0	11,473,700	11,473,700
c) Compaction and shaping	m3	7,000	61	22	427,000	154,000	581,000
d) Concrete block mattress	m2	15,400	1,245	964	19,173,000	14,845,600	34,018,600
e) Jute mat	m2	11,200	0	71	0	795,200	795,200
f) Steel bar (D9, 50 cm/no. @2,000)	ton	1.2	13,000	13,000	15,600	15,600	31,200
Total of Item 2.					19,615,600	27,838,300	47,253,900
3 Painalghat (13 nos., 1420 m)							
a) Excavation	m3	15,620	0	46	0	718,520	718,520
b) Jute bag embankment	m3	26,270	0	886	0	23,275,220	23,275,220
c) Compaction and shaping	m3	14,200	61	22	866,200	312,400	1,178,600
d) Concrete block mattress	m2	31,240	1,245	964	38,893,800	30,115,360	69,009,160
e) Jute mat	m2	22,720	0	71	0	1,613,120	1,613,120
f) Steel bar (D9, 50 cm/no. @2,000)	ton	2.3	13,000	13,000	29,900	29,900	59,800
Total of Item 3.					39,789,900	56,064,520	95,854,420
Total of Item C.					88,669,900	120,590,520	209,260,420

Table 7.6 CONSTRUCTION COST OF TRE (6/8)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
D. Regulator							
1 Additional regulator at Mirganj (Additional 2 vents)							
a) Excavation for structure	m3	554	0	46	0	25,484	25,484
b) Base gravel	m3	10	209	1,194	2,090	11,940	14,030
c) Lean concrete	m3	3	734	1,124	2,202	3,372	5,574
d) Structural concrete	m3	145	1,685	3,236	244,325	469,220	713,545
e) Reinforcing bar	ton	10.8	16,900	17,700	182,520	191,160	373,680
f) Concrete tile (200 x 300 x 100)	m3	29	1,589	1,122	46,081	32,538	78,619
g) Concrete block (300 x 300 x 300)	m3	8	1,589	1,122	12,119	8,557	20,676
h) Brick chip	m3	22	154	873	3,368	19,090	22,457
i) PVC drain pipe (D50,400 in length)	m	32	44	46	1,417	1,481	2,898
j) PVC water stop (200 in width)	m	37	315	327	11,654	12,098	23,752
k) Steel slide gate (1.9m x 1.6m)	ton	1.4	522,500	27,500	731,500	38,500	770,000
l) Steel pipe hand rail	m	101	1,021	128	103,121	12,928	116,049
m) RC-Precast concrete pile (400 x 400)	m	90	782	1,032	70,380	92,880	163,260
n) Pavement (brick)	m2	33	109	235	3,597	7,755	11,352
Total of item 1.					1,414,373	927,003	2,341,376
2 New regulator (G-7 basin : 3 vents)							
a) Excavation for structure	m3	713	0	46	0	32,798	32,798
b) Base gravel	m3	14	209	1,194	2,926	16,716	19,642
c) Lean concrete	m3	5	734	1,124	3,670	5,620	9,290
d) Structural concrete	m3	147	1,685	3,236	247,695	475,692	723,387
e) Reinforcing bar	ton	11.3	16,900	17,700	190,970	200,010	390,980
f) Concrete tile (200 x 300 x 100)	m3	6	1,589	1,122	9,534	6,732	16,268
g) Concrete block (300 x 300 x 300)	m3	32	1,589	1,122	50,848	35,904	86,752
h) Brick chip	m3	27	154	873	4,158	23,571	27,729
i) PVC drain pipe (D50,400 in length)	m	31	44	46	1,364	1,426	2,790
j) PVC water stop (200 in width)	m	37	315	327	11,655	12,099	23,754
k) Steel slide gate (1.9m x 1.6m)	ton	2.1	522,500	27,500	1,097,250	57,750	1,155,000
l) Steel pipe hand rail	m	102	1,021	128	104,142	13,056	117,198
m) RC-Precast concrete pile (400 x 400)	m	120	782	1,032	93,840	123,840	217,680
n) Pavement (brick)	m2	34	109	235	3,706	7,990	11,696
Total of item 2.					1,821,758	1,013,204	2,834,962
3 New regulator (G-6 basin : 3 vents)							
a) Excavation for structure	m3	713	0	46	0	32,798	32,798
b) Base gravel	m3	14	209	1,194	2,926	16,716	19,642
c) Lean concrete	m3	5	734	1,124	3,670	5,620	9,290
d) Structural concrete	m3	139	1,685	3,236	234,215	449,804	684,019
e) Reinforcing bar	ton	10.7	16,900	17,700	180,830	189,390	370,220
f) Concrete tile (200 x 300 x 100)	m3	5	1,589	1,122	7,945	5,610	13,555
g) Concrete block (300 x 300 x 300)	m3	32	1,589	1,122	50,848	35,904	86,752
h) Brick chip	m3	24	154	873	3,696	20,952	24,648
i) PVC drain pipe (D50,400 in length)	m	29	44	46	1,278	1,334	2,610
j) PVC water stop (200 in width)	m	36	315	327	11,340	11,772	23,112
k) Steel slide gate (1.9m x 1.6m)	ton	2.1	522,500	27,500	1,097,250	57,750	1,155,000
l) Steel pipe hand rail	m	100	1,021	128	102,100	12,800	114,900
m) RC-Precast concrete pile (400 x 400)	m	120	782	1,032	93,840	123,840	217,680
n) Pavement (brick)	m2	33	109	235	3,597	7,755	11,352
Total of item 3.					1,793,533	972,045	2,765,578
4 Rehabilitation of Kasiabari regulator							
a) Cocrete removal	m3	74	1,103	401	81,622	29,674	111,296
b) Base gravel	m3	3	209	1,194	627	3,582	4,209
c) Lean concrete	m3	1	734	1,124	734	1,124	1,858
d) Structural concrete	m3	74	1,685	3,236	124,690	239,464	364,154
e) Reinforcing bar	ton	2.6	16,900	17,700	43,940	46,020	89,960
f) Concrete tile (200 x 300 x 100)	m3	5	1,589	1,122	7,945	5,610	13,555
g) Concrete block (300 x 300 x 300)	m3	10	1,589	1,122	15,890	11,220	27,110
h) Brick Chip	m3	28	154	873	4,312	24,444	28,756
i) PVC drain pipe (D50,400 in length)	m	28	44	46	1,232	1,288	2,520
j) PVC water stop (200 in width)	m	35	315	327	11,025	11,445	22,470
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of item 4.					657,767	393,121	1,050,888

Table 7.6 CONSTRUCTION COST OF TRE (7/8)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
5 Rehabilitation of Narayanpur regulator							
a) Cocrete removal	m3	18	1,103	401	19,854	7,218	27,072
b) Base gravel	m3	3	209	1,194	627	3,582	4,209
c) Lean concrete	m3	1	734	1,124	734	1,124	1,858
d) Structural concrete	m3	10	1,685	3,236	16,850	32,360	49,210
e) Reinforcing bar	ton	0.4	16,900	17,700	6,760	7,080	13,840
f) Concrete tile (200 x 300 x 100)	m3	0	1,589	1,122	0	0	0
g) Concrete block (300 x 300 x 300)	m3	7	1,589	1,122	11,123	7,854	18,977
h) Brick Chip	m3	0	154	873	0	0	0
i) PVC drain pipe (D50,400 in length)	m	0	44	46	0	0	0
j) PVC water stop (200 in width)	m	17	315	327	5,355	5,559	10,914
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of Item 5.					427,053	84,027	511,080
6 New regulator (G-2 basin : 6 vents)							
a) Channel excavation (400 m)	m3	5,600	0	46	0	257,600	257,600
b) Excavation for structure	m3	1,190	0	46	0	54,740	54,740
c) Base gravel	m3	28	209	1,194	5,852	33,432	39,284
d) Lean concrete	m3	9	734	1,124	6,608	10,116	16,722
e) Structural concrete	m3	203	1,685	3,236	342,055	656,808	998,863
f) Reinforcing bar	ton	15.6	16,900	17,700	263,640	276,120	539,760
g) Concrete tile (200 x 300 x 100)	m3	4	1,589	1,122	6,356	4,488	10,844
h) Concrete block (300 x 300 x 300)	m3	62	1,589	1,122	98,518	69,564	168,082
i) Brick chip	m3	26	154	873	4,004	22,698	26,702
j) PVC drain pipe (D50,400 in length)	m	31	44	46	1,364	1,426	2,790
k) PVC water stop (200 in width)	m	46	315	327	14,490	15,042	29,532
l) Steel slide gate (1.9m x 1.6m)	ton	4.2	522,500	27,500	2,194,500	115,500	2,310,000
m) Steel pipe hand rail	m	121	1,021	128	123,541	15,488	139,029
n) RC-Precast concrete pile (400 x 400)	m	210	782	1,032	164,220	216,720	380,940
o) Pavement (brick)	m2	44	109	235	4,796	10,340	15,136
Total of Item 6.					3,229,942	1,780,182	4,990,124
7 Rehabilitation of Bhairhat regulator							
a) Cocrete removal	m3	59	1,103	401	65,077	23,659	88,736
b) Base gravel	m3	5	209	1,194	1,045	5,970	7,015
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	59	1,685	3,236	99,415	190,924	290,339
e) Reinforcing bar	ton	2.1	16,900	17,700	35,490	37,170	72,660
f) Concrete tile (200 x 300 x 100)	m3	1	1,589	1,122	1,589	1,122	2,711
g) Concrete block (300 x 300 x 300)	m3	3	1,589	1,122	4,767	3,366	8,133
h) Brick Chip	m3	18	154	873	2,772	15,714	18,486
i) PVC drain pipe (D50,400 in length)	m	18	44	46	792	828	1,620
j) PVC water stop (200 in width)	m	27	315	327	8,505	8,829	17,334
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of Item 7.					586,870	309,080	895,750
8 Rehabilitation of Rajib regulator							
a) Cocrete removal	m3	17	1,103	401	18,751	6,817	25,568
b) Base gravel	m3	7	209	1,194	1,463	8,358	9,821
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	17	1,685	3,236	28,645	55,012	83,657
e) Reinforcing bar	ton	0.6	16,900	17,700	10,140	10,620	20,760
f) Concrete tile (200 x 300 x 100)	m3	0	1,589	1,122	0	0	0
g) Concrete block (300 x 300 x 300)	m3	3	1,589	1,122	4,767	3,366	8,133
h) Brick Chip	m3	0	154	873	0	0	0
i) PVC drain pipe (D50,400 in length)	m	0	44	46	0	0	0
j) PVC water stop (200 in width)	m	17	315	327	5,355	5,559	10,914
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of Item 8.					438,339	111,230	547,569

Table 7.6 CONSTRUCTION COST OF TRE (8/8)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
9 Rehabilitation of Kalirhat regulator							
a) Concrete removal	m3	70	1,103	401	77,210	28,070	105,280
b) Base gravel	m3	7	209	1,194	1,463	8,358	9,821
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	70	1,685	3,238	117,950	226,520	344,470
e) Reinforcing bar	ton	2.5	16,900	17,700	42,250	44,250	86,500
f) Concrete tile (200 x 300 x 100)	m3	0	1,589	1,122	0	0	0
g) Concrete block (300 x 300 x 300)	m3	0	1,589	1,122	0	0	0
h) Brick Chip	m3	19	154	873	2,926	16,587	19,513
i) PVC drain pipe (D50,400 in length)	m	19	44	46	836	874	1,710
j) PVC water stop (200 in width)	m	28	315	327	8,820	9,156	17,976
k) Steel slide gate (1.8m x 1.8m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	0	1,021	128	0	0	0
m) RC-Precast concrete pile (400 x 400)	m	0	782	1,032	0	0	0
n) Pavement (brick)	m2	0	109	235	0	0	0
Total of item 9.					618,873	355,313	973,986
Total of Item D.					10,986,108	5,925,205	16,911,313
E. Sluiceway (5 nos.) including drain ditch and approach channel							
1 Excavation	m3	15,810	0	46	0	727,260	727,260
2 Base gravel	m3	50	209	1,194	10,366	59,222	69,589
3 Lean concrete	m3	19	734	1,124	13,652	20,906	34,559
4 Structural concrete	m3	229	1,733	3,463	397,550	794,412	1,191,962
5 Reinforcing bar	ton	21.7	16,900	17,700	366,730	384,090	750,820
6 Concrete tile (200 x 300 x 100)	m3	19	1,589	1,122	29,555	20,869	50,425
7 Concrete block (300 x 300 x 300)	m3	37	1,589	1,122	59,111	41,738	100,849
8 Brick chip	m3	12	154	873	1,910	10,825	12,735
9 PVC drain pipe (D50,400 in length)	m	31	44	46	1,364	1,426	2,790
** PVC water stop (200 in width)	m	112	315	327	35,154	36,493	71,647
** Steel flap gate (1.2m x 1.2m)	ton	1.5	522,500	27,500	783,750	41,250	825,000
Total of Item E.					1,699,143	2,138,493	3,837,836
F. Total Construction Cost of TRE (Items A to E)					147,149,291	275,948,558	423,097,849

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (1/10)

(manual + mechanical)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
A. Flood Embankment							
I. Ghagot Left Embankment							
1 Back-water embankment (0.0 km to 25.0 km)							
a) Stripping	m2	547,100	11	4	6,018,100	2,188,400	8,206,500
b) Embankment	m3	402,700	99	62	39,867,300	24,967,400	64,834,700
c) Turfing	m2	493,500	0	5	0	2,467,500	2,467,500
d) Jute bag embankment	m3	20,200	61	22	1,232,200	444,400	1,676,600
e) Sand drain	m3	48,400	90	519	4,356,000	25,119,600	29,475,600
Total of Item 1.					45,685,400	29,623,300	75,508,700
2 Resectioning/heightening of the existing embankment (25.0 km to 43.0 km)							
a) Stripping	m2	290,800	11	4	3,198,800	1,162,400	4,359,000
b) Embankment	m3	102,700	99	62	10,167,300	6,367,400	16,534,700
c) Turfing	m2	165,800	0	5	0	829,000	829,000
Total of Item 2.					13,363,900	8,358,800	21,722,700
3 Extention of the existing Left embankment (43.0 km to 75.9 km)							
a) Stripping	m2	379,700	11	4	4,176,700	1,518,800	5,695,500
b) Embankment	m3	180,500	99	62	17,869,500	11,191,000	29,060,500
c) Turfing	m2	308,400	0	5	0	1,532,000	1,532,000
Total of Item 3.					22,046,200	14,241,800	36,288,000
II. Ghagot Right Embankment							
1 Back-water embankment on the right bank (32.7 k							
a) Stripping	m2	456,000	11	4	5,016,000	1,824,000	6,840,000
b) Embankment	m3	862,000	99	62	85,338,000	53,444,000	138,782,000
c) Turfing	m2	591,300	0	5	0	2,956,500	2,956,500
Total of Item 1.					90,354,000	58,224,500	148,578,500
Total of Item A.					171,649,500	110,448,400	282,097,900
B. River channel excavation							
I. Outfall of Ghgaot (1.2 km)							
a) Excavation	m3	225,200	38	40	8,557,600	9,006,000	17,565,600
II. Gaibandha (0.5 km)							
a) Excavation	m3	73,000	38	40	2,774,000	2,920,000	5,694,000
Total of Item B.					11,331,600	11,926,000	23,259,600
C. Regulator							
1 New regulator (G-14-1 basin : 1 vent)							
a) Excavation	m3	395	38	40	15,010	15,800	30,810
b) Base gravel	m3	6	209	1,184	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	153	1,685	3,236	257,805	495,108	752,913
e) Reinforcing bar	ton	10.8	16,900	17,700	182,520	191,160	373,680
f) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	45	154	873	6,930	39,285	46,215
i) PVC drain pipe (D50,400 in length)	m	40	44	46	1,760	1,840	3,600
j) PVC water stop (200 in width)	m	40	315	327	12,600	13,060	25,660
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	103	1,021	128	105,163	13,184	118,347
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	34	109	235	3,706	7,990	11,696
o) Dewatering works	LS.						
Total of Item 1.					1,032,656	890,469	1,923,125
2 New regulator (G-14-2 basin : 11 vents)							
a) Excavation for structure	m3	1,984	38	40	75,392	79,360	154,752
b) Base gravel	m3	50	209	1,184	10,450	59,700	70,150
c) Lean concrete	m3	17	734	1,124	12,478	19,108	31,586
d) Structural concrete	m3	481	1,685	3,236	810,485	1,556,516	2,367,001
e) Reinforcing bar	ton	37.8	16,900	17,700	635,440	665,520	1,300,960
f) Concrete tile (200 x 300 x 100)	m3	7	1,589	1,122	11,123	7,854	18,977
g) Concrete block (300 x 300 x 300)	m3	113	1,589	1,122	179,557	126,786	306,343
h) Brick chip	m3	62	154	873	9,548	54,126	63,674
i) PVC drain pipe (D50,400 in length)	m	67	44	46	2,948	3,082	6,030
j) PVC water stop (200 in width)	m	84	315	327	26,460	27,468	53,928
k) Steel slide gate (1.9m x 1.6m)	ton	7.7	522,500	27,500	4,023,250	211,750	4,235,000
l) Steel pipe hand rail	m	186	1,021	128	189,906	23,808	213,714
m) RC-precast concrete pile (400 x 400)	m	360	782	1,032	281,520	371,520	653,040
n) Pavement (brick)	m2	80	109	235	8,720	18,800	27,520
o) Dewatering works	LS.						
Total of Item 2.					6,277,277	3,225,398	9,502,675

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (2/10)

(manual + mechanical)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
3 New regulator (G-15 basin : 2 vents)							
a) Excavation for structure	m3	554	38	40	21,052	22,160	43,212
b) Base gravel	m3	10	209	1,194	2,090	11,940	14,030
c) Lean concrete	m3	3	734	1,124	2,202	3,372	5,574
d) Structural concrete	m3	140	1,685	3,236	235,900	453,040	688,940
e) Reinforcing bar	ton	10.5	16,900	17,700	177,450	185,850	363,300
f) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
g) Concrete block (300 x 300 x 300)	m3	22	1,589	1,122	34,958	24,684	59,642
h) Brick chip	m3	31	154	873	4,774	27,063	31,837
i) PVC drain pipe (D50,400 in length)	m	36	44	46	1,584	1,656	3,240
j) PVC water stop (200 in width)	m	37	315	327	11,655	12,099	23,754
k) Steel slide gate (1.9m x 1.6m)	ton	1.4	522,500	27,500	731,500	38,500	770,000
l) Steel pipe hand rail	m	99	1,021	128	101,079	12,672	113,751
m) RC-precast concrete pile (400 x 400)	m	90	782	1,032	70,380	92,880	163,260
n) Pavement (brick)	m2	32	109	235	3,488	7,520	11,008
o) Dewatering works	L.S.						
Total of Item 3.					1,410,824	902,412	2,313,236
4 Additional regulator for South Gagoa regulator (G-16-1 basin : 1 vents)							
a) Excavation for structure	m3	395	38	40	15,010	15,800	30,810
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	160	1,685	3,236	269,600	517,760	787,360
e) Reinforcing bar	ton	11.1	16,900	17,700	187,590	196,470	384,060
f) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	41	154	873	6,314	35,793	42,107
i) PVC drain pipe (D50,400 in length)	m	46	44	46	2,024	2,116	4,140
j) PVC water stop (200 in width)	m	41	315	327	12,915	13,407	26,322
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	104	1,021	128	106,184	13,312	119,496
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	35	109	235	3,815	8,225	12,040
o) Dewatering works	L.S.						
Total of Item 4.					1,050,624	915,905	1,966,529
5 New regulator regulator (G-16-2 basin : 1 vents)							
a) Excavation for structure	m3	395	38	40	15,010	15,800	30,810
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	96	1,685	3,236	161,760	310,656	472,416
e) Reinforcing bar	ton	7.3	16,900	17,700	123,370	129,210	252,580
f) Concrete tile (200 x 300 x 100)	m3	7	1,589	1,122	11,123	7,854	18,977
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	24	154	873	3,696	20,952	24,648
i) PVC drain pipe (D50,400 in length)	m	29	44	46	1,276	1,334	2,610
j) PVC water stop (200 in width)	m	28	315	327	8,820	9,156	17,976
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	86	1,021	128	87,806	11,008	98,814
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	25	109	235	2,725	5,875	8,600
o) Dewatering works	L.S.						
Total of Item 5.					850,048	615,891	1,465,937
6 Additional regulator for Bheramara regulator (G-17 basin : 1 vents)							
a) Excavation for structure	m3	395	38	40	15,010	15,800	30,810
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	145	1,685	3,236	244,325	469,220	713,545
e) Reinforcing bar	ton	10.3	16,900	17,700	174,070	182,310	356,380
f) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	38	154	873	5,852	33,174	39,026
i) PVC drain pipe (D50,400 in length)	m	42	44	46	1,848	1,932	3,780
j) PVC water stop (200 in width)	m	39	315	327	12,285	12,753	25,038
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	100	1,021	128	102,100	12,800	114,900
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	33	109	235	3,597	7,755	11,352
o) Dewatering works	L.S.						
Total of Item 6.					1,006,259	848,766	1,855,025

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (3/10)

(manual + mechanical)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
7 New regulator regulator (G-18/19 basin : 3 vents)							
a) Excavation for approach channel	m3	5,600	38	40	212,800	224,000	436,800
b) Excavation for structure	m3	713	38	40	27,094	28,520	55,614
c) Base gravel	m3	14	209	1,194	2,926	16,716	19,642
d) Lean concrete	m3	5	734	1,124	3,670	5,620	9,290
e) Structural concrete	m3	135	1,685	3,236	227,475	436,860	664,335
f) Reinforcing bar	ton	10.4	16,900	17,700	175,760	184,080	359,840
g) Concrete tile (200 x 300 x 100)	m3	6	1,589	1,122	9,534	6,732	16,266
h) Concrete block (300 x 300 x 300)	m3	32	1,589	1,122	50,848	35,904	86,752
i) Brick chip	m3	25	154	873	3,850	21,825	25,675
j) PVC drain pipe (D50,400 in length)	m	29	44	46	1,276	1,334	2,610
k) PVC water stop (200 in width)	m	34	315	327	10,710	11,118	21,828
l) Steel slide gate (1.9m x 1.6m)	ton	2.1	522,500	27,500	1,097,250	57,750	1,155,000
m) Steel pipe hand rail	m	99	1,021	128	101,079	12,672	113,751
n) RC-precast concrete pile (400 x 400)	m	120	782	1,032	93,840	123,840	217,680
o) Pavement (brick)	m2	32	109	235	3,488	7,520	11,008
p) Dewatering works	L.S.						
Total of Item 7.					2,021,600	1,174,491	3,196,091
8 New regulator regulator (G-21 basin : 1 vents)							
a) Excavation for structure	m3	395	38	40	15,010	15,800	30,810
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	86	1,685	3,236	144,910	278,296	423,206
e) Reinforcing bar	ton	6.7	16,900	17,700	113,230	118,590	231,820
f) Concrete tile (200 x 300 x 100)	m3	6	1,589	1,122	9,534	6,732	16,266
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	21	154	873	3,234	18,333	21,567
i) PVC drain pipe (D50,400 in length)	m	26	44	46	1,144	1,196	2,340
j) PVC water stop (200 in width)	m	26	315	327	8,190	8,502	16,692
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	83	1,021	128	84,743	10,624	95,367
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	23	109	235	2,507	5,405	7,912
o) Dewatering works	L.S.						
Total of Item 8.					816,962	567,524	1,384,486
9 Additional regulator for Kantanagar regulator (G-22 basin : 1 vents)							
a) Excavation for structure	m3	395	38	40	15,010	15,800	30,810
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	84	1,685	3,238	141,540	271,824	413,364
e) Reinforcing bar	ton	6.6	16,900	17,700	111,540	116,820	228,360
f) Concrete tile (200 x 300 x 100)	m3	4	1,589	1,122	6,356	4,488	10,844
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	18	154	873	2,772	15,714	18,486
i) PVC drain pipe (D50,400 in length)	m	23	44	46	1,012	1,058	2,070
j) PVC water stop (200 in width)	m	26	315	327	8,190	8,502	16,692
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	82	1,021	128	83,722	10,496	94,218
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	23	109	235	2,507	5,405	7,912
o) Dewatering works	L.S.						
Total of Item 9.					807,109	554,153	1,361,262
10 Additional regulator for Bhangamor North regulator (G-23 basin : 2 vents)							
a) Excavation for structure	m3	554	38	40	21,052	22,160	43,212
b) Base gravel	m3	10	209	1,194	2,090	11,940	14,030
c) Lean concrete	m3	3	734	1,124	2,202	3,372	5,574
d) Structural concrete	m3	106	1,685	3,236	178,610	343,016	521,626
e) Reinforcing bar	ton	8.2	16,900	17,700	138,580	145,140	283,720
f) Concrete tile (200 x 300 x 100)	m3	4	1,589	1,122	6,356	4,488	10,844
g) Concrete block (300 x 300 x 300)	m3	22	1,589	1,122	34,958	24,684	59,642
h) Brick chip	m3	19	154	873	2,926	16,587	19,513
i) PVC drain pipe (D50,400 in length)	m	24	44	46	1,056	1,104	2,160
j) PVC water stop (200 in width)	m	30	315	327	9,450	9,810	19,260
k) Steel slide gate (1.9m x 1.6m)	ton	1.4	522,500	27,500	731,500	38,500	770,000
l) Steel pipe hand rail	m	90	1,021	128	91,890	11,520	103,410
m) RC-precast concrete pile (400 x 400)	m	90	782	1,032	70,380	92,880	163,260
n) Pavement (brick)	m2	27	109	235	2,943	6,345	9,288
o) Dewatering works	L.S.						
Total of Item 10.					1,293,993	731,546	2,025,539

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (4/10)

(manual + mechanical)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
11 New regulator regulator (Outlet of Samondanga Beel : 1 vent)							
a) Excavation for structure	m3	318	38	40	12,084	12,720	24,804
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	88	1,685	3,236	144,910	278,286	423,208
e) Reinforcing bar	ton	6.6	16,900	17,700	111,540	116,820	228,360
f) Concrete tile (200 x 300 x 100)	m3	3	1,589	1,122	4,767	3,366	8,133
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	18	154	873	2,772	15,714	18,486
i) PVC drain pipe (D50,400 in length)	m	23	44	46	1,012	1,058	2,070
j) PVC water stop (200 in width)	m	26	315	327	8,190	8,502	16,692
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	82	1,021	128	83,722	10,498	94,218
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	23	109	235	2,507	5,405	7,912
o) Dewatering works	L.S.						
Total of Item 11.					805,964	556,423	1,362,387
12 New regulator regulator (G-28 basin : 2 vents)							
a) Excavation for structure	m3	588	38	40	22,344	23,520	45,864
b) Base gravel	m3	10	209	1,194	2,090	11,940	14,030
c) Lean concrete	m3	3	734	1,124	2,202	3,372	5,574
d) Structural concrete	m3	106	1,685	3,236	178,810	343,016	521,826
e) Reinforcing bar	ton	8.3	16,900	17,700	140,270	146,910	287,180
f) Concrete tile (200 x 300 x 100)	m3	4	1,589	1,122	6,356	4,488	10,844
g) Concrete block (300 x 300 x 300)	m3	22	1,589	1,122	34,958	24,684	59,642
h) Brick chip	m3	20	154	873	3,080	17,460	20,540
i) PVC drain pipe (D50,400 in length)	m	24	44	46	1,056	1,104	2,160
j) PVC water stop (200 in width)	m	30	315	327	9,450	9,810	19,260
k) Steel slide gate (1.9m x 1.6m)	ton	1.4	522,500	27,500	731,500	38,500	770,000
l) Steel pipe hand rail	m	90	1,021	128	91,890	11,520	103,410
m) RC-precast concrete pile (400 x 400)	m	90	782	1,032	70,380	92,880	163,260
n) Pavement (brick)	m2	27	109	235	2,943	6,345	9,288
o) Dewatering works	L.S.						
Total of Item 12.					1,297,129	735,549	2,032,678
13 New regulator on the Alal (1 vent)							
a) Excavation for structure	m3	395	38	40	15,010	15,800	30,810
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	235	1,685	3,236	395,975	760,460	1,156,435
e) Reinforcing bar	ton	15.1	16,900	17,700	255,190	267,270	522,460
f) Concrete tile (200 x 300 x 100)	m3	7	1,589	1,122	11,123	7,854	18,977
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	62	154	873	9,548	54,126	63,674
i) PVC drain pipe (D50,400 in length)	m	66	44	46	2,904	3,036	5,940
j) PVC water stop (200 in width)	m	52	315	327	16,380	17,004	33,384
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	120	1,021	128	122,520	15,360	137,880
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	44	109	235	4,796	10,340	15,136
o) Dewatering works	L.S.						
Total of Item 13.					1,267,906	1,255,298	2,523,202
Total of Item C.					19,938,359	12,973,823	32,912,182
D. Sluiceway including drain ditch and approach channel							
I. Ghagot Left Embankment							
1 0.0 km to 25.0 km : 2 nos.							
a) Excavation	m3	4,590	38	40	174,420	183,600	358,020
b) Base Gravel	m3	14	209	1,194	3,010	17,194	20,203
c) Lean Concrete	m3	5	734	1,124	3,984	6,070	10,033
d) Structural Concrete	m3	67	1,733	3,483	115,418	230,636	346,054
e) Reinforcing Bar	ton	6.3	16,900	17,700	106,470	111,510	217,980
f) Concrete Tile (200 x 300 x 100)	m3	5	1,589	1,122	8,581	6,059	14,639
g) Concrete Block (300 x 300 x 300)	m3	11	1,589	1,122	17,161	12,118	29,279
h) Brick Chip	m3	4	154	873	554	3,143	3,697
i) PVC Drain Pipe(D50,400 in length)	m	9	44	46	396	414	810
j) PVC Water Stop (200 in width)	m	32	315	327	10,208	10,595	20,801
k) Steel Flap Gate (1.2m x 1.2m)	ton	0.6	522,500	27,500	313,500	16,500	330,000
l) Dewatering Works	L.S.						
Total of Item 1.					753,679	597,837	1,351,516

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (5/10)

(manual + mechanical)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
2 25.0 km to 43.0 km : 3 nos.							
a) Excavation	m3	5,100	38	40	193,800	204,000	397,800
b) Base Gravel	m3	16	209	1,194	3,344	19,104	22,448
c) Lean Concrete	m3	6	734	1,124	4,404	6,744	11,148
d) Structural Concrete	m3	74	1,733	3,463	128,242	256,262	384,504
e) Reinforcing Bar	ton	10.5	16,900	17,700	177,450	185,850	363,300
f) Concrete Tile (200 x 300 x 100)	m3	6	1,589	1,122	9,534	6,732	16,266
g) Concrete Block (300 x 300 x 300)	m3	12	1,589	1,122	18,068	13,464	32,532
h) Brick Chip	m3	4	154	873	616	3,492	4,108
i) PVC Drain Pipe(D50,400 in length)	m	10	44	46	440	460	900
j) PVC Water Stop (200 in width)	m	36	315	327	11,340	11,772	23,112
k) Steel Flap Gate (1.2m x 1.2m)	ton	0.9	522,500	27,500	470,250	24,750	495,000
l) Dewatering Works	L.S.						
Total of Item 2.					1,018,488	732,630	1,751,118
3 43.0 km to 75.9 km : 8 nos.							
a) Excavation	m3	9,308	38	40	353,685	372,300	725,985
b) Base Gravel	m3	29	209	1,194	6,103	34,865	40,968
c) Lean Concrete	m3	11	734	1,124	8,037	12,308	20,345
d) Structural Concrete	m3	135	1,733	3,463	234,042	467,678	701,720
e) Reinforcing Bar	ton	12.8	16,900	17,700	215,888	226,118	442,015
f) Concrete Tile (200 x 300 x 100)	m3	11	1,589	1,122	17,400	12,286	29,685
g) Concrete Block (300 x 300 x 300)	m3	22	1,589	1,122	34,799	24,572	59,371
h) Brick Chip	m3	7	154	873	1,124	6,373	7,497
i) PVC Drain Pipe(D50,400 in length)	m	18	44	46	803	840	1,643
j) PVC Water Stop (200 in width)	m	66	315	327	20,696	21,484	42,179
k) Steel Flap Gate (1.2m x 1.2m)	ton	2.4	522,500	27,500	1,254,000	66,000	1,320,000
l) Dewatering Works	L.S.						
Total of Item 3.					2,146,586	1,244,822	3,391,408
II. Back-water embankment on the right bank							
1 0.0 km to 32.7 km : 11 nos.							
a) Excavation	m3	13,515	38	40	513,570	540,600	1,054,170
b) Base Gravel	m3	42	209	1,194	8,862	50,626	59,487
c) Lean Concrete	m3	16	734	1,124	11,671	17,872	29,542
d) Structural Concrete	m3	196	1,733	3,463	339,841	679,094	1,018,936
e) Reinforcing Bar	ton	18.6	16,900	17,700	313,495	328,335	641,830
f) Concrete Tile (200 x 300 x 100)	m3	16	1,589	1,122	25,265	17,840	43,105
g) Concrete Block (300 x 300 x 300)	m3	32	1,589	1,122	50,530	35,680	86,210
h) Brick Chip	m3	11	154	873	1,632	9,254	10,886
i) PVC Drain Pipe(D50,400 in length)	m	27	44	46	1,166	1,219	2,385
j) PVC Water Stop (200 in width)	m	95	315	327	30,051	31,196	61,247
k) Steel Flap Gate (1.2m x 1.2m)	ton	3.0	522,500	27,500	1,567,500	82,500	1,650,000
l) Dewatering Works	L.S.						
Total of Item 1.					2,863,583	1,794,215	4,657,798
Total of Item D.					6,782,336	4,369,504	11,151,840
E. Road bridge at Galbandha							
1 Excavation	m3	321	38	40	12,198	12,840	25,038
2 Base Gravel	m3	27	209	1,194	5,643	32,238	37,881
3 Lean Concrete	m3	14	734	1,124	10,276	15,736	26,012
4 Structural Concrete	m3	560	1,568	2,674	876,960	1,497,440	2,374,400
5 Reinforcing Bar	ton	46	16,900	17,700	777,400	814,200	1,591,600
6 Concrete Tile(200*300*100)	m3	60	1,589	1,122	95,340	67,320	162,660
7 Concrete Block(300*300*300)	m3	90	1,589	1,122	143,010	100,980	243,990
8 Brick Chip	m3	30	154	873	4,620	26,190	30,810
9 PVC Drain Pipe(D50,400 in length)	m	12	44	46	528	552	1,080
10 Turfing	m2	1,400	0	5	0	7,000	7,000
11 RC-Precast Concrete Pile(400*400)	m	620	782	1,032	484,840	639,840	1,124,680
12 Post Tention PC- Girder(23m span)	nos.	12	240,345	255,780	2,884,140	3,069,360	5,953,500
13 Asphalt Pavement	m2	1,853	613	471	1,135,889	872,763	2,008,652
14 Base coarse	m3	186	191	999	35,526	185,814	221,340
15 Expansion Joint	m	28	14,016	1,565	392,448	44,380	436,828
16 Rubber Bearing Shoe	nos.	24	10,854	1,254	260,496	30,096	290,592
17 Joint Filler(Asphalt)	m3	2	1,298	1,048	2,596	2,096	4,692
18 Cobble Stone for Footing Cover	m3	232	210	476	48,720	110,432	159,152
19 Miscellaneous (3 % of total of items (1) to (18))					215,119	225,878	440,997
20 Dewatering Works	L.S.						
Total of Item E.					7,385,749	7,755,155	15,140,904
F. Total Construction Cost of Ghagot River (Items A to E)					217,087,544	147,474,882	364,562,426

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (6/10)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
A. Flood Embankment							
I. Ghagot Left Embankment							
1 Back-water embankment (0.0 km to 25.0 km)							
a) Stripping	m2	547,100	0	9	0	4,923,900	4,923,900
b) Embankment	m3	402,700	0	69	0	27,786,300	27,786,300
c) Turfing	m2	493,500	0	5	0	2,467,500	2,467,500
d) Jute bag embankment	m3	20,200	61	22	1,232,200	444,400	1,676,600
e) Sand drain	m3	48,400	90	519	4,356,000	25,119,900	29,475,900
Total of Item 1.					0	35,177,700	35,177,700
2 Resectioning/heightening of the existing embankment (25.0 km to 43.0 km)							
a) Stripping	m2	290,600	0	9	0	2,615,400	2,615,400
b) Embankment	m3	102,700	0	69	0	7,086,300	7,086,300
c) Turfing	m2	165,800	0	5	0	829,000	829,000
Total of Item 2.					0	10,530,700	10,530,700
3 Extention of the existing Left embankment (43.0 km to 75.9 km)							
a) Stripping	m2	379,700	0	9	0	3,417,300	3,417,300
b) Embankment	m3	180,500	0	69	0	12,454,500	12,454,500
c) Turfing	m2	306,400	0	5	0	1,532,000	1,532,000
Total of Item 3.					0	17,403,800	17,403,800
II. Ghagot Right Embankment							
1 Back-water embankment on the right bank (32.7 k							
a) Stripping	m2	456,000	0	9	0	4,104,000	4,104,000
b) Embankment	m3	862,000	0	69	0	59,478,000	59,478,000
c) Turfing	m2	591,300	0	5	0	2,956,500	2,956,500
Total of Item 1.					0	66,538,500	66,538,500
Total of Item A.					0	129,650,700	129,650,700
B. River channel excavation							
I. Outfall of Ghgaot (1.2 km)							
a) Excavation	m3	225,200	0	46	0	10,359,200	10,359,200
II. Galbandha (0.5 km)							
a) Excavation	m3	73,000	0	46	0	3,358,000	3,358,000
Total of Item B.					0	13,717,200	13,717,200
C. Regulator							
1 New regulator (G-14-1 basin : 1 vent)							
a) Excavation	m3	395	0	46	0	18,170	18,170
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	153	1,685	3,236	257,805	495,108	752,913
e) Reinforcing bar	ton	10.8	16,900	17,700	182,520	191,160	373,680
f) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	45	154	873	6,930	39,285	46,215
i) PVC drain pipe (D50,400 in length)	m	40	44	46	1,760	1,840	3,600
j) PVC water stop (200 in width)	m	40	315	327	12,600	13,080	25,680
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	103	1,021	128	105,163	13,184	118,347
m) RC-precast concrete pile (400 x 400)	m	60	762	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	34	109	235	3,706	7,990	11,696
o) Dewatering works	L.S.				1,017,656	892,839	1,910,495
Total of Item 1.							
2 New regulator (G-14-2 basin : 11 vents)							
a) Excavation for structure	m3	1,984	0	46	0	91,264	91,264
b) Base gravel	m3	50	209	1,194	10,450	59,700	70,150
c) Lean concrete	m3	17	734	1,124	12,478	19,108	31,586
d) Structural concrete	m3	481	1,685	3,236	810,485	1,556,516	2,367,001
e) Reinforcing bar	ton	37.6	16,900	17,700	635,440	665,520	1,300,960
f) Concrete tile (200 x 300 x 100)	m3	7	1,589	1,122	11,123	7,854	18,977
g) Concrete block (300 x 300 x 300)	m3	113	1,589	1,122	179,557	128,786	308,343
h) Brick chip	m3	62	154	873	9,548	54,126	63,674
i) PVC drain pipe (D50,400 in length)	m	67	44	46	2,948	3,082	6,030
j) PVC water stop (200 in width)	m	84	315	327	26,460	27,468	53,928
k) Steel slide gate (1.9m x 1.6m)	ton	7.7	522,500	27,500	4,023,250	211,750	4,235,000
l) Steel pipe hand rail	m	186	1,021	128	189,906	23,808	213,714
m) RC-precast concrete pile (400 x 400)	m	360	762	1,032	281,520	371,520	653,040
n) Pavement (brick)	m2	80	109	235	8,720	18,800	27,520
o) Dewatering works	L.S.						
Total of Item 2.					6,201,885	3,237,302	9,439,187

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (7/10)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
3 New regulator (G-15 basin : 2 vents)							
a) Excavation for structure	m3	554	0	46	0	25,484	25,484
b) Base gravel	m3	10	209	1,194	2,090	11,940	14,030
c) Lean concrete	m3	3	734	1,124	2,202	3,372	5,574
d) Structural concrete	m3	140	1,685	3,236	235,900	453,040	688,940
e) Reinforcing bar	ton	10.5	16,900	17,700	177,450	185,850	363,300
f) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
g) Concrete block (300 x 300 x 300)	m3	22	1,589	1,122	34,958	24,684	59,642
h) Brick chip	m3	31	154	873	4,774	27,063	31,837
i) PVC drain pipe (D50,400 in length)	m	36	44	46	1,584	1,656	3,240
j) PVC water stop (200 in width)	m	37	315	327	11,655	12,099	23,754
k) Steel slide gate (1.9m x 1.6m)	ton	1.4	522,500	27,500	731,500	38,500	770,000
l) Steel pipe hand rail	m	99	1,021	128	101,079	12,672	113,751
m) RC-precast concrete pile (400 x 400)	m	90	782	1,032	70,380	92,880	163,260
n) Pavement (brick)	m2	32	109	235	3,488	7,520	11,008
o) Dewatering works	L.S.						
Total of Item 3.					1,369,772	905,738	2,295,508
4 Additional regulator for South Gagoa regulator (G-16-1 basin : 1 vents)							
a) Excavation for structure	m3	395	0	46	0	18,170	18,170
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	160	1,685	3,236	269,600	517,760	787,360
e) Reinforcing bar	ton	11.1	16,900	17,700	187,590	196,470	384,060
f) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	41	154	873	6,314	35,793	42,107
i) PVC drain pipe (D50,400 in length)	m	46	44	46	2,024	2,116	4,140
j) PVC water stop (200 in width)	m	41	315	327	12,915	13,407	26,322
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	104	1,021	128	106,184	13,312	119,496
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	35	109	235	3,815	8,225	12,040
o) Dewatering works	L.S.						
Total of Item 4.					1,035,814	918,275	1,953,689
5 New regulator regulator (G-16-2 basin : 1 vents)							
a) Excavation for structure	m3	395	0	46	0	18,170	18,170
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	96	1,685	3,236	161,760	310,656	472,416
e) Reinforcing bar	ton	7.3	16,900	17,700	123,370	129,210	252,580
f) Concrete tile (200 x 300 x 100)	m3	7	1,589	1,122	11,123	7,854	18,977
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	24	154	873	3,698	20,952	24,648
i) PVC drain pipe (D50,400 in length)	m	29	44	46	1,276	1,334	2,610
j) PVC water stop (200 in width)	m	28	315	327	8,820	9,156	17,976
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	86	1,021	128	87,806	11,008	98,814
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	25	109	235	2,725	5,875	8,600
o) Dewatering works	L.S.						
Total of Item 5.					835,036	618,261	1,453,297
6 Additional regulator for Bheramara regulator (G-17 basin : 1 vents)							
a) Excavation for structure	m3	395	0	46	0	18,170	18,170
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	145	1,685	3,236	244,325	469,220	713,545
e) Reinforcing bar	ton	10.3	16,900	17,700	174,070	182,310	356,380
f) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	38	154	873	5,852	33,174	39,026
i) PVC drain pipe (D50,400 in length)	m	42	44	46	1,848	1,932	3,780
j) PVC water stop (200 in width)	m	39	315	327	12,285	12,753	25,038
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	100	1,021	128	102,100	12,800	114,900
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	33	109	235	3,597	7,755	11,352
o) Dewatering works	L.S.						
Total of Item 6.					991,249	851,136	1,842,385

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (8/10)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
7 New regulator regulator (G-18/19 basin : 3 vents)							
a) Excavation for approach channel	m3	5,600	0	46	0	257,600	257,600
b) Excavation for structure	m3	713	0	46	0	32,798	32,798
c) Base gravel	m3	14	209	1,194	2,926	16,716	19,642
d) Lean concrete	m3	5	734	1,124	3,670	5,620	9,290
e) Structural concrete	m3	135	1,685	3,236	227,475	436,860	664,335
f) Reinforcing bar	ton	10.4	16,900	17,700	175,760	184,080	359,840
g) Concrete tile (200 x 300 x 100)	m3	6	1,589	1,122	9,534	6,732	16,266
h) Concrete block (300 x 300 x 300)	m3	32	1,589	1,122	50,848	35,904	86,752
i) Brick chip	m3	25	154	873	3,850	21,825	25,675
j) PVC drain pipe (D50,400 in length)	m	29	44	46	1,276	1,334	2,610
k) PVC water stop (200 in width)	m	34	315	327	10,710	11,118	21,828
l) Steel slide gate (1.9m x 1.6m)	ton	2.1	522,500	27,500	1,097,250	57,750	1,155,000
m) Steel pipe hand rail	m	99	1,021	128	101,079	12,672	113,751
n) RC-precast concrete pile (400 x 400)	m	120	782	1,032	93,840	123,840	217,680
o) Pavement (brick)	m2	32	109	235	3,488	7,520	11,008
p) Dewatering works	L.S.						
Total of Item 7.					1,781,706	1,212,369	2,994,075
8 New regulator regulator (G-21 basin : 1 vents)							
a) Excavation for structure	m3	395	0	46	0	18,170	18,170
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	86	1,685	3,236	144,910	278,296	423,206
e) Reinforcing bar	ton	6.7	16,900	17,700	113,230	118,590	231,820
f) Concrete tile (200 x 300 x 100)	m3	6	1,589	1,122	9,534	6,732	16,266
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	21	154	873	3,234	18,333	21,567
i) PVC drain pipe (D50,400 in length)	m	28	44	46	1,144	1,196	2,340
j) PVC water stop (200 in width)	m	28	315	327	8,190	8,502	16,692
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	83	1,021	128	84,743	10,624	95,367
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	23	109	235	2,507	5,405	7,912
o) Dewatering works	L.S.						
Total of Item 8.					801,952	569,894	1,371,846
9 Additional regulator for Kantanagar regulator (G-22 basin : 1 vents)							
a) Excavation for structure	m3	395	0	46	0	18,170	18,170
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	84	1,685	3,236	141,540	271,824	413,364
e) Reinforcing bar	ton	6.6	16,900	17,700	111,540	116,820	228,360
f) Concrete tile (200 x 300 x 100)	m3	4	1,589	1,122	6,356	4,488	10,844
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	18	154	873	2,772	15,714	18,486
i) PVC drain pipe (D50,400 in length)	m	23	44	46	1,012	1,058	2,070
j) PVC water stop (200 in width)	m	28	315	327	8,190	8,502	16,692
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	82	1,021	128	83,722	10,496	94,218
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	23	109	235	2,507	5,405	7,912
o) Dewatering works	L.S.						
Total of Item 9.					792,099	556,523	1,348,622
10 Additional regulator for Bhangamor North regulator (G-23 basin : 2 vents)							
a) Excavation for structure	m3	554	0	46	0	25,484	25,484
b) Base gravel	m3	10	209	1,194	2,090	11,940	14,030
c) Lean concrete	m3	3	734	1,124	2,202	3,372	5,574
d) Structural concrete	m3	106	1,685	3,236	178,610	343,016	521,626
e) Reinforcing bar	ton	8.2	16,900	17,700	138,580	145,140	283,720
f) Concrete tile (200 x 300 x 100)	m3	4	1,589	1,122	6,356	4,488	10,844
g) Concrete block (300 x 300 x 300)	m3	22	1,589	1,122	34,958	24,684	59,642
h) Brick chip	m3	19	154	873	2,926	16,587	19,513
i) PVC drain pipe (D50,400 in length)	m	24	44	46	1,056	1,104	2,160
j) PVC water stop (200 in width)	m	30	315	327	9,450	9,810	19,260
k) Steel slide gate (1.9m x 1.6m)	ton	1.4	522,500	27,500	731,500	38,500	770,000
l) Steel pipe hand rail	m	90	1,021	128	91,890	11,520	103,410
m) RC-precast concrete pile (400 x 400)	m	90	782	1,032	70,380	92,880	163,260
n) Pavement (brick)	m2	27	109	235	2,943	6,345	9,288
o) Dewatering works	L.S.						
Total of Item 10.					1,272,941	734,870	2,007,811

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (9/10)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
11 New regulator regulator (Outlet of Bamondanga Beel : 1 vent)							
a) Excavation for structure	m3	318	0	46	0	14,628	14,628
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	86	1,685	3,236	144,910	278,296	423,206
e) Reinforcing bar	ton	6.6	16,900	17,700	111,540	116,820	228,360
f) Concrete tile (200 x 300 x 100)	m3	3	1,589	1,122	4,767	3,366	8,133
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	18	154	873	2,772	15,714	18,486
i) PVC drain pipe (D50,400 in length)	m	23	44	46	1,012	1,058	2,070
j) PVC water stop (200 in width)	m	26	315	327	8,190	8,502	16,692
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	82	1,021	128	83,722	10,496	94,218
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	23	109	235	2,507	5,405	7,912
o) Dewatering works	L.S.						
Total of Item 11.					793,680	558,331	1,352,211
12 New regulator regulator (G-26 basin : 2 vents)							
a) Excavation for structure	m3	588	0	46	0	27,048	27,048
b) Base gravel	m3	10	209	1,194	2,090	11,940	14,030
c) Lean concrete	m3	3	734	1,124	2,202	3,372	5,574
d) Structural concrete	m3	106	1,685	3,236	178,610	343,016	521,626
e) Reinforcing bar	ton	8.3	16,900	17,700	140,270	146,910	287,180
f) Concrete tile (200 x 300 x 100)	m3	4	1,589	1,122	6,356	4,488	10,844
g) Concrete block (300 x 300 x 300)	m3	22	1,589	1,122	34,958	24,684	59,642
h) Brick chip	m3	20	154	873	3,080	17,460	20,540
i) PVC drain pipe (D50,400 in length)	m	24	44	46	1,056	1,104	2,160
j) PVC water stop (200 in width)	m	30	315	327	9,450	9,810	19,260
k) Steel slide gate (1.9m x 1.6m)	ton	1.4	522,500	27,500	731,500	38,500	770,000
l) Steel pipe hand rail	m	90	1,021	128	91,890	11,520	103,410
m) RC-precast concrete pile (400 x 400)	m	90	782	1,032	70,380	92,880	163,260
n) Pavement (brick)	m2	27	109	235	2,943	6,345	9,288
o) Dewatering works	L.S.						
Total of Item 12.					1,274,785	739,077	2,013,862
13 New regulator on the Alai (1 vent)							
a) Excavation for structure	m3	395	0	46	0	18,170	18,170
b) Base gravel	m3	6	209	1,194	1,254	7,164	8,418
c) Lean concrete	m3	2	734	1,124	1,468	2,248	3,716
d) Structural concrete	m3	235	1,685	3,236	395,975	760,460	1,156,435
e) Reinforcing bar	ton	15.1	16,900	17,700	255,190	267,270	522,460
f) Concrete tile (200 x 300 x 100)	m3	7	1,589	1,122	11,123	7,854	18,977
g) Concrete block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick chip	m3	62	154	873	9,548	54,126	63,674
i) PVC drain pipe (D50,400 in length)	m	66	44	46	2,904	3,036	5,940
j) PVC water stop (200 in width)	m	52	315	327	16,380	17,004	33,384
k) Steel slide gate (1.9m x 1.6m)	ton	0.7	522,500	27,500	365,750	19,250	385,000
l) Steel pipe hand rail	m	120	1,021	128	122,520	15,360	137,880
m) RC-precast concrete pile (400 x 400)	m	60	782	1,032	46,920	61,920	108,840
n) Pavement (brick)	m2	44	109	235	4,796	10,340	15,136
o) Dewatering works	L.S.						
Total of Item 13.					1,252,896	1,257,666	2,510,562
Total of Item C.					19,441,471	13,052,279	32,493,750
D. Sluiceway including drain ditch and approach channel							
I. Ghagot Left Embankment							
1 0.0 km to 25.0 km : 2 nos.							
a) Excavation	m3	4,590	0	46	0	211,140	211,140
b) Base Gravel	m3	14	209	1,194	3,010	17,194	20,203
c) Lean Concrete	m3	5	734	1,124	3,964	6,070	10,033
d) Structural Concrete	m3	67	1,733	3,463	115,418	230,636	346,054
e) Reinforcing Bar	ton	6.3	16,900	17,700	106,470	111,510	217,980
f) Concrete Tile (200 x 300 x 100)	m3	5	1,589	1,122	8,581	6,059	14,639
g) Concrete Block (300 x 300 x 300)	m3	11	1,589	1,122	17,161	12,118	29,279
h) Brick Chip	m3	4	154	873	554	3,143	3,697
i) PVC Drain Pipe(D50,400 in length)	m	9	44	46	396	414	810
j) PVC Water Stop (200 in width)	m	32	315	327	10,206	10,595	20,801
k) Steel Flap Gate (1.2m x 1.2m)	ton	0.6	522,500	27,500	313,500	16,500	330,000
l) Dewatering Works	L.S.						
Total of Item 1.					579,259	625,377	1,204,636

Table 7.7 CONSTRUCTION COST OF GHAGOT RIVER (10/10)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
2 25.0 km to 43.0 km : 3 nos.							
a) Excavation	m3	5,100	0	46	0	234,600	234,600
b) Base Gravel	m3	16	209	1,194	3,344	19,104	22,448
c) Lean Concrete	m3	6	734	1,124	4,404	6,744	11,148
d) Structural Concrete	m3	74	1,733	3,483	128,242	258,262	384,504
e) Reinforcing Bar	ton	10.5	16,900	17,700	177,450	185,850	363,300
f) Concrete Tile (200 x 300 x 100)	m3	6	1,589	1,122	9,534	6,732	16,266
g) Concrete Block (300 x 300 x 300)	m3	12	1,589	1,122	19,068	13,464	32,532
h) Brick Chip	m3	4	154	873	616	3,492	4,108
i) PVC Drain Pipe(D50,400 in length)	m	10	44	46	440	460	900
j) PVC Water Stop (200 in width)	m	36	315	327	11,340	11,772	23,112
k) Steel Flap Gate (1.2m x 1.2m)	ton	0.9	522,500	27,500	470,250	24,750	495,000
l) Dewatering Works	L.S.				824,688	783,230	1,587,918
Total of Item 2.							
3 43.0 km to 75.9 km : 8 nos.							
a) Excavation	m3	9,308	0	46	0	428,145	428,145
b) Base Gravel	m3	29	209	1,194	6,103	34,965	40,968
c) Lean Concrete	m3	11	734	1,124	8,037	12,308	20,345
d) Structural Concrete	m3	135	1,733	3,483	234,042	467,678	701,720
e) Reinforcing Bar	ton	12.8	16,900	17,700	215,898	226,118	442,015
f) Concrete Tile (200 x 300 x 100)	m3	11	1,589	1,122	17,490	12,288	29,865
g) Concrete Block (300 x 300 x 300)	m3	22	1,589	1,122	34,799	24,572	59,371
h) Brick Chip	m3	7	154	873	1,124	6,373	7,497
i) PVC Drain Pipe(D50,400 in length)	m	18	44	46	803	840	1,643
j) PVC Water Stop (200 in width)	m	66	315	327	20,896	21,484	42,179
k) Steel Flap Gate (1.2m x 1.2m)	ton	2.4	522,500	27,500	1,254,000	66,000	1,320,000
l) Dewatering Works	L.S.				1,792,901	1,300,667	3,093,568
Total of Item 3.							
II. Back-water embankment on the right bank							
1 0.0 km to 32.7 km : 11 nos.							
a) Excavation	m3	13,515	0	46	0	621,690	621,690
b) Base Gravel	m3	42	209	1,194	8,862	50,626	59,487
c) Lean Concrete	m3	16	734	1,124	11,871	17,672	29,542
d) Structural Concrete	m3	196	1,733	3,483	339,841	679,094	1,018,936
e) Reinforcing Bar	ton	18.6	16,900	17,700	313,495	328,335	641,830
f) Concrete Tile (200 x 300 x 100)	m3	16	1,589	1,122	25,265	17,840	43,105
g) Concrete Block (300 x 300 x 300)	m3	32	1,589	1,122	50,530	35,680	86,210
h) Brick Chip	m3	11	154	873	1,632	9,254	10,886
i) PVC Drain Pipe(D50,400 in length)	m	27	44	46	1,166	1,219	2,385
j) PVC Water Stop (200 in width)	m	95	315	327	30,051	31,196	61,247
k) Steel Flap Gate (1.2m x 1.2m)	ton	3.0	522,500	27,500	1,567,500	82,500	1,650,000
l) Dewatering Works	L.S.				2,350,013	1,875,305	4,225,318
Total of Item 1.							
Total of Item D.					5,546,861	4,564,579	10,111,440
E. Road bridge at Gaibandha							
1 Excavation	m3	321	0	46	0	14,766	14,766
2 Base Gravel	m3	27	209	1,194	5,643	32,238	37,881
3 Lean Concrete	m3	14	734	1,124	10,276	15,736	26,012
4 Structural Concrete	m3	560	1,566	2,674	876,960	1,497,440	2,374,400
5 Reinforcing Bar	ton	46	16,900	17,700	777,400	814,200	1,591,600
6 Concrete Tile(200*300*100)	m3	60	1,589	1,122	95,340	67,320	162,660
7 Concrete Block(300*300*300)	m3	90	1,589	1,122	143,010	100,980	243,990
8 Brick Chip	m3	30	154	873	4,620	26,190	30,810
9 PVC Drain Pipe(D50,400 in length)	m	12	44	46	528	552	1,080
10 Turfing	m2	1,400	0	5	0	7,000	7,000
11 RC-Precast Concrete Pile(400*400)	m	620	782	1,032	484,840	639,840	1,124,680
12 Post Tention PC- Girder(23m span)	nos.	12	240,345	255,780	2,884,140	3,069,360	5,953,500
13 Asphalt Pavement	m2	1,853	613	471	1,135,689	872,763	2,008,452
14 Base coarse	m3	186	191	999	35,526	185,814	221,340
15 Expansion Joint	m	28	14,016	1,585	392,448	44,360	436,828
16 Rubber Bearing Shoe	nos.	24	10,854	1,254	260,496	30,096	290,592
17 Joint Filler(Asphalt)	m3	2	1,298	1,048	2,596	2,096	4,692
18 Cobble Stone for Footing Cover	m3	232	210	476	48,720	110,432	159,152
19 Miscellaneous (3 % of total of items (1) to (18))	L.S.				214,753	225,936	440,689
20 Dewatering Works							
Total of Item E.					7,373,185	7,757,139	15,130,324
F. Total Construction Cost of Ghagot River (Items A to E)					32,361,517	168,741,697	201,103,414

Table 7.8 CONSTRUCTION COST OF COMPARTMENTALISATION (1/2)

(manual + mechanical)

	Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
A.	New road embankment for compartmentalisation (6.3 km)							
	1 Stripping	m3	53,000	11	4	583,000	212,000	795,000
	2 Excavation	m3	71,800	38	40	2,728,400	2,872,000	5,600,400
	3 Compaction and shaping	m3	71,800	61	22	4,379,800	1,579,600	5,959,400
	4 Turfing	m2	49,000	0	5	0	245,000	245,000
	5 Pavement(Brick)	m2	12,500	109	235	1,362,500	2,937,500	4,300,000
	Total of Item A.					9,053,700	7,846,100	16,899,800
B.	Closure of existing openings							
	I. By earth filling (7 places)							
	1 Stripping	m3	3,300	11	4	36,300	13,200	49,500
	2 Excavation	m3	6,400	38	40	243,200	256,000	499,200
	3 Compaction and shaping	m3	6,400	61	22	390,400	140,800	531,200
	4 Turfing	m3	3,000	0	5	0	15,000	15,000
	Total of Item I.					669,900	425,000	1,094,900
	II. By provision of sluiceway with gates (5 places)							
	1 Excavation	m3	12,750	38	40	484,500	510,000	994,500
	2 Base gravel	m3	40	209	1,194	8,360	47,760	56,120
	3 Lean concrete	m3	15	734	1,124	11,010	16,860	27,870
	4 Structural concrete	m3	185	1,733	3,463	320,605	640,655	961,260
	5 Reinforcing bar	ton	17.5	16,900	17,700	295,750	309,750	605,500
	6 Concrete tile (200 x 300 x 100)	m3	15	2,072	2,779	31,080	41,685	72,765
	7 Concrete block (300 x 300 x 300)	m3	30	2,072	2,779	62,160	83,370	145,530
	8 Brick chip	m3	10	154	873	1,540	8,730	10,270
	9 PVC drain pipe (D50,400 in length)	m	25	44	46	1,100	1,150	2,250
	10 PVC water stop (200 in width)	m	90	315	327	28,350	29,430	57,780
	11 Steel flap gate (1.2m x 1.2m)	ton	3.0	522,500	27,500	1,567,500	82,500	1,650,000
	12 Dewatering works	L.S.				2,811,955	1,771,890	4,583,845
	Total of Item II.							
	Total of Item B.					3,481,855	2,196,890	5,678,745
C.	Provision of Drain Pipe (450 places)							
	1 Excavation	m3	11,250	38	40	427,500	450,000	877,500
	2 Base sand	m3	2,250	90	519	202,500	1,167,750	1,370,250
	3 Backfill	m3	10,350	6	29	62,100	300,150	362,250
	4 Brick (200 x 100 x 50)	m3	900	694	1,508	624,600	1,355,400	1,980,000
	5 RC-Precast pipe(D700) with collar	m	3,825	2,121	2,828	8,112,825	10,817,100	18,929,925
	6 Turfing	m2	9,000	0	5	0	45,000	45,000
	7 Dewatering works	L.S.						
	Total of Item C.					9,429,525	14,135,400	23,564,925
D.	New regulator (G-11 basin : 4 vents)							
	a) Excavation for approach channel	m3	51,000	38	40	1,938,000	2,040,000	3,978,000
	b) Excavation for structure	m3	872	38	40	33,136	34,880	68,016
	c) Base gravel	m3	19	209	1,194	3,971	22,688	26,657
	d) Lean concrete	m3	6	734	1,124	4,404	6,744	11,148
	e) Structural concrete	m3	246	1,685	3,236	414,510	796,056	1,210,566
	f) Reinforcing bar	ton	18	16,900	17,700	307,580	322,140	629,720
	g) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
	h) Concrete block (300 x 300 x 300)	m3	42	1,589	1,122	66,738	47,124	113,862
	i) Brick chip	m3	46	154	873	7,084	40,158	47,242
	j) PVC drain pipe (D50,400 in length)	m	51	44	46	2,244	2,346	4,590
	k) PVC water stop (200 in width)	m	54	315	327	17,010	17,658	34,668
	l) Steel slide gate (1.9m x 1.6m)	ton	2.8	522,500	27,500	1,463,000	77,000	1,540,000
	m) Steel pipe hand rail	m	128	1,021	128	130,688	16,384	147,072
	n) RC-Precast concrete pile (400 x 400)	m	15	782	1,032	11,730	15,480	27,210
	o) Pavement (brick)	m2	48	109	235	5,232	11,280	16,512
	p) Dewatering works	L.S.				4,418,039	3,458,912	7,876,951
	Total of Item D.					26,383,119	27,637,302	54,020,421
F.	Total Construction Cost of Compartmentalisation (Items A to D)							

Table 7.8 CONSTRUCTION COST OF COMPARTMENTALISATION (2/2)

(manual)

Work Items	Unit	Quantity	Unit Rate F/C (TK.)	Unit Rate L/C (TK.)	Amount F/C (TK.)	Amount L/C (TK.)	Amount Total (TK.)
A. New road embankment for compartmentalisation (8.3 km)							
1 Stripping	m3	53,000	0	9	0	477,000	477,000
2 Excavation	m3	71,800	0	46	0	3,302,800	3,302,800
3 Compaction and shaping	m3	71,800	0	23	0	1,651,400	1,651,400
4 Turfing	m2	49,000	0	5	0	245,000	245,000
5 Pavement(Brick)	m2	12,500	109	235	1,362,500	2,937,500	4,300,000
Total of Item A.					1,362,500	8,613,700	9,976,200
B. Closure of existing openings							
I. By earth filling (7 places)							
1 Stripping	m3	3,300	0	9	0	29,700	29,700
2 Excavation	m3	6,400	0	46	0	294,400	294,400
3 Compaction and shaping	m3	6,400	0	23	0	147,200	147,200
4 Turfing	m3	3,000	0	5	0	15,000	15,000
Total of Item I.					0	486,300	486,300
II. By provision of sluiceway with gates (5 places)							
1 Excavation	m3	12,750	0	46	0	586,500	586,500
2 Base gravel	m3	40	209	1,194	8,360	47,760	56,120
3 Lean concrete	m3	15	734	1,124	11,010	16,860	27,870
4 Structural concrete	m3	185	1,733	3,483	320,605	640,655	961,260
5 Reinforcing bar	ton	17.5	16,900	17,700	295,750	309,750	605,500
6 Concrete tile (200 x 300 x 100)	m3	15	2,072	2,779	31,080	41,685	72,765
7 Concrete block (300 x 300 x 300)	m3	30	2,072	2,779	62,160	83,370	145,530
8 Brick chip	m3	10	154	873	1,540	8,730	10,270
9 PVC drain pipe (D50,400 in length)	m	25	44	46	1,100	1,150	2,250
10 PVC water stop (200 in width)	m	90	315	327	28,350	29,430	57,780
11 Steel flap gate (1.2m x 1.2m)	ton	3.0	522,500	27,500	1,567,500	82,500	1,650,000
12 Dewatering works	LS.						
Total of Item II.					2,327,455	1,848,360	4,175,845
Total of Item B.					2,327,455	2,334,660	4,662,145
C. Provision of Drain Pipe (450 places)							
1 Excavation	m3	11,250	0	46	0	517,500	517,500
2 Base sand	m3	2,250	90	519	202,500	1,167,750	1,370,250
3 Backfill	m3	10,350	6	29	62,100	300,150	362,250
4 Brick (200 x 100 x 50)	m3	900	694	1,506	624,600	1,355,400	1,980,000
5 RC-Precast pipe(D700) with collar	m	3,825	2,121	2,828	8,112,825	10,817,100	18,929,925
6 Turfing	m2	9,000	0	5	0	45,000	45,000
7 Dewatering works	LS.						
Total of Item C.					9,002,025	14,202,900	23,204,925
D. New regulator (G-11 basin : 4 vents)							
a) Excavation for approach channel	m3	51,000	0	46	0	2,346,000	2,346,000
b) Excavation for structure	m3	872	0	46	0	40,112	40,112
c) Base gravel	m3	19	209	1,194	3,971	22,686	26,657
d) Lean concrete	m3	6	734	1,124	4,404	6,744	11,148
e) Structural concrete	m3	248	1,685	3,238	414,510	798,056	1,210,566
f) Reinforcing bar	ton	18	16,900	17,700	307,560	322,140	629,720
g) Concrete tile (200 x 300 x 100)	m3	8	1,589	1,122	12,712	8,976	21,688
h) Concrete block (300 x 300 x 300)	m3	42	1,589	1,122	66,738	47,124	113,862
i) Brick chip	m3	46	154	873	7,084	40,158	47,242
j) PVC drain pipe (D50,400 in length)	m	51	44	46	2,244	2,346	4,590
k) PVC water stop (200 in width)	m	54	315	327	17,010	17,658	34,668
l) Steel slide gate (1.9m x 1.6m)	ton	2.8	522,500	27,500	1,463,000	77,000	1,540,000
m) Steel pipe hand rail	m	128	1,021	128	130,688	16,384	147,072
n) RC-Precast concrete pile (400 x 400)	m	15	782	1,032	11,730	15,480	27,210
o) Pavement (brick)	m2	48	109	235	5,232	11,280	16,512
p) Dewatering works	LS.						
Total of Item D.					2,446,903	3,770,144	6,217,047
F. Total Construction Cost of Compartmentalisation (Items A to D)					15,136,883	28,921,434	44,060,317

Table 7.9 SUMMARY OF CONSTRUCTION COST (1/3)

(Phase-1 work)

I. FCD Works along TRE

(Unit: Tk)

Work Items	Manual/Mechanical			Manual		
	F/C	L/C	Total	F/C	L/C	Total
A. Preparatory Works (10 % of items B to F)	28,480,219	26,085,586	54,565,805	14,714,929	27,594,856	42,309,785
B. Flood Embankment	133,222,100	84,979,700	218,201,800	0	99,372,800	99,372,800
C. Revetment by Concrete Block	38,047,040	37,363,840	75,410,880	36,101,440	37,671,040	73,772,480
1) Horipur (3,200 m)	2,999,010	3,155,460	6,154,470	2,907,810	3,169,860	6,077,670
2) Sundarganj (300 m)	7,024,290	7,042,840	14,067,130	6,784,890	7,080,640	13,865,530
3) Tambulpur (700 m)	48,070,340	47,562,140	95,632,480	45,794,140	47,921,540	93,715,680
Total of Item C.						
D. Groyne	29,598,800	36,834,900	66,433,700	29,264,400	36,887,700	66,152,100
1) Belka (5 nos.,1050 m)	19,908,200	27,592,100	47,500,300	19,615,600	27,638,300	47,253,900
2) Sundarganj (8 nos., 700 m)	40,383,460	55,970,800	96,354,260	39,789,900	56,064,520	95,854,420
3) Painalghat (13 nos., 1320 m)	89,890,460	120,397,800	210,288,260	88,669,900	120,590,520	209,260,420
Total of Item D.						
E. Regulator	1,435,425	923,679	2,359,104	1,414,373	927,003	2,341,376
1) Additional regulator at Mirganj (Additional 2 vents)	1,848,852	1,008,926	2,857,778	1,821,758	1,013,204	2,834,962
2) New regulator (G-7 basin : 3 vents)	1,820,627	967,767	2,788,394	1,793,533	972,045	2,765,578
3) New regulator (G-6 basin : 3 vents)	657,767	393,121	1,050,888	657,767	393,121	1,050,888
4) Rehabilitation of Kasiabari regulator	427,053	84,027	511,080	427,053	84,027	511,080
5) Rehabilitation of Narayanpur regulator	3,487,962	1,719,442	5,207,404	3,229,942	1,760,182	4,990,124
6) New regulator (G-2 basin : 6 vents)	586,670	309,080	895,750	586,670	309,080	895,750
7) Rehabilitation of Bhairhat regulator	436,339	111,230	547,569	436,339	111,230	547,569
8) Rehabilitation of Rajib regulator	618,673	355,313	973,986	618,673	355,313	973,986
9) Rehabilitation of Kalirhat regulator	11,319,368	5,872,585	17,191,953	10,986,108	5,925,205	16,911,313
Total of Item E.						
F. Sluiceway (5 nos.) including ditch and approach channel	2,299,923	2,043,633	4,343,556	1,699,143	2,138,493	3,837,636
Total of Item I.	313,282,410	286,941,444	600,223,854	161,864,220	303,543,414	465,407,634
Total of construction cost (Phase-1)	313,282,410	286,941,444	600,223,854	161,864,220	303,543,414	465,407,634

Table 7.9 SUMMARY OF CONSTRUCTION COST (2/3)

(Phase-2 work)

(Unit: Tk)

Work Items	Manual/Mechanical			Manual		
	F/C	L/C	Total	F/C	L/C	Total
I. FCD Works along the Ghagot						
A. Preparatory Works (10 % of items B to F)	17,349,121	11,975,164	29,324,285	2,480,827	13,558,481	16,039,308
B. Flood Embankment						
1) Ghagot Left Embankment (0.0 km to 25.0 km)	45,885,400	29,623,300	75,508,700	0	35,177,700	35,177,700
2) Back-Water Levee on the Right Bank (0.0 km to 32.7 km)	90,354,000	58,224,500	148,578,500	0	66,538,500	66,538,500
Total of Item B.	136,239,400	87,847,800	224,087,200	0	101,716,200	101,716,200
C. River channel excavation						
1) Outfall of Ghgaot (1.2 km)	8,557,600	9,008,000	17,565,600	0	10,359,200	10,359,200
2) Gaibandha (0.5 km)	2,774,000	2,920,000	5,694,000	0	3,358,000	3,358,000
Total of Item C.	11,331,600	11,928,000	23,259,600	0	13,717,200	13,717,200
D. Regulator						
1) New regulator (G-14-1 basin : 1 vent)	1,032,666	890,469	1,923,135	1,017,656	892,839	1,910,495
2) New regulator (G-14-2 basin : 11 vents)	6,277,277	3,225,398	9,502,675	6,201,885	3,237,302	9,439,187
3) New regulator (G-15 basin : 2 vents)	1,410,824	902,412	2,313,236	1,389,772	905,736	2,295,508
4) Additional regulator for South Gagoa regulator (G-16-1 basin : 1 vents)	1,050,624	915,905	1,966,529	1,035,614	918,275	1,953,889
5) New regulator regulator (G-16-2 basin : 1 vent)	850,046	615,891	1,465,937	835,036	618,261	1,453,297
6) Additional regulator for Bheramara regulator (G-17 basin : 1 vents)	1,006,259	848,766	1,855,025	991,249	851,136	1,842,385
7) New regulator regulator (G-18/19 basin : 3 vents)	2,021,600	1,174,491	3,196,091	1,781,706	1,212,369	2,994,075
8) New regulator on the Alai (1 vent)	1,267,906	1,255,296	2,523,202	1,252,896	1,257,666	2,510,562
Total of Item D.	14,917,202	9,828,628	24,745,830	14,505,814	9,893,584	24,399,398
E. Sluiceway including drain ditch and approach channel						
1) Ghagot Left Embankment (0.0 km to 25.0 km : 2 nos.)	753,679	597,837	1,351,516	579,259	625,377	1,204,636
2) Back-water embankment on the right bank (32.7 km : 12 nos.)	2,863,583	1,794,215	4,657,798	2,350,013	1,875,305	4,225,318
Total of Item E.	3,617,262	2,392,052	6,009,314	2,929,272	2,500,682	5,429,954
F. Road bridge at Gaibandha	7,385,749	7,755,155	15,140,904	7,373,185	7,757,139	15,130,324
Total of Item I.	190,840,334	131,726,799	322,567,133	27,289,098	149,143,286	176,432,384
Total of construction cost (Phase-2)	190,840,334	131,726,799	322,567,133	27,289,098	149,143,286	176,432,384

Table 7.9 SUMMARY OF CONSTRUCTION COST (3/3)

(Phase-3 work)

(Unit: Tk)

I. FCD Works along the Ghagot

Work Items	Manual/Mechanical			Manual		
	F/C	L/C	Total	F/C	L/C	Total
A. Preparatory Works (10 % of items B to D)	4,359,633	2,772,325	7,131,958	755,325	3,315,709	4,071,034
B. Flood Embankment						
1) Ghagot Left Embankment						
a) 25.0 km to 43.0 km	13,363,900	8,358,800	21,722,700	0	10,530,700	10,530,700
b) 43.0 km to 75.9 km	22,046,200	14,241,800	36,288,000	0	17,403,800	17,403,800
Total of Item B.	35,410,100	22,600,600	58,010,700	0	27,934,500	27,934,500
C. Regulator						
1) New regulator regulator (G-21 basin: 1 vent)	816,962	567,524	1,384,486	801,952	569,894	1,371,846
2) Additional regulator for Kantanagar regulator (G-22 basin: 1 vent)	807,109	554,153	1,361,262	792,099	556,523	1,348,622
3) Additional regulator for Bhangamor North regulator (G-23 basin: 2 vents)	1,293,993	731,546	2,025,539	1,272,941	734,870	2,007,811
4) New regulator regulator (Outlet of Bamondanga Beel: 1 vent)	805,964	556,423	1,362,387	793,880	558,331	1,352,211
5) New regulator regulator (G-26 basin: 2 vents)	1,297,129	735,549	2,032,678	1,274,785	739,077	2,013,862
Total of Item C.	5,021,157	3,145,195	8,166,352	4,935,657	3,158,695	8,094,352
D. Sluiceway including drain ditch and approach channel						
1) Ghagot Left Embankment						
a) 25.0 km to 43.0 km : 3 nos.	1,018,488	732,630	1,751,118	824,688	763,230	1,587,918
b) 43.0 km to 75.9 km : 8 nos.	2,146,586	1,244,822	3,391,408	1,792,901	1,300,667	3,093,568
Total of Item D.	3,165,074	1,977,452	5,142,526	2,617,589	2,063,897	4,681,486
Total of Item I.	47,955,964	30,495,572	78,451,536	8,308,571	36,472,801	44,781,372

(Unit: Tk)

II. Compartmentalisation Works

Work Items	Manual/Mechanical			Manual		
	F/C	L/C	Total	F/C	L/C	Total
A. Preparatory Works (10 % of total of items B to E)	2,638,312	2,763,730	5,402,042	1,513,888	2,892,143	4,406,032
B. New road embankment for compartments (6.3 km)	9,053,700	7,846,100	16,899,800	1,362,500	8,613,700	9,976,200
C. Closure of existing openings						
1) By earth filling (7 places)	669,900	425,000	1,094,900	0	486,300	486,300
2) By provision of sluiceway with gates (5 places)	2,811,955	1,771,890	4,583,845	2,327,455	1,848,390	4,175,845
Total of Item C.	3,481,855	2,196,890	5,678,745	2,327,455	2,334,690	4,662,145
D. Provision of Drain Pipe (450 places)	9,429,525	14,135,400	23,564,925	9,002,025	14,202,900	23,204,925
E. New regulator (G-11 basin : 4 vents)	4,418,039	3,458,912	7,876,951	2,446,903	3,770,144	6,217,047
Total of Item II.	29,021,431	30,401,032	59,422,463	16,652,771	31,813,577	48,466,349
Total of construction cost (Phase-3)	76,977,395	60,896,604	137,873,999	24,961,342	68,286,379	93,247,721

Table 7.10 SUMMARY OF LAND ACQUISITION COST

(Unit: Tk)

Work Items	F/C	L/C	Total
(Phase-1)			
A. TRE	0	30,464,000	30,464,000
Total of land acquisition cost (Phase-1)	0	30,464,000	30,464,000
(Phase-2)			
A. Ghagot			
1) Ghagot Left Embankment			
(0.0 km to 25.0 km)	0	12,604,000	12,604,000
2) Ghagot Right Embankment	0	21,828,000	21,828,000
Total of land acquisition cost (Phase-2)	0	34,432,000	34,432,000
(Phase-3)			
A. Ghagot			
1) Ghagot left embankment			
a) 25.0 km to 43.0 km	0	6,168,000	6,168,000
b) 43.0 km to 75.9 km	0	12,570,000	12,570,000
2) Compartmentalisation	0	1,398,000	1,398,000
Total of land acquisition cost (Phase-3)	0	20,136,000	20,136,000
Total of land acquisition cost (Phase-1,2,3)	0	85,032,000	85,032,000

Table 7.11 DISBURSEMENT OF PROJECT COST (1/2)

(manual & mechanical construction)

(Unit: 1000 Tk)

Year	1	2	3	4	5	6	7	8	9	10	11	Total cost
Phase-1												
Construction cost			90,034	210,078	240,090	60,022						600,224
Administration cost	1,801	1,801	3,601	3,601	3,601	3,601						18,007
Physical contingency			22,509	22,509	22,509	22,509						90,034
Engineering cost	20,708	20,708	6,903	6,903	6,903	6,903						69,026
Land acquisition		6,093	9,139	9,139	6,093							30,464
Sub-total	22,509	28,601	132,185	252,230	279,195	93,035						807,755
Phase-2												
Construction cost					48,385	112,898	129,027	32,257				322,567
Administration cost			968	968	1,935	1,935	1,935	1,935				9,677
Physical contingency					12,096	12,096	12,096	12,096				48,385
Engineering cost			11,129	11,129	3,710	3,710	3,710	3,710				37,095
Land acquisition				6,886	10,330	10,330	6,886					34,432
Sub-total			12,096	18,983	76,456	140,969	153,654	49,998				452,156
Phase-3									41,362	68,937	27,575	137,874
Construction cost							620	620	1,034	1,034	827	4,136
Administration cost									7,238	7,238	6,204	20,681
Physical contingency							5,550	5,550	1,586	1,586	1,586	15,856
Engineering cost								4,027	7,048	7,048	2,014	20,136
Land acquisition							6,170	10,197	58,268	85,843	38,206	198,683
Sub-total												
Total (Phase-1,2,3)	22,509	28,601	144,282	271,213	355,651	234,004	159,824	60,195	58,268	85,843	38,206	1,458,594

Table 7.11 DISBURSEMENT OF PROJECT COST (2/2)

(manual construction)

(Unit: 1000 Tk)

Year	1	2	3	4	5	6	7	8	9	10	11	Total cost
Phase-1												
Construction cost			69,811	162,893	186,163	46,541						465,408
Administration cost	1,396	1,396	2,792	2,792	2,792	2,792						13,962
Physical contingency			17,453	17,453	17,453	17,453						69,811
Engineering cost	16,057	16,057	5,352	5,352	5,352	5,352						53,522
Land acquisition		6,093	9,139	9,139	6,093							30,464
Sub-total	17,453	23,546	104,548	197,629	217,853	72,138						633,167
Phase-2												
Construction cost					26,465	61,751	70,573	17,643				176,432
Administration cost			529	529	1,059	1,059	1,059	1,059				5,293
Physical contingency					6,616	6,616	6,616	6,616				26,465
Engineering cost			6,087	6,087	2,029	2,029	2,029	2,029				20,290
Land acquisition				6,886	10,330	10,330	6,886					34,432
Sub-total			6,616	13,503	46,498	81,785	87,163	27,347				262,912
Phase-3									27,974	46,624	18,650	93,248
Construction cost							420	420	700	700	560	2,798
Administration cost									4,895	4,895	4,196	13,987
Physical contingency							3,753	3,753	1,072	1,072	1,072	10,724
Engineering cost								4,027	7,048	7,048	2,014	20,136
Land acquisition							4,173	8,200	41,689	60,339	26,491	140,893
Sub-total												
Total (Phase-1,2,3)	17,453	23,546	111,164	211,132	264,352	153,923	91,336	35,547	41,689	60,339	26,491	1,036,972

Figure 7.1 TIME SCHEDULE OF CONSTRUCTION