Government of the People's Republic of Bangladesh
Bangladesh Water Development Board
Flood Plan Coordination Organisation

FLOOD ACTION PLAN

NORTHEAST REGIONAL WATER MANAGEMENT PROJECT (FAP 6)

KALNI-KUSHIYARA PILOT DREDGING PROJECT

IMPLEMENTATION PLAN FINAL REPORT

January 1996

SNC ♦ Lavalin International
Northwest Hydraulic Consultants

in association with

Engineering and Planning Consultants Ltd.
Bangladesh Engineering and Technological Services

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ACRONYMS AND ABBREVIATIONS

BIWTA	Bangladesh Inland Water Transport Authority
BRAC	Bangladesh Rural Advancement Committee
BRDB	Bangladesh Rural Development Board
BW	Beneficiary Women
BWDB	Bangladesh Water Development Board
CAS	Catch Assessment Survey
CEA	Canadian Executing Agency
CMPM	cubic metre place measurement
CO	Community Organizer
EIA	environmental impact assessment
EMP	Environmental Management Plan
FAP	Flood Action Plan
FPCO	Flood Plan Coordination Organisation
FES	Fishing Effort Survey
FIVDB	Friends in Village Development Bangladesh
ha	hectare
IEC	important environmental components
IGA	income generating activities
km	kilometre
LAD	Least Available Depth
m	meter
m^3	cubic metre
mg	milligram
mm	millimetre
Mm^3	million cubic metres
NERP	Northeast Regional Water Management Project
NGO	non-governmental organization
O & M	operation and maintenance
PWD	Public Works Department
RESP	Rural Employment Strategy Program
RMP	Rural Maintenance Program
SLI	SNC-Lavalin International

CAD $1 = Tk 29

GLOSSARY OF TERMS

beel	floodplain lake that may be perennial or may dry up in the winter months
boro	dry season rice crop
char	land emerging from the river
haor	depression on floodplain located between rivers that functions as a small, internal drainage basin
khal	channel
para	cluster of housing groups forming a neighbourhood
purdah	a system in certain Muslim and Hindu socities of screening women from strangers by means of a veil or curtain
thana	geo-administrative unit under a district comprising several unions

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1. INTRODUCTION

1.1 Project Background

The Kalni-Kushiyara River Improvement Project was identified in the Northeast Regional Water Management Plan as a key component for realising integrated development of the deeply flooded Central Basin. During the pre-feasibility investigation (NERP, 1994), trends of deteriorating river navigation, drainage congestion and increasing frequency of damage to *boro* cultivation by pre-monsoon floods were identified. The pre-feasibility report presented possible alternatives for rehabilitating portions of the river channel affected by sedimentation and other channel modifications. The pre-feasibility investigation considered a combination of channel re-excavation and limited river training and loop-cutting over a length of 50 km between Markuli and Madna (Figure 1). The main potential benefits from the work included (1) improvements in agriculture from reduced pre-monsoon flood damage and more rapid post-monsoon drainage, (2) improved water transport in the dry season, and (3) improved living conditions of villagers through construction of new village platforms from dredge spoil.

The Canadian International Development Agency (CIDA), with Flood Plan Coordination Organisation (FPCO) and the Bangladesh Water Development Board (BWDB) agreed to conduct a feasibility study to assess the specific work required, the benefits that may be expected and the nature of the impacts that may be produced from a river improvement project. The investigation consists of two main components:

- a comprehensive feasibility-level investigation to define project alternatives, region-wide benefits, impacts and management required, and
- a pilot dredging project to test and evaluate specific ideas related to dredging operations and beneficial uses of the dredge spoil, particularly for constructing village platforms.

The main components of the pilot project are listed in Table 1. The physical works include dredging at strategic locations over a 10-km reach of the Kalni River and pumping the spoil into confined disposal chambers. These would be used to construct new flood-resistant village platforms to benefit local people. Approximately 500,000 m^3 of material will be removed from the river to provide a navigable channel having a minimum depth of approximately two metres during the dry season. The budget for the physical works is CAD$ 2.1 million. The project's monitoring and assessment components are intended to ensure that various mitigation measures can be carried out during the work and that some alternate approaches can be tested.

The results of the pilot project are intended to provide feedback for the main feasibility study. This will improve reliability of the predictions concerning technical operations, effectiveness of environmental monitoring and management, as well as social impacts related to public participation and community response to using the spoil for homestead improvements.

1.2 Report Outline

The purpose of this report is to document how the pilot project was planned, how it will be carried out, what will be monitored during the dredging operation and maintenance. Approaches

used to ensure people's participation in the project and methods for managing various social and environmental impacts are also discussed.

Table 1: Main Components of the Pilot Project

Sl. No	Component
1.	Project Planning and Site Selection
2.	Technical Design
3.	Construction of Containment Chambers
4.	Dredging Operations
5.	Environmental Management
6.	Social and Institutional Dimensions
7.	Project Monitoring and Assessment

Besides this brief introduction, the report contains seven chapters and three appendices. Chapter 2 describes the biophysical and socioeconomic settings for the pilot project. Chapter 3 provides a brief summary of the physical works that will be constructed during the project. Chapter 4 describes the criteria used to select the pilot project sites and summarises the planning work carried out to ensure proper consideration of technical, social and environmental issues. Chapter 5 characterises the potential pilot-project sites: describing location and extent, current and proposed land-uses, impacted population, communal benefits expected from the project, anticipated environmental impacts. Final recommendations for pilot dredging sites are made. Chapter 6 describes construction activities and provides the environmental management plan for the project. Chapter 7 describes the monitoring and assessment components of the project. Chapter 8 summarises the estimated costs, phasing of the work and disbursement schedules. Annex A contains the rationale, the implementation plan and the proposed budget for enhancing the social and gender aspects of the project. Annex B provides a detailed environmental management plan for the pilot project (separate volume). Annex C contains the report figures.

2. EXISTING SITUATION

This chapter summarises some key features in the region that directly affect the planning of the pilot project. Additional background information is contained in the *Kalni-Kushiyara Improvement Project Pre-Feasibility Study* (NERP, 1994).

2.1 Flooding Characteristics

The Kalni-Kushiyara River experiences two principal kinds of floods. Pre-monsoon floods occur between March and May in response to intense, short-duration, local rainstorms. During this season, the lower Meghna River water levels are low, so backwater conditions are absent. Consequently, the channel velocities along the Kalni River are relatively high and the water surface gradient is steep. During these floods, river water from overflows and breaches enters the *haor* through *khals* and low lands, causing damage to the pre-harvest standing crop. Pre-monsoon floods do not commonly cause damage to homestead settlements.

The monsoon flood season can extend from May to October and is accompanied by rising backwater conditions on the lower Meghna River. During this period, much of the Central Basin is deeply flooded and most of the river's flow is conveyed to the floodplain. Consequently, channel velocities in the Kalni River are relatively low. Villages experience severe erosion from waves generated by strong monsoon winds that blow across the vast, deeply-flooded Central Basin *haor* area. Houses on lower land or on land near the *haor* may be severely inundated by flood water. Over time, erosion of village platforms has resulted in severe crowding and reduction of the quality of domestic life during the monsoon period. These effects are acutely experienced by women of the household.

Channel instability occurs along the river during both the pre-monsoon and the monsoon flood seasons. The main types of instability are: avulsion and channel shifting when the river abandons its old course and re-occupies a former route; loop cutting when the river cuts off the neck of a meander bend, and bank erosion along the concave (outer) side of bends. This channel instability has resulted in the complete erosion of several villages in the project area. In such cases, people who have been unable to obtain alternate homestead land have either migrated permanently to urban centres or have become seasonal agricultural labourers in *haor* areas and live in temporary homesteads during the dry season.

2.2 Settlement Pattern

Villages in the pilot project area are characteristically settled on high land, either on the river's edge or set back some 200 - 500 meters. Settlements are traditionally built in a linear pattern between the river and the *haor*, providing all households' access to river transportation and agricultural fields. Changes in traditional settlement patterns are a consequence of household land erosion, population increase and fragmentation of land holdings. As a result, the habitation pattern has become remarkably dense as people struggle to obtain security from floods by clustering houses on patches of high land. Such a cluster of houses (or *para*) is often separated from other clusters by tracts of low land. In the monsoon period, inundation of the low land creates large bodies of water and restricts movement between village *paras*. Within the village,

wealthier households are commonly located on the highest land and can obtain further protection from floods through higher quality building materials and superior construction.

2.3 Agriculture

The people of the Kalni River communities are mainly engaged in the cultivation of the rich farmland of the *haor*. Agriculture on the *haor* is traditionally characterised by large land holdings and the production of a single *boro* rice crop. Because of severe production losses, caused by pre-monsoon floods over the years, middle and small-sized farmers have increasingly resorted to distress sales of land to cover the costs of agricultural inputs and consumption. The economic stress of middle farmers is further evidenced by an increase in the practice of leasing-in cultivatable land. Small farmers have resorted to out-migration during the monsoon season to labour for the cash required for the next farming season.

A second type of land farmed in the area is known as *char* land or land that has recently emerged from the river. However, the extent of *char* land is insignificant in comparison to the rice-cropped area. Secondary crops, such as sweet potatoes and ground nuts are commonly grown on the sandy soil of recently formed *char* land. *Char* land is generally owned by the government and is declared to be *Khas* land. Though by law in Bangladesh *Khas* land is intended for allocation to authentically landless people, in the pilot project area, *Khas* land is commonly claimed through occupation and cultivated by influential groups.

The average land value in the pilot project villages, based on cost per acre (100 decimals) is as follows: *haor* farm land, Tk. 40,000; *char* land, Tk. 20,000; homestead land, Tk. 100,000, and market-site land, Tk. 950,000.

2.4 Fisheries

The Kalni-Kushiyara River is an important fish migration route in the Northeast Region, connecting upstream mother fisheries and carp spawning grounds with downstream riverine, estuarine and marine habitats. Fish traffic is especially heavy during the pre- to early monsoon and the post-monsoon seasons. Important migratory species include major carps, gonia, boal, baghair, hilsa, chital, and golda chingri. Most of the species follow a common migratory pattern governed by seasonal hydrological changes. After preliminary study the following fish migratory patterns were developed based on fish fry, fish movement and hatchling studies; data also comes from regular Fishing Effort Surveys (FES) and Catch Assessment Surveys (CAS) that are in progress.

- post-monsoon season (October-November): as water levels drop in the post-monsoon season, fish start migrating from grazing areas to overwintering habitats. Preliminary field information suggests that about 30 species (including major species listed above) migrate into the river systems in the September-October period. Some species are present in the river systems after October but their abundance declines sharply with the drop of water level.

- dry season (December - March): fish abundance declines sharply as water levels continue to drop. Most of the 30 migratory species try to find shelter in overwintering habitats such as *duars* and normally restrict their movement within these deeper portions of the river during the dry season. Data show that there are about 20 small migratory species that are always present in the river system but not in significant numbers.

  Three *duars* (Shantipur, Madhabpur and Shahebnagar) are located within the pilot dredging area (Figure 11). Shantipur and Madhabpur *duars* are located between the Anandapur and Katkhal sites and the Shahebnagar Duar is downstream from the Katkhal site. The latter was formed by river avulsion in 1994. The average depth of these *duars* is about 6-8 m during the dry season. About 10 major migratory species including dolphins are present in these *duars*.

- pre-monsoon (April - May): during the first intense rain storms and initial rise of water levels, fish leave their overwintering habitat and start their migration towards areas suitable for spawning. However, if there is sufficient rainfall, small fishes start local migration as early as February. Large fishes, particularly major carps, breed in May and hatchlings are present from mid May in the study area. Hatchlings of smaller fishes are also present during the same period.

- monsoon season (June - September): This season corresponds to the maximum depth of flooding in the project area. Mass migration and schooling behaviour of fishes are observed during this season. Some species move from deep to shallow water. The fingerlings of both the floodplain and the river breeder move freely. This is the season of rapid fish growth as habitat and food availability increase enormously. However, during the monsoon season, fingerlings suffer high mortality rates due to changes in water quality, increased predation, insects, disease and untimely human exploitation.

2.5 Transportation

The Meghna-Kalni-Kushiyara system is a key transport route for the Northeast Region, carrying over 60 percent of the navigation traffic in the Greater Sylhet District. This is because road transport is almost nonexistent in most villages along the river, while there are usually internal canals that connect the lowest levels of the *haors* to the main river systems. Important landing facilities include Madna, Austagram, Ajmiriganj, Markuli, Raniganj, Sherpur and Zakiganj. The Kushiyara River is also an important international transportation route connecting Calcutta and Karimganj.

Figure 2 shows the main navigation routes near the project area. The various routes have been classified according to their Least Available Depth (LAD). The Kalni River is classed by BIWTA as having an LAD of 2.1 m during the post-monsoon recession between October and December, and an LAD of 1.5 m during the dry season between January and March. However, sediment deposition in the reach between Ajmiriganj and Madna has reduced the available depths so that no major barges, ships or large launches can operate in the dry season. The lowest reported depth is approximately 0.8 m in some locations between December and March.

2.6 Subsistence Strategies

Through the mechanisms of empoverishment commonly found in Bangladesh (crop failure, indebtedness, distress sales of agriculture land, loss of homestead land, provision of dowry for daughter's marriage), the numbers of landless are reported to have increased in the project area over the past five years. Subsistence strategies for landless households include increasing income through multiple sources of earning and the maximum number of household persons engaged in earning. Permanent and seasonal migration is an important element for increasing labour opportunities. In addition, subsistence strategies include optimal use of communally available foodstuffs. In the project area such subsistence strategies include:

- local, agricultural labour (male and female) in the *boro* season;
- local, non-agricultural labour (male and female) in the monsoon season such as earth-cutting, market portering, navigation, fishing, rice-processing, and domestic work;
- out-migration (male and female) for occasional and seasonal labour opportunities in distant centres;
- rice gleaning following harvest (destitute women and female heads of households);
- vegetable and other food collection from the *haor*

Poor women in the Sylhet area traditionally do not engage in labour activities in the public sphere. However, due to the deteriorating economic conditions over the years, women of landless and destitute households are now engaged in public-sphere labour activities in both the agricultural and the non-agricultural sectors. This practice occurs locally and in distant centres and participation in these sectors is undertaken individually and as members of labour groups, by both male and female-heads (de-facto, destitute) of households.

2.7 Economic and Political Influences

Most of the economic, political, and social relationships in the project area are influenced by several large power brokers. Contrary to other areas of Bangladesh, where increased communication and modernisation have reduced the pervasiveness of local power brokers, the relative isolation of the Kalni River area seems to have provided a base for their continuation. The economic power of local brokers is related to large land holdings in the *haor*, control of fishing-ground leases, fish trading, informal credit facilities, local industry, transportation and control over agricultural inputs such as irrigation and fertilizer. Such vast economic control implies major control over the local political structure as well.

In the pilot communities, village economic and organisational structures are influenced by relationships within the political-economic power structures of the area. Such relationships are of particular significance for the pilot project because of the creation of village platforms that will be a valuable resource.

3. THE PILOT PROJECT

3.1 Objectives

The pilot project has the following specific objectives:

- to evaluate the effectiveness of dredging methods in terms of productivity, maintenance requirements, need for environmental management, and cost;
- to develop, test, and demonstrate beneficial uses of dredge spoil, including potential use for creating new village platforms;
- to clarify social aspects of disposing spoil and identify constraints that may affect site selection and the design of future dredging programs;
- to develop methodology and guidelines for public participation activities in future dredging programs, and
- to develop a framework for institutional cooperation in Kalni-Kushiyara River dredging activities.

The remaining sections of this chapter describe the physical works that will be undertaken during the pilot project. All aspects of project monitoring and assessment are described separately in Chapter 7.

3.2 Dredging Activities

Channel re-excavation will be accomplished with suction cutter dredges that consist of a large centrifugal pump mounted on a barge (Figure 3). The suction pipe is fitted with a rotating cutter head that breaks up the bottom materials so it can be sucked into the pipeline. During operations the dredge is anchored by steel piles mounted on either side of the stern. The dredge can be made to "walk" along the channel as the cutter head swings from side to side. Sediment is pumped through a discharge line to a dyked onshore reclamation site for disposal. The maximum pumping distance will depend on several factors such as size and horsepower of the pump, production rate and static head, but typically it can reach up to one thousand m. Slurry concentrations in the discharge line typically range from 10 to 15 percent by weight, and sediment production typically averages 250 m^3/hour for a dredge with a 45-cm diameter discharge pipeline.

3.3 Village Platform Construction

The platforms will be constructed so that the new villages will be above the level of 1:10 year monsoon flood, with 0.9 m of freeboard to allow for wave action and settlement. The main components of the construction work include:

- site preparation;
- construction of containment dykes;

- filling of the chambers with dredged material;
- drainage and effluent control from the chambers;
- placement of erosion protection on the side slopes of the platforms.

These operations are planned to be completed within one construction season, approximately between November 1995 and June 1996.

3.3.1 Site preparation

Site preparation includes:

- detailed field surveys to delineate the chamber's boundaries: establishment of right-of-ways, and reception of written permission from land owners and authorities for the construction of permanent and temporary facilities, such as dykes, effluent drainage channels and the laying of pipelines;

- drainage/seepage interceptor ditches construction along the outer perimeter of the disposal chambers to prevent seepage or any spills onto the surrounding land. Ditches will drain back into the river, and will improve post-monsoon drainage. Spoil from the perimeter ditches will be used for construction of the dykes, and

- dissemination of information regarding unavoidable crop damage caused by laying of the inflow pipes and excavation of the outflow channel. Provisions are made for payment of compensation for crop damage (refer Chapter 6).

3.3.2 Containment Dykes

Construction of the containment dykes began in November 1995 and is on-going at the time of writing. The dykes are being constructed from available soil at village platform sites. Top soil and turf was first removed and stored for later use. A typical village platform will cover an area of approximately 3 ha. The dykes will typically be 4 to 6 m in height (Figures 5 and 6). Design sections of the confinement dykes are as follows:

Full Section Earthen Dyke

- crest elevation 9.5 m PWD
- crest width 2.0 m PWD
- exterior side slope 1V:2H
- interior side slope 1V:1.5H
- height up to 6.0 m

Special consideration was given when existing villages were to be extended and enlarged. For example, measures were incorporated to prevent damage to existing homesteads that abut the containment chamber. These include constructing bamboo and *tarja* retaining walls to protect the existing structures during filling (Figures 7 and 8). The design section for this is as follows:

Partial Section (with* tarja *wall)

- crest elevation 9.5 m PWD
- crest width 1.0 m PWD

- exterior side slope 1V:1.5H
- interior side slope vertical wall
- height up to 1.5 m

The dyke dimensions and elevations shown above are design construction parameters; the dyke height will decrease about 10 percent due to settlement during the dredge filling operation. It is expected that about one month will be required to construct the dykes at each site.

3.3.3 Filling of Chambers with Dredged Material

Dredge spoil will be pumped as slurry into the containment chamber. The time required to fill the chamber will depend on the production rate of the dredge, the number of hours of operation per day and the sediment trapping efficiency of the chambers. Assuming 45 cm diameter dredges are used, the production rate will be approximately 250 m^3/hour. Current practice by the Bangladesh Water Development Board (BWDB) and the Bangladesh Inland Water Transport Authority (BIWTA) is to operate only one shift per day. In this case, two or three months will be required to fill each chamber. It is expected that dredging will be completed by 30 June 1996.

3.3.4 Drainage and Disposal of Effluent

Seepage through the confinement dykes will flow through the drainage/seepage interceptor trenches constructed along the outer perimeter of disposal chambers (Figure 5). During construction of the perimeter dykes, material will be excavated from inside the confinement chambers to create a slope toward the outflow point(s).

The effluent will be discharged through outflow pipes placed in the main dyke on the opposite side from the dredge discharge pipe (Figure 4). This will to allow for the maximum time for settling of the sediments. The effluent will discharge back to the river through excavated canals or existing drainage channels. During dredging operations, it is expected that all of the sand will be deposited in the chamber, however, some silt and clay sized particles will pass through the outlet and will be discharged into the river. The average trap efficiency for a chamber is estimated to be 90 - 95 percent when the dredged sediment is granular in nature. Therefore, sediment concentrations in the spillway discharge will be in the order of 5000-10,000 m/l during pumping operations. During the dry season, when flows in the Kalni River are lowest, the suspended sediment concentration will be raised by approximately 35 mg/l downstream of the mixing zone during dredging operations. The length of this mixing zone will depend on the lateral and vertical mixing characteristics of the river channel but is expected to be in the order of 1000 m. If operations are restricted to one shift per day, then the general rate of sediment retention will be further increased. Consequently, potential turbidity effects will be lower in magnitude but will extend over a longer duration.

3.3.5 Completion of the Platforms

The contractor will be responsible for rough grading of the chamber during its filling. Once the chambers are filled, final grading and top soil placement will be carried out by the local people. Local people will also be involved in placement of saplings for slope protection to prevent wave erosion. Village development activities after construction is completed are further described in Chapter 6.

4. SITE SELECTION AND PLANNING

4.1 Site Selection Criteria

The main criteria used to identify, rank, and select the pilot project sites are illustrated in Figure 10 and are detailed below.

4.1.1 Dredging Considerations

The location of major shoals and the volume of material to be dredged drives the process of identifying potential dredging sites. Dredging costs account for roughly 90 percent of the project costs, so the amount of material that can be dredged is limited by the construction budget. Furthermore, dredges in Bangladesh cannot pump further than about 1.5 km, so the disposal site must be situated close to the dredge site. In addition, the disposal site should be on the same side of the channel as the shoal to prevent obstruction of navigation by the dredge's pipeline. This problem could be overcome by technical measures (such as submerging the pipeline), but since Bangladesh does not possess this technology, the idea was dropped from the pilot project. Since the location of shoals can shift from one monsoon to the next, the exact location and volume of spoil material cannot always be predicted. Channel surveys were carried out at the end of the1995 monsoon season to finalise site locations.

4.1.2 Platform Considerations

The new platforms should not be exposed to severe erosion hazards that could endanger the stability of the structures. These hazards include both wave attack when the floodplain is deeply flooded and erosion from flood flows. If the platforms are subject to some risk of erosion, then mitigation measures need to be provided. The two main measures that have been included to reduce these risks include (1) providing sufficient freeboard so that the platforms are not overtopped by wave run-up and (2) turfing the exposed side slopes in a manner associated with a plantation programme.

4.1.3 Social Considerations

It is very important that local villagers display a strong interest in participating in the pilot project and that new platforms benefit communities as well as individual families. The platforms should be constructed at sites where there are the need and the desire to participate in the pilot project. Ideally, the construction of new village platforms should improve living conditions for landless people. Due to time constraints, it was decided that sites engaged in serious social conflicts or land ownership disputes would be avoided unless these issues could be resolved early in the selection process. Furthermore, since land compensation could not be paid, permission to construct the platform had to be obtained from effected landowners. For sites located on *Khas* land, permission had to be obtained from local government or landless groups to which the land had been allocated.

4.1.4 Environmental Considerations

Environmental considerations included: expected impact on water and sediment quality at the dredging site; terrestrial impacts at the disposal site (filling of ponds or *beels*), and impacts on the aquatic habitat. An analysis of sediment samples showed that bed materials in the channel were essentially uncontaminated alluvial materials. Therefore, issues concerning contaminant releases did not affect the selection of individual sites. However, the grain size characteristics of the bed sediments were highly variable in nature, with mid-channel bars consisting of clean

fine sand while point bars and side bars consisted of fine sand and silt. It is expected that the silty sediments will produce greater turbidity during dredging and will have a lower trapping efficiency in the containment chambers than the clean, sandy sediments. Consequently, sites with sandier materials are preferable to sites with predominantly silty sediments.

Dredging operations will affect aquatic habitats to a greater degree than terrestrial habitats. There will be changes in the physical, chemical and biological characteristics of the water due to the high content of suspended solids, or turbidity. The specific nature and extent of these changes will vary depending on the location of dredging operations, and the quantity and nature of suspended solids.

Suspended solids cause injury to the gill structure of fish. The extent of the injuries will depend on the species of fish, i.e., their resistance, and on the nature of the suspended solid particles, i.e., their hardness and angularity. The most pronounced mechanical effects of suspended particles occur when the water contains 4 percent of solids by volume. Turbidity affects fish directly by killing them, reducing their growth rate, or preventing their reproduction; or, indirectly, by reducing the natural food (plankton) available to the fish in the water. At concentrations of 100-500 mg/l turbidity can be harmful to zooplankton by clogging their filter feeding apparatus and digestive organs. Furthermore, turbidity is important in deciding critical demographic parameters, and therefore, it will play an important role in determining fish population-level parameters such as abundance and species-level characteristics including distribution levels. Therefore, two primary questions are identified:

i) how do aquatic habitats change in response to changes in water quality and turbidity? and

ii) how do fish respond to habitat change both at the individual and population levels, considering that fish survival, is strongly dependent on turbidity?

During the investigation, the level of information available on the river, the communities and the technical issues involved in dredging and platform construction increased tremendously. Consequently, site selection has followed an iterative process, involving the multi-disciplinary team and the local communities. A final review of site conditions was made in September 1995, at the end of the monsoon season. This included a re-survey of the channel and shallow soil bores to determine sediment grain size characteristics at the proposed sites. After the dredging sites were finalised, permission was obtained from the affected land owners to construct the village platforms.

4.2 Selection of Pilot Project Sites

Identification of potential sites was initiated during a field trip by the multi-disciplinary team in June 1994. Four Community Organisers (COs) were sent to the Kalni - Kushiyara River in August 1994 to start identifying potential village platform sites. The COs began documenting social conditions in the area and people's perceptions and interest in participating in the pilot dredging project. The COs also identified key issues relating to land ownership and social conflicts between large landowners.

By December 1994, it was decided that the most appropriate location for pilot project sites would be in the reach downstream of Ajmiriganj. Work that should be carried out upstream of Ajmiriganj is beyond the scale of a pilot project and would involve land acquisition. Consequently, it was decided to focus the investigations to the 24 km reach between Ajmiriganj and Kalimpur.

Table 2: Village Platform Sites

Site	Platform Location	Type
Gazaria	right bank	join two villages and extend
Shahanagar	left bank	join two villages and extend
Kakailseo	left bank	extend village and fill in lowland
Anandapur	right bank	construct new village on *Khas* land
Katkhal	right bank	extend market and village

The social team then compiled an inventory of proposals from local communities for the use of the dredge spoil. Over 40 platform sites were identified in this reach by the local communities. The total volume of spoil necessary for these sites amounted to about 40 million m^3, nearly 80 times the amount budgeted for the pilot project. This shows the huge demand for flood-free land in the region and indicates the willingness of local communities to participate in the project. A public consultation meeting was held on 30 January 1995 at Ajmiriganj to review the progress of the project and to inform people about the tentative scope of the work. It was decided that between three and five village platforms could be constructed with the time and resources available.

The locations of the platforms proposed by the local communities were then compared with the locations of the known shoals in the channel. From this comparison and discussions with the COs, five potential sites were identified. The location of and proposals for these sites are summarised on Figure 11 and in Table 2. The platform sites were visited in March 1995 by the multi-disciplinary team and the COs. Detailed hydrographic surveys of the river channel were completed, and topographic surveys at each proposed village platform site were carried out. Village committees were formed to establish the intended uses for the platforms and to decide the beneficiaries. From this information, preliminary designs were made for each site to estimate dredging and construction volumes, costs, areal extent of the platforms, number and types of beneficiaries, land-use impacts and environmental impacts. The result is a portfolio of sites that can be compared, ranked and evaluated and from which final sites may be selected.

5. PILOT PROJECT SITES

Table 3 summarises the main features of the five village platform sites. Individual land-use and site maps are shown in Figures 12 to 16.

Table 3: Characteristics of Village Platforms

Site	Area (ha)	Fill Volume (m^3)	Direct Beneficiaries		Communal Beneficiaries	
			Households	People	Households	People
Gazaria	6.2	310,000	95	552	95	552
Shahanagar	3.0	150,000	23	154	115	690
Kakailseo	4.6	174,000	40	248	400	2480
Anandapur	2.0	97,000	33	205	33	205
Katkhal	1.6	70,000	5	53	300	1860

5.1 Gazaria

The site is located in Kishoreganj District about four km downstream of Ajmiriganj. The village is completely surrounded by water for up to five months of the year during the monsoon season. Gazaria experienced considerable erosion during the 1988 flood, causing the village to be divided into a northern and southern portion. It also suffers from annual wave erosion on its western (*haor*) side. Consequently, the village platform is very narrow, typically only 10 m. As a result, the density of habitation is extreme. Houses are packed so closely together that there is no courtyard space for grain drying. During the monsoon, households from the village lowlands move to higher ground, resulting in even more people sharing inadequate space with livestock and straw stacks.

The village is also at risk from flooding and overtopping by wave action. Ground levels of the existing village varies between 7.0 - 8.0 m PWD, with individual homesteads raised above the surrounding ground. By comparison, the 1988 flood level was 8.0 m PWD.

Gazaria residents have proposed to connect the northern and southern portions of the village (about 130 m) and to expand Gazaria North by 80 to 100 m on the west side. There are 552 inhabitants in 95 households in Gazaria North. Their tradition of allocating *char* land among all households has helped their decision to share the new village platform among all households. The land will be used to develop new homesteads with space for paddy threshing, kitchen garden and livestock shelter. The village elders have a long-term plan to build a primary school on the expanded platform.

Since the platform site is relatively low-lying (approximately 4 m PWD) site preparation work will start well after the end of the monsoon. Preparatory work for the disposal chamber includes

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constructing 980 m of confinement dyke with a full earth section, and 470 m of small dykes with bamboo and *tarja* walling on one side along the existing homestead boundaries. Filling will start at the chamber's northern side and the effluent water will be collected at the south side and discharged back to the river by a 350-m-long channel excavated through the paddy fields. After completion, the new homestead platform will cover an area of approximately 5 ha and will be 0.9 to 1.2 m above the existing village ground level (Figure 12).

Dredging will take place over 500 m, along the right side of the channel, progressing in an upstream (northern) direction. Excavating 250,000 m^3 of material is expected to take five months (assuming an 18-inch dredge working a single shift per day). The existing bed levels in the channel vary between -1.0 m and +2.0 m PWD, so the depth of cut will be up to three m. Grab samples from the shoal consisted of fine sand (D_{50} = 0.1 mm) and silty-sand, with up to 50 percent of the material in the silt size range. The fine-grained characteristics of the sediments will result in high turbidity levels and loss of fine materials during filling of the chamber. Results of drilling investigations will be used to define the extent of predominantly sandy sediments near the site.

5.2 Shahanagar

The site is located on the left bank of the Kalni River in Habiganj District, just north of Kakailseo market and about 5.5 km downstream of Ajmiriganj. In 1988, erosion of the intervening land between the villages of Shahanagar and Mahmudpur effectively cut the two villages off from each other. In addition, the villages experience annual wave erosion from the east (*haor* side). For example, in 1993 the school collapsed because of undermining from wave erosion. Flood spills from the main river also inundate the floodplain land by the villages through several channels.

The residents of Shahanagar have proposed to use spoil from river excavations to rejoin the two villages, thus providing flood-free access to Kakailseo Bazaar during the monsoon season. There are 23 households (with a population of 154) who are dedicating land for spoil development. The land will be used for new homesteads and eventually for cultivation.

The new platform would extend 300 m in length, 100 m in width and would cover an area of 3.0 ha (Figure 13). The estimated volume of material required to fill the chamber is 150,000 m^3.

Preparatory works for the disposal chamber include the construction of about 770 m of full-earth-section dykes in an open area, and 130 m of smaller dykes with bamboo and *tarja* walling on the sides abutting existing homestead boundaries. The top of the new homestead platform will be constructed about 1.0 m above the existing village surface (to 8.9 m PWD), with a 0.2 m allowance for settlement. Filling of the disposal chamber would start at the southern side near Mahmudpur Village. Two short outflow channels would direct the effluent into the existing channel that drains into the Kalni about 100 m north of the chamber. Construction of outflow channels will not impair crop cultivation in the area.

The existing shoal extends along the right bank of the Kalni River, forming a low submerged side bar (0 to +2 m PWD), composed of sand and silty-sand. If this bar were dredged, the pipeline would have to extend across the navigation channel, which would block ship traffic. Although it would be possible to excavate a trench and submerge the pipeline, this would require

specialised equipment and expertise. Consequently, it is not clear that this work could be carried out without impeding navigation. Material could be excavated from the deeper left side of the river, where the channel bottom is already around -1 m PWD. In order to obtain the required volume of material, the channel would have to be over-dredged to around -3 m along the edge of the left bank, adjacent to the existing village. This deepening could contribute to further erosion near the village which would be undesirable. This situation illustrates some problems associated with finding a dredging location to match an appropriate disposal site.

5.3 Kakailseo

The site is located on the left bank of the Kalni River in Habiganj District, about six km downstream of Ajmiriganj. The village is a principal market centre in the area and is relatively developed, with a police camp, a high school, a dispensary and a communication centre. The low land in the centre of the village is deeply flooded in the monsoon season, separating outlying *paras* from each other and impeding access to the school and to Kakailseo market. The Village Spoils Committee proposed to fill the local depression. Land will be developed for access via the raised school play ground, for household expansion and eventually for cultivation. The land is owned by 40 landowners, some of whom have rights by documentation and others who have claimed land by possession.

The confinement dyke for the platform would require the construction of about 570 m of full earth section dyke along the road alignment on the eastern side and 710 m of *tarja* walling with partial dyke to protect the existing homesteads. The new platform will be 4.6 ha in area and will raise the ground level by 0.5 to 1.2 m above the existing village surface.

The dredged material will be excavated from the predominately sandy shoal on the left side of the Kalni channel. Dredging will start about 600 m downstream from the site and would progress in an upstream (northerly) direction. The depth of channel excavation will range from 0.5 m near the upstream end to three m at its downstream end. Dredging operations require approximately 3.5 months to produce the 174,000 m^3 of material needed for the platform. Filling of the disposal chamber will be carried out from two or three points: near the radio tower, near the hospital and possibly near the cemetery (Figure 14). The effluent will be drained directly into the Kalni through a small channel to the north. The construction of outflow channels will not impair crop cultivation in the area.

5.4 Anandapur

The site is located nine km downstream from Ajmiriganj on the left bank of the Kalni River, on a stretch of open and uninhabited land. The land is recently formed *char*, which was created following a shift in the Kalni River. The new land has been declared *Khas* and given by the Government in legal title to a group of 33 landless households. The landless group is currently living on others' homesteads in Anandapur at the southern end of the site. The proposed site and surrounding land are being farmed by a group of landed households living in Kakailseo at the northern end of the site.

It is proposed that a village platform be constructed for settlement of the 33 landless households on their own homesteads. The platform will cover an area of 2.0 ha and will require about

70,000 m^3 of spoil for construction. Filling of the disposal chamber will be carried out from south to north toward the outflow weir (Figure 15). Dredging will be carried out through the large sand shoal that extends along the left side of the channel. The shoal is an obstruction to navigation and consists of clean fine sand (D_{50} = 0.12 mm). There is approximately 400,000 m^3 of material in the sand bar. However, given the shallow depths in this reach, it may be difficult to operate the dredge effectively during the dry season. Portions of the bar become exposed at this time and will not be accessible to the dredger.

So far, the landless group has refused to dedicate their land for construction of a platform until they have been given possession by those occupying the site. Efforts are underway by local authorities and NERP to reach a negotiated agreement.

5.5 Katkhal

Katkhal Village is located on the right bank of the Kalni River in Kishorganj District, about 14 km downstream from Ajmiriganj. The village is a principal market centre of the area, with approximately three thousand persons attending a regular market day. There are approximately 300 households (1800 persons) in the village. The village school is temporarily located in the Union Council Compound. Villagers initially proposed construction at two sites: a triangular strip of land along the right bank of the Kalni River and a rectangular landfill immediately west of the village. The former site was considered unsuitable by NERP because of its encroachment into the river and its susceptibility to erosion. Therefore, a tentative design was prepared only for the site west of the village.

The proposed platform site borders the Katkhal market and extends about 120 m to the west (Figure 16). This is the smallest site considered in the pilot project, covering an area of about 1.5 ha. The area to be developed is owned by five landowners and the school. The site will be developed to provide a permanent location for the school and to increase the area of the market. It is anticipated that an enhanced market will expand commerce in the area and provide increased labour and petty trade opportunities. In the long-term, the village faces potentially severe erosion problems due to upstream channel shifting.

The confinement chamber will require the construction of about 400 m of full section earth dykes in an open area, and 150 m of small dykes with bamboo and *tarja* walling on the side along the existing village and market area. The new homestead platform will be raised by 1.0 m above the existing village level.

The dredged material will be excavated from sandy shoals along the right side of the Kalni channel. Approximately two months of dredging are required to fill the chamber. During this period, the left part of the channel will remain open for navigation. The filling of the chamber will progress from north to south and the effluent water will drain into the Old Kalni Channel (Figure 16).

5.6 Comparison of Sites

Anandapur has no major technical constraints related to either navigation or platform construction but sections of the bar may become exposed above water and it may be difficult to operate the dredges effectively during the dry season. Removing the existing shoal would benefit navigation, construction of the platform would be relatively simple since the land is not developed, and the sandy bed material in this area would be suitable for construction purposes. In terms of social criteria, the site at Anandapur is problematic. On the positive side, it is the only one of the five where a new village platform could be constructed to settle landless families on government *Khas* land. On the negative side, the land cannot be developed while the local elites are occupying the land. Until there is a change in possession, the land will not be dedicated and anyway, should not be developed to the disadvantage of the landless group. Field investigation suggested that change in possession may take much longer than the duration of the pilot dredging project. Therefore, this site was dropped from the pilot dredging program.

The project at Kakailseo appears to generate important communal benefits in terms of linkage to the village centre and market facility. Furthermore, the ground level at Kakailseo is higher than at the other four sites, alowing construction to start earlier as the land emerges during the post-monsoon season.

A project at Gazaria would benefit individual households and the community. However, there may be more problems associated with loss of fine sand during pumping than at the other sites.

Katkhal is the smallest of the five sites and, although direct benefits will accrue to only a few households, the community will be benefitted by a school site and expanded market facility. There does not appear to be any major technical problems associated with dredging or platform construction.

Although constructing a platform at Shahanagar would produce useful social benefits it has major technical problems since the shoal is located on the opposite bank from the disposal site. The floating pipeline would cause a serious obstruction to navigation during construction (approximately three months). Therefore, this site was also dropped from the implementation program.

Only three sites (Kakailseo, Gazaria and Katkhal) were recommended for the final selection stage.

5.7 Recommended Pilot Dredging Sites

The total budget for the implementation of the pilot dredging project is CAD$ 2.1 million. With this budget, only two of the three sites can be implemented. All three sites are almost equal in terms of merits for implementation. Therefore, for final selection, special attention was paid to the identification of problems and issues related to dredging operations, sediment concentration time, people's perception and social conditions on both banks of the river. Based on these considerations, Gazaria and Kakailseo Sites have been selected for implementation.

6. PILOT PROJECT MANAGEMENT

6.1 Introduction

The pilot Dredging Project is being executed and managed under the following broad categories:

- civil works;
- environmental management plan, and
- expanded social and gender program.

6.2 Civil Works

The civil works include activities related to the construction of homestead platforms and the dredging of the Kalni-Kushiyara River. This includes:

- all activities related to the removal of major shoals by dredging and the disposition of the dredged materials into the containment chambers, and

- all activities related to construction and maintenance of the containment dykes and effluent outlets.

The civil works are being executed by a single contractor through appropriate tendering and contracting documents.

NERP is responsible for managing the project and supervising the contractor's work through the teams as described below.

- Technical Committee: The project coordinator, the project engineer, the river/sediment engineer, the environmental impact assessment (EIA) advisor and the social-gender specialist.

- Field Team: The resident engineer, two BWDB engineers, two dredger inspectors, one botanist, one fishery biologist and six community organisers (male and female).

The Project Engineer (Canadian planning/civil engineer) is fully responsible for project execution and completion of the civil works. The Technical Committee is responsible for reviewing the progress and quality of the work, helping the project engineer wherever necessary, coordinating activities of various groups and reporting to NERP.

Working under the project engineer, the NERP Resident Engineer, assisted by two BWDB engineers, is responsible for overseeing the construction and maintenance of the containment dykes and effluent outlets. Inspectors will be placed on each dredge to monitor all aspects of dredging operations and to liaise with the Resident Engineer (see Chapter 7). The botanist, in association with a junior fishery biologist, is responsible for monitoring and testing programs related to the environmental management plan (EMP). The multi-disciplinary team is responsible for following up EMP (refer to Annex B for further details) and CO activities at regular intervals and making progress reports to the Technical Committee.

As the NERP guest house in Ajmiriganj is too small, additional space is required to accommodate field offices and staff. More appropriate space is required for the women on the field team (refer to Annex A).

6.2.1 Contracting Procedure

Selection of Pre-qualified Contractors
Pre-qualified contractors were selected based on the following procedures:

- NERP and BWDB decided to advertise locally;
- advertisements were published in four national dailies in March and April 1995;
- responses were reviewed and selected by NERP, and
- NERP's selections were reviewed with BWDB.

Tender Document
Tenders for the civil works were called in August 1995, following CIDA policy on competitive bidding. The tenders were evaluated by NERP and subsequently sent to CIDA for approval. Tenders were approved in October 1995.

Award of Contract
Work Order for Civil Works were issued by NERP in October 1995. This was done at the request of BWDB according to their established procedures.

6.2.2 Measurement and Payment

i) No payment will be made to the Contractor, for any purpose or reason, for excavation beyond the established lines and grades.

ii) Measurement for excavation will be made by net volume in m^3 of material in the excavation within the lines and to the depths shown on drawings or authorised by the ENGINEER (Team Leader). Payment will be made at the Unit Rate per m^3 tendered in the Bill of Quantities.

iii) Measurement for the dyke fill will be made by net volume in m^3 of material compacted in place, and payment will be made at the Unit Rate per m^3 tendered in the Bill of Quantities.

iv) Measurement for dressing and turfing shall be made in m^2 of the area covered with growing turf, and payment will be made based upon the Unit Rate per m^2 tendered in the Bill of Quantities.

River Channel Dredging and Disposal of Excavated Material

i) All costs connected with mobilisation and demobilisation of material, plant, pipelines, ancillary equipment and labour: the installation and dismantling of shore pipes, floating pipelines and effluent outlets: the maintenance of dykes and drainage channels: costs associated with the backfilling of the chambers, such as moving between sites, shall be included in the Tender Form as a Lump Sum Price, to be paid according to conditions of the contract on the following basis:

a) Fifty percent of the Lump Sum Price will be paid when the dredge or dredges start backfilling operations at the first confinement chamber.

b) The remaining 50 percent will be paid when all equipment and material leave the sites to be demobilised.

ii) The contract price for dredging shall cover removal of sediment from designated shoaling areas into the confinement chambers on shore. The cost shall also include labour, diesel fuel, materials, maintenance and any other costs related to the operation of the dredge and of its ancillary equipment. There will be no extra payment in this regard. The pay quantity will be measured by Cubic Metre Place Measurement (CMPM) in the confinement chambers. Volume will be determined from the difference between the initial and final joint surveys, subject to the final elevation of the fill shown on the drawings or as instructed by the Resident Engineer.

iii) Limiting factors for warranting stoppage of dredging operation have been presented in Annex B: the Environmental Management Plan. On request of the Resident Engineer, the Contractor will shut down dredging and backfilling operations, either for environmental restrictions or for any other reason and the Contractor shall, therefore, submit with his tender standby rates for such stoppages.

The Contractor shall ensure that the work meets all applicable regulations and standards. There will be no additional payment for down time or delays other than those requested by the Resident Engineer. Claims for loss of production, shut down periods or any other expenses resulting from water levels, whether high or low, will not be entertained.

6.2.3 Additional Terms and Conditions

Local Employment
The Contractor shall, to the maximum possible extent, employ local labour for manual earthworks, particularly in the construction of disposal chambers. Local female labour must comprise at least 20 percent of the workforce. Liaison will be maintained between the project engineer and the contractor to obtain fair wage and working conditions for the female workers.

Volume of Civil Works
The exact volume of civil works can only be confirmed only final designs and detailed estimates are prepared by the NERP survey and design teams. These will be completed after the alignment of the containment dykes is finalized.

Layout of Work
NERP staff is responsible for setting stakes and establishing control points to show the location and reference elevation of the work.

6.2.4 Schedule

Figure 17 and 18 show the schedule for the pilot project, including the timing of monitoring, construction, assessment and reporting. Key dates for construction of the civil works are as follows:

• pre-qualification of contractors	April 1995
• preparation of tender documents	June 1995
• review of tender documents	July 1995
• invitation for tender	August 1995
• tender evaluation report	September 1995
• tender evaluation and approval by CIDA	October 1995
• awarding of contract	October 1995
• mobilisation of equipment and labour	October - November 1995
• construction of containment chambers	November - February 1995
• dredging operations	January 1995 - June 1996
• completion of platforms	June - July 1996

6.2.5 Authorisation and Project Implementation

NERP, the Canadian Executing Authority (CEA), will act on behalf of BWDB to implement the pilot dredging project.

Before awarding the contract, approval of the work was obtained from CIDA, BWDB and BIWTA. NERP established contacts with concerned government bodies such as the Deputy Commissioner and Thana Nirbahi Officers. To ensure effective execution of the pilot project, a meeting between NERP, BWDB and BIWTA was organised to establish full cooperation among the interested parties. BIWTA nominated an engineer to act as liaison to discuss future issues and concerns as they arise.

Permission in principle has been obtained from all owners of land within the containment chambers. Detailed documentation collection occurred between October and December 1995.

6.3 Environmental Management Plan

The Environmental Management Plan (EMP) was prepared as an integral component of the Pilot Dredging Project. This was done to incorporate into the project measures required to reduce or mitigate adverse impacts of activities associated with the project itself. The major components of the EMP include:

- mitigation programs for adverse impacts;
- enhancement programs to maximise project benefits;
- contingency plans;
- long term management capacity, and
- a monitoring program.

Most of the work related to the EMP are being executed and managed by NERP through the multi-disciplinary team. The project engineer and his staff assist wherever necessary. Identified mitigation measures, enhancement programs and costs were finalised by the multi-disciplinary team after further field survey. After review by the Technical Committee (refer section 6.2), the programs and their corresponding costs are to be approved by NERP for implementation.

To help in the implementation of the EMP a second group of Community Organisers (COs) were trained by the multi-disciplinary team members. The COs then began training the village

committees in preparation for project execution. The village committees were taught to manage implementation procedures during the dredging and construction period and to maintain and repair platforms in the post-construction phase. Village-level training, which incorporates material adapted for illiterate groups and includes both men and women of the community, entails:

- In the pre-dredging period: dissemination of information regarding the technical and social dimensions of the project, and the role of the community in land dedication and in on-site construction and labour activities.

- In the post-dredging period: instruction on platform maintenance and repair; kitchen garden and homestead plantation; composting, and water and sanitation issues.

6.3.1 Mitigation Measures

Mitigation measures were identified and evaluated in terms of practicality, manageability and cost by the multi-disciplinary team and the COs. Identified mitigation measures include the use of bamboo barriers and water hyacinth around the dredge and at the outfall of effluent channels, the plantation of flood-tolerant vegetation to reduce platform wave erosion, the construction and repair of earthen canals and bamboo bridges to facilitate existing irrigation and village communication, the provision of adequate drainage, sanitation and drinking facilities for effected villagers and compensation for crop losses (refer to Annexes A and B for further details).

Some 2 to 5 ha of crop land will be out of cultivation due to the installation of shore pipelines and the construction of effluent outlets. Compensation was estimated and will be paid through the village committees with the help of COs before dredging operations began.

The construction of labour sheds, equipped with sanitation and drinking water supplies, is included in the tender document to mitigate anticipated social disruption. The tender document dictates the contractor keep proper lighting on all floating equipment connected with the work, as well as all ranges and other stakes in connection with the dredging between the hours of sunset and sunrise.

6.3.2 Enhancement Program

Enhancement measures have been considered where significant gains in production and environmental protection can be achieved. Potential enhancement measures include:

- homestead plantation and kitchen garden management, and
- top soil management.

These programs will be carried out through the project by the provision of technical and financial support and training (refer Annexes A and B).

6.3.3 Disaster Management

Failure of the containment dykes and leakage from the discharge pipelines could be major hazards during the pilot dredging operations. Proper precautionary measures (i.e., sand bags, bamboo fences and standby workers) have been included in the contract documents. In addition, dredger inspectors and disposal chamber engineers will be provided with short-distance walkie-talkies to stop work immediately in case of sudden failure of a containment dyke (refer to Annex B for further details).

6.3.4 Long-Term Management Capacity

Rural-development NGO's interested in working in Habiganj and/or Kishoreganj Districts were contacted to ascertain their interest in collaboration over the long-term. Discussions are on-going and are aimed at discerning the NGO's capacity and desire to work with target groups (landless and poor women) in such areas as credit provision and legal support. Their potential to work with a community-wide approach in horticulture activities and for provision of water and sanitation facilities will also be assessed.

Besides the village committees, Kalni River Project Management Committees will be formed at two *thana* levels. These committees will be involved in mediating land disputes and providing the pilot project communities with government linkages to such agencies as Land, Public Health Engineering and Agriculture Extension. Based on the experience with the use of the *thana*-level committees, consideration may be given to using such committees as a Kalni River Authority for the long-term management of the pilot project and other such projects that may be undertaken as a result of the feasibility study.

6.3.5 Monitoring

Chapter 7 describes the monitoring and assessment component of the project.

6.4 Expanded Social and Gender Program

Though one objective of this project is to benefit target groups of poor and landless, in such a specialised project this objective cannot take top priority. Also, a regular construction contractor cannot afford to provide protected working conditions for the target groups. This issue was discussed with the CIDA Review Mission and it was decided that an expanded social and gender program be undertaken to find a means for addressing this issue. The budget required to conduct this expanded program was drawn from the total allocated CAD$ 2.1 million for the pilot project. The expanded program includes the following components:

- provision of basic facilities conducive to introducing female workers to the project area;
- strengthening of women's activities in the project area, including functional education, on-site facilities for female labour groups, support to women's groups in the beneficiary villages;
- provision of material assistance and training of landless households, establishment of homesteads on village platforms, access to revolving credit for income generation;
- strengthening of community-based institutions through material assistance for water access, sanitation and kitchen gardening as well as training in platform management and maintenance, and
- development of local, long-term involvement by other groups in this or other projects that may come out of the feasibility study.

These activities were assigned to six staff members, consisting of three female, and three male COs assigned to fieldwork on the Dredging and Village Platform Project. In addition, two male

staff members, assigned from the Dhaka office, are responsible for field supervision, on-the-job-training, documentation and logistical management.

Field workers are responsible for introducing the Expanded Social and Gender Program to the female labour groups involved in disposal chamber construction. Where necessary, special attention is to be given to teach such groups the basics of earth measurement and labour rate calculations. Liaison is maintained with the Project Engineer to obtain fair wage and working conditions particularly for the women workers (refer to Annex A for further details).

6.5 Administration

All operations such as accounting, banking, transportation, communications, graphics, duplicating, equipment procurement, and personnel contracting (mobilisation, salaries, demobilisation) are being carried out through NERP.

7. PROJECT MONITORING

The pilot project's monitoring program was planned for three key periods:

- pre-project (January 1995 - October 1995)
- construction (November 1995 - June 1996)
- post-project (July 1996 - December 1996)

This schedule allows for limited post-project monitoring since observations will be made during only one monsoon season immediately following construction. The brief comments in the following sections summarise the key parameters that will be documented in each phase of the project. The detailed monitoring program is presented in Annex B - The Environmental Management Plan.

7.1 Hydrology and Morphology

7.1.1 Channel Topography

Hydrographic charts of the river were prepared over a 50-km length between Ichapur and Markuli in September 1994 and March 1995. A repeat survey was carried out in September 1995, shortly before the sites were finalised, to determine the location of shoals and bed levels after the 1995 monsoon. Each survey involved measuring approximately 500 cross-sections using an echo sounder and a differentially corrected global positioning system with a data logger. Contour maps and channel cross-sections were prepared using a digital-terrain model.

Surveys will be made at weekly intervals at each dredging site during operations to monitor the progress of the excavation. More comprehensive surveys will be made at monthly intervals upstream and downstream of each dredging site to monitor any channel changes that occur during dredging. Following completion of dredging, a major re-survey of the entire reach between Ajmiriganj and Madna will be carried out to document post-project conditions before the start of the monsoon season. These surveys will be repeated in September 1996 to document conditions after the monsoon.

7.1.2 Water Levels and Discharges

Water levels are measures by the BWDB six times each day at Ajmiriganj (four km upstream of the study reach) and Madna (11 km downstream of the study reach). Discharges are measured at Sherpur, 40 km upstream. Data from these stations will be sufficient for establishing the hydrologic conditions during the project and for providing historical values for comparison purposes.

7.1.3 Bed Sediment Characteristics

Fifteen bed material samples were collected from the channel between Ajmiriganj and Madna to document the grain size characteristics of the river sediments. These samples were collected with a "grab" sampler that collects material from the surface. In September, six shallow core samples (to a depth of approximately 3 m below the existing bed level) were collected near each proposed site. Additional grab samples will be collected following the completion of dredging and again at the end of the monsoon season to document changes to the sediment characteristics during infilling.

7.1.4 Suspended Sediment Concentration

A program to measure suspended sediment concentrations was initiated by NERP in March 1995 at three locations on the river (Sherpur, Markuli and Ajmiriganj). This involves sampling with a DH-76 depth integrating sampler at three locations in each cross section. The samples are being collected eight times each month at each station. At the time of this report, approximately 215 samples have been collected. These data will be used to represent the expected background range in sediment concentrations at the time of dredging.

During dredging operations, additional sediment sampling will be carried out at Ajmiriganj (to measure natural concentrations) and downstream of the dredge sites to document project impacts on sediment concentration and load in the river.

7.2 Environmental Monitoring

The Environmental Monitoring Plan includes the following programs:

- dredging monitoring program;
- water quality monitoring program;
- river channel monitoring program;
- fish observation program;
- dolphin observation program;
- agriculture monitoring program;
- vegetation monitoring program;
- containment dykes;
- pipeline verification program, and
- supervision of earthen structures.

Further details on the above items are described in Annex B.

7.3 Construction

7.3.1 Dredging

NERP Inspectors will be on each dredge to monitor all aspects of dredging operations, including hours of running, powerplant performance, mechanical problems, progress in channel excavation and conditions in the disposal chambers. Since they will have the authority to stop operations, these inspectors will play a key role in preventing undesirable situations from arising. Limiting factors for warranting stoppage of dredging operation has been presented in Annex B.

7.3.2 Filling of Containment Chamber

The Resident Engineer along with BWDB engineers will monitor the progress of filling each disposal chamber. They will also monitor the effluent disposal and take action to correct any problems such as embankment erosion, effluent overflow or occurrence of unusually high turbidity levels. Weekly surveys of the spoil will be made by the NERP survey team to determine the rate of filling of the chamber. Sediment samples will be collected to determine the size distribution of the spoil material.

7.3.3 Maintenance Requirements

Following the completion of construction in June, the village platforms will experience high floods and possible wave attack during the monsoon season. Monthly inspections will be made by the NERP engineering team between July 1996 and October 1996 to assess the condition of the structure, the performance of the slope protection, settlement of the platform, gullying and surface erosion and the level of maintenance work being carried out.

7.4 Social and Gender

The social impact monitoring will be conducted to help in designing future projects and to ensure successful replication. Such 'lessons learned' will focus on the impact of the platforms and the river dredging on socioeconomic change in the villages. Social impacts will be monitored against social and demographic baseline data collected from each project village.

Social impact monitoring will be conducted during the pre-dredging, dredging and post-dredging periods. The long-term social impact assessment will be developed as part of the complete assessment of the pilot project and the Kalni-Kushiyara feasibility project.

Social assessments in the pre-dredging period included the degree of readiness for platform construction as indicated by the acceptance and participation of the community-at-large, the formation of a Village Spoils Committee, the Committee's management of land dedication and documentation for spoil deposit.

During the dredging period, assessment will be made of the Committee's management of dredger-line access, including negotiations with the Project for compensation of crop losses and the Committee's relationship with the Project and Resident Engineers. In the period immediately following dredging, assessment will be made of the Committee's undertakings to prevent platform erosion and set up long-term maintenance activities.

Social assessments in the post-construction period should include the following assessments: the use of newly created land; the individual, communal and gender-specific benefits of enhanced space; the security of homesteads during flood periods; changes in habitation patterns; socioeconomic impacts in agriculture, fishing, labour and trading practices; changes in permanent and seasonal migration patterns; changes in village-level decision-making structures, and institutional capacity.

The requirement to conduct social impact monitoring should be perceived of as opportunity to help pilot communities to fully use and maintain their village platforms as a valuable communal resource.

8. COST ESTIMATES

8.1 Cost Estimates for Dredging and Platform Construction

Table 4 provides a cost breakdown for each site. The cost for completing Gazaria and Kakailseo sites is estimated to be Tk. 59.45 million (CAD$ 2.05 million).

Dredging costs are based on accepted tendered values. Estimated unit cost is Tk. 125/m^3 of the disposed soil. This unit cost includes all costs associated with mobilisation, demobilisation and dredging, including all costs associated with shoreline connection, dismantling, transportation to and from the dredger base and some EMP costs (contractor's item). These EMP costs include construction and management of cross drainage and effluent outlets, homestead damage repair, navigation lighting, leaks and breaks along the pipelines, storage of sand/soil bags and *tarja* walling for disaster management and third-party insurance.

A provisional cost of 10 days standby/idle period (refer section 7.3.1) has been included in the Summary Cost Estimates based on tendered value (Tk. 22,800/day). However, this cost may increase or decrease depending upon local conditions.

Tendered value for the construction of disposal chamber is 9 percent above the scheduled rate. The preliminary cost estimates for each disposal chamber was based on the current Schedule of Rates for the Moulvibazar O&M Circle, BWDB, Moulvibazar, effective from 1 July 1994.

A Bill of Quantities of Works has been prepared using the design sections of the confinement dykes and the ground profiles from site surveys conducted in April and May 1995. Final cost estimates will be prepared based on detailed topographic surveys of chambers and the alignment of the confinement dykes and drainage channels as they are finalised and established in the field. The detailed field surveys are on-going at the time of this report.

8.2 Cost Estimates for Environmental Management Plan (EMP) Components

Total EMP cost is estimated to be Tk. 9.08 million. About 68 percent (Tk. 6.06 million) of the total costs will be spent directly by NERP, and the remaining amount (Tk. 3.02 million) is included in the bid prices. A specific breakdown of Environmental Management costs is contained in Annex B. The budget for the Enhanced Social and Gender Program has also been included in the EMP cost. A breakdown of the Enhanced Social and Gender costs is presented in Annex A.

Table 4: Pilot Project Cost Summary

Items	Sites	Cost	
		('000 Tk)	CAD ('000 $)
Construction of Confinement Chambers	Gazaria	2,605.10	89.83
	Kakailseo	953.75	32.89
Mobilisation and Demobilisation	Two Sites	14,411.75	496.96
Dredging of Kalni River and Filling of Confinement Chambers	Gazaria	20,553.00	708.72
	Kakailseo	14,304.89	493.27
Top Grading	Two Sites	333.00	11.48
Stand-by/Idle Period	10 days	228.00	7.86
Sub-Total		**53,389.49**	**1,841.01**
EMP	NERP Items	6,058.00	208.90
Total		**59,447.49**	**20,49.91**

ANNEX A

ENHANCED GENDER AND SOCIAL DEVELOPMENT PROGRAM

KALNI-KUSHIYARA PILOT DREDGING PROJECT

ANNEX A

ENHANCED GENDER AND SOCIAL DEVELOPMENT PROGRAM

As part of the NERP feasibility study in the Kalni-Kushiyara area, a pilot project was implemented in the river reach between Ajmiriganj and Kakailseo. The project consists of dredging river shoals and using the dredged spoil to extend village platforms in Kakailseo and Gazaria villages.

The intent of the project is to improve navigation in the river, to provide labour opportunities for women and landless groups of the area, to improve security of homesteads and to enhance quality of life for residents in the two villages. Following CIDA's mandate to target poor households and women, additional activities under the Enhanced Gender and Social Development Program were designed for these groups. This annex contains the rationale, the implementation strategy and the budget for the program.

A.1 Rationale

Socioeconomic Condition of Target Groups in the Pilot Dredging Area

In the Kalni-Kushiyara area, as in other parts of Bangladesh, women's social and economic roles are located within the family and the household. The system of *purdah*, which requires that women remained screened from men outside their family, and other prevailing socio-religious customs, dictate that women confine their activities to the household compound.

The lack of communication and the relative isolation of the Kalni-Kushiyara area appear to have reinforced traditional conservative attitudes towards women. The practice of *purdah*, which effectively restricts women's access to educational opportunities and employment in the public sphere, is rigorously applied in the project area, more so than in other areas of Bangladesh. The NERP socioeconomic study showed that women in target villages do not play an active role in decision-making on the village committees, and have no organisational forum.

In the project area, river and channel siltation has resulted in increasing flood severity and subsequent crop loss. Over the past five years repeated crop failure has resulted in the deterioration of economic conditions for small and middle-sized farmholders. Diminished agricultural labour opportunities have resulted in landless households resorting to a variety of alternate income-earning strategies, including the use of women's labour outside the household.

In the past five years, women of the project area have increasingly engaged in public-sphere labour activities in both the agricultural and the non-agricultural sectors. This practice occurs locally and in distant centres and participation in these sectors is undertaken individually and as members of labour groups, by both male and female-heads (de-facto, destitute) of households. The socioeconomic study indicated that in 1994 and 1995 some 400 to 600 women worked in informal labour groups in agricultural and construction work in the area. Women have also migrated to Sylhet, Dhaka, Comilla, Mymensingh and Chittagong for seasonal employment.

In other areas of Bangladesh, NGOs have successfully targeted men and women of landless households. Such development efforts are notably absent in the Kalni-Kushiyara area. There are no programs in education, credit or income-earning activities. Large development NGOs such as Bangladesh Rural Advancement Committee (BRAC) and Proshika have virtually withdrawn their

presence. Organisations like the Grameen Bank, which runs successful programs for rural women in other parts of the country, are not active here. Semi-governmental institutions such as the Bangladesh Rural Development Board (BRDB) have only limited programs in the area.

Project Intervention

Extending village platforms in Kakailseo and Gazaria will require the construction of earthen dykes for the containment of dredged river spoils. A large amount of manual labour (ranging from 500 - 1200 persons) will be required to cut earth from inside the disposal chamber and move it by head load for use in the construction of the dyke walls. The local firm engaged for dredging and the construction of disposal chambers is contractually obliged to hire local labour to the maximum extent possible. Of the total local work force to be engaged, 20 percent shall be women.

Once the platforms are built and finished with protective turf, village committees will be responsible for preventative maintenance and repair of the platform. Male COs have been working for the past year to develop village committees in the pilot villages. Work with these committees will be intensified over the next year with the intent to create village institutions capable of planning improved homestead development on the expanded space and maintaining the platforms.

For example, families without flood-proof homestead land will be settled by the village committees on the new platform. In Kakailseo, eight households owning neither homestead nor cultivatable land will be provided with housing assistance, tubewells and latrines. In Gazaria, 12 families without homesteads will be resettled. The village committees will be responsible for the planning and resettlement activities.

The effectiveness of the village committee in providing long-term maintenance is considered to be the critical component in platform sustainablity. Women in riverine communities have traditionally been responsible for the earth repair works needed on houses and compound platforms following the monsoon flood. Therefore, the formation and development of women's committees is believed to be an important untapped element in sustainable platform maintenance. It is hoped that the involvement of female Community Organisers (COs) will serve to enhance the role of women in platform maintenance and bring essential gender issues into focus for the larger feasibility study.

Enhanced Gender and Social Components

The experience of other aid agencies in Bangladesh, such as the Rural Employment Strategy Program (RESP), have shown that specific project interventions are needed to ensure that women are paid fair labour rates by local Union Council Chairmen and contractors. Other gender-orientated interventions include the provision of sanitation facilities and women's protection on labour sites. According to information from the Rural Maintenance Program (RMP), long-term benefits can be provided to landless women through the development of groups, the introduction of a savings routine and the promotion of income generating activities.

The pilot project provides an ideal opportunity for introducing an Enhanced Social and Gender Program into the Kalni-Kushiyara area. Using women's labour groups for the construction of the disposal chambers and providing women's organisational structures for maintenance of the village platforms provides an excellent opportunity to begin working with women in the area. NERP field staff will work with an estimated 15 - 25 women's labour groups, in the vicinity of the two

construction sites. It is hoped that once NERP begins activities aimed at development for women and the poor, other organisation will expand into the area.

Field workers involved in both the pilot dredging project and the feasibility study will be responsible for data collection on two gender-related Important Environmental Components (IECs) that have initially been identified as:

- Women's deteriorating economic condition related to pre-monsoon floods, loss of agricultural production and erosion of villages;
- The capacity of riverine communities to utilise women's organisational structures in village platform maintenance.

An appropriate study design for these IECs will be prepared by the social staff.

It is believed that men of the village committees will listen to women's ideas on platform repair and plantation once women are organised into formal village groups. Men from village committees, along with local Chairmen and members will be provided with basic gender training to enhance their understanding of women's role in community development. Male CO's, trained in basic gender concepts, are responsible to educate and support local men.

Using the knowledge and skills developed from working with village groups in the pilot project area, women's groups will be created in the Kashimpur Fish Pass area. Using gender-specific group formation, various income-earning activities will be identified with these groups. Work with Kashimpur women's groups will be conducted by the Fish Pass CO team with the help of the pilot-project team.

A.2 Implementation Strategy

Staff Training

In order to implement the Enhanced Social and Gender component in 12 months, NERP field workers will require many different skills. Two formal training sessions, as well as on-the-job training will be provided to equip COs with the communication techniques and group methodologies required to serve the needs of women, landless and village committees. The NERP social team in collaboration with an external agency will conduct this training.

Six COs (three female and three male) have been assigned to work in the field. In addition, two staff members were assigned from the Dhaka office for field supervision, on-the-job training, documentation and logistical management. Staffing of the pilot program and the feasibility study will be monitored and adjusted according to demand.

All social staff on the pilot project will be trained in gender, community development and field research techniques. USHA, an NGO that provides gender awareness, communication and women's group formation skills, have begun activities in the project area. The first training emphasised 'Gender in Community Development' and was provided for COs and CONCERN field workers. A second session of field-based training is planned for union-level officials, village-based committees and COs working with village groups.

NERP's professional and technical staff will be trained in Gender Analysis and Communication in sessions to be held in Dhaka. This is considered essential to generate the organisational support required for the success of a gender component in a project such as NERP.

Accommodation for female staff of the pilot project has been rented in Kakailseo, providing easy access to Ajmiriganj, Kakailseo, Gazaria and surrounding villages. Female staff of the feasibility study team are based at the Kakailseo house and have accommodation at temporary sites as required. Female staff contribute to house rent from their living allowance, in order to equalise the working conditions set for male COs.

Some costs for the female staff house will be paid from the Enhanced Social and Gender budget. Such costs include the provision of a tubewell, latrine, basic furnishings and a portion of the house rent. Considerable supervision and support is required for female staff stationed in this isolated region of Bangladesh. NERP's female social staff will use the house on field visits.

In order to complete the work in time, field teams for the pilot project and the feasibility study will be provided with three engine boats, to be leased as required. The boats will be shared by the social team working on the river.

Role of Field Staff

Female CO's will work at construction sites with the women's labour groups. The COs will teach earth measurements for wage calculations and up-date work techniques. Group solidarity and leadership will be encouraged. Discussions will include motivation for women's savings from wages earned during the construction period and planning for income-generating activities. Women's labour groups will be trained in specific construction tasks or work routines required of them at the site when necessary.

Social staff will facilitate effective working relationships between labour groups and the contractor. Observation and verification of wage payments will take place at the construction sites to ensure fair payment. Past practices of the local Chairmen supplying labour to contractors for a share of their earnings will be discouraged. The CO staff will act as mediators between the contractor and all local labour groups.

Following the construction period and throughout the monitoring period, COs will work with the women's labour groups to refine their formation, leadership and awareness of gender issues. Savings will be encouraged, and various income-earning options will be explored. It is anticipated that duck-rearing will be a particularly suitable activity for women in riverine communities. Appropriate training and procurement of vaccines will be arranged either through BRAC at their Markuli station or Friends in Village Development in Bangladesh (FIVDB) in Sylhet.

Women participating in labour and beneficiary groups will be given a production grant, or premium, to fund income generating activities of their choice. The premium will be based on a percentage of their earnings on the construction sites and/or on their savings. Funds will be held for the group women and made available to them when they have made an investment plan. Women will be taught and assisted to open individual and/or group bank accounts.

CO staff will help to form women's beneficiary groups in Kakailseo and Gazaria. Such gender-specific groups will serve as a forum for women's participation in decision-making about village platform maintenance. The groups will be encouraged and trained in:

- nursery establishment for flood-tolerant vegetation,
- composting techniques to improve kitchen gardens on the expanded platform,
- sanitation education and the importance of the use of clean water,
- the value of individual and group savings and
- group income-generating activities.

Building Area Sustainability

During the course of the pilot project, efforts will be made to establish and assess *thana*-based committees to serve in an institutional capacity for the Kalni-Kushiyara area. *Thana*-level officers in agriculture, cooperatives and family planning will be invited to participate in village-level training.

The capacity of relevant NGOs will be reviewed to determine their potential for a role in programs that would ultimately support platform sustainability. CONCERN and BRAC are presently the only NGOs with activities in the pilot project area. CONCERN is located in Gazaria and has one male field worker serving Gazaria Village. CONCERN's programming in Gazaria includes children's education and the formation of groups for women in households with landholdings under 1.5 acres. Other areas of common programming interest in Gazaria, include CONCERN's work with flood-tolerant tree plantation, and an improved latrine design for flood conditions.

NERP anticipates working with CONCERN in erosion protection and plantation. Depending on CONCERN's capacity to assign female field workers to Gazaria and their programs for village women's groups, NERP anticipates further collaboration with CONCERN in nursery plantation, village training, women's group formation, training of female field workers, latrine distribution and hygiene education.

BRAC is located in Ajmiriganj Thana. They are running an immunisation program and a brood duck farm at Markuli. NERP and BRAC will explore the possibility of collaboration for the extension of BRAC's immunisation program to women's groups to be formed in the area. In addition, training in duck rearing and immunisation will be sought from BRAC, if the women's groups choose such activities.

A savings and loan program is believed to be a suitable intervention for meeting the needs of women and landless in the pilot project area,. NERP will seek the involvement of such credit-orientated institutions as the Grameen Bank for long-term support for groups involved in the pilot project.

Project Supervision, Management and Monitoring

Implementation of the gender and social program will be done through collaborative teams, involving NERP staff from Dhaka, NERP field staff and CONCERN. The possibility of participation of other gender-orientated NGO's as advisory groups and monitors for NERP's gender component is being explored.

Further on-the-job training in gender and community development will be provided by senior staff. Staff meetings to review progress and 'lessons learned' will continue be held on a regular monthly basis.

The evaluation of the enhanced gender and social component will be done as part of the Kalni-Kushiyara feasibility study in the form of 'lessons learned'.

Work Plan

a) **October** - female CO staff deputed to the area, field orientation for female staff: arrangement for housing for female staff and leased engine boats.

b) **November** - Gender and Community Development training (1st Phase) for all COs and appropriate CONCERN staff; development of integrated field teams; liaison with engineering staff and Kakailseo community for final chamber design; preliminary identification of gender-related IECs and design of appropriate studies; initial discussions with pilot project labour contractor; identification and initial discussions with women's labour groups in the area of Kakailseo; identification and initial discussion with the Kakailseo women's beneficiary groups; identification of CONCERN's women's groups in Gazaria and mapping for remaining women's groups; data gathering and discussion on platform maintenance methods with Village Committees in Kakailseo and Gazaria.

c) **December** - liaison with engineering staff and Gazaria community for final chamber design; village-wide training for platform maintenance and plantation for women's and men's beneficiary groups in Kakailseo and Gazaria involving CONCERN Kaliajuri; ensure timely provision of erosion protection trees; monitoring of female labour groups at the Kakailseo site; meetings with the Kakailseo Village women's groups; discussions with women's labour groups in the area of Gazaria; identification and initial discussions with Gazaria women's beneficiary groups; discussion with CONCERN/ Dhaka/ Itna regarding platform maintenance program for all women's groups in Gazaria; begin meeting with local *thana* committee (where possible involve members in village-based work).

d) **January** - plantation of erosion protection trees in Kakailseo and Gazaria; monitoring of female labour groups at the Gazaria site; meetings with the Gazaria women's beneficiary groups; continuing meetings with the Kakailseo labour groups and the Kakailseo women's beneficiary groups; Gender and Community Development training (2nd Phase in Ajmiriganj); kitchen gardening and compost training for all women's groups; prepare first set of Working Papers (lessons learned on women's group formation, numbers, location and development, progress of Village Committees, gender-related IECs).

e) **February** - activities continue as above; complete wave protection plantation at Kakailseo and Gazaria; explore demand for literacy and numeric basic education; discussion of savings in women's groups; Gender Training for village men's committees; develop appropriate training and promotion materials for non-literate village participants.

f) **March** - continue as above; begin discussion of CONCERN's material on sanitation and water; explore possibilities of tubewell and latrine design/ distribution.

g) **April** - continue as above; training Village Committees and women's beneficiary groups on sodding and embankment plantation for finished village sites; prepare 2nd Working Paper of gender-related IECs.

h) **May** - continue as above; if advisable, complete sodding and embankment plantation for finished village sites; implement the premium and income generating program, with management plan and strategy; begin training in duck hatching and immunisation (using either BRAC in Markuli or FIVDB in Sylhet).

i) **June** - continue as above;

j) **July** - continue all women's meetings as flood conditions permit; monitor platform conditions in flood; prepare 3rd Working Paper of gender-related IECs.

k) **August** - continue as above; de-mobilise non-essential field staff; prepare detailed profiles on platform conditions during flood; prepare Draft Feasibility Study report.

l) **September** - continue as above;

m) **October** - intensify all women's group meetings; involve Thana Committee members; prepare 4th Working Paper of gender-related IECs.

n) **November** - withdraw front-line activities with women's groups; leave any available support systems in place; supervise and support Thana Committee's involvement with Women's Groups; discuss any possible hand-over work plan with CONCERN or any other suitable NGO.

o) **December** - demobilise all field staff; prepare final report Enhanced Social and Gender Component as part of Feasibility Study.

A.3 Budget for Enhanced Program

The budget for the social and gender components of the Pilot Dredging and Construction of Village Platforms is estimated at Tk 2,735,350. These funds have been provided for in the overall budget of $Cdn 2.1 million, allocated for dredging and construction of village platforms.

A. Local level institutional strengthening

1. Form *Thana* Committee to elicit support for NERP activities

   - Start advocacy meetings
   - Form two committees
   - Organise two Public Consultation Meetings — 20,000

2. Train local administration and Beneficiary Committees on Gender in Community Development

   - 2 Trainers @3,000 each x 4 days — 24,000
   - Food — 8,000
   - Logistics — 2,000

Sub-total for A — **54,000**

B. Start-up for women's activities

1. Housing for female field staff		
House rent for 12 months, Kakailseo Village; a portion will be paid by the female COs posted to the dredging project		7,200
2. Staff Salary - Kakailseo Guest House		
- Night Guard for 12 months	@Tk.1800/month	21,600
- Cook for 12 months	@Tk.1000/month	12,000
3. Tubewell, latrine, kitchen and bathroom		
- Temporary kitchen construction		3,000
- Temporary bathroom construction		2,500
- White wash inside of the house		2,000
- Tubewell installation and cleaning		7,000
- Water seal latrine sinking		2,500
4. Furniture and fixtures		
- Wooden cots(4)	@ Tk.750	3,000
- Bedding sets(4)	@ Tk.2,000	8,000
- Camp cots(2) with bedding	@ Tk.4,500	9,000
- Clothes racks(3)	@ Tk.500	1,500
- Steel almirah(1)	@ Tk.6,000	6,000
- Meat safe(1)	@ Tk.1,200	1,200
- Writing tables(3)	@ Tk.500	1,500
- Dining table(1)	@ Tk.1,500	1,500
- Wooden chairs(9)	@ Tk.400	3,600
- Wooden table(1) for kitchen	@ Tk.600	600
- Side tables(3)	@ Tk.400	1,200
- Wooden bench(2)	@ Tk.1,000	2,000
- Bamboo racks(3)	@ Tk.350	1,050
- Curtains for Office		1,200
- Partex Board for Office		1,200
- Utensils for Kitchen		5,000
5. Boat Transport for Field Work		
- 2 Engine Boats (1 for 12 months for dredging and 1 for 8 months for feasibility)		180,000
	Sub total for B	**285,350**

C. NERP staff training on gender and community development

1. Training for social-sector team (COs, senior social staff) in Dhaka

- Trainers' fees@ Tk.3,000 per day (2 trainers for 5 days, 1 for 4 days)	42,000
- Logistics	6,000
- Food	12,000
- Facility renting	12,000

2. Training for the same group on applied use of gender concepts to be held in Ajmiriganj.

- Trainers' fees @Tk.3,000 per day (3 Trainers for 5 days)	45,000
- Logistics	3,000
- Food	10,000
- Facility renting	1,000

3. Training for the multi-disciplinary team of NERP will be held in Dhaka in 3 batches.

- Trainers' fees @Tk.3,000 (2 Trainers for 8 days)	48,000
- Logistics	10,000
- Food	15,000
- Facility Renting	24,000

Sub-total for C **228,000**

D. Women's labour groups

400 women will be organised in 20 groups for gender awarness training and income generation activities in Pilot Dredging (Kakailseo and Gazaria) and Kashimpur fish pass projects.

1. Train groups on earth cutting measurement, group dynamics and leadership through meetings facilitated by the female COs.

2. Travel for 30 women group leaders for 5 days estimated at Taka 1800 per women 54,000

3. Train groups on income generating projects using relevant trainers from FIVDB, BRAC or other NGOs (1 Trainer for 20 days) @Tk.2,500 per day 50,000

4. Support 400 group members with a lump sum premium from NERP to undertake income generating activities (IGA's) (Tk.600 X 400) 240,000

Sub-total for D **344,000**

E. Platform beneficiary women's groups

1. Train platform beneficiary women (BW) for their roles in platform protection. COs will act as group facilitator. Refreshment cost:		3,000
2. Train BW on long and short-term protection techniques (1 CONCERN Trainer for plantation and protection training for short-term. NERP Biologist will impart training on long-term protection). Four training sessions @Tk.2,500 per day for 6 days + Refreshment cost		18,000
3. Train BW groups on nursery development; NERP agronomist and biologist will train		3,000
4. Support BW groups to start 8 community nurseries @Tk.3,000		24,000
5. Train BW groups on feasible IGAs. FIVDB or other NGO Trainers will be hired @Tk.2,500 (for 6 days)		15,000
6. Raise awareness of BW groups on sanitation, hygiene and nutrition. COs will train beneficiary women in this regard. Refreshment cost:		3,000
	Sub total for E	**66,000**

F. Settlement of people on new village platforms

1. Housing - 20 Temporary houses	@Tk.8.000	160,000
2. Tube-wells - 6	@Tk.8,000	48,000
3. Latrines -110 in Gazaria and 10 in Kakailseo	@Tk.500	60,000
	Sub total for F	**268,000**

G. Platform protection activities

Saplings for plantation (5000)	@Tk.5	25,000
Bamboo case to protect saplings (5000)	@Tk.10	50,000
Construction of *tarja* and *chailla* fence in Gazaria, calculated for 800 meters or 2500 feet	@Tk.8600/100 ft.	215,000
	Sub total for G	**290,000**

H. Production of video documentary

Scripting, filming and editing of 20 minute video documentary demonstrating the community's participation and the role of women in the pilot project. Three estimates for the production have been obtained; ranging between Tk. 800,000 and 1,200,000. Full tender will be conducted in January 1996. For the purposes of this estimate an amount of Tk. 1,200,000 has been budgeted

TOTALS:	A. Local Institution Strengthening	54,000
	B. Start-up Women's Activities	285,350
	C. NERP Staff Training on Gender + C.D.	228,000
	D. Women's Labour Groups	344,000
	E. Women's Platform Beneficiary Groups	66,000
	F. Homestead Settlement	268,000
	G. Platform Protection	290,000
	H. Production of Video Documentary	1,200,000
	Grand total	**2,735,350**

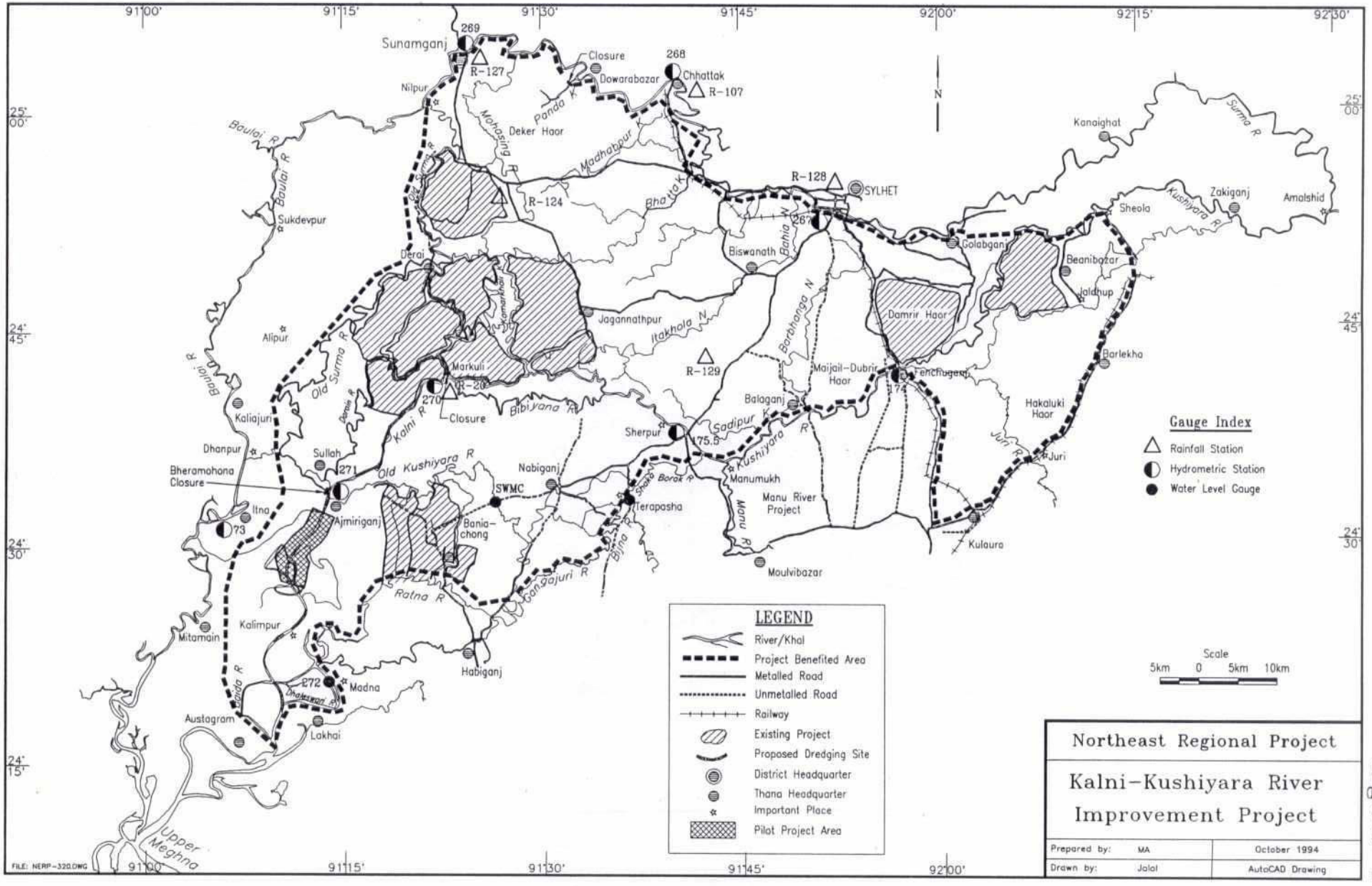
ANNEX B

ENVIRONMENTAL MANAGEMENT PLAN

(SEPARATE VOLUME)

ANNEX C

FIGURES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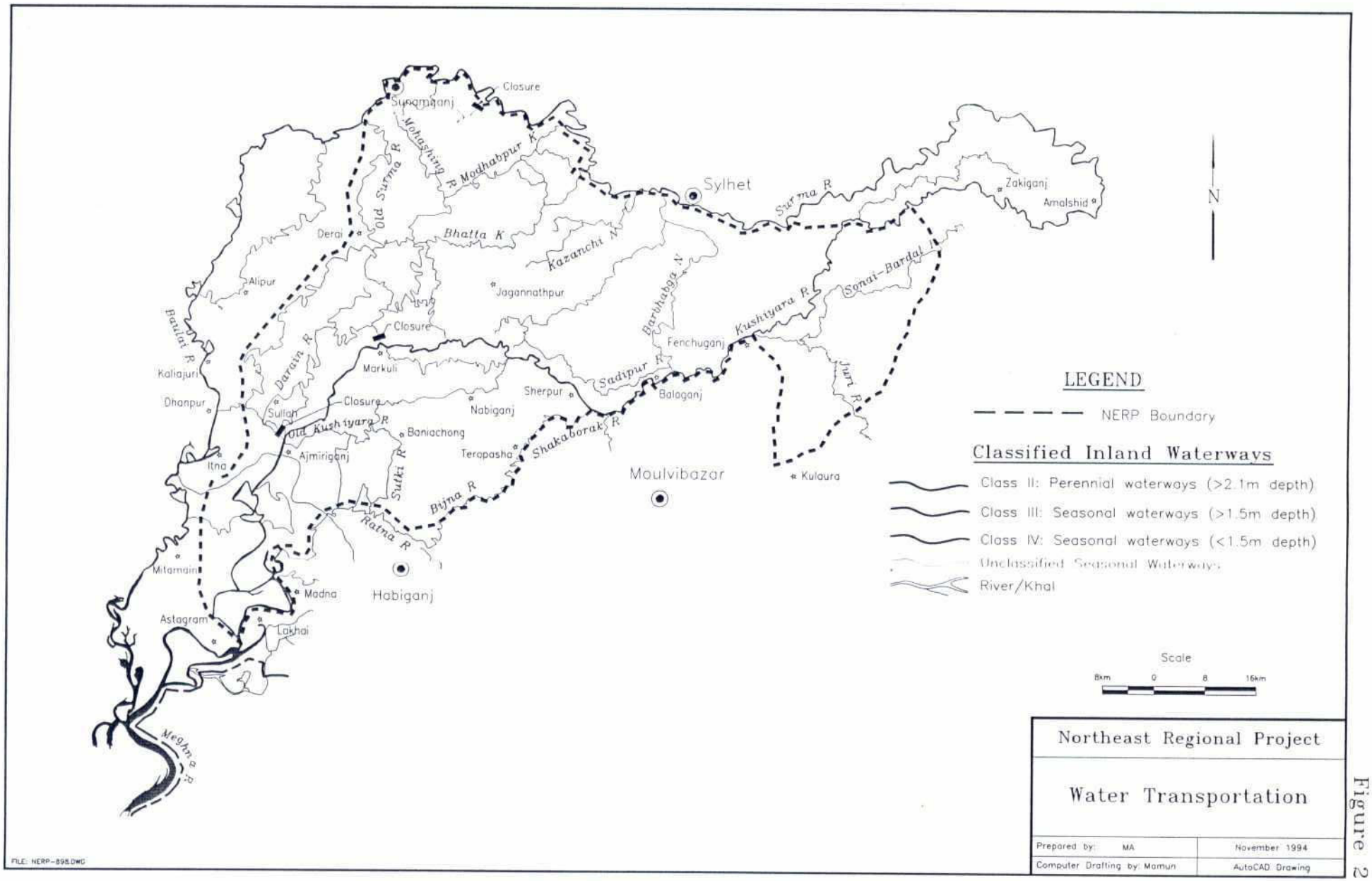
N
Sunamganj
269
R-127
Closure
Dowarabazar
268
Chhattak
R-107
Nilpur
Deker Haor
Mohasing R
Panda K
Madhabpur
Baulai R
Sukdevpur
R-124
Bhatia K
R-128
SYLHET
Kanaighat
Surma R
Zakiganj
Amalshid
Sheola
Kushiyara R
Golabganj
Biswanath
Bahia N
267
Beanibazar
Jaldhup
Derai
Jagannathpur
Itakhola N
Damrir Haor
Barbhanga N
Alipur
Old Surma R
Markuli
R-20
R-129
Maijail-Dubrir Haor
Fenchuganj
Barlekha
Kaliajuri
270
Closure
Kalni R
Bibiyana R
Balaganj
Sadipur K
Hakaluki Haor
Dhanpur
Sherpur
175.5
Kushiyara R
Juri R
Juri
Sullah
271
Old Kushiyara R
Bheramohana Closure
Nabiganj
SWMC
Manumukh
Itna
73
Ajmiriganj
Bania-chong
Terapasha
Manu River Project
Kulaura
Moulvibazar
Ratna R
Ganagajuri R
Bijna K
Kalimpur
Mitamain
Habiganj
Madna
272
Austagram
Lakhai
Upper Meghna
Gauge Index
Rainfall Station
Hydrometric Station
Water Level Gauge
LEGEND
River/Khal
Project Benefited Area
Metalled Road
Unmetalled Road
Railway
Existing Project
Proposed Dredging Site
District Headquarter
Thana Headquarter
Important Place
Pilot Project Area
Scale
5km 0 5km 10km
Northeast Regional Project
Kalni-Kushiyara River Improvement Project
Prepared by: MA
October 1994
Drawn by: Jalal
AutoCAD Drawing
FILE: NERP-320.DWG

Figure 1


Sunamganj
Closure
Mohashing R
Madhabpur K
Sylhet
Surma R
Zakiganj
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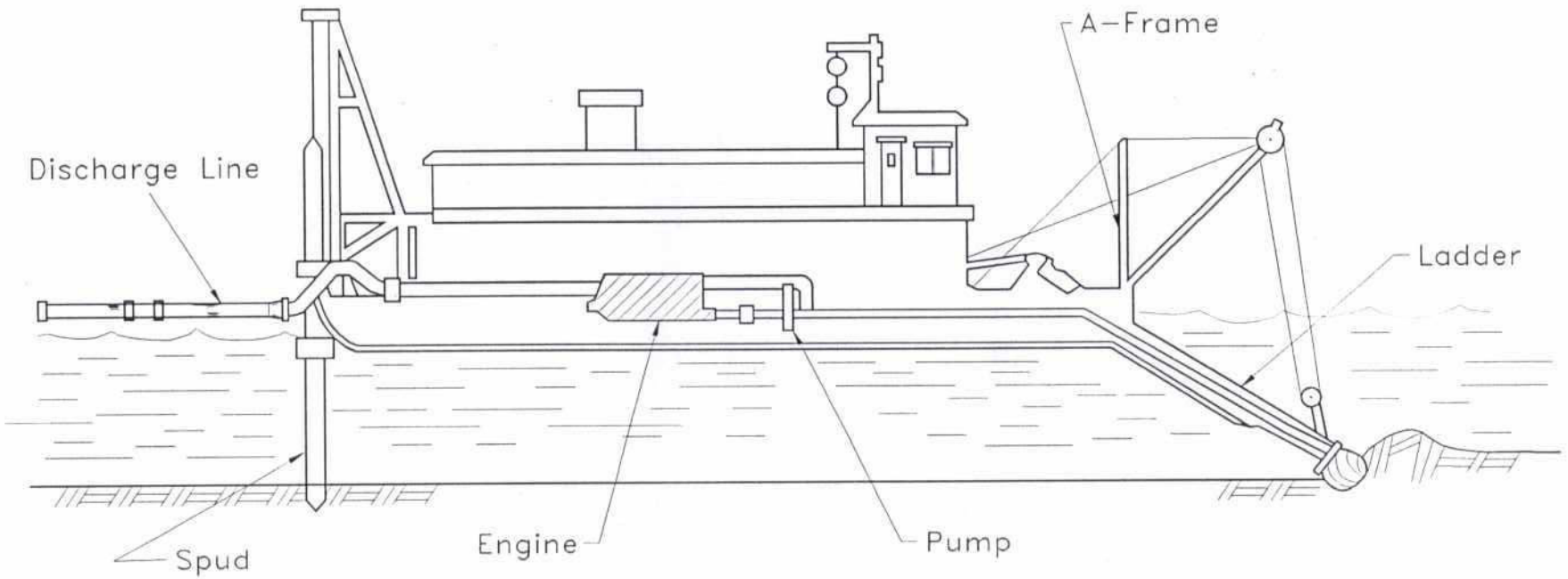
Old Surma R
Derai
Bhatta K
Kazanchi K
Alipur
Jagannathpur
Barbhatga K
Sonai-Bardal
Kushiyara R
Baulai R
Closure
Fenchuganj
Darain R
Markuli
Kaliajuri
Sadipur R
Jiri R
Dhanpur
Sherpur
Balaganj
Sullah
Closure
Nabiganj
Old Kushiyara R
Baniachong
Ajmiriganj
Itna
Terapasha
Shakaborak R
Sutki R
Bijna R
Moulvibazar
Kulaura
Ratna R
Habiganj
Mitamain
Madna
Astagram
Lakhai
Meghna R
LEGEND
NERP Boundary
Classified Inland Waterways
Class II: Perennial waterways (>2.1m depth)
Class III: Seasonal waterways (>1.5m depth)
Class IV: Seasonal waterways (<1.5m depth)
Unclassified Seasonal Waterways
River/Khal
Scale
8km 0 8 16km
Northeast Regional Project
Water Transportation
Prepared by: MA
November 1994
Computer Drafting by: Mamun
AutoCAD Drawing
FILE: NERP-B98.DWG

Figure 2

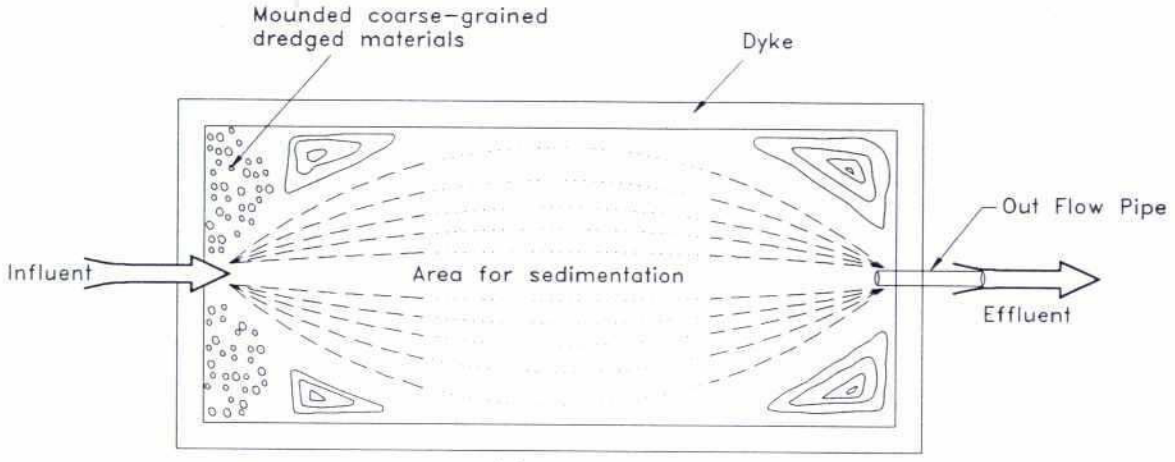


Northeast Regional Project	
Sketch of Hydraulic Pipeline Dredge	
Prepared by: DMc	November 1994
Computer Drafting by: Jalal	AutoCAD Drawing

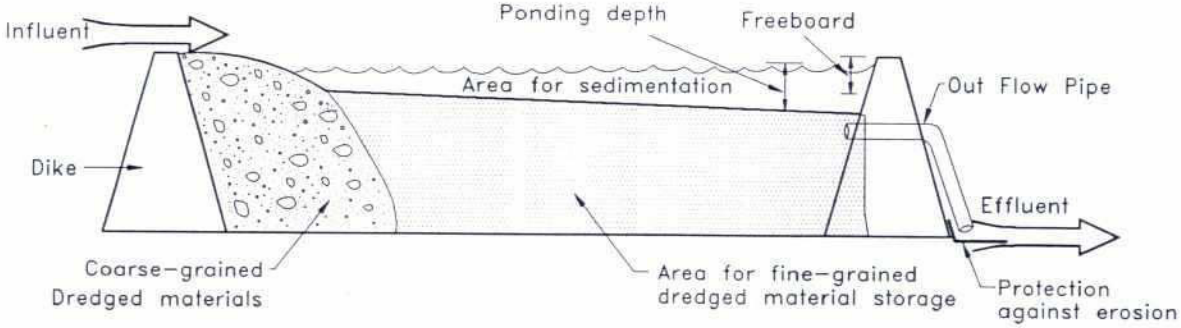
FILE: 1 DWG

Figure 3

Figure 4



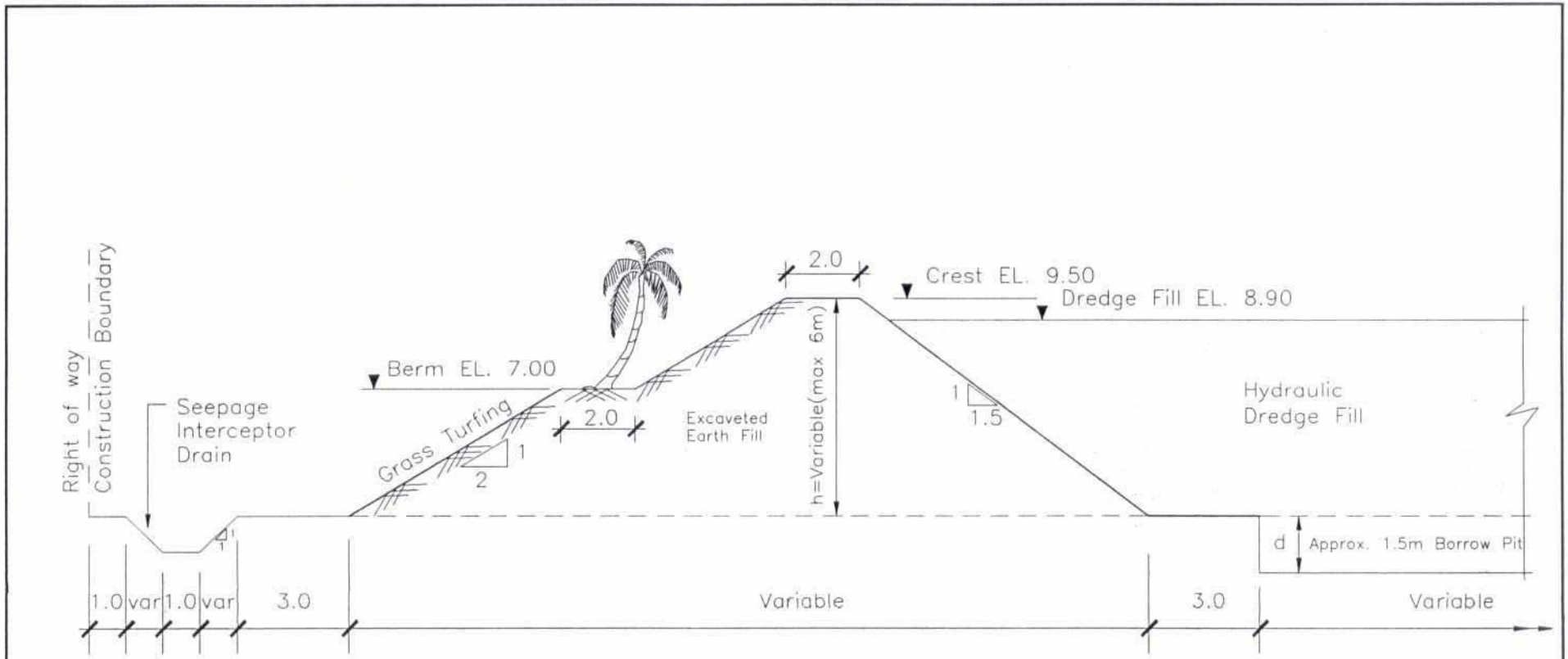
(a) PLAN



(b) CROSS SECTION

Northeast Regional Project	
Main Features of Confined Disposal Chamber	
Prepared by: DMc	November 1994
Computer Drafting by: Jalal	AutoCAD Drawing

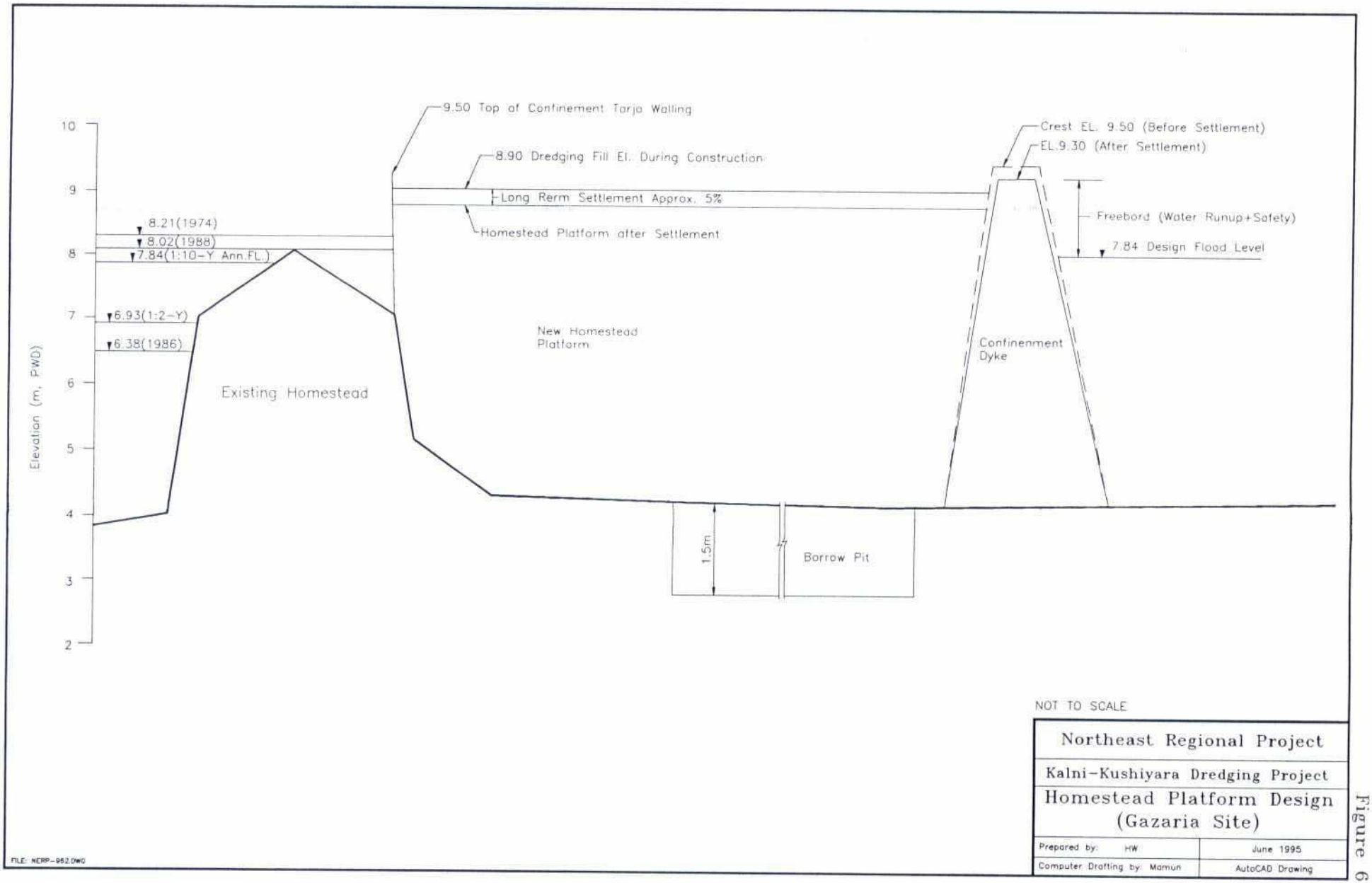
FILE: 2.DWG



Northeast Regional Project	
Kalni-Kushiyara Pilot Dredging Project	
Cross-Section of Confinement Dyke in Open Area	
Prepared by: HW	June. 1995
Computer Drafting by: Mamun	AutoCAD Drawing

FILE: NERP-954.DWG

Figure 5

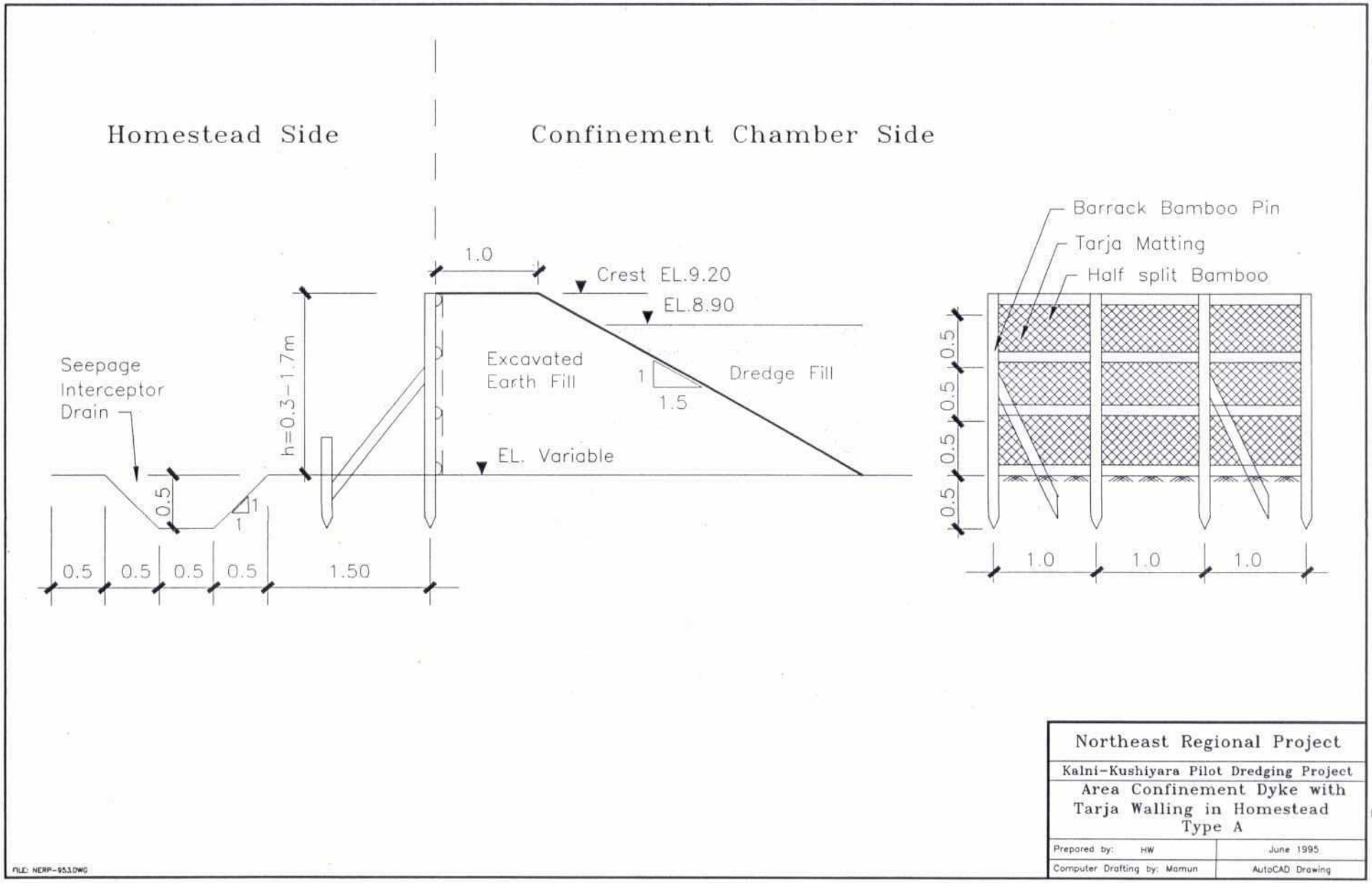


NOT TO SCALE

Northeast Regional Project	
Kalni-Kushiyara Dredging Project	
Homestead Platform Design (Gazaria Site)	
Prepared by: HW	June 1995
Computer Drafting by: Mamun	AutoCAD Drawing

FILE: NERP-952.DWG

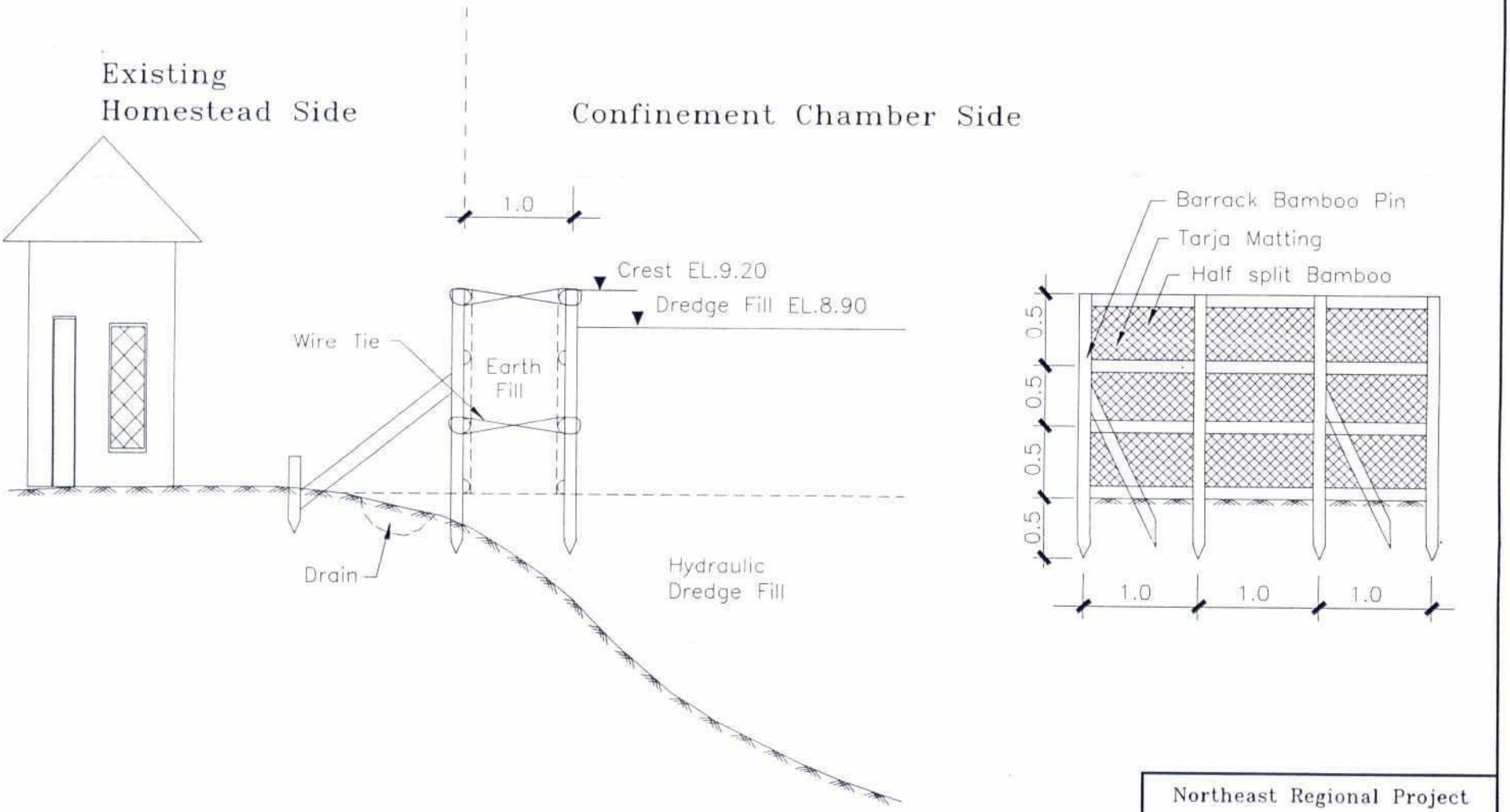
Figure 6



Northeast Regional Project	
Kalni-Kushiyara Pilot Dredging Project	
Area Confinement Dyke with Tarja Walling in Homestead Type A	
Prepared by: HW	June 1995
Computer Drafting by: Mamun	AutoCAD Drawing

FILE: NERP-953.DWG

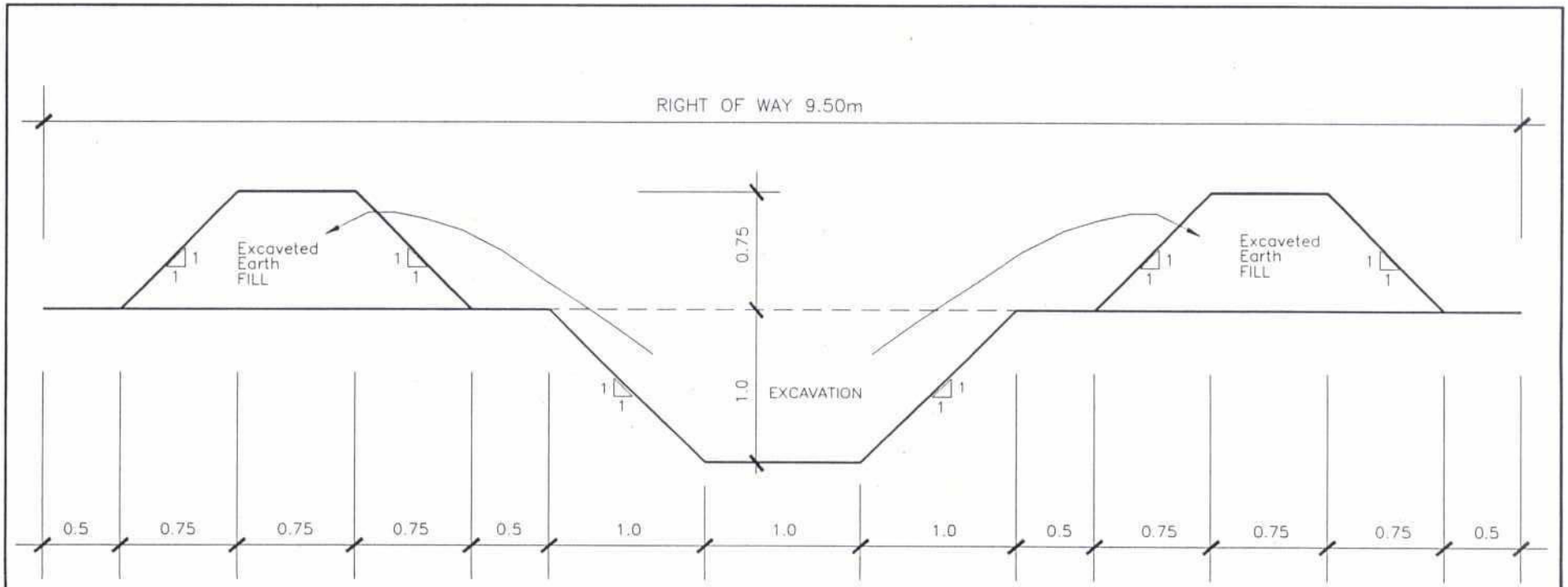
Figure 2



Northeast Regional Project	
Kalni-Kushiyara Pilot Dredging Project	
Area Confinement Dyke with Tarja Walling in Homestead Type B	
Prepared by: HW	June 1995
Computer Drafting by: Mamun	AutoCAD Drawing

FILE: NERP-957.DWG

Figure 8



Northeast Regional Project	
Kalni-Kushiyara Pilot Dredging Project	
Typical Section of Confinement Chamber Drainage Channel	
Prepared by: HW	June 1995
Computer Drafting by: Mamun	AutoCAD Drawing

FILE: NERP-955.DWG

Figure 9

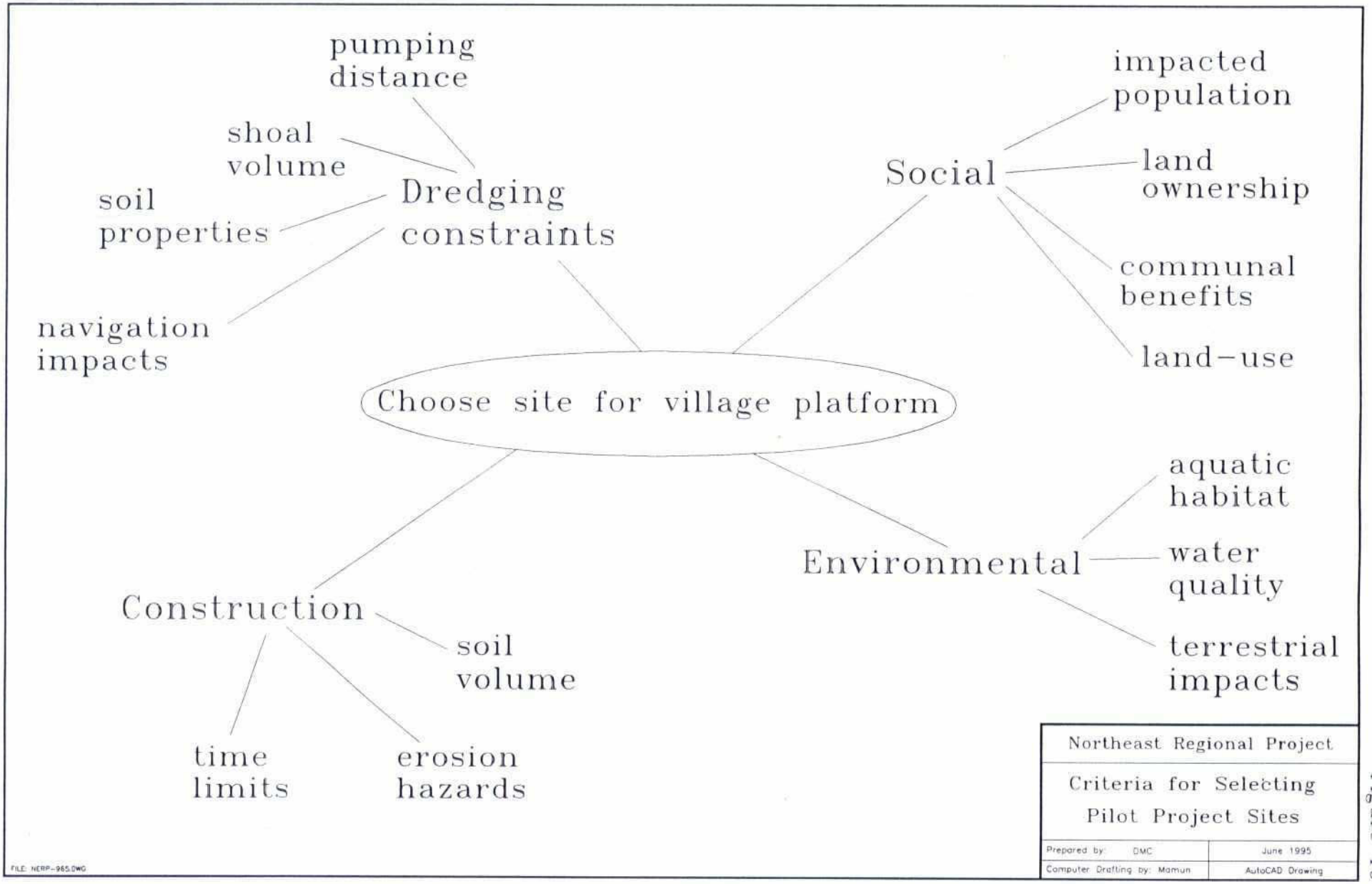
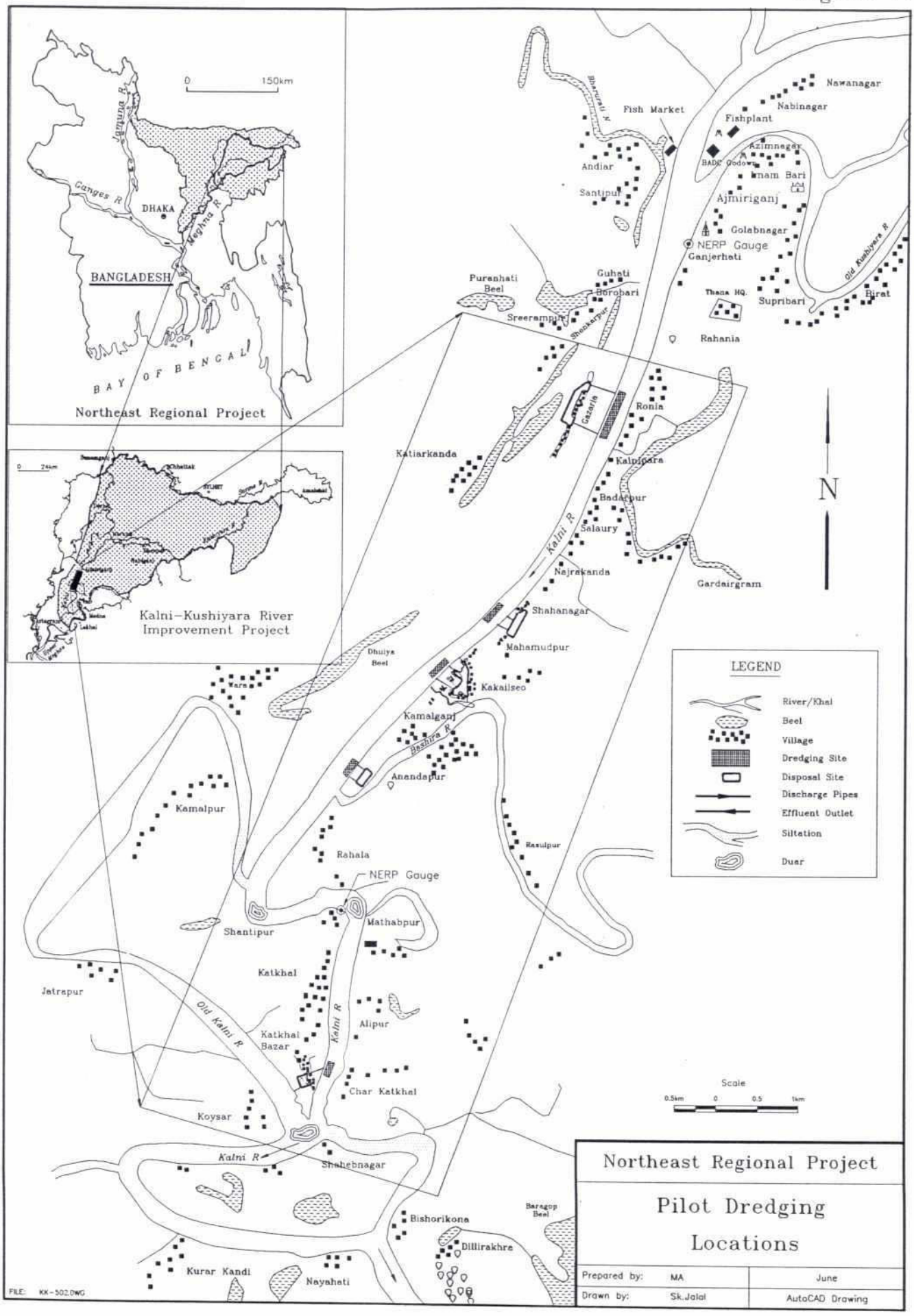
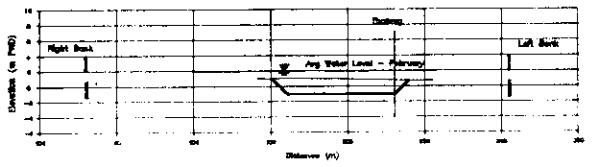

pumping distance
shoal volume
soil properties
Dredging constraints
navigation impacts
impacted population
Social
land ownership
communal benefits
land-use
Choose site for village platform
aquatic habitat
Environmental
water quality
terrestrial impacts
Construction
soil volume
time limits
erosion hazards
FILE: NERP-965.DWG
Northeast Regional Project
Criteria for Selecting Pilot Project Sites
Prepared by: DMC
June 1995
Computer Drafting by: Mamun
AutoCAD Drawing

Figure 10

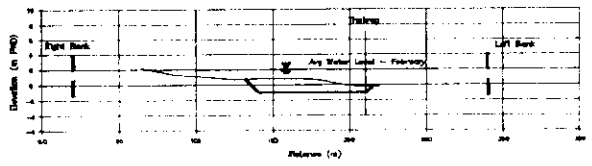
Figure 11


0 150km
Jamuna R.
Ganges R.
DHAKA
Meghna R.
BANGLADESH
BAY OF BENGAL
Northeast Regional Project
Kalni-Kushiyara River Improvement Project
Nawanagar
Nabinagar
Fishplant
Fish Market
Bhogirati R.
Andiar
Santipur
Azimnagar
BADC Godown
Imam Bari
Ajmiriganj
Golabnagar
NERP Gauge
Ganjerhati
Old Kushiyara R.
Puranhati Beel
Guhati
Borobari
Sreerampur
Shankarpur
Thana HQ.
Supribari
Birat
Rahania
Ronia
Gazaria
Katiarkanda
Kalpipara
Badarpur
Salaury
Kalni R.
Najrakanda
Gardairgram
Shahanagar
Mahamudpur
Dhuiya Beel
Kakailseo
Kamalganj
Beshira R.
Anandapur
Kamalpur
Rahala
NERP Gauge
Rasulpur
Shantipur
Mathabpur
Katkhal
Jatrapur
Old Kalni R.
Katkhal Bazar
Kalni R.
Alipur
Char Katkhal
Koysar
Kalni R.
Shahebnagar
Bishorikona
Baragop Beel
Dillirakhre
Kurar Kandi
Nayahati
N
LEGEND
River/Khal
Beel
Village
Dredging Site
Disposal Site
Discharge Pipes
Effluent Outlet
Siltation
Duar
Scale
0.5km 0 0.5 1km
Northeast Regional Project
Pilot Dredging Locations
Prepared by: MA
June
Drawn by: Sk.Jalal
AutoCAD Drawing
FILE: KK-502.DWG

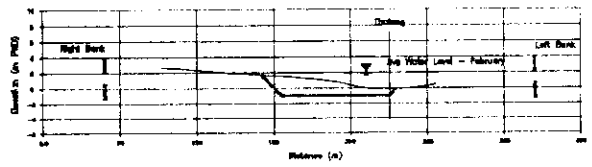
X-Sec. a-a



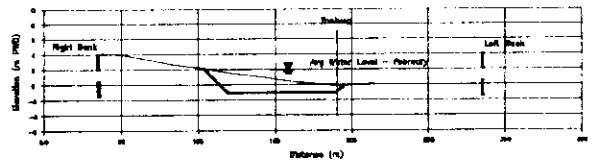
X-Sec. b-b



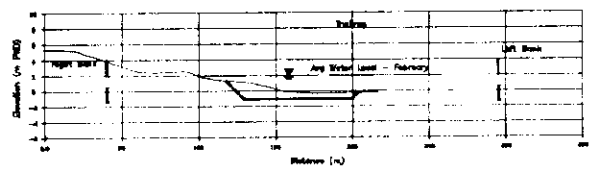
X-Sec. c-c



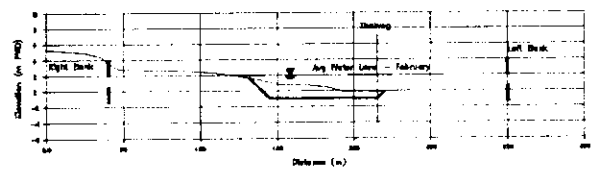
X-Sec. d-d



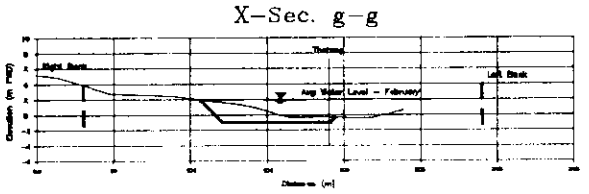
X-Sec. e-e



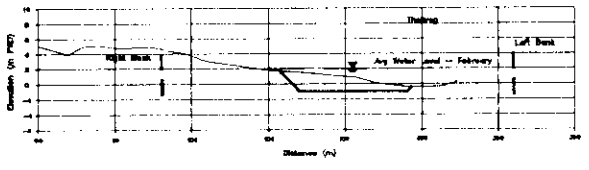
X-Sec. f-f



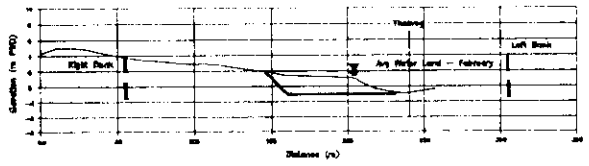
X-Sec. g-g



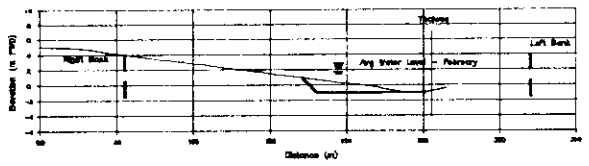
X-Sec. h-h



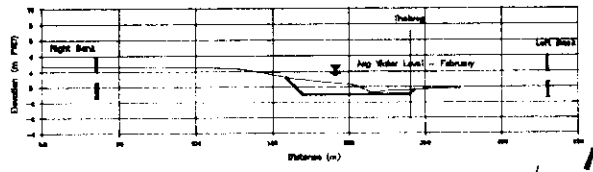
X-Sec. i-i



X-Sec. j-j



X-Sec. k-k



Thalweg

Dredged Area

Road

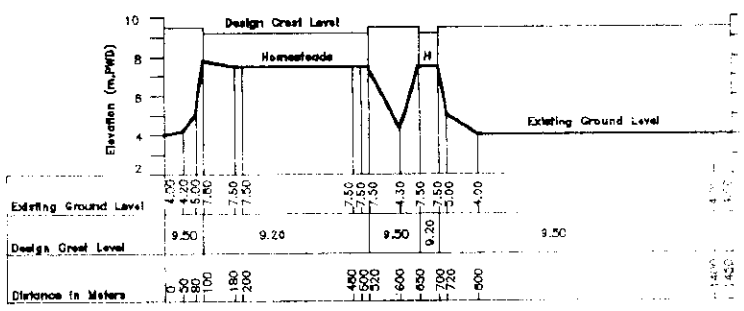
Road

Cemetary

Transverse Mercator Projection
1,000 Metre grid
Everest spheroid
Central meridian : 90° East Greenwich
Latitude of origin : 0° (the equator)
False Northing : 0 metres
False Easting : 500,000 metres
Scale factor at central meridian : 0.9998

LEGEND
- Homestead
- School
- Masque
- Mondir
- Bazar
- Left bank launch signal
- Right bank launch signal
- NERP Control Points
- Elevation mark
- Confinement Dyke - Earth Section
- Confinement Dyke with Tarja Walls
- Bank line as per NERP Surveys
- River Thalweg
- Drainage Channel
- Inflow Pipeline
- Topographic Line
- Dredged Area
- Spoil Disposal Area

Notes :
1.) Survey made in May 1995 by NERP River Morphology Team using an echo-sounder and GPS.
2.) This map should only be used as an approximation of the river's topography.
3.) All elevations are in metres PWD.
4.) Contour interval :
-for elevations >=-2 mPWD is 1 metre
-for elevations <-2 mPWD is 2 metre
5.) All cross sections view upstream.



Long Section of Confinement Dyke

PRELIMINARY CHART
NOT FOR CONSTRUCTION

SNC • LAVALIN International
Northwest Hydraulic Consultants Ltd.
EPC Ltd., BETS

KALNI-KUSHIYARA RIVER IMPROVEMENT PROJECT (500)
NORTHEAST REGIONAL PROJECT

Gazaria Pilot Dredging Site

HYDROGRAPHER	:	C.H.Wrzbo
DESIGNER	:	H. Warsalo
DRAWN	:	Mamun
SCALE	:	1:4,000
DATE	:	JUNE 1995
Dwg. No.	:	NERP/KK/DREDGE/GAZ-DRDG

TEAM LEDER
NERP

Figure 12

X-Sec. a-a

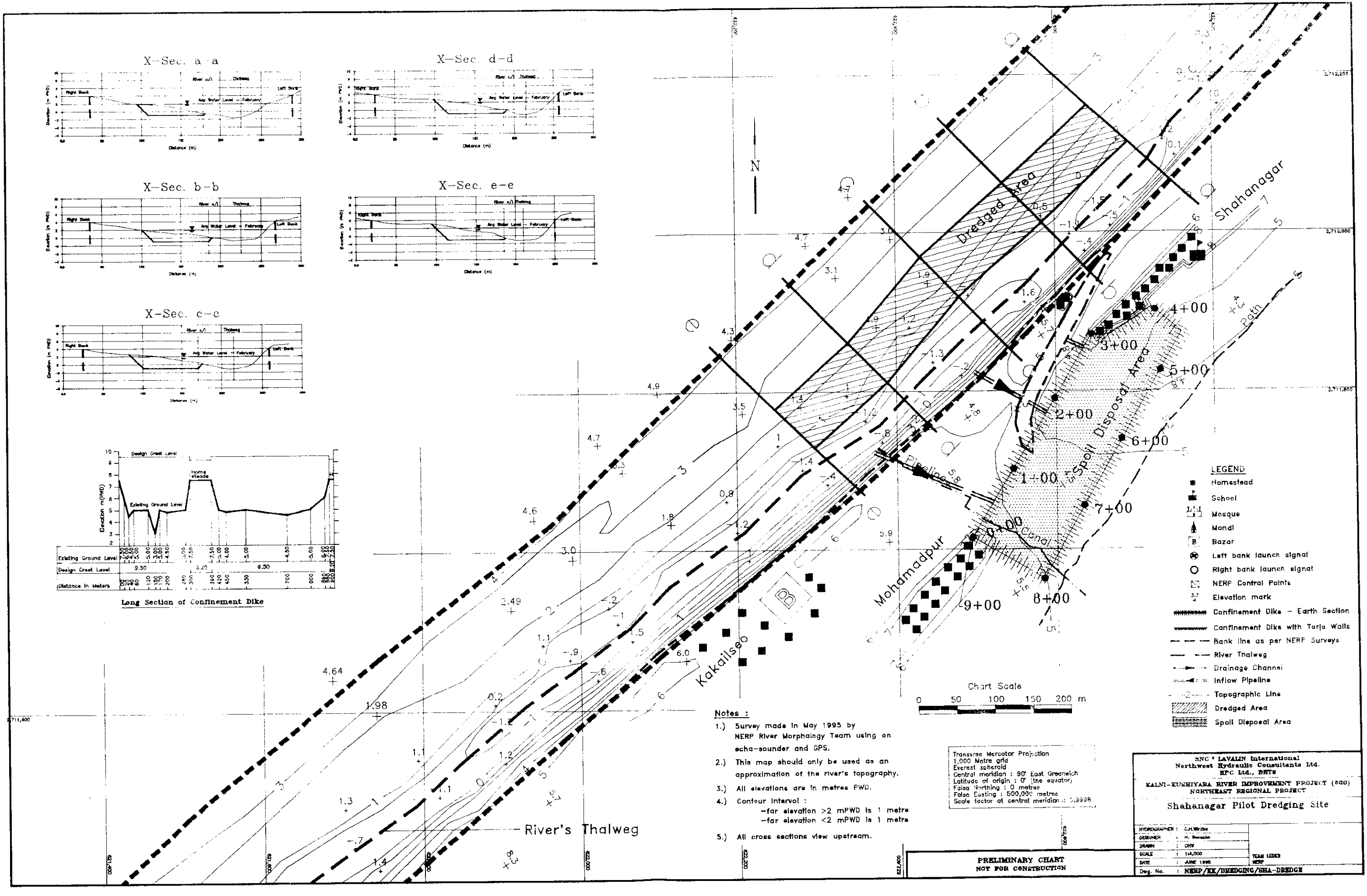
X-Sec. d-d

X-Sec. b-b

X-Sec. e-e

X-Sec. c-c

Long Section of Confinement Dike



Notes :

1.) Survey made in May 1995 by NERP River Morphology Team using an echo-sounder and GPS.

2.) This map should only be used as an approximation of the river's topography.

3.) All elevations are in metres PWD.

4.) Contour Interval :
- for elevation >2 mPWD is 1 metre
- for elevation <2 mPWD is 1 metre

5.) All cross sections view upstream.

Transverse Mercator Projection
1,000 Metre grid
Everest spheroid
Central meridian : 90° East Greenwich
Latitude of origin : 0° (the equator)
False Northing : 0 metres
False Easting : 500,000 metres
Scale factor at central meridian : 0.9996

PRELIMINARY CHART
NOT FOR CONSTRUCTION

SNC • LAVALIN International
Northwest Hydraulic Consultants Ltd.
KPC Ltd., BSTN

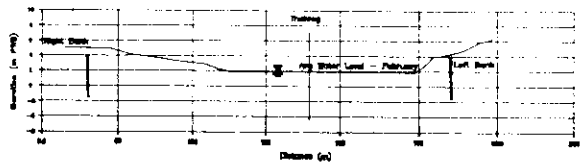
KALNI-KUSHIYARA RIVER IMPROVEMENT PROJECT (540)
NORTHEAST REGIONAL PROJECT

Shahanagar Pilot Dredging Site

HYDROGRAPHER	: C.H.Wiebe	
DESIGNER	: H. Yeracaris	
DRAWN	: CHW	
SCALE	: 1:4,000	TEAM LEADER
DATE	: JUNE 1995	NERP
Dwg. No.	: NERP/RK/DREDGING/SHA-DREDGE	

ALL VALUES ARE ELEVATIONS REFERENCED TO P.W.D. DATUM

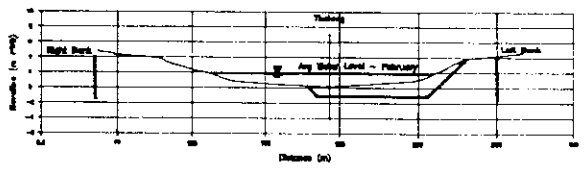
X-Sec. a-a



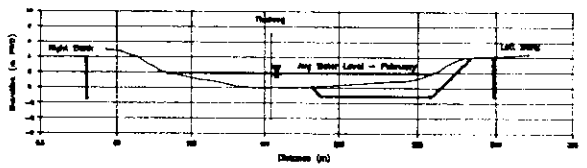
X-Sec. h-h

X-Sec. i-i

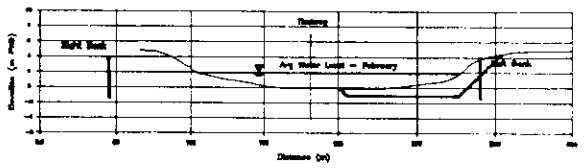
X-Sec. b-b



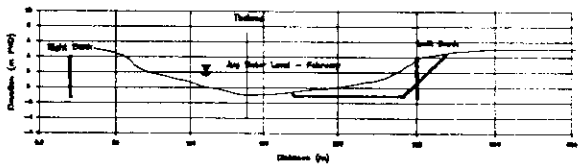
X-Sec. c-c



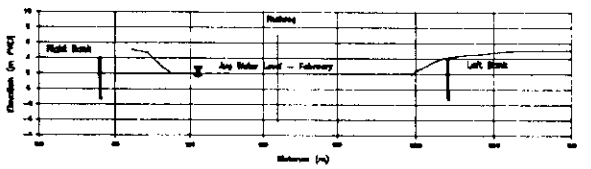
X-Sec. d-d



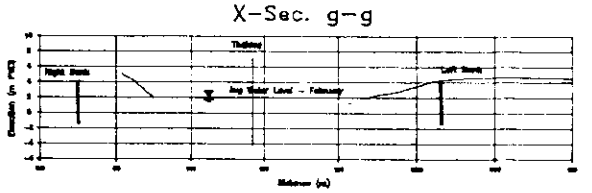
X-Sec. e-e



X-Sec. f-f

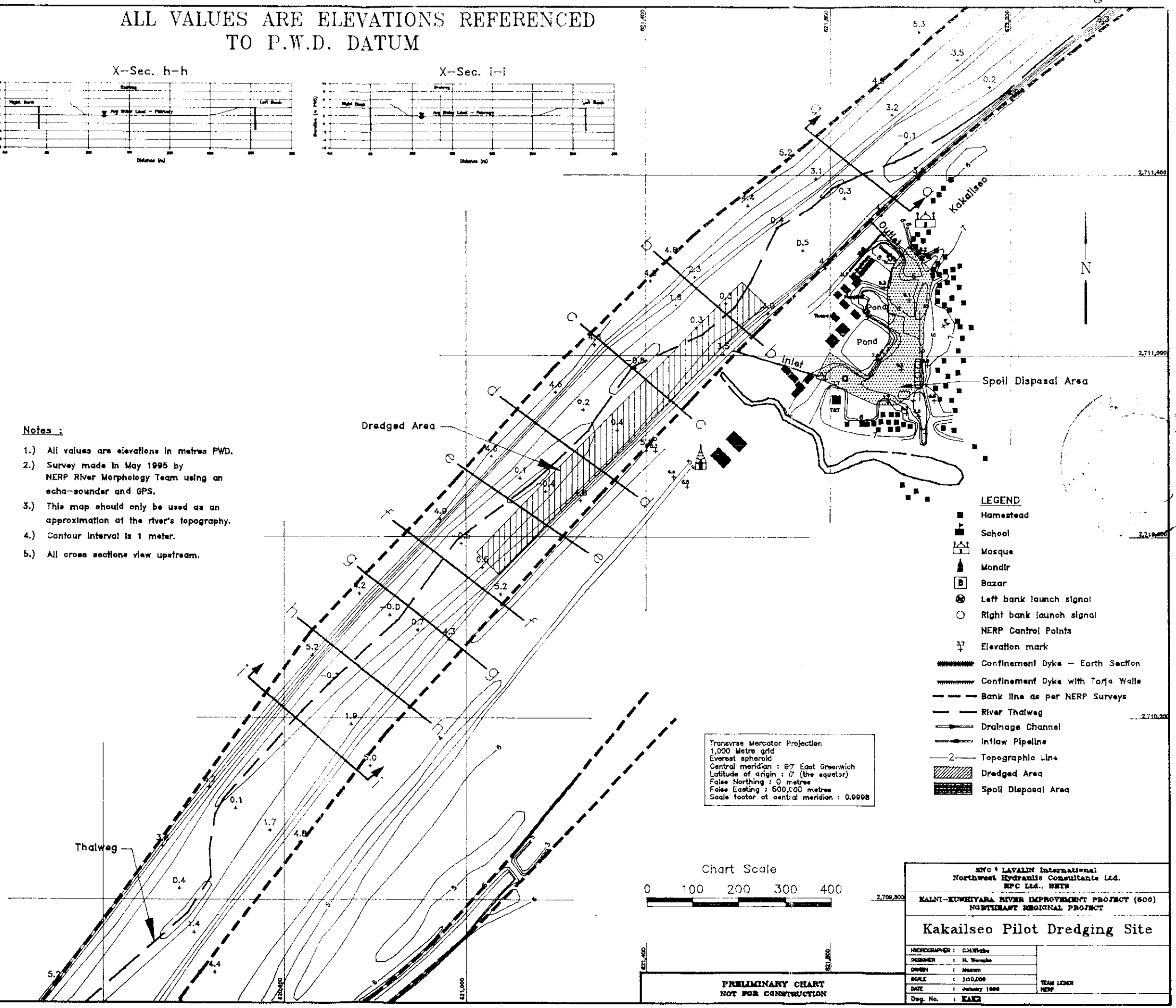


X-Sec. g-g



Notes :

1.) All values are elevations in metres PWD.
2.) Survey made in May 1995 by NERP River Morphology Team using an echo-sounder and GPS.
3.) This map should only be used as an approximation of the river's topography.
4.) Contour interval is 1 meter.
5.) All cross sections view upstream.



Transverse Mercator Projection
1,000 Metre grid
Everest spheroid
Central meridian : 89° East Greenwich
Latitude of origin : 0° (the equator)
False Northing : 0 metres
False Easting : 500,000 metres
Scale factor at central meridian : 0.9998

Chart Scale
0 100 200 300 400

PRELIMINARY CHART
NOT FOR CONSTRUCTION

SNC + LAVALIN International
Northwest Hydraulic Consultants Ltd.
EPC Ltd., BETS

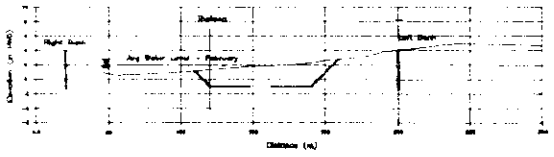
KALNI-KUSHIYARA RIVER IMPROVEMENT PROJECT (600)
NORTHEAST REGIONAL PROJECT

Kakailseo Pilot Dredging Site

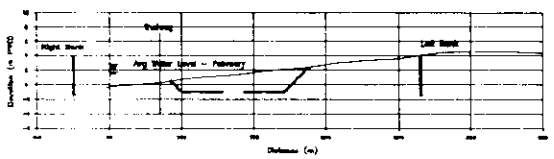
HYDROGRAPHER	: C.M.Wiebe	
DESIGNER	: M. Wernahe	
DRAWN	: Mamm	
SCALE	: 1:10,000	
DATE	: January 1996	TEAM LEADER NERP
Dwg. No.	: KAK2	

Figure 15

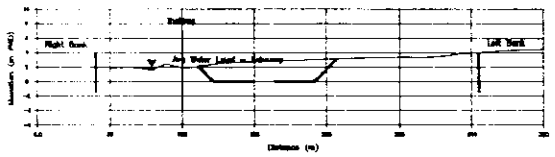
X-Sec. a-a



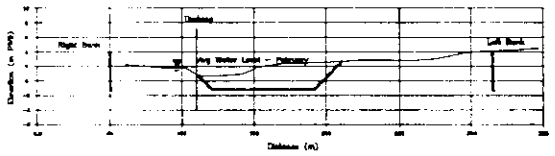
X-Sec. b-b



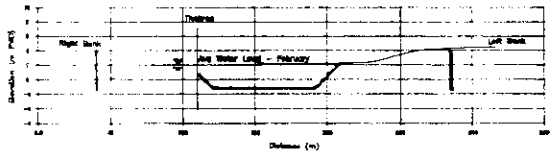
X-Sec. c-c



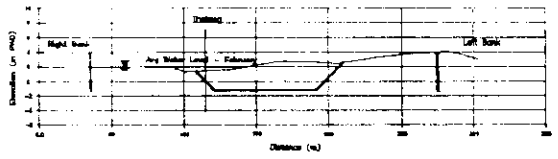
X-Sec. d-d



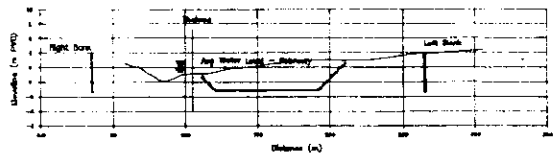
X-Sec. e-e



X-Sec. f-f



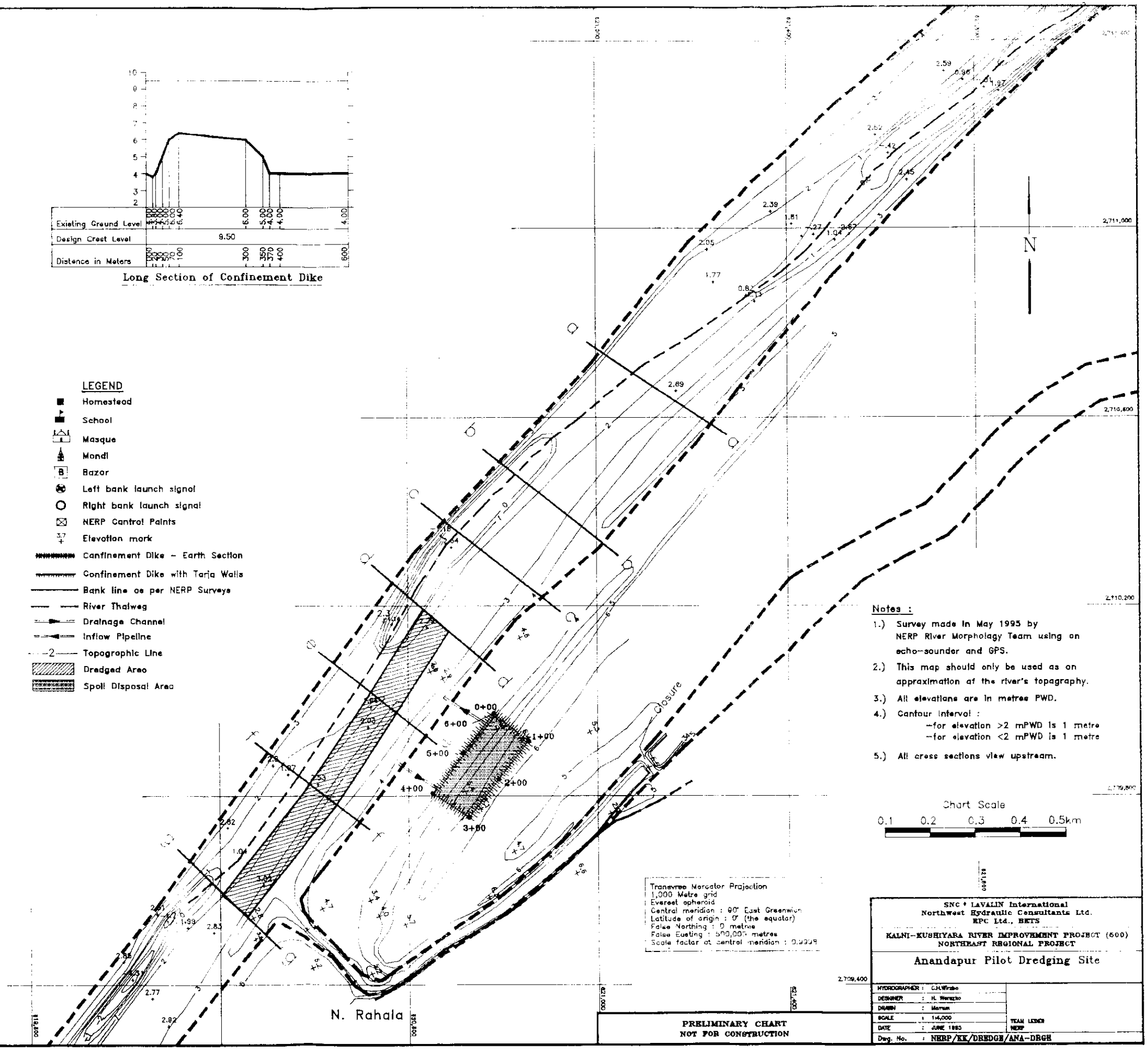
X-Sec. g-g



Long Section of Confinement Dike

LEGEND

- Homestead
- School
- Masque
- Mondl
- Bazar
- Left bank launch signal
- Right bank launch signal
- NERP Control Points
- Elevation mark
- Confinement Dike - Earth Section
- Confinement Dike with Tarja Walls
- Bank line as per NERP Surveys
- River Thalweg
- Drainage Channel
- Inflow Pipeline
- Topographic Line
- Dredged Area
- Spoil Disposal Area



Notes :

1.) Survey made in May 1995 by NERP River Morphology Team using an echo-sounder and GPS.

2.) This map should only be used as an approximation of the river's topography.

3.) All elevations are in metres PWD.

4.) Contour interval :
- for elevation >2 mPWD is 1 metre
- for elevation <2 mPWD is 1 metre

5.) All cross sections view upstream.

Chart Scale

0.1 0.2 0.3 0.4 0.5km

Transverse Mercator Projection
1,000 Metre grid
Everest spheroid
Central meridian : 90° East Greenwich
Latitude of origin : 0° (the equator)
False Northing : 0 metres
False Easting : 500,000 metres
Scale factor at central meridian : 0.9999

PRELIMINARY CHART
NOT FOR CONSTRUCTION

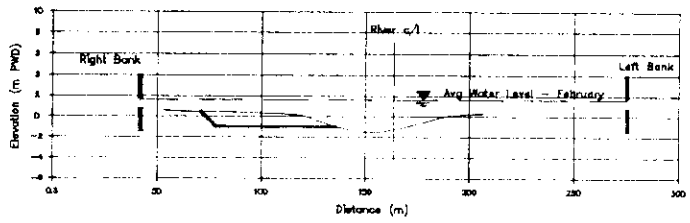
SNC • LAVALIN International
Northwest Hydraulic Consultants Ltd.
RPC Ltd., BETS

KALNI-KUSHIYARA RIVER IMPROVEMENT PROJECT (600)
NORTHEAST REGIONAL PROJECT

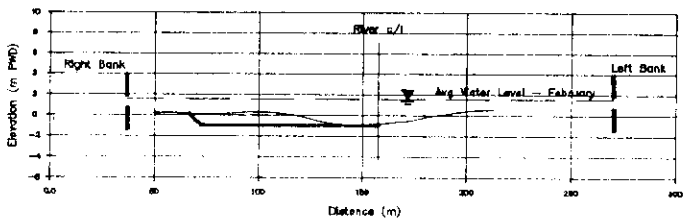
Anandapur Pilot Dredging Site

HYDROGRAPHER	: C.H.Wiratno	
DESIGNED	: H. Warnana	
DRAWN	: Marnan	
SCALE	: 1:4,000	TEAM LEADER NERP
DATE	: JUNE 1995	
Dwg. No.	: NERP/KK/DREDGE/ANA-DRGH	

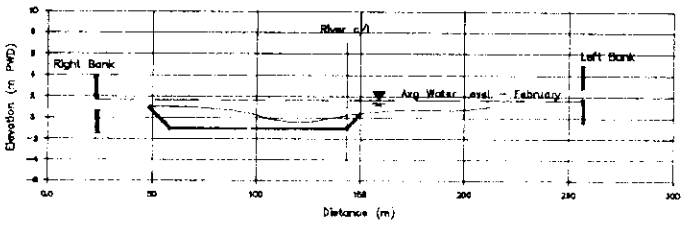
X-Sec. a-a



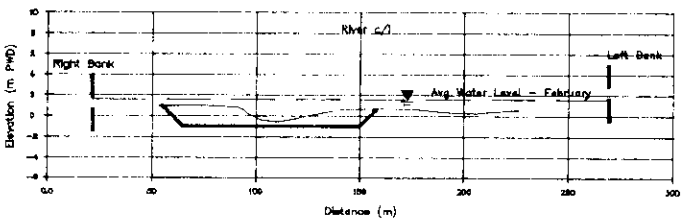
X-Sec. b-b



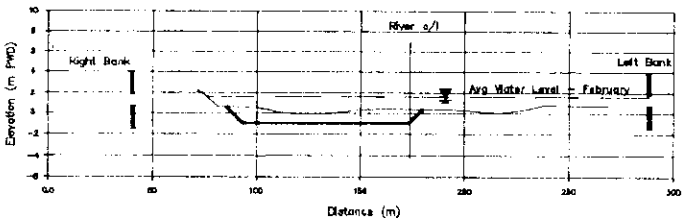
X-Sec. c-c

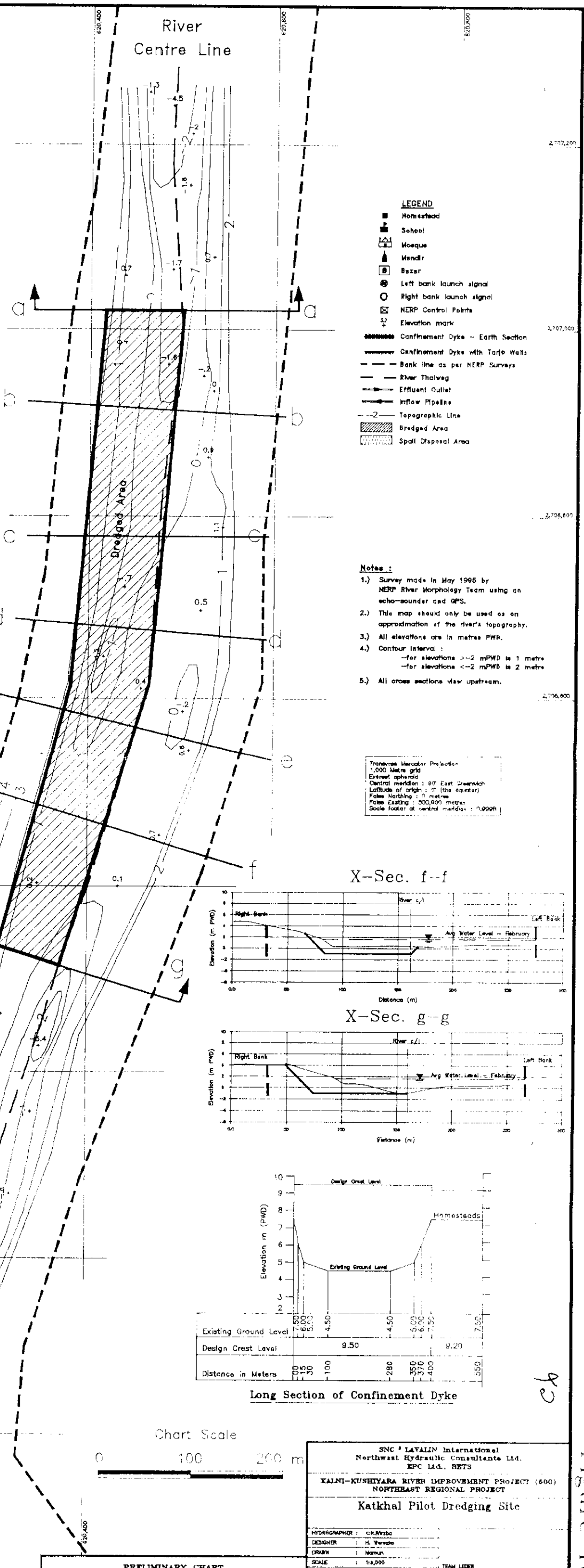


X-Sec. d-d



X-Sec. e-e





LEGEND

- Homestead
- School
- Mosque
- Mandir
- Bazar
- Left bank launch signal
- Right bank launch signal
- NERP Control Points
- Elevation mark
- Confinement Dyke - Earth Section
- Confinement Dyke with Tarje Walls
- Bank line as per NERP Surveys
- River Thalweg
- Effluent Outlet
- Inflow Pipeline
- Topographic Line
- Bredged Area
- Spoil Disposal Area

Notes :

1.) Survey made in May 1995 by NERP River Morphology Team using an echo-sounder and GPS.

2.) This map should only be used as an approximation of the river's topography.

3.) All elevations are in metres PWD.

4.) Contour Interval :
- for elevations >-2 mPWD is 1 metre
- for elevations <-2 mPWD is 2 metre

5.) All cross sections view upstream.

Transverse Mercator Projection
1,000 Metre grid
Everest spheroid
Central meridian : 90° East Greenwich
Latitude of origin : 0° (the equator)
False Northing : 0 metres
False Easting : 500,000 metres
Scale factor at central meridian : 0.9996

X-Sec. f--f

X-Sec. g-g

Long Section of Confinement Dyke

Chart Scale
0 100 200 m

PRELIMINARY CHART
NOT FOR CONSTRUCTION

SNC ² LAVALIN International
Northwest Hydraulic Consultants Ltd.
EPC Ltd., BETS

KALNI-KUSHIYARA RIVER IMPROVEMENT PROJECT (500)
NORTHEAST REGIONAL PROJECT

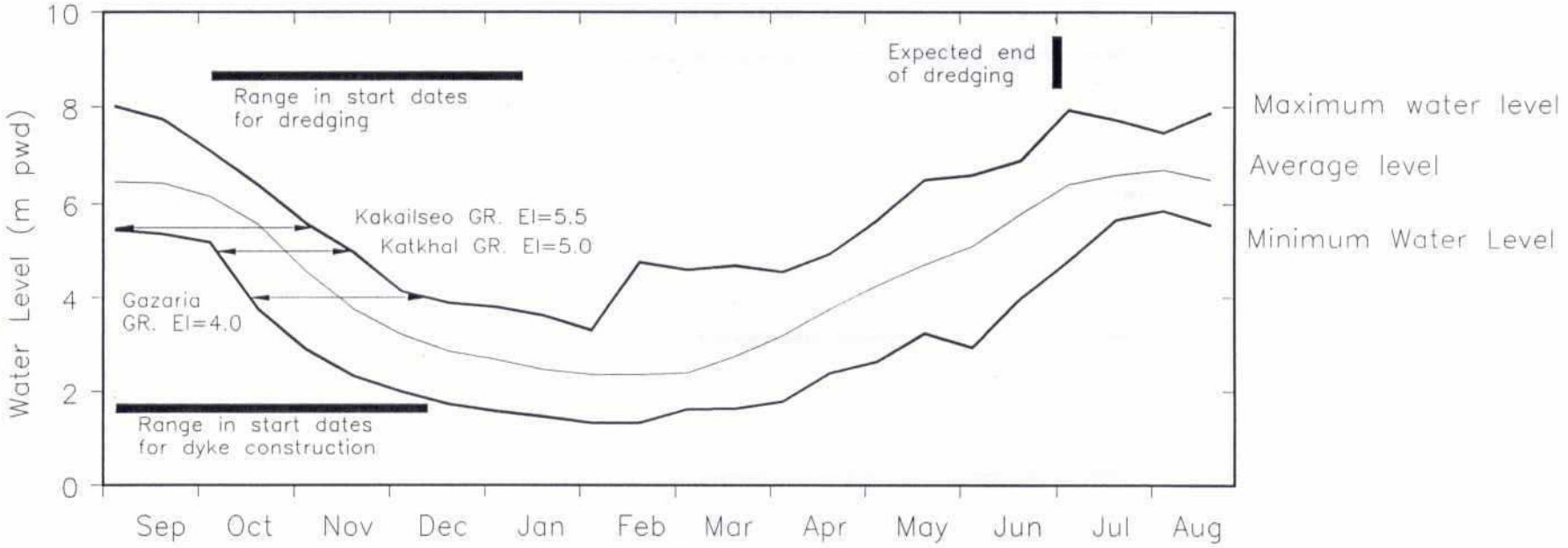
Katkhal Pilot Dredging Site

HYDROGRAPHER	:	G.M.Mirza
DESIGNER	:	H. Yeasin
DRAWN	:	Nazmun
SCALE	:	1:5,000
DATE	:	June 1995

TEAM LEADER
NERP

c4

H 1613.6



Note:
Water level statistics computed for the period 1982–1992 from BWDB gauge 271 at Ajmiriganj

FILE: kkw1.DWG

Northeast Regional Project

Range in Dates for Dredging Operations

Prepared by: DMc	June 1995

Figure 17

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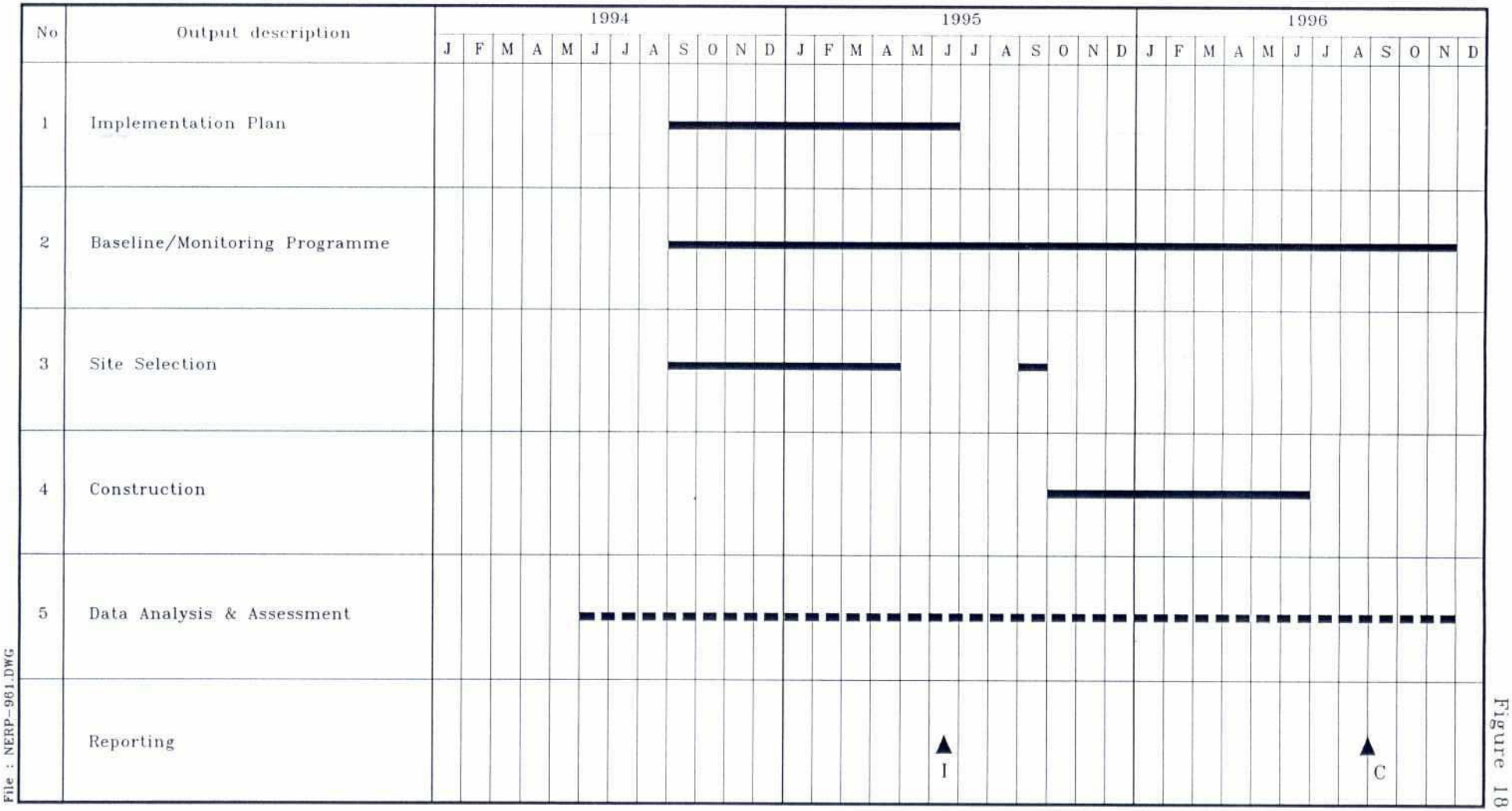
PILOT DREDGING PROJECT
SCHEDULED ACTIVITIES



File : NERP-961.DWG

Note: I= Implementation Plan, C= Completion Report.

Figure 18