**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

**PEOPLE'S COMMITTEE OF HO CHI MINH CITY (PCHCMC)**
**MINISTRY OF PLANNING AND INVESTMENT (MPI)**
**THE SOCIALIST REPUBLIC OF VIET NAM**

THE DETAILED DESIGN STUDY
ON
HO CHI MINH CITY
WATER ENVIRONMENT IMPROVEMENT PROJECT
IN
THE SOCIALIST REPUBLIC OF VIET NAM

# FINAL REPORT

# MAIN REPORT

## VOLUME 2

**JUNE 2001**

**PACIFIC CONSULTANTS INTERNATIONAL**

Foreign Currency Exchange Rate Applied in this Report

| Currency | Exchange Rate/US$ |
|---|---|
| Vietnamese Dong (VND) | 14,500 |
| Japanese Yen (JPY) | 110.00 |

(As of December, 2000)

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# DETAILED DESIGN

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## ABBREVIATIONS

### 1. ORGANIZATIONS

| | |
|---|---|
| ADB | Asian Development Bank |
| CDM | Camp Dresser & MaKee International Inc. |
| CEC | City Environment Company |
| CITENCO | Ho Chi Minh City Environmental Company |
| DARD | Department of Agriculture and Rural Development |
| DFP | Department of Finance-Pricing |
| DHI | Danish Hydraulics Institute |
| DOF | Department of Finance |
| DOSTE | Department of Science, Technology, and Environment |
| DPI | Department of Planning and Investment |
| DTPW | Department of Transport and Public Works |
| ENCO | Environmental Committee (renamed recently to the Environmental Management Section) |
| GOJ | Government of Japan |
| GOV | Government of Viet Nam |
| HCMC | Ho Chi Minh City |
| IDA | International Development Association |
| JICA | Japan International Cooperation Agency |
| JBIC | Japan Bank for International Cooperation (previous name: Overseas Economic Cooperation Fund: OECF) |
| MARD | Ministry of Agriculture and Rural Development |
| MOC | Ministry of Construction |
| MOF | Ministry of Finance |
| MOSTE | Ministry of Science, Technology, and Environment |
| MPI | Ministry of Planning and Investment |
| OECF | Overseas Economic Cooperation Fund (renamed to Japan Bank for International Cooperation: JBIC) |
| OWM | Office of Waterway Management |
| PC | People's Committee |
| PCHCMC | People's Committee of Ho Chi Minh City |
| PMU | Project Management Unit |
| SDC | Sewerage and Drainage Company |
| SOE | State Owned Enterprise |
| UDC | Urban Drainage Company |
| UPI | Urban Planning Institute |
| URENCO | Urban Environment Company |
| USAID | United State International Assistance Department |
| WB | World Bank |
| WSC | Water Supply Company |

## 2. TERMINOLOGY

| | | | |
|---|---|---|---|
| ATP | Affordability to Pay | BOD | Biochemical Oxygen Demand |
| B/C | Benefit by Cost Ratio | cm | Centimeter |
| CIF | Cost, Insurance and Freight | COD | Chemical Oxygen Demand |
| DHWL | Design High Water Level | DLWL | Design Low Water Level |
| DO | Dissolved Oxygen | FC | Foreign Currency |
| EIRR | Economic Internal Rate of Return | FOB | Free on Board |
| FIRR | Financial Internal Rate of Return | GIS | Geographic Information System |
| GRDP | Gross Regional Domestic Products | GDP | Gross Domestic Products |
| ha | Hectare | HH/HHs | Household or Households |
| IDF | Intensity-Duration-Frequency | kg | Kilogram |
| km | Kilometer | $km^2$ | Square kilometer |
| kw | Kilowatt | l | Litter |
| m | Meter | m/s | Meter per second |
| $m^2$ | Square meter | $m^3$ | Cubic meter |
| $m^3/s$ | Cubic meter per second | mg | Milligram |
| mg/l | Milligram per litter | mm | Millimeter |
| LC | Local Currency | NLTN | Nhieu Loc Thi Nghe |
| NPV | Net Present Value | OM or O/M | Operation and Maintenance |
| s | Second | SCF | Standard Conversion Factor |
| SE | South East | SS | Suspended Solid |
| SAPROF | Special Assistance for Project Formation | | |
| THBNDT | Tau Hu Ben Nghe Doi Te | THLG | Tan Hoa Lo Gom |
| TLBC | Thanh Long Binh chang | TQC | Total Quality Control |
| US$ | United States Dollar | VND | Vietnamese Dong |
| % | Percent | | |

# *Chapter 1*

# *GENERAL*

# CHAPTER 1 GENERAL

## 1.1 General

Construction works for HCMC Water Environment Improvement Project in Phase I are divided into following five (5) packages;

Package A: Tau Hu-Ben Nghe Canal Improvement
Package B: Pump Drainage Improvement
Package C: Interceptor Sewer Construction, Intermediate Wastewater Pumping Station Construction and Procurement of Sewer Cleaning Equipment
Package D: Conveyance Sewer Construction and Existing Combined Sewer Improvement
Package E: Wastewater Treatment Plant Construction

Detailed design report is compiled based on the construction packages mentioned above.

Detailed design report consists of (1) Summary report, (2) Main report, (3) Design report, (4) Data book, and (5) Draft bidding documents.

Main report indicates the applicable design code and standard, design condition and criteria, and design concept of each facility. In the design report, all structural calculation sheets and basic data are compiled. Topographic survey data is complied in data book. And bidding document is composed of (i) Vol. 1: Invitation of bid, Instruction of bidders, Conditions of contract, Bill of quantities and etc, (ii) Vol. 2 Specification and (iii) Vol. 3 Tender drawings.

The following shows the composition of the detail for the report.

(1) Summary
    Japanese
    English

(2) Main Report
    Volume 1 (Definitive Design)
    Volume 2 (Detailed Design)

(3) Design Report
    Volume 1 (Structural Calculation)
    Volume 2 (Structural Calculation)
    Volume 3 (Quantity Estimation)

(4) Data Book

Volume 1 (Water quality survey, EIA, etc)
Volume 2 (Topographic Survey and Soil Investigation)

(5) Draft Bidding Documents

| | |
|---|---|
| Package A | Prequalification Documents |
| | Volume 1 |
| | Volume 2 (Specification) |
| | Volume 3 (Tender Drawings) |
| Package B | Prequalification Documents |
| | Volume 1 |
| | Volume 2 (Specification) |
| | Volume 3 (Tender Drawings) |
| Package C | Prequalification Documents |
| | Volume 1 |
| | Volume 2 (Specification) |
| | Volume 3 (Tender Drawings) |
| Package D | Prequalification Documents |
| | Volume 1 |
| | Volume 2 (Specification) |
| | Volume 3 (Tender Drawings) |
| Package E | Prequalification Documents |
| | Volume 1 |
| | Volume 2 (Specification) |
| | Volume 3 (Tender Drawings 1/3) |
| | Volume 3 (Tender Drawings 2/3) |
| | Volume 3 (Tender Drawings 3/3) |

# *Chapter 2*

# *TAU HU-BEN NGHE CANAL IMPROVEMENT (PACKAGE A)*

# CHAPTER 2 TAU HU - BEN NGHE CANAL IMPROVEMENT (PACKAGE A)

## 2.1 General

Tau Hu- Ben Nghe Canal locates along southern edge of the central business area of HCMC and flow into Saigon River to the east. Total length of the canal is more than 12.0km. The canal formerly had three functions, such as urban drainage for storm water and sewer from 8 Districts of the city, waterway transportation between Mekong Delta and HCMC, and water body open space. Due to the recent rapid growth of the city, however, these functions have being deteriorated drastically by much sedimentation of garbage, waste disposal and soil deposit, encroachment of illegal houses and buildings on/along the canal, and direct inflow of domestic and home industry wastewater from its basin. The canal improvement work is necessary to create its primary functions.

This report covers the further study of Basic Design on Tau Hu – Ben Nghe Canal Improvement Project (Phase I).

## 2.2 Scope of Project

Package A: Tau Hu – Ben Nghe Canal Improvement Project (Phase I) (hereinafter referred to as "THBNCIP") consists of the following components:

(a) Ben Nghe canal improvement: L = 3,158m
(b) Tau Hu canal improvement: L = 4,128m
(c) Landscape work on both banks of Tau Hu – Ben Nghe canals
(d) New road construction of about 360m long including replacement of utility services, sewer, water supply pipe, electricity and telecommunication line along south bank of Tau Hu canal

## 2.3 Design of Channel Improvement

### 2.3.1 General

In the previous study stage, channel improvement plan of Tau Hu – Ben Nghe canal system of about 13.38km including Lo Gom and Ngang No.1 to No.3 canals, which was formulated in the feasibility study, has been reviewed based on the recent additional data and information.

This study stage includes the detailed design on Tau Hu – Ban Nghe Canal Improvement Project (Phase I), of which channel section is between the junctions with Saigon River to the east and Ngang No.1 Canal to the west. Objective channel length for the detailed design is about 7.3km in total as shown in Fig. 2.1.

### 2.3.2 Channel Alignment

Through several meetings between JICA Study Team and PMU of HCMC East-West Highway Project (EWHP), the channel alignment of Tau Hu – Ben Nghe Canal has been revised and finalized Main revised channel alignments in Phase I project are mentioned below:

(a) Total length of canal improvement of Ben Nghe and Tau Hu (Downstream) canals in the feasibility study is revised as follows:

- Ben Nghe Canal: 3,140m in F/S to 3,158m in D/D
- Tau Hu (Dowenstream): 4,220m in F/S to 4,128m in D/D

(b) Alignment of Ben Nghe Canal between Khan Hoi and Mong bridges is shifted about 10m to the south in order to acquire the additional land for relocation of existing access road of Mong Bridge, which is to be left as a historical structure.

(c) Radii of previous S-curve alignment of Tau Hu canal nearby Cho Quan Hospital is revised from 100 and 175m to 160 and 250m in order to acquire the minimum road curb radius of 200m, which is proposed in EWHP. Accordingly, the existing city road (Ben Ba Dinh Road) of about 350m located along south bank (right bank) of Tau Hu Canal is necessary to replace. Existing public utility services, such as sewer, water supply pipe, electricity and telecommunication line are also simultaneously required to replace.

Proposed channel alignment is shown in Fig. 2.1. Detailed channel alignments with scale of 1:1000 are compiled as PA-THBNCI-201 to 214 in Tender Document, Volume III Tender Drawing (Package B Tau Hu – Ben Nghe Canal Improvement).

### 2.3.3 Profile and Cross Section

The canal bed elevation, bed slope and cross sections designed in Definitive Plan are basically not changed. Namely,

(a) Canal bed elevation is designed to meet the requirements of navigation boat of 100 – 200ton. So, highest canal bed elevation of Ben Nghe and Tau Hu (Downstream) canals shall be EL. -3.30m.

(b) Canal bed slope is designed at 1:20,000 to be more gentle hydraulic gradient of DHWL, which is principally almost the same or lower than the existing ground elevation along the canals not to create newly drainage problems.

(c) Following two (2) types of single cross sections are designed mainly in view of

difficulty of land acquisition.

- Type A: Trapezoidal in shape channel with 1:1.5 in slope lined by revetment of stone masonry
- Type B: Trapezoidal in shape channel with 1:0.5 in slope lined by revetment of stone masonry

Table 2.1 (1/4) to (4/4) and Fig.2.2 show the proposed profile of THBNCI (Phase I). Table 2.2 (1/7) to (7/7) show the Proposed cross section of THBCI (Phase I). Detailed profile (1:100 in vertical, 1:1000 in horizontal scale) and cross sections with scale of 1:200 are also compiled as PA-THBNCI 201 to 214 and PA-THBNCI-215 to 244 respectively in Tender Document, Volume III Tender Drawing (Package B Tau Hu – Ben Nghe Canal Improvement).

## 2.4 Design of Revetment

### 2.4.1 General

Revetments along Tau Hu – Ben Nghe canal have been constructed at some sections along in different times to develop waterway transport facility and to prevent scouring and sliding of the canal banks as well as to improve the landscape of the canal. Execution agency of these constructions was Office of Water Management (OWM). However, the discontinuous revetment has created negative effects to protection purpose and landscape. On the other hand, there are still many portions without any bank protection facility, so that the construction of revetment for Tau Hu – Ben Nghe canal is necessary.

Revetment construction is an important component of Tau Hu – Ben Nghe Canal improvement project. It is carries out to create the following functions:

- Prevent the scouring and sliding for both banks of the canal
- Clean the canal banks caused by dumping waste along both bank of the canal
- Improve general landscape in line with the City Development
- Decrease roughness coefficient of the canal banks (to increase discharge capacity)

### 2.4.2 Applicable Codes and Standards

The detailed design of channel revetment is conducted based on the following Vietnamese codes and standards:

- Flood Control Embankments, Design Procedure: 14 TNC 84-91, Ministry of Agriculture and Rural Development
- TCVN 4612-1998 and TCVN 5574-1991 Vietnamese design standard for reinforced concrete structure
- TCVN 5573 – 1991 Vietnamese design standard for masonry structures

- Bearing capacity of wooden pile, concrete material is referred on available Vietnamese hand books

As reference information, the following Japanese standards are also applied.

- Manual for River Works in Japan: Published by River Bureau, Ministry of Construction, Japan
- Standard Specification for Design and Construction of Concrete Structures, 1996, Japan Society of Civil Engineering

### 2.4.3 Design Condition and Criteria

(1) Design Length in Phase I Project

Design length in Phase I project includes Ben Nghe Canal of 3.16km from confluence with Saigon River to Chu Y Bridge and Tau Hu (Downstream) Canal of 4.12km from Chu Y bridge to T-junction with Ngang No.1 Canal. Total design length is about 7.28km.

(2) Hydraulic Parameter

Design water levels (DHHWL, DHWL, DLWL) of Tau Hu – Ben Nghe canal system are as follows:

| Canal | DHHWL (m) | DHWL (m) | DLWL (m) |
|---|---|---|---|
| Ben Nghe | +1.54 | +1.35 | -2.05 |
| Tau Hu | +1.54 | +1.42 | -2.00 |

Note: 1. DHHWL: Design highest high water level in Mui Nai benchmark (recorded historical maximum water level at Phu An station at Saigon River):
2. DHWL: Design high water level in Mui Nai benchmark (Average of monthly maximum water levels for the month August and November)
3. DLWL: Design low water level in Mui Nai benchmark (Average of annual minimum water level)

(3) Geological Condition

Soil condition along Tau Hu – Ben Nghe canal was surveyed and analyzed for 14 boreholes. Geologic stratum at each borehole is very similar except thickness of each layer, as shown in Fig.2.3. Soil characteristics of each layer are summarized below

(a) Layer 1: Made ground – clay sand or gravelly sand with cobbles of stone, brick, concrete (OH layer)

This layer is occurred at all boreholes with the thickness ranging from 0.7m (borehole

SC-08) to 3.0m (borehole SS-11).

(b) Layer 2: Very soft, high plasticity blackish or gravelly sand with cobble of stone, brick and concrete

This layer is occurred at most boreholes with the thickness from 1.5m (boreholes DBN – 04) to 6.4m (borehole SC-02). Main soil characteristics of this layer is as follows:

- Wet density: $\gamma_w = 1.461 g/cm_3$
- Natural moisture: 95%
- Unconfined compressive strength: qu = 0.175kg/cm2
- Compression index: Cc = 1.274
- Coefficient of consolidation: Cv = 3.65 x 10-4

(c) Layer 4: Stiff, low plasticity yellowish brown, grey clay (CL)

It is also found at most boreholes with the thickness from 1.5m (borehole DBN-02) to 5.0m (borehole SC-09). The main characteristics are as follows:

- Wet density: γw = 1.963g/cm3
- Natural moisture: 20 - 35%
- Unconfined compressive strength: qu = 1.202kg/cm2
- Compression index: Cc = 0.181
- Coefficient of consolidation: Cv = 6.88 x 10-4

(d) Layer4b: Medium dense, whitish gray, yellowish brown clayey sand (SC)

This is occurred at most boreholes with the thickness from 4.0m (borehole DBN-04) to 14.0m (borehole SC-01). The main characteristics are mentioned below:

- Wet density: γw = 1.98g/cm3
- Natural moisture: 12 - 25%
- Unconfined compressive strength: qu = 0.928kg/cm2
- Compression index: Cc = 0.155
- Coefficient of consolidation: Cv = 9.28 x 10-4

Lower layers does not concern to stability of revetment. The above soil data are used for analysis of anti-sliding of the revetment and the canal banks

(4) Bank elevation

Top elevation of the bank (EL.+2.00m) proposed in the feasibility study is revised at EL.+2.20m in Mui Nai benchmark to harmonize the future road improvement plan (HCMC East-West Highway Project). Accordingly, freeboard of the canal is able to ensure about 0.6 to 0.9m.

(5) Quality requirement for materials

The following requirements for quality of materials are applied.

- Concrete block of revetment foundation: Cast-in situ reinforced concrete blocks are made using Concrete Class E (cylinder 28 days compressive strength is 210 kgf/cm$^2$)
- Cast in-situ reinforced concrete: Concrete Class E is applied for apron, wing wall, headwall of outlets
- Concrete class F (cylinder 28 days compressive strength is approximately 180 kgf/cm2) is used for plain concrete of revetment including stone masonry
- Concrete class G (cylinder 28 days compressive strength is approximately 100 kgf/cm2) is applied for leveling of foundation and outlets
- Cobble stone of average diameter 250mm – 300mm is acceptable for stone masonry
- Timber pile of ϕ80mm - ϕ 100mm and 4.5m long is applied.

### 2.4.4 Design of Revetment

(1) Revetment Type A

Revetment type A is designed to satisfy the following requirement

- To harmonize with proposed canal cross section
- To be strong structure and economical
- To be easy for land acquisition and house evacuation
- To be easy construction
- To Beautify

As shown in Fig.2.4, this type is lined by stone masonry with 1:1.5 slope, which is the most typical type revetment in HCMC and applied for bank protection having no land acquisition and house relocation problems. Stone with mortal of 300mm thick is supported and fixed by plain concrete layer with thickness of 100mm. Free draining gravel of 300mm thick in average is placed between plain concrete layer and sandy soil filling. In front of sandy soil filling, geotextile sheet is provided to protect outflow of filling material. PVC pipe of 100mm diameter (weep hole) is provided at 2.0m interval in 3 stages to drain out groundwater to the canal in short term during low tide. These weep holes are utilized for stability of revetment. The foundation of revetment is made of cast-in-situ reinforced concrete block of 600mm wide, 400mm high and 4.0m long. This foundation concrete block is supported by wooden piles of ϕ80 - ϕ100mm diameter, l = 4.50 and 25pcs/m$^2$. For some low-lying area to be filled up more than 2.0m, the same wooden piles are also driven with density of 9 pcs/m2 to prevent from sliding risk due to filling. To avoid the cracks by expansion and contraction due to temperature variation, elastic joint filer of 10mm thick is designed to provide in front and behind of one lot revetment of 26m long.

As shown in Fig.2.1, this type is applied for all along Ben Nghe canal of about 3.16km and downstream channel of Tau Hu canal of about 2.69km. The construction of revetment is carried out under dry condition. Therefore, cofferdam is required for drying up construction site.

(2) Revetment type B

As shown in Fig.2.4, This type is lined by stone masonry with slope of 1:0.5 and is applied for channel having land restriction. The structure of this type is basically the same as that of Type A except the following some changes:

- Thickness of stone masonry is 450mm
- Thickness of concrete layer is 150mm
- Dimension of RC block foundation is 800mmW x 400mmH x 4mL
- Thickness of free draining gravel layer is 300 – 375mm

This type revetment is applied for up and downstream channel of about 1.34km long at Cha Ba Bridge of Tau Hu canal, as shown in Fig.2.1.

(3) Proposed Length of Revetment to be Newly Constructed

Length of Type A and B revetments by left and right bank of Tau Hu – Ben Nghe canal is summarized in the table below:

REVETMENT LENGTH BY REVETMENT TYPE

| Canal | Ben Ngeh (m) | | | Tau Hu (m) | | |
|---|---|---|---|---|---|---|
| Revetment type | Left Bank | Right Bank | Total | Left Bank | Right Bank | Total |
| Type A | 2,777 | 2,910 | 5,687 | 2,654 | 2,539 | 5,193 |
| Type B | 0 | 0 | 0 | 1,343 | 1,389 | 2,732 |
| Total | 2,777 | 2,910 | 5,687 | 3,997 | 3,928 | 7,925 |

Note: All figures are not included revetment length of 223m to be constructed by other related projects, such as HCMC East-West Highway Project, Hang Bang Drainage Improvement and Package D in JBIC Project.

### 2.4.5 Countermeasure for Sliding of Bank due to Filling

Prevention work for sliding of the canal banks due to filling work is studied based on the following conditions

- Existing soil condition along Tau Hu – Ben Nghe canal
- Filling volume
- Filling materials

Existing soil condition used on this study is based on the results of soil investigation for 4 boreholes, SS-02, SS-09, SS-08, SC-01 along Tau Hu canal and 10 boreholes, SC-01, DBN-03, DNB-02, DBN-01, SS-10, SS-12, SS-11, DBN-04 along Tau Hu (Downstream)

Filling volume of each section is estimated based on the channel alignment, profile and cross section plan, which are compiled in Data Book. Soil characteristics for filling material of sandy soil/clay (mixing soil with black sand and clay) are as follows:

| Item | Sandy Soil/Clay |
|---|---|
| - Specific gravity: | $\gamma$ = 1.6 (t/m3) |
| - Cohesion: | Cu = 1.5 (t/m2) |
| - Internal friction angle: | $\phi$ = 0o |

(1) Selection of typical section

Typical risky sections for filling work are selected based on the following conditions:

- Weak soil condition. It is the most important factor.
- Big filling volume, especially high depth and large width
- Steep slope revetment
- All above conditions

Weak soil layer, according to soil investigation report, is confirmed to be OH layer (Very soft, high plasticity blackish gray organic clay). The main soil characteristics of OH layer are shown below:

- Wet density $\gamma_W$ = 1.4 – 1.7 (t/m3)
- Cohesion Cu = 0.65 – 1.10 (t/m2)

With these requirements, there are four (4) cases can be selected to evaluate for prevention of sliding. These are:

(a) Case1 (Cross section No7): This case is very weak soil condition and high depth of filling. As mentioned in Fig.2.5, this case is for soil condition at boreholes SS-02 and SC-01.

(b) Case 2 (Cross section No.24): This case is weak soil condition and high depth of filling. As shown in Fig.2.5, This case is for soil condition at borehole SS-08.

(c) Case 3 (Cross section No.82): This case is weak soil condition and very high depth of filling. As shown in Fig.2.6, this case is soil condition at borehole SS-10.

(d) Case 4 (Cross section No.120): This case is stiff revetment and high depth of filling. As shown in Fig.2.6, this case is for soil condition at

borehole SS-11

(2) Sliding Analysis

Wooden pile of ϕ80 – 100mm, l = 4.50m is driven to strengthen the soil condition. The cohesion coefficient of OH Layer depend on number of wooden pile is indicated below:

| Number of pile (Pcs/$m^2$) | 0 | 6 | 9 | 16 | 25 |
|---|---|---|---|---|---|
| $C_u$ of 1:1.5slope Revetment | 0.65 | 0.90 | 0.995 | 1.225 | 1.50 |
| $C_u$ of 1:0.5slope Revetment | 0.65 | 0.70 | 0.80 | 0.90 | 1.02 |

Note: The above cohesion coefficient was proposed by Dr. CHAU NGOC, Technical University.

Software FORUM-8, which was developed in Japan, is used for sliding analysis of canal banks due to filling work.

Wooden pile driven is separated into two parts

(a) Part1: Wooden pile driven for revetment foundation with the density of 25pcs/$m^2$ is constant
(b) Part 2: Penetration of wooden pile in filling area with the various pile density of 0, 6, 9, 16 and 25 pcs/$m^2$

(3) Calculation Result

The canal banks are stable when Fs = (M1: M2) >1.2
Where, M1 is anti-sliding moment
M2 is sliding moment respectively

According to the results of several sliding calculation cases, if the wooden piles with 9 pcs/$m^2$ are penetrate in the part 2 area, it is found that safety value of Fs is more than 1.2, as shown in Table 2.3 (1/4) to (4/4).

(4) Conclusion

Base on the result of sliding analysis, it is concluded as follows:

- In case of more than 2.0m filling height, it is necessary to penetrate wooden pile before filling to strengthen the subsoil for sliding.
- Penetration of wooden pile is separated into two parts: Foundation of revetment with density of 25pcs/m2 and filling area with density of 9 pcs/m2. Penetration boundary is limited by outer edge of O/M road
- Wooden pile of ϕ 80 - ϕ 100, L = 4.5m is applicable.

### 2.4.6 Temporary Coffer Dam

Tau Hu – Ben Nghe Canal is always affected by tidal effect occurring two times per day. Considering the low excavation level of EL.-2.40m for construction of concrete foundation of revetment, temporary cofferdam is necessary to provide in order to obtain a sufficient dry construction condition. Top elevation of cofferdam is designed at EL.+2.00m, which is about 60cm higher than average monthly maximum water levels of Tau Hu – Ben Nghe Canal.

Temporary cofferdam is designed to use steel sheet pile of PU 8, l = 8.0m, and H section steel beam of 200x200x8x12, l = 3 to 8.5m. The proposed temporary cofferdam is shown in Fig.2.7.

One lot length of revetment construction is designed at 26.0m due consideration of easiness for making dry up condition in the construction site. Accordingly, length of one lot cofferdam is designed at 30.0m to get 2.0m allowance in front and behind of revetment.

## 2.5 Design of Sewer Outlet

### 2.5.1 General

Rainwater, domestic and industrial wastewater from districts 1, 4, 5, 6, 8, 10, 11 and Binh Chanh is discharged into Tau Hu – Ben Nghe canal system through a large number of existing sewer outlets. The existing canal banks are designed to move right and left and to be protected by stone masonry revetment in the canal improvement works. Therefore, existing sewer outlets were proposed to reconstruct in Definitive Plan.

Some existing sewers connecting with outlet are clogged, encroached or broken. These are also designed to simultaneously replace.

### 2.5.2 Existing Sewer Outlet

There are about 96 existing sewer outlets along both banks of Tau Hu – Ben Nghe canal. They are connected with some kinds of sewers, such as concrete pipes of D400mm – D1500mm, box culverts from dimension 1000mmW x 1000mmH to 2800mmW x 2500mmH single cell, double cell or brick arch sewers. Many of them have been constructed long time ago. Some sewers made from brick have been collapsed already. All of sewers and outlets are managed and maintained by Urban Drainage Company (UDC).

Some sewers have been clogged by soil and debris and out of work and some others are under the illegal houses occupying both bank of the channel. Most of outlets are broken or damaged. Existing sewers and outlets is listed in Table 2.4.

### 2.5.3 Applicable Codes and Standards

The following codes and standards are applied for design of sewer outlet including sewer.

- Flood Control Embankments, Design Procedure: 14 TNC 84-91, Ministry of Agriculture and Rural Development
- Vietnamese Design Standard 20 TCN – 51 – 84 from Ministry of Construction on "Outside Sewer Network" .
- Proceedings of Vietnam Construction Standards, Volume III (Ministry of Construction 1997)
- TCVN 4612-1998 and TCVN 5574-1991 Vietnamese design standard for reinforced concrete structure
- Standard Specification for Design and Construction of Concrete Structure (The Japan Society of Civil Engineers 1996)
- Standard Specification for Design and Construction of Concrete Structure (The Japan Society of Civil Engineers 1996)

### 2.5.4 Design Condition and Criteria

(1) Hydraulic Conditions

(a) Design water levels

Design water levels (DHHWL, DHWL, DLWL) of Tau Hu – Ben Nghe canal system are as follows:

| Canal | DHHWL (m) | DHWL (m) | DLWL (m) |
|---|---|---|---|
| Ben Nghe | +1.54 | +1.35 | -2.05 |
| Tau Hu | +1.54 | +1.42 | -2.00 |

Note: 1. DHHWL: Design highest high water level (recorded historical maximum water level at Phu An station at Saigon River)
4. DHWL: Design high water level (Average of monthly maximum water levels for the month August and November)
5. DLWL: Design low water level (Average of annual minimum water level)

(b) Minimum velocity in drainage pipe

Velocity in additional pipe is not lower than 0.8m/s in case of maximum discharge flow. It is consist with criteria in package C and D

(2) Geological Condition

Geological conditions are explained in the previous Section 2.4.3 (2).

(3) Structural Design Condition and Criteria

(a) Allowable Stress

Concrete

| Item \ Concrete Type | Concrete Type D | Concrete Type E | Concrete Type F | Concrete Type G |
|---|---|---|---|---|
| 28-day compressive strength by cylinder test (300mmx150mm dia.) | 250 | 210 | 180 | 100 |
| Bending compressive stress (σca) | 83.3 | 70 | 60 | - |
| Shearing stress (τca) | 4.0 | 3.6 | 3.3 | - |

Note: 1. Unit: $kg/cm^2$
2. Concrete Type D: Precast concrete, Concrete Type E: Reinforced concrete
Concrete Type F: Plain concrete, Concrete Type G: Leveling concrete

Reinforcing Bar

| Reinforcing Bar | Deformed Bar |
|---|---|
| Tensile and compressive stress (τca) | 1,600 $kg/cm^2$ |

(b) Design Loads

- Design ground level: + 2.200 m
- Design ground water level: + 0.200 m
- Unit weight of soil: γ' = 1.8($t/m^3$), friction angle $\phi = 35°$

Under ground water γ' = 0.8($t/m^3$)
(Backfill is used sandy soil, locally called "black sand")
Under ground water load: Pw (unit weight is 1.0$t/m^3$)
Soil pressure: P = (vertical soil load) x Ko
Ko = 0.5 (Earth pressure at rest)
Horizontal load pressure: Pv = (Vertical load) x Ko
Surcharge Pa = 1.0 $t/m^2$

(4) Others

Navigation requirements are considered in the detailed design, other criteria reported in definitive plan report is also considered

### 2.5.5 Design of Sewer Outlet

Generally, sewers to be replaced are designed to provide the same shape and dimension

as existing one. All of additional sewers are made of pre-cast reinforced concrete pipe. Centrifugal RC pipes are supplied from factories while box culvert could be pre-cast in construction site to reduce transportation cost. The main comparison between cast –on –situ and pre-cast concrete box culvert has been done and shown in the table below:

COMPARISON OF BOX CULVERT

| Item | Cast –on –situ box culvert | Pre-cast box culvert |
|---|---|---|
| Advantage | Low transportation cost, low material and machinery cost easy to adjust the length | Economize materials, time for construction easy to mechanize, low labor cost, good quality production |
| Disadvantage | High labor cost, long construction time, quality is unstable | High transportation, labor and machinery cost. Difficult to adjust the length, |
| Construction cost for $1m^3$ Concrete | 2,455,000 VND | 2,100,000 VND |

Based on the above comparison result, the pre-cast box culverts fabricated at the project site is applied for additional sewer box culvert along Tau Hu – Ben Nghe canal.

Drainage pipe: As shown in Fig.2.8, 4m long centrifugal RC pipes with cup end are laid on sand bedding of 350mm in thickness, which supported by 100mm thick leveling concrete layer. Wooden piles ϕ 80mm – 100mm, 4,5m long are penetrated under the additional sewers with the density of 16pcs/m2. The second sanding layer covers pilling area with the thickness of 200mm.

Box culvert: As shown in Fig. 2.9, pre-cast box culverts are laid on a leveling concrete, which is supported by wooden piles ϕ 80mm – 100mm, 4,5m, penetrated under the box culverts with the density of 16pcs/m2. Yellow sand is compacted on top of pilling area with the thickness of 200mm.

Outlet structures are designed to construct using cast –on –situ reinforced concrete (Concrete Type E). Outlet structure is likely U channel. It is constructed with head wall of 300mm thick, wing wall of 300mm thick and apron (bottom slab) of 350mm thick. Wooden piles of ϕ 80mm – 100mm, 4,5m and 25pcs./m2 are driven to support the outlet. 100mm thick leveling concrete and 200mm thick yellow sand should be placed.

### 2.5.6 Temporary Coffer Dam

Because of low invert level of sewers and high tidal effect of canal, temporary cofferdam is necessary for construction of the outlets. Generally, sewer outlet is completed before the construction of revetment. Temporary cofferdam is provided by steel sheet pile of PU8, 8.0m long and H section steel beam of 200x200x8x12, L = 3 to 8m as shown in Fig.

2.7, and is installed around the outlet to make dry up condition in the site. Top elevation of cofferdam is designed at EL.+2.00m. It is larger than outlet width about 1m. After completion of sewer outlet, temporary cofferdam shall be removed to construct the canal revetment

## 2.6 Earth Works

### 2.6.1 Earth Works for Revetment and Sewer Outlet Construction

Earth works for the construction of revetment and sewer outlet shall be conducted under the dry condition after construction of the temporary cofferdam along the canal, which was mentioned in previous Section 2.5 and 2.6. Mud Soil, sludge, low quality soil and surplus soil excavated by clamshell, backhoe or other excavator are loaded to the barge with capacity of 200 to 500ton moored near the site and transported to the designed dumping site, which will be mentioned later. If the quality of excavated soil is available for filling to both low banks of the canal, these are directly used as filling materials or hauled to stockpile provided in vicinity of the site.

Filling material along both low banks of the canal is basically used the sandy soil, which shall be adequate for the requirement mentioned in technical specification. This material is locally known as “black sand”, which is cheaper than natural sand (locally called as “yellow sand”) for sand bedding. Before filling the sandy soil for some sections, timber piles of 80 – 100mm in diameter and 4,500mm long shall be penetrated to

### 2.6.2 Channel Excavation

After completion of the construction of revetment and sewer outlet, channel excavation shall be commenced to increase waterway channel of Tau Hu and Ben Nghe canals. Channel excavation shall be conducted below water level. There are many types of dredger; pump type, bucket type, grab type and dipper type. In Ho Chi Minh City and its outskirts, ordinary barge (200 to 500ton) with clamshell or grab equipment is generally used for canal dredging. Grab bucket capacity is 1.2m3. Excavation around the existing bridge pier is proposed to use a suction cutter.

Dredged and dug soil and materials are loaded into the barge, of which capacity is from 140 – 300m3 and its bottom can be opened to dump. The fully loaded barge is towed to the designed dumping site by a tugboat with capacity of 150 to 250hp. During the barge is being towed to dump site, it should be covered by sheet to prevent from odor and dropping of soil.

Joint meeting with DTPW, OWM, PMU of WEIP and JICA Study Team held on 18th October 2000, OWM agree that the dumping sites in Can Gio and Nha Be districts shown in Fig. 2.10 can be used for dumping sludge dredged in THBNCIP. The proposed

dumping sites are summarized below:

(a) Tam Thon Hiep, Can Gio District

This dumping site with area of about 50ha is located at the right bank of Long Tau River, nearby T-junction with Tac Roi Canal. This site is also surrounded with Cha La and Duoc canals of 2 to 3m depth and 10 to 12m wide, as shown in Fig. 2.11. The site is low-lying area consisting of mixed land use with paddy field, papyrus field and water coconut palm field. The average tidal inundation depth is surveyed to be 0.5 to 0.7m. This dumping site has potential to receive a great amount of dredged soil and sludge. People's Committee of Tam Thon Hiep commune agree to receive light polluted dredged soil and sludge of maximum 480,000m3 from Tau Hu – Ben Nghe canals for filling up the low-lying site in order to construct the resettlement site for the residents from Tac Roi Island in line with relocation program of Can Gio District.

This dumping site is about 45 to 50km far from Chu-Y Bridge. Two navigation routes will be considered: (i) Saigon River – Nhabe River – Long Tau River, (ii) Rach Ong – rach Dia – Nha Be river – Long Tau River. Distance of both routes is not so different.

(b) Hiep Phuoc Commune, Nha Be District

This dumping site of about 25ha is located along the right bank of Lo Canal, which is a tributary of Nha Be River. It is 30 to 35km far from Chu Y-Bridge as shown in Fig. 2.12. Land use of the site is mixed one with resident and garden in filling up land, paddy field and water coconut palm field in low-lying area. An average tidal inundation depth is only 0.2 to 0.5m. People's Committee of Hiep Phuoc Commune and other households agreed to fill up light polluted dredged sludge of 50,000m3 each from Tau Hu – Bne Nghe canals.

There are also two considerable navigation routes: (i) Rach Can Guioc – Raci Doi – Dong Dien Canal – Nha Be River, (ii) Rach Can Guioc – Rach Dua – Giong River – Lo Canal.

## 2.7 New Road and Sewer Line Construction along Tau Hu Canal

### 2.7.1 General

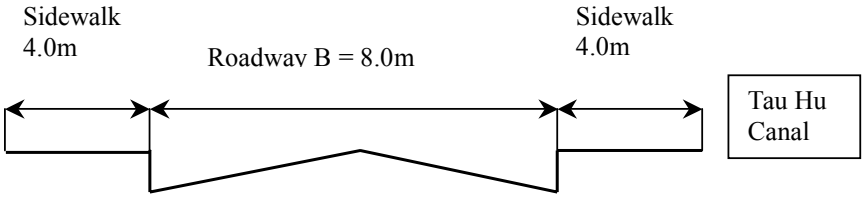
The existing Tau Hu canal alignment of about 340m long between Section 77 and 85 is planned to shift to the south with the maximum length of about 60m in order to obtain the minimum curve length of 200m for East-West Highway. As a result, the existing city road of Ben Ba Dinh Road including water supply pipe, small sewers electricity and telecommunication line shall be replaced. 74 houses shall be relocated and 30 households shall be acquitted a part of building and land. In this Section, detailed design of new Ben Ba Dinh Road and sewer line construction are mentioned below.

### 2.7.2 Road Construction

(1) Future Plan of Ben Ba Dinh Road

Existing Ben Ba Dinh Road is classified into "Collection Street (secondary street)", however, it is very narrow (only 4.0 to 5.0m) and no sidewalk. According to the City Master Plan prepared by Urban Planning Institute (UPI), Ben Ba Dinh Road between Chu Y-Bridge and U Cay Canal is planned to expand to 8.0m of roadway and 4.0m of both sidewalk as shown below:

CROSS SECTION OF BEN BA DINH ROAD PROPOSED BY UPI




Replacement of Ben Ba Dinh Road is to be designed under the future plan prepared by UPI.

(2) Applicable Codes and Standards

The following Codes and Standard of Vietnam are applied:

(a) 20 TCN 104-83 "Standard for Urban Highway Design" approved by Ministry of Construction, (MOC)
(b) TCVN 4054-98 "Standard for Rural Highway Design" approved by Ministry of Transportation, (MOT)
(c) 22 TCN 211-93 "Standard for Flexible Pavement Design" approved by MOT
(d) TCVN 2201-1993 " Soil for Construction – Testing method for compacting index in laboratory" approved by MOC
(e) 22 TCN 249-98 "Specification for asphalt concrete construction, hot laid" approved by MOT

References have been made to the following publication additionally:

(a) A policy on Geometric Design of Highways and Streets – AASHTO 1990
(b) Guide for Design of Pavement Structures – AASHTO 1986
(c) Standard specification for transportation materials and methods of sampling and testing. AASHTO 1990

(3) Design Conditions and Parameters

According to 20 TCN 104-83, Ben Ba Dong Road is classified into "Collection Street".

(a) Basic Design Parameters.

- Design load for pavement: Axle load 12 ton
  Tire pressure 6 Kg/cm2
  Diameter of tire mark 36 cm
- Design Traffic Volume (H10): 300 vehicle/Day
- Design speed: 60 Km/h
- Pavement structure: Asphalt concrete Type P4

(b) Basic Design Geometric Parameters

| | |
|---|---|
| Existing Ground Level: | EL.+1.50 ~ +1.70 m |
| Design new pavement level: | EL.+1.60 ~ +1.80 m |
| DHWL of Tau Hu canal: | EL.+1.50 m |
| Road bed width: | 17.00 m |
| Design width of pavement: | 8.00 m |
| Sidewalk width: | North side: 5.00m and south side: 4.00 m |
| Total Length of Road: | 362m |
| Profile slope: | 0007 |

(c) Geological Condition

According to the soil survey results based on borehole number DBN-01 conducted on June 2000, geological conditions of Ben Ba Donh Street are summarized in the table below:

Geological Condition near Ben Ba Dong Road Replacement Site

| Properties | Unit | Layer 2 | Layer 2a | Layer 2b | Layer 4 |
|---|---|---|---|---|---|
| Thickness of layer | m | 1.8-3.5 | 2.0 | 1.5 | 1.2-4.0 |
| Wet density , $\gamma_w$ | $g/cm^3$ | 1.481 | 1.728 | 1.979 | 2.059 |
| Unconfined compressive strength $q_u$ | $Kg/cm^2$ | 0.241 | 0.371 | 0.621 | 1.198 |
| Compression index , Cc | $cm^2/Kg$ | 0.866 | 0.3935 | 0.1946 | 0.194 |
| Coefficient of consolidation , Cv | $cm^2/s$ | $3.5*10^{-4}$ | $3.7*10^{-4}$ | $7.8*10^{-4}$ | $5.9*10^{-4}$ |
| Coefficient of volume compressibility, $m_v$ | $cm^2/g$ | $9.3*10^{-5}$ | $5.9*10^{-5}$ | $2.3*10^{-5}$ | $3.7*10^{-5}$ |
| Standard penetration resistance, SPT, N | Blow | 0-2 | 4-5 | 4 | 7-15 |

Note: Soil classification of each layer is as follows:
- Layer 1: right on surface, thickness is from 1.00 to 3.00m.
- Layer 2: Blackish gray, ORGANIC CLAY (OH)
- Layer 2a: Yellowish brow CLAY (CH)
- Layer 2b: Blackish gray CLAYEY SAND (SC)
- Layer 4: Stiff, yellowish gray SANDY CLAY (CL)

(4) Design Layout, Profile and Cross Section

(a) Layout

Local road in THBNCI project location on a curve with radius R = 126 m. Road bed wide is 17 m, compose 8 m asphalt concrete pavement and 5+4 m sidewalk. Elevation of concrete curb at both side of pavement is 20 cm higher than that of pavement surface.

(b) Longitudinal Slope

Following existing level, profile of road designed 0.07%. Drainage water will concentrated by cross section slop 2% to raining inlet at both side.

(c) Cross Section

Cross section of road compose:
- Asphalt concrete Pavement, between two concrete curb, have cross slope of 2%
- Design wide of pavement surface 8.00 m
- Side walk at two side pavement, (5 + 4 m) of wide

(5) Pavement Structure and Concrete Curb

(a) Pavement structure

The following asphalt concrete pavement (Type P4) is designed for the replacement of Ben Ba Dong Road.

- 5cm Wearing course, Asphalt concrete (gravel is small size)
- Emulsified asphalt Tack coat 0.2 ~ 0.7 l/m2
- 7cm Binder course, Asphalt concrete (gravel is middle size)
- Emulsified asphalt Prime coat 1.0 ~ 2.0 l/m2
- 26cm Base course, crush aggregate (size 2 ~ 4 cm)
- 15cm Sub-base course, mixture sand + 10% cement

Total thickness of pavement is 53cm.

(b) Concrete Curb

Both sides of asphalt concrete pavement are connected with concrete curve with 180W x 260H and 180W x 300H, which is constructed by cast-in-situ concrete (Concrete Type E). Top elevation of curb is 20cm higher than that of pavement surface.

### 2.7.3 Sewer Line Construction

(1) General

Tau Hu canal alignment will be improved in the section of nearly 400m belongs District 8 in the south and District 5 in the north. In this section of canal, a part of the existing road – Ben Ba Dinh – will be omitted. It is necessary to construct a new road in order to replace the omitted road as mentioned above. This new road will be also constructed with the attached infrastructure, such as electric, water supply, telephone, drainage, etc. For the drainage of the new road, a sewer line is designed.

(2) Applicable Codes and Standards.

The following codes and standards are applied for this detailed design.

(a) Vietnamese Design Standard 20 TCN – 51 – 84 from Ministry of Construction on "Outside Sewer Network" .
(b) Standard Specification for Design and Construction of Concrete Structure (The Japan Society of Civil Engineers 1996)
(c) Proceedings of Vietnam Construction Standards, Volume III (Ministry of Construction 1997)
(d) Japanese Industrial Standard (Japan Standards Association 2000)
(e) Typical Sewer Design from HCMC Urban Drainage Company for reference.
(f) Japanese Typical Sewer Design Sample for reference.

(3) Design Conditions and Parameters.

(a) Design Conditions:

There is no existing sewer pipes along the omitted road. But there are many small pipes with the size from 200mm to 400mm, which drain storm water and wastewater for the small inner road in the area. They discharge directly into Tau Hu canal. Therefore, the designed sewer on the new road has to connect with all these small existing sewer pipes.

(b) Design Parameters:

Design parameters applied in this design are as follows:

- Service Area: 3,9 ha, including the area of 1.7ha, which is outside this section will be connected in the future.
- Flow system: Gravity flow
- Sewer system: Combined system
- Flow equation: Manning formula
- Design velocity: 1,4m/s.
- Design flows of storm water and wastewater: 1.28m3/s.
- High water tide level on Tau Hu canal: +1.320
- Pipe size: 2ϕ800, i = 2.5‰, ϕ1,200, I = 1.2‰
- Length of pipe : ϕ800, L = 362m, ϕ1200, L = 11m

(4) Design for Layout, Profile of Sewer Line:

(a) Layout Design: (refer to DWG.No PA-THBNCI-260,261 in Tender Drawings)

Because the sidewalk has no space enough to install for all facilities; the center of sewer line ϕ800 is defined under the road, in the side which is opposite Tau Hu canal bank, and about 0 – 1.3m far from the curb based on the radius of the new road.

There are 14 manholes above this line with the step from 20m to 37m, based on the radius of the new road. The first and the last manhole will use grid cover to collect surface water because there is no inlet installed here.

There are 12 inlets on the sidewalk, which is opposite Tau Hu canal bank because the new

road is 1-slope road. They are connected with the 12 remain new manholes by connection pipes ϕ400 and connected with all the existing crossing small pipes of the area

Center of sewer line ϕ1200 is perpendicularly with the road, nearly at the middle of the line ϕ800.

An outlet for the pipe ϕ1200 will be constructed.

(b) Profile Design: (refer to DWG.No PA-THBNCI-260,261 in Volume III, Tender Drawings)

Based on (i) The design elevation of the new road mentioned in previous section, (ii) The hydraulic calculation results, (iii) The preparation of the future connection for the 100m – 150m existing continuously pipes both sides of this designed section.

Profile is designed as follow:

- Invert elevation at the manhole M1: IE = -0.200
- Invert elevation at the manhole M7: IE = -0.695 for the pipe ϕ800 and IE = -1.100 for the pipe ϕ1200.
- Invert elevation at the manhole M14: IE = -0.206
- Gradient for ϕ800: 2.5%o
- Gradient for ϕ120: 1.2%o

(5) Design for Structure

(a) Pipes: Precast centrifugal reinforced concrete Type D – 250kg/cm2.
(b) Foundation of sewer pipes: Driving timber piles ϕ80 - ϕ100with 16trees/m2, L = 4.5m/tree, Cast in situ concrete Type G – 100kg/cm2
(c) Manholes: Cast in situ reinforced concrete Type E – 210kg/cm2. (refer to DWG. No. PA - THBNCI-264)
(d) Inlets: Cast in situ reinforced concrete Type E – 210kg/cm2. (refer to DWG. No. PA - THBNCI-264
(e) Manhole cover: 12 circle cast iron covers with the load 30 Tons (Type A) and 02 grid cast Iron cover with the load 30 Tons (Type C). (refer to Drawing DWG. No.PA-THBNCI-265)
(f) Inlet cover: 12 square cast iron covers with the load 6 Tons (Type E). (refer to DWG. No. PA-THBNCI-265)
(g) Outlet: Cast in situ reinforced concrete Type E – 210kg/cm Drawing DWG. No. PA - THBNCI-264)

After installation of the pipes, the trench will be backfilled by yellow sand until 0.2m higher than the top of pipes and by sandy soil until the layers of new road.

(6) Construction method: using machine in combination with manual.

Cutting the road first by road cutter, then excavate the soil by using backhoe, because the excavation depth is below 6.0m. Installation of the pipes is to be conducted by the suitable crane. The trench in this section is lower than 4.0m deep, so, the trench shall be shored by the timber and the timber board. Timber board pile with section of 30mm x

300mm and timber strut and wailing of 60mm x 120mm (double) are to be used.

The excavation width is proposed as follows:

| Diameter (mm) | ϕ800 | ϕ1200 |
|---|---|---|
| Width (m) | 2.0 | 2.6 |

The works, such as construction of the manholes, inlets, outlets, adjustment work for the position of pipes will be conducted mostly by manual.

### 2.7.4 Other Utility Services

There are three utility services to be replaced simultaneously with the reconstruction of Ben Ba Dinh Road. These are water supply pipe of 150mm diameter, electric line of low voltage and 15kv in voltage and telecommunication line.

Water supply pipe of 150mm diameter is planned to install at 1.0m from the road boundary and 1.2m below ground along the southern sidewalk. 12 electric RC poles shall be newly provided at 1.0m from the edge of the roadway along the southern sidewalk to install low voltage and 15kv cables. Telecommunication lines are to be install at same time to electric RC poles.

Construction of these public utility services will be executed by the agency concerned, Ho chi Minh City Water Supply Company, Power Company and Telecommunication Company.

## 2.8 Landscape Work

For establishment of beautiful canal side scenery, objective area for landscaping is 7.4km in Tau Hu – Ben Nghe canal section and 6.0km in up-stream of Tau Hu canal section and total length becomes to 13.4km in length.

(1) Landscape facility

Paving of operation and maintenance space shall be colored concrete block. Concrete curb of the planting area is 1.8m square type and rectangular type of 1.8m x 9.8m. The curb rises 20cm in height from the paving level and width of top to be 20cm.

(2) Plantings

Medium size canopy trees are planted along the revetment top of operation / maintenance space. Interval of each planting tree is 8.0 m in general for consideration of future growth of crown of the trees. 1.8m x 1.8m square planting shall be applied for each planting location. Each interval of 24.0m rectangular formed planting areas is to be as for a visual accent though the O/M space, in which grass sods is planted. Introduced plants species are shown as follows.

(a) Medium size canopy tree:

*Lagaestromea tomentosa* 710 Nos. and *Mimusops elengi* 990 Nos shall be planted in total. Both species are H=4.0m, stem diameter is 4cm in 1.2m height from the ground. All trees shall be supported by tripod type support with pole individually to sustain trees in stable.

(b) Flowering shrub:

*Ixora chinensis rosa* 497 m2, *Ixora macropthysa* 497m2, *Hibiscus rosa - chinensis* 693m2, and *Musaenda erythrophylla* 693m2 shall be planted in total.

All flowering shrub is 40cm in height and crown width is 25cm, they are planted in group with 10 Nos/m2.

(c) Ground cover plant:

*Wederia trilobata* 1,645m2 shall be planted in total. Lower growing plants with yellow flower, height of plant is about 10cm, and 16 Nos/ m2 shall be applied when planted.

(d) Grass sods:

*Axonopus compressus* 1,611.6m2 shall be planted in total. Broad leafed type grass is planted with sods within the square planting area.

All planting work shall required proper size of planting hole and existing soil to be replaced agriculture soil.

Proposed Landscape Development Scheme along Tau Hu – Ben Nghe Canal is shown in Fig.2.13.

## 2.9 Allotment of a Part of Canal Improvement Works to Ongoing Relevant Project

There are three ongoing projects related to THBNCIP, such as

(a) Dredge and Rehabilitation Project on Ben Nghe - Tau Hu - Lo Gom for Navigation managed by Office of Waterway Management (OWM)
(b) Ho Chi Minh City East-West Highway Project (EWHP) managed by Department of Transportation and Public Works (DTPW)
(c) Ho Chi Minh City Environmental Improvement Project (Hang Bang Canal Rehabilitation: HBCRP) assisted by Asian development Bank (ADB)

(1) Channel Excavation

According to OWM, Ben Nghe and Tau Hu canals between the junctions with Saigon River and Ngang No.1 Canal will be commenced to dredge from the end of 2000 without any house relocation along the canal. Total dredging volume of Ben Nghe (Saigon River to Chu Y-Bridge) and Tau Hu (Chu Y-Bridge to Junction with Ngang No.1 Canal) is estimated at about 192,000 and 158,000m3 respectively.

Through the meeting with PMU, OWM and JICA Study Team, it has been concluded that total dredging volume of about 350,000m3 estimated by OWM for Tau Hu – Ben Nghe canals shall be deducted from the estimated volume of about 700,000m3 in THBNCIP.

(2) Construction of Sewer Outlet and Revetment

For existing four road bridges along the canal of THBNCIP, such as Khanh Hoi, Calmette, Chu Y and Cha Ba bridges, are recommended to reconstruct in EWHP. Therefore, construction of revetment and sewer outlet proposed in up and downstream stretch of 20 to 25m from the center of the existing bridge is planned to implement in EWHP.

Moreover, six combined sewers including their outlets, which exist from Section 130 to 146 of Tau Hu Canal are proposed to reconstruct. So, construction of the revetment from 5 to 10m shall be executed simultaneously with these outlet constructions.

Table 2.5 Shows the construction works to be executed by other relevant projects.

## 2.10 Work Quantity

Work Quantities of Tau Hu – Ben Nghe Canal Improvement Project (Package A) are summarized in Table 2.6 (1/3) to (3/3). Details of Work Quantities are compiled in Design Report, Volume III.

## 2.11 Construction Plan and Schedule

This section deals with the construction plan and schedule of Package A :Tau Hu – Ben Nghe Canal Improvement.

### 2.11.1 Basic Condition

For preparation of construction plan and schedule, the following considerations have been taken as a basic concept of construction works.

(1) Scope of Package A Project

Package A: Tau Hu – Ben Nghe Canal Improvement Project consists of the following main construction component:

(a) Construction of revetment
- Type A: 5,687m for Ben Nghe canal, 5,193m for Tau Hu canal
- Type B: 0m for Ben Nghe canal, 2,735m for tau Hu canal
- Excavation for revetment: V = 177,860$m^3$
- Bank filling: V = 207,640 $m^3$

- Timber piling: L = 3,102,350m for foundation of revetment and sliding protection

(b) Channel Excavation: V = 201,310 $m^3$

(2) Other Conditions

(a) Mode of construction:
The construction shall be carried out by sufficient contractor(s) selected through international competitive bidding (ICB).

(b) Availability of Construction Plant and Equipment:
The major construction work shall be conducted by applying heavy equipment, which mostly procured locally, due to limited construction period and keeping good quality of construction.

(c) Construction Materials
Most of basic construction materials could be found available in this country. Some particular processed materials (steel sheet pile, H type steel beam, etc) are to be procured from outside.

(d) Pattern of Construction Method

Main work comprises of temporary cofferdam work, earth work, concrete work and stone masonry work. Temporary coffer dam and earth works are planned to conduct by heavy machinery (pile driver, clamshell, backhoe, barge, tug boat, etc.) in combination with manpower. While, concrete and stonemasonry works will be conducted by mainly manpower.

### 2.11.2 Major Works of the Project

Major works of Tau Hu – Ben Nghe Canal Improvement Project consists of the followings:

(a) Construction of Sewer Outlet
(b) Construction of Revetment including Landscape Work
(c) Channel Excavation

The construction methods for the above major works are designed as follows:

(1) Sewer Outlet Construction

Out of 96 existing sewer outlet along the canal, 87 sewer outlet connecting with concrete pipe from ϕ400mm to ϕ2000mm and box culvert from 1000mmW x 1000mmH to

2800mmW x 2500mmH, shall be reconstructed in this project. Basically, sewer outlet construction consists of outlet construction and sewer line construction to connect with outlet and the existing sewer.

Sewer outlet construction shall be conducted prior to revetment works. Firstly, steel sheet pile of PU8, l = 8.0m shall be driven in the canal in front of the outlet to be constructed in order to provide the temporary coffer dam. The steel sheet piles, of which top elevation is 1.5 to2.0m, shall be fixed rigidly by H section steel beam of 200x200x8x12. Then, excavation work could be conducted under the dry condition. After completion of the excavation around the designed outlet, foundation piling (wooded pile of $\phi$80 – $\phi$100, l = 4.5m, 25 pcs/$m^2$) and reinforced concrete work shall be conducted. While, sewer pipe or box culvert shall be constructed simultaneously by open cut method shoring steel sheet pile and connected between the existing sewer and newly constructed outlet.

(2) Construction of Revetment

In succession of sewer outlet construction, the revetment construction would be commenced. Main works of revetment construction are (i) temporary coffer dam work, (ii) earth work, (iii) foundation work, (iv) revetment work, and (v) crest treatment work (landscape work). Fig. 2.14 shows the construction plan of revetment work.

(a) Temporary Coffer Dam Work:

As mentioned in Section 2.4.6, at the commencement of the revetment work, temporary coffer dam, which is designed by steel sheet pile of PU 8, l = 8.0m, shall be constructed to protect the construction site from the tidal effect occurring two times per day and to obtain a sufficient dry condition. Steel sheet piles are driven by pile driver on barge and shall be supported and fixed rigidly by H section steel beam of 200x200 and 260x260. One lot length of the temporary coffer dam is designed at 30m to be able to construct the revetment of one lot length of 26.0m.

(b) Earth Work:

After completion of the coffer dam, earth work, such as cutting and filling for bank slope preparation and excavation of canal bed for revetment foundation work shall be conducted. Earth work would be conducted by backhoe, clamshell, bulldozer in combination with man power. As shown in Section 2.6.1, mud soil, low quality soil and surplus soil excavated are loaded to the barge (200 – 500 ton) and transported to the proposed dumping sites. Filling materials shall be used good quality of sandy soil/clay (mixed soil with black sand and clay).

(c) Foundation Work:

After completion of excavation of canal bed up to the design elevation, foundation piling (wooden pile of $\phi$80 –$\phi$100, l = 4.5m, n = 25pcs/$m^2$) shall be conducted. Wooden piles are driven by mainly manpower wooden driver. Simultaneously,

wooden piles for protection from sliding by filling are also to be driven. After piling, gravel bedding and leveling concrete work shall be conducted. Foundation of revetment is provided by reinforced concrete block (600W x 400H x 4000L for Type A revetment and 800W x 400H x 4000L for Type B revetment), which are made at the construction site in advance to shorten the construction period. Rip rap work shall be also done.

(d) Revetment Work:

In succession of foundation work, revetment work consisting of geotextile sheet, stone masonry and gravel filling works including installation of weep hole. Geotextile sheet shall be laid out uniformly taking care not to puncture the cloth. The mortal shall be well driven into gaps between stones. Gravel shall be placed between plain concrete behind stone masonry and geotextile cloth and compacted in continuous horizontal layers. During stone masonry work, weep hole shall be provided at the designated place. Sandy soil/clay filling shall be simultaneously conducted. Filling adjacent to revetment shall be placed and compacted to avoid damage to such structure. Compaction adjacent to revetment shall be carried out by suitable hand operated equipment.

(e) Crest Treatment Work (Landscape Work):

After completion of the revetment work including filling work of both banks, crest treatment works (landscape works). This work consists of the followings:

- Cable wiring and lighting work
- Concrete block pavement work including sand bedding and concrete curb works
- Planting works

(3) Channel Excavation

After completion of construction of sewer outlet and revetment in some section, channel excavation shall be commenced to increase the flow area of Tau Hu – Ben Nghe canal. Channel excavation volume is estimated at more than 71,000$m^3$ for Ben Nghe canal and about 130,000 $m^3$ for Tau Hu canal. (Note: This figure excludes the dredging volume of Tau Hu – Ben Nghe rehabilitation project by OWM)

As described in Section 2.6.2, channel excavation method is designed to apply local dredging method. For ordinary channel excavation, 200 to 500 ton barge with clamshell or grab equipment (bucket capacity is 1.2$m^3$) shall be employed. Excavation around the existing bridge pier is proposed to use a suction cutter. Dredged and dug soil and materials are loaded into the barge, of which capacity is from 140 – 300m3 and its bottom can be opened to dump. The fully loaded barge is towed to the designed dumping site by a tugboat with capacity of 150 to 250hp. During the barge is being towed to dump site, it should be covered by sheet to prevent from odor and dropping of soil. The dumping site

is planned to use two places, Tam Thon Hiep (480,000$m^3$) , Can Gio District and Hiep Phuoc Commun (100,000$m^3$) , Nha Be District.

### 2.11.3 Construction Schedule

Construction schedule is prepared based on the following assumptions:

(a) Construction could be commenced at the beginning of February 2002 after due consideration of extended over a long period of relocation implementation and tender process for construction.
(b) Preparatory work period is considered at least two (2) months.
(c) Construction of sewer outlet shall be commenced first, then revetment construction, of which total construction period would be 26 months, is to be followed. Channel excavation work could be commenced the beginning of the year 2004.
(d) The Project will be completed at the end of July 2005.

The proposed construction schedule is shown in Table 2.7.

## TABLE 2.1 (1/4) PROPOSED LONGITUDINAL PROFILE OF TAU HU - BEN NGHE CANAL

| Station | Distance (m) | Accumu-late Distance (m) | Existing | | | Design | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Bed Elevation EL1 (m) | Left Bank Elevation EL2 (m) | Right Bank Elevation EL3 (m) | Canal Bed Elevation EL4 (m) | High Water Level EL5 (m) | Left Dike Crown Elevation EL6(m) | Right Dike Crown Elevation EL7(m) |
| No.0 (BP) | 0.00 | 0.00 | -8.75 | - | - | -3.450 | 1.320 | - | - |
| No.1 | 50.00 | 50.00 | -2.68 | 2.15 | 1.98 | -3.448 | 1.321 | 2.150 | 1.980 |
| No.2 | 50.00 | 100.00 | -2.57 | 2.20 | 1.52 | -3.445 | 1.321 | 2.200 | 1.520 |
| No.3 | 50.00 | 150.00 | -2.35 | 2.20 | 1.96 | -3.443 | 1.322 | 2.350 | 1.960 |
| BC1 | 19.47 | 169.47 | -2.27 | 2.13 | 2.19 | -3.442 | 1.322 | 2.350 | 1.960 |
| SP1 | 20.33 | 189.80 | -2.19 | 2.06 | 2.42 | -3.441 | 1.322 | 2.350 | 1.960 |
| No.4 | 10.20 | 200.00 | -2.15 | 2.02 | 2.54 | -3.440 | 1.323 | 2.200 | 2.200 |
| EC1 | 10.13 | 210.13 | -2.11 | 2.02 | 2.43 | -3.439 | 1.323 | 2.200 | 2.200 |
| No.5 | 39.87 | 250.00 | -1.97 | 2.04 | 1.99 | -3.438 | 1.323 | 2.200 | 2.200 |
| No.6 | 50.00 | 300.00 | -2.04 | 2.04 | 1.98 | -3.435 | 1.324 | 2.200 | 2.200 |
| No.7 | 50.00 | 350.00 | -1.95 | 1.98 | 2.09 | -3.433 | 1.324 | 2.200 | 2.200 |
| No.8 | 50.00 | 400.00 | -2.28 | 2.10 | 2.03 | -3.430 | 1.325 | 2.200 | 2.200 |
| BC2 | 39.47 | 439.47 | -2.25 | 2.07 | 1.99 | -3.428 | 1.326 | 2.200 | 2.200 |
| No.9 | 10.53 | 450.00 | -2.24 | 2.06 | 1.98 | -3.428 | 1.326 | 2.200 | 2.200 |
| SP2 | 49.78 | 499.78 | -1.98 | 2.00 | 2.00 | -3.425 | 1.326 | 2.200 | 2.200 |
| No.10 | 0.23 | 500.00 | -1.98 | 2.00 | 2.00 | -3.425 | 1.326 | 2.200 | 2.200 |
| No.11 | 50.00 | 550.00 | -1.75 | 2.08 | 2.01 | -3.423 | 1.327 | 2.200 | 2.200 |
| EC2 | 10.08 | 560.08 | -1.82 | 2.09 | 2.02 | -3.422 | 1.327 | 2.200 | 2.200 |
| No.12 | 39.92 | 600.00 | -2.12 | 2.13 | 2.04 | -3.420 | 1.328 | 2.200 | 2.200 |
| No.13 | 50.00 | 650.00 | -2.06 | 2.12 | 1.99 | -3.418 | 1.328 | 2.200 | 2.200 |
| No.14 | 50.00 | 700.00 | -1.66 | 2.08 | 1.94 | -3.415 | 1.329 | 2.200 | 2.200 |
| No.15 | 50.00 | 750.00 | -2.15 | 1.84 | 1.92 | -3.413 | 1.330 | 2.200 | 2.200 |
| BC3 | 10.73 | 760.73 | -2.19 | 1.86 | 1.91 | -3.412 | 1.330 | 2.200 | 2.200 |
| No.16 | 39.27 | 800.00 | -2.32 | 1.91 | 1.86 | -3.410 | 1.330 | 2.200 | 2.200 |
| SP3 | 4.44 | 804.44 | -2.29 | 1.92 | 1.91 | -3.410 | 1.330 | 2.200 | 2.200 |
| EC3 | 43.71 | 848.14 | -2.02 | 2.04 | 2.40 | -3.408 | 1.331 | 2.200 | 2.200 |
| No.17 | 1.86 | 850.00 | -2.01 | 2.04 | 2.42 | -3.408 | 1.331 | 2.200 | 2.200 |
| No.18 | 50.00 | 900.00 | -1.93 | 2.08 | 2.38 | -3.405 | 1.332 | 2.200 | 2.200 |
| No.19 | 50.00 | 950.00 | -1.83 | 2.04 | 1.96 | -3.403 | 1.332 | 2.200 | 2.200 |
| BC4 | 6.69 | 956.69 | -1.83 | 2.03 | 1.95 | -3.402 | 1.332 | 2.200 | 2.200 |
| SP4 | 12.90 | 969.59 | -1.82 | 2.00 | 1.94 | -3.402 | 1.332 | 2.200 | 2.200 |
| EC4 | 12.90 | 982.49 | -1.81 | 1.98 | 1.92 | -3.401 | 1.333 | 2.200 | 2.200 |
| No.20 | 17.51 | 1,000.00 | -1.80 | 1.94 | 1.90 | -3.400 | 1.333 | 2.200 | 2.200 |
| No.21 | 50.00 | 1,050.00 | -1.85 | 2.04 | 1.94 | -3.398 | 1.333 | 2.200 | 2.200 |
| No.22 | 50.00 | 1,100.00 | -1.82 | 2.06 | 1.78 | -3.395 | 1.334 | 2.200 | 2.200 |
| BC5 | 13.28 | 1,113.28 | -1.90 | 2.06 | 1.77 | -3.394 | 1.334 | 2.200 | 2.200 |
| No.23 | 36.72 | 1,150.00 | -2.14 | 2.06 | 1.76 | -3.393 | 1.335 | 2.200 | 2.200 |
| SP5 | 18.23 | 1,168.23 | -2.02 | 1.96 | 1.78 | -3.392 | 1.335 | 2.200 | 2.200 |
| No.24 | 31.77 | 1,200.00 | -1.82 | 1.78 | 1.82 | -3.390 | 1.335 | 2.200 | 2.200 |
| EC5 | 23.18 | 1,223.18 | -1.82 | 1.81 | 1.82 | -3.389 | 1.336 | 2.200 | 2.200 |
| No.25 | 26.82 | 1,250.00 | -1.83 | 1.84 | 1.82 | -3.388 | 1.336 | 2.200 | 2.200 |
| No.26 | 50.00 | 1,300.00 | -1.74 | 1.84 | 1.73 | -3.385 | 1.337 | 2.200 | 2.200 |
| No.27 | 50.00 | 1,350.00 | -1.86 | 1.82 | 1.80 | -3.383 | 1.337 | 2.200 | 2.200 |
| IP6 | 47.66 | 1,397.66 | -1.87 | 1.76 | 1.91 | -3.380 | 1.338 | 2.200 | 2.200 |
| No.28 | 2.34 | 1,400.00 | -1.87 | 1.76 | 1.92 | -3.380 | 1.338 | 2.200 | 2.200 |
| No.29 | 50.00 | 1,450.00 | -1.84 | 1.76 | 1.96 | -3.378 | 1.339 | 2.200 | 2.200 |
| No.30 | 50.00 | 1,500.00 | -1.97 | 1.63 | 2.06 | -3.375 | 1.339 | 2.200 | 2.200 |
| No.31 | 50.00 | 1,550.00 | -1.70 | 1.64 | 1.99 | -3.373 | 1.340 | 2.200 | 2.200 |
| No.32 | 50.00 | 1,600.00 | -1.73 | 1.75 | 2.03 | -3.370 | 1.341 | 2.200 | 2.200 |
| BC7 | 1.07 | 1,601.07 | -1.73 | 1.75 | 2.03 | -3.370 | 1.341 | 2.200 | 2.200 |
| No.33 | 48.93 | 1,650.00 | -1.73 | 1.79 | 1.95 | -3.368 | 1.341 | 2.200 | 2.200 |
| SP7 | 8.43 | 1,658.43 | -1.70 | 1.81 | 1.96 | -3.367 | 1.341 | 2.200 | 2.200 |
| No.34 | 41.57 | 1,700.00 | -1.53 | 1.93 | 2.01 | -3.365 | 1.342 | 2.200 | 2.200 |

## TABLE 2.1 (2/4) PROPOSED LONGITUDINAL PROFILE OF TAU HU - BEN NGHE CANAL

| Station | Distance (m) | Accumu-late Distance (m) | Existing | | | Design | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Bed Elevation EL1 (m) | Left Bank Elevation EL2 (m) | Right Bank Elevation EL3 (m) | Canal Bed Elevation EL4 (m) | High Water Level EL5 (m) | Left Dike Crown Elevation EL6(m) | Right Dike Crown Elevation EL7(m) |
| EC7 | 15.79 | 1,715.79 | -1.51 | 1.99 | 2.12 | -3.364 | 1.342 | 2.200 | 2.200 |
| No.35 | 34.21 | 1,750.00 | -1.46 | 2.13 | 2.34 | -3.363 | 1.342 | 2.200 | 2.200 |
| No.36 | 50.00 | 1,800.00 | -1.41 | 2.28 | 2.07 | -3.360 | 1.343 | 2.200 | 2.200 |
| No.37 | 50.00 | 1,850.00 | -1.44 | 2.40 | 1.89 | -3.358 | 1.344 | 2.200 | 2.200 |
| No.38 | 50.00 | 1,900.00 | -1.43 | 2.34 | 1.93 | -3.355 | 1.344 | 2.200 | 2.200 |
| No.39 | 50.00 | 1,950.00 | -1.44 | 2.01 | 1.77 | -3.353 | 1.345 | 2.200 | 2.200 |
| BC8 | 24.33 | 1,974.33 | -1.55 | 2.04 | 1.77 | -3.351 | 1.345 | 2.200 | 2.200 |
| No.40 | 25.67 | 2,000.00 | -1.66 | 2.07 | 1.78 | -3.350 | 1.346 | 2.200 | 2.200 |
| No.41 | 50.00 | 2,050.00 | -1.53 | 1.98 | 1.78 | -3.348 | 1.346 | 2.200 | 2.200 |
| SP7 | 46.09 | 2,096.09 | -1.64 | 2.12 | 1.95 | -3.345 | 1.347 | 2.200 | 2.200 |
| No.42 | 3.92 | 2,100.00 | -1.65 | 2.13 | 1.96 | -3.345 | 1.347 | 2.200 | 2.200 |
| No.43 | 50.00 | 2,150.00 | -1.78 | 2.27 | 2.15 | -3.343 | 1.348 | 2.200 | 2.200 |
| No.44 | 50.00 | 2,200.00 | -1.72 | 2.16 | 2.00 | -3.340 | 1.348 | 2.200 | 2.200 |
| EC8 | 17.84 | 2,217.84 | -1.69 | 2.20 | 1.98 | -3.339 | 1.348 | 2.200 | 2.200 |
| No.45 | 32.16 | 2,250.00 | -1.62 | 2.25 | 1.95 | -3.338 | 1.349 | 2.200 | 2.200 |
| No.46 | 50.00 | 2,300.00 | -1.63 | 2.04 | 1.97 | -3.335 | 1.349 | 2.200 | 2.200 |
| No.47 | 50.00 | 2,350.00 | -1.88 | 2.10 | 1.89 | -3.333 | 1.350 | 2.200 | 2.200 |
| No.48 | 50.00 | 2,400.00 | -1.77 | 2.06 | 1.95 | -3.330 | 1.351 | 2.200 | 2.200 |
| No.49 | 50.00 | 2,450.00 | -1.73 | 1.92 | 2.02 | -3.328 | 1.351 | 2.200 | 2.200 |
| BC9 | 8.00 | 2,458.00 | -1.72 | 1.93 | 2.00 | -3.327 | 1.352 | 2.200 | 2.200 |
| No.50 | 42.00 | 2,500.00 | -1.62 | 1.98 | 1.92 | -3.325 | 1.352 | 2.200 | 2.200 |
| SP9 | 1.94 | 2,501.94 | -1.64 | 1.98 | 1.92 | -3.325 | 1.352 | 2.200 | 2.200 |
| EC9 | 43.94 | 2,545.87 | -1.91 | 1.85 | 1.83 | -3.323 | 1.353 | 2.200 | 2.200 |
| No.51 | 4.13 | 2,550.00 | -1.93 | 1.84 | 1.82 | -3.323 | 1.353 | 2.200 | 2.200 |
| No.52 | 50.00 | 2,600.00 | -1.86 | 1.83 | 1.93 | -3.320 | 1.353 | 2.200 | 2.200 |
| No.53 | 50.00 | 2,650.00 | -1.84 | 1.83 | - | -3.318 | 1.354 | 2.200 | 2.200 |
| No.54 | 50.00 | 2,700.00 | -1.87 | 1.90 | 1.60 | -3.315 | 1.355 | 2.200 | 2.200 |
| No.55 | 50.00 | 2,750.00 | -2.04 | 1.95 | 1.58 | -3.313 | 1.355 | 2.200 | 2.200 |
| No.56 | 50.00 | 2,800.00 | -2.07 | 2.15 | 1.62 | -3.310 | 1.356 | 2.200 | 2.200 |
| No.57 | 50.00 | 2,850.00 | -2.22 | 2.39 | 1.91 | -3.308 | 1.357 | 2.200 | 2.200 |
| BC10 | 26.36 | 2,876.36 | -2.34 | 2.84 | 1.71 | -3.306 | 1.357 | 2.200 | 2.200 |
| No.58 | 23.64 | 2,900.00 | -2.45 | 3.24 | 1.53 | -3.305 | 1.357 | 2.200 | 2.200 |
| SP10 | 21.77 | 2,921.77 | -2.52 | 2.85 | 1.50 | -3.304 | 1.357 | 2.200 | 2.200 |
| No.59 | 28.24 | 2,950.00 | -2.63 | 2.34 | 1.45 | -3.303 | 1.358 | 2.200 | 2.200 |
| EC10 | 17.17 | 2,967.17 | -3.42 | 2.24 | - | -3.302 | 1.358 | 2.200 | 2.200 |
| BC11 | 9.84 | 2,977.01 | -3.88 | 2.18 | - | -3.301 | 1.358 | 2.200 | 2.200 |
| No.60 | 22.99 | 3,000.00 | -4.94 | 2.04 | - | -3.300 | 1.358 | 2.200 | 2.200 |
| No.61 | 50.00 | 3,050.00 | -6.66 | 1.93 | - | -3.564 | 1.360 | 2.200 | - |
| No.62 | 50.00 | 3,100.00 | -7.04 | 1.88 | - | -5.042 | 1.361 | 2.200 | - |
| No.63 | 50.00 | 3,150.00 | -7.46 | 1.85 | - | -5.664 | 1.363 | 2.200 | - |
| SP11(EP,BP) | 7.42 | 3,157.42 | -7.68 | 1.90 | - | -7.462 | 1.363 | 2.200 | - |
| No.64 | 42.58 | 3,200.00 | -10.23 | 1.90 | - | -5.532 | 1.364 | 2.200 | - |
| No.65 | 50.00 | 3,250.00 | -10.24 | 1.89 | - | -5.840 | 1.366 | 2.200 | - |
| No.66 | 50.00 | 3,300.00 | -8.62 | 2.02 | - | -4.624 | 1.368 | 2.200 | - |
| EC11 | 37.83 | 3,337.83 | -4.39 | 2.17 | 1.56 | -3.497 | 1.368 | 2.200 | 2.200 |
| No.67 | 12.17 | 3,350.00 | -3.03 | 2.22 | 1.56 | -3.497 | 1.369 | 2.200 | 2.200 |
| No.68 | 50.00 | 3,400.00 | -2.53 | 2.10 | 1.53 | -3.494 | 1.369 | 2.200 | 2.200 |
| No.69 | 50.00 | 3,450.00 | -2.73 | 2.10 | 1.53 | -3.492 | 1.370 | 2.200 | 2.200 |
| No.70 | 50.00 | 3,500.00 | -2.74 | 2.08 | 1.50 | -3.489 | 1.370 | 2.200 | 2.200 |
| No.71 | 50.00 | 3,550.00 | -2.94 | 2.18 | 1.70 | -3.487 | 1.371 | 2.200 | 2.200 |
| BC12 | 38.95 | 3,588.95 | -2.55 | 2.31 | 1.68 | -3.485 | 1.371 | 2.200 | 2.200 |
| No.72 | 11.05 | 3,600.00 | -2.43 | 2.35 | 1.67 | -3.484 | 1.371 | 2.200 | 2.200 |

## TABLE 2.1 (3/4) PROPOSED LONGITUDINAL PROFILE OF TAU HU - BEN NGHE CANAL

| Station | Distance (m) | Accumu-late Distance (m) | Existing | | | Design | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Bed Elevation EL1 (m) | Left Bank Elevation EL2 (m) | Right Bank Elevation EL3 (m) | Canal Bed Elevation EL4 (m) | High Water Level EL5 (m) | Left Dike Crown Elevation EL6(m) | Right Dike Crown Elevation EL7(m) |
| SP12 | 44.98 | 3,644.98 | -2.35 | 2.08 | 1.50 | -3.482 | 1.371 | 2.200 | 2.200 |
| No.73 | 5.03 | 3,650.00 | -2.34 | 2.05 | 1.48 | -3.482 | 1.372 | 2.200 | 2.200 |
| No.74 | 50.00 | 3,700.00 | -2.66 | 2.04 | 1.50 | -3.479 | 1.372 | 2.200 | 2.200 |
| EC12 | 1.00 | 3,701.00 | -2.66 | 2.04 | 1.50 | -3.479 | 1.372 | 2.200 | 2.200 |
| No.75 | 49.00 | 3,750.00 | -2.34 | 2.04 | 1.54 | -3.477 | 1.373 | 2.200 | 2.200 |
| No.76 | 50.00 | 3,800.00 | -3.26 | 2.10 | 1.75 | -3.474 | 1.373 | 2.200 | 2.200 |
| No.77 | 50.00 | 3,850.00 | -2.78 | 2.13 | 1.70 | -3.472 | 1.374 | 2.200 | 2.200 |
| BC13 | 19.28 | 3,869.28 | -2.63 | 2.12 | 1.67 | -3.471 | 1.374 | 2.200 | 2.200 |
| SP13 | 23.04 | 3,892.32 | -2.45 | 2.11 | 1.63 | -3.470 | 1.374 | 2.200 | 2.200 |
| No.78 | 7.68 | 3,900.00 | -2.38 | 2.10 | 1.62 | -3.469 | 1.374 | 2.200 | 2.200 |
| EC13 | 15.36 | 3,915.36 | -2.41 | 2.16 | 1.64 | -3.469 | 1.374 | 2.200 | 2.200 |
| No.79 | 34.64 | 3,950.00 | -2.45 | 2.28 | 1.68 | -3.467 | 1.375 | 2.200 | 2.200 |
| BC14 | 23.09 | 3,973.09 | -2.60 | 2.25 | 1.59 | -3.466 | 1.375 | 2.200 | 2.200 |
| No.80 | 26.91 | 4,000.00 | -2.77 | 2.21 | 1.49 | -3.464 | 1.375 | 2.200 | 2.200 |
| No.81 | 50.00 | 4,050.00 | -2.94 | 2.17 | 1.56 | -3.462 | 1.376 | 2.200 | 2.200 |
| SP14 | 31.69 | 4,081.69 | -2.87 | 2.06 | 1.65 | -3.460 | 1.376 | 2.200 | 2.200 |
| No.82 | 18.32 | 4,100.00 | -2.83 | 2.00 | 1.70 | -3.459 | 1.376 | 2.200 | 2.200 |
| No.83 | 50.00 | 4,150.00 | -2.44 | 2.07 | 1.72 | -3.457 | 1.377 | 2.200 | 2.200 |
| EC14 | 40.28 | 4,190.28 | -2.23 | 2.15 | 1.55 | -3.455 | 1.377 | 2.200 | 2.200 |
| No.84 | 9.72 | 4,200.00 | -2.18 | 2.17 | 1.51 | -3.454 | 1.377 | 2.200 | 2.200 |
| BC15 | 8.82 | 4,208.82 | -2.21 | 2.12 | 1.53 | -3.454 | 1.377 | 2.200 | 2.200 |
| No.85 | 41.18 | 4,250.00 | -2.33 | 1.86 | 1.60 | -3.452 | 1.378 | 2.200 | 2.200 |
| No.86 | 50.00 | 4,300.00 | -2.44 | 1.89 | 1.49 | -3.449 | 1.378 | 2.200 | 2.200 |
| No.87 | 50.00 | 4,350.00 | -2.45 | 1.78 | 1.42 | -3.447 | 1.379 | 2.200 | 2.200 |
| SP15 | 23.32 | 4,373.32 | -2.35 | 1.76 | 1.40 | -3.446 | 1.379 | 2.200 | 2.200 |
| No.88 | 26.68 | 4,400.00 | -2.25 | 1.74 | 1.38 | -3.444 | 1.379 | 2.200 | 2.200 |
| No.89 | 50.00 | 4,450.00 | -2.23 | 1.78 | 1.39 | -3.442 | 1.380 | 2.200 | 2.200 |
| No.90 | 50.00 | 4,500.00 | -2.13 | 1.72 | 1.49 | -3.439 | 1.380 | 2.200 | 2.200 |
| EC15 | 37.82 | 4,537.82 | -2.23 | 1.80 | 1.43 | -3.437 | 1.380 | 2.200 | 2.200 |
| No.91 | 12.18 | 4,550.00 | -2.26 | 1.83 | 1.41 | -3.437 | 1.381 | 2.200 | 2.200 |
| No.92 | 50.00 | 4,600.00 | -2.04 | 1.97 | 1.40 | -3.434 | 1.381 | 2.200 | 2.200 |
| BC16 | 4.60 | 4,604.60 | -2.02 | 1.96 | 1.41 | -3.434 | 1.381 | 2.200 | 2.200 |
| SP16 | 42.12 | 4,646.72 | -1.85 | 1.83 | 1.51 | -3.432 | 1.381 | 2.200 | 2.200 |
| No.93 | 3.29 | 4,650.00 | -1.83 | 1.82 | 1.51 | -3.432 | 1.382 | 2.200 | 2.200 |
| EC16 | 38.83 | 4,688.83 | -1.86 | 1.99 | 1.52 | -3.430 | 1.382 | 2.200 | 2.200 |
| No.94 | 11.17 | 4,700.00 | -1.86 | 2.03 | 1.52 | -3.429 | 1.382 | 2.200 | 2.200 |
| No.95 | 50.00 | 4,750.00 | -1.83 | 2.02 | 1.80 | -3.427 | 1.383 | 2.200 | 2.200 |
| No.96 | 50.00 | 4,800.00 | -1.94 | 2.08 | 1.43 | -3.424 | 1.383 | 2.200 | 2.200 |
| No.97 | 50.00 | 4,850.00 | -1.83 | 1.99 | 1.46 | -3.422 | 1.384 | 2.200 | 2.200 |
| BC17 | 0.40 | 4,850.40 | -1.83 | 1.99 | 1.47 | -3.422 | 1.384 | 2.200 | 2.200 |
| SP17 | 35.54 | 4,885.94 | -1.87 | 2.19 | 1.57 | -3.420 | 1.384 | 2.200 | 2.200 |
| No.98 | 14.06 | 4,900.00 | -1.88 | 2.27 | 1.61 | -3.419 | 1.384 | 2.200 | 2.200 |
| EC17 | 21.48 | 4,921.48 | -1.75 | 2.15 | 1.87 | -3.418 | 1.384 | 2.200 | 2.200 |
| No.99 | 28.52 | 4,950.00 | -1.57 | 2.00 | 2.20 | -3.417 | 1.385 | 2.200 | 2.200 |
| BC18 | 14.79 | 4,964.79 | -1.65 | 2.00 | 2.03 | -3.416 | 1.385 | 2.200 | 2.200 |
| SP18 | 20.09 | 4,984.88 | -1.76 | 2.00 | 1.80 | -3.415 | 1.385 | 2.200 | 2.200 |
| No.100 | 15.12 | 5,000.00 | -1.83 | 2.00 | 1.62 | -3.414 | 1.385 | 2.200 | 2.200 |
| EC18 | 4.97 | 5,004.97 | -1.83 | 2.01 | 1.62 | -3.414 | 1.385 | 2.200 | 2.200 |
| No.101 | 45.03 | 5,050.00 | -1.77 | 2.11 | 1.58 | -3.412 | 1.386 | 2.200 | 2.200 |
| No.102 | 50.00 | 5,100.00 | -1.47 | 2.33 | 1.60 | -3.409 | 1.386 | 2.200 | 2.200 |
| No.103 | 50.00 | 5,150.00 | -1.51 | 2.34 | 1.30 | -3.407 | 1.387 | 2.200 | 2.200 |

## TABLE 2.1 (4/4) PROPOSED LONGITUDINAL PROFILE OF TAU HU - BEN NGHE CANAL

| Station | Distance (m) | Accumu-late Distance (m) | Existing | | | Design | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Bed Elevation EL1 (m) | Left Bank Elevation EL2 (m) | Right Bank Elevation EL3 (m) | Canal Bed Elevation EL4 (m) | High Water Level EL5 (m) | Left Dike Crown Elevation EL6(m) | Right Dike Crown Elevation EL7(m) |
| No.104 | 50.00 | 5,200.00 | -1.13 | 2.10 | 1.53 | -3.404 | 1.387 | 2.200 | 2.200 |
| No.105 | 50.00 | 5,250.00 | -1.42 | 2.28 | 1.57 | -3.402 | 1.388 | 2.200 | 2.200 |
| No.106 | 50.00 | 5,300.00 | -1.16 | 2.17 | 1.83 | -3.399 | 1.388 | 2.200 | 2.200 |
| No.107 | 50.00 | 5,350.00 | -1.21 | 2.11 | 1.78 | -3.397 | 1.389 | 2.200 | 2.200 |
| No.108 | 50.00 | 5,400.00 | -1.43 | 1.89 | 1.77 | -3.394 | 1.389 | 2.200 | 2.200 |
| BC19 | 18.57 | 5,418.57 | -1.45 | 1.84 | 1.78 | -3.393 | 1.389 | 2.200 | 2.200 |
| No.109 | 31.43 | 5,450.00 | -1.46 | 1.75 | 1.79 | -3.392 | 1.390 | 2.200 | 2.200 |
| No.110 | 50.00 | 5,500.00 | -1.53 | 1.61 | 1.90 | -3.389 | 1.390 | 2.200 | 2.200 |
| SP19 | 22.36 | 5,522.36 | -1.59 | 1.70 | 1.89 | -3.388 | 1.390 | 2.200 | 2.200 |
| No.111 | 27.64 | 5,550.00 | -1.66 | 1.81 | 1.87 | -3.387 | 1.391 | 2.200 | 2.200 |
| No.112 | 50.00 | 5,600.00 | -1.55 | 1.97 | 1.65 | -3.384 | 1.391 | 2.200 | 2.200 |
| EC19 | 26.15 | 5,626.15 | -1.57 | 1.99 | 1.66 | -3.383 | 1.391 | 2.200 | 2.200 |
| No.113 | 23.85 | 5,650.00 | -1.59 | 2.00 | 1.68 | -3.382 | 1.392 | 2.200 | 2.200 |
| No.114 | 50.00 | 5,700.00 | -1.58 | 2.28 | 1.73 | -3.379 | 1.392 | 2.200 | 2.200 |
| No.115 | 50.00 | 5,750.00 | -1.66 | 2.14 | 1.70 | -3.377 | 1.393 | 2.200 | 2.200 |
| No.116 | 50.00 | 5,800.00 | -1.73 | 2.07 | 1.80 | -3.374 | 1.393 | 2.200 | 2.200 |
| No.117 | 50.00 | 5,850.00 | -1.64 | 2.06 | 1.78 | -3.372 | 1.394 | 2.200 | 2.200 |
| No.118 | 50.00 | 5,900.00 | -1.52 | 2.06 | 1.65 | -3.369 | 1.394 | 2.200 | 2.200 |
| No.119 | 50.00 | 5,950.00 | -1.56 | 2.05 | 1.78 | -3.367 | 1.395 | 2.200 | 2.200 |
| No.120 | 50.00 | 6,000.00 | -1.54 | 2.13 | 1.75 | -3.364 | 1.395 | 2.200 | 2.200 |
| No.121 | 50.00 | 6,050.00 | -1.57 | 2.43 | 2.09 | -3.362 | 1.396 | 2.200 | 2.200 |
| IP20 | 35.05 | 6,085.05 | -1.55 | 2.38 | 2.31 | -3.360 | 1.396 | 2.200 | 2.200 |
| No.122 | 14.95 | 6,100.00 | -1.55 | 2.35 | 2.40 | -3.359 | 1.396 | 2.200 | 2.200 |
| No.123 | 50.00 | 6,150.00 | -1.52 | 3.24 | 2.63 | -3.357 | 1.397 | 2.200 | 2.200 |
| No.124 | 50.00 | 6,200.00 | -1.55 | 2.37 | 2.15 | -3.354 | 1.397 | 2.200 | 2.200 |
| No.125 | 50.00 | 6,250.00 | -1.39 | 1.80 | 1.94 | -3.352 | 1.398 | 2.200 | 2.200 |
| No.126 | 50.00 | 6,300.00 | -1.46 | 1.90 | 1.95 | -3.349 | 1.398 | 2.200 | 2.200 |
| No.127 | 50.00 | 6,350.00 | -1.37 | 1.92 | 1.75 | -3.347 | 1.399 | 2.200 | 2.200 |
| IP21 | 21.98 | 6,371.98 | -1.40 | 1.95 | 1.84 | -3.346 | 1.399 | 2.200 | 2.200 |
| No.128 | 28.02 | 6,400.00 | -1.43 | 1.98 | 1.96 | -3.344 | 1.399 | 2.200 | 2.200 |
| No.129 | 50.00 | 6,450.00 | -1.55 | 2.05 | 1.86 | -3.342 | 1.400 | 2.200 | 2.200 |
| BC22 | 25.37 | 6,475.37 | -1.61 | 2.12 | 1.80 | -3.341 | 1.400 | 2.200 | 2.200 |
| No.130 | 24.63 | 6,500.00 | -1.66 | 2.18 | 1.75 | -3.339 | 1.400 | 2.200 | 2.200 |
| SP22 | 25.28 | 6,525.28 | -1.50 | 2.21 | 1.79 | -3.338 | 1.400 | 2.200 | 2.200 |
| No.131 | 24.73 | 6,550.00 | -1.34 | 2.23 | 1.83 | -3.337 | 1.401 | 2.200 | 2.200 |
| EC22 | 25.18 | 6,575.18 | -1.34 | 2.26 | 1.83 | -3.336 | 1.401 | 2.200 | 2.200 |
| No.132 | 24.82 | 6,600.00 | -1.33 | 2.28 | 1.84 | -3.334 | 1.401 | 2.200 | 2.200 |
| No.133 | 50.00 | 6,650.00 | -1.55 | 2.02 | 1.86 | -3.332 | 1.402 | 2.200 | 2.200 |
| No.134 | 50.00 | 6,700.00 | -1.66 | 1.68 | 1.70 | -3.329 | 1.402 | 2.200 | 2.200 |
| No.135 | 50.00 | 6,750.00 | -1.65 | 1.68 | 1.83 | -3.327 | 1.403 | 2.200 | 2.200 |
| No.136 | 50.00 | 6,800.00 | -1.73 | 1.87 | 1.74 | -3.324 | 1.403 | 2.200 | 2.200 |
| No.137 | 50.00 | 6,850.00 | -1.61 | 1.90 | 1.70 | -3.322 | 1.404 | 2.200 | 2.200 |
| No.138 | 50.00 | 6,900.00 | -1.88 | 1.91 | 1.64 | -3.319 | 1.404 | 2.200 | 2.200 |
| No.139 | 50.00 | 6,950.00 | -1.82 | 1.92 | 1.69 | -3.317 | 1.405 | 2.200 | 2.200 |
| No.140 | 50.00 | 7,000.00 | -1.73 | 1.86 | 1.70 | -3.314 | 1.405 | 2.200 | 2.200 |
| No.141 | 50.00 | 7,050.00 | -1.85 | 1.90 | 1.67 | -3.312 | 1.406 | 2.200 | 2.200 |
| No.142 | 50.00 | 7,100.00 | -1.86 | 1.98 | 1.61 | -3.309 | 1.406 | 2.200 | 2.200 |
| No.143 | 50.00 | 7,150.00 | -1.93 | 1.96 | 1.75 | -3.307 | 1.407 | 2.200 | 2.200 |
| No.144 | 50.00 | 7,200.00 | -2.14 | 1.91 | 1.90 | -3.304 | 1.407 | 2.200 | 2.200 |
| No.145 | 50.00 | 7,250.00 | -2.75 | 1.95 | 3.44 | -3.302 | 1.408 | 2.200 | 2.200 |
| IP24 (EP) | 36.72 | 7,286.72 | -2.75 | 1.95 | 3.44 | -3.300 | 1.408 | - | - |

## TABLE 2.2 (1/7) PROPOSED CROSS SECTION OF TAU HU - BEN NGHE CANAL IMPROVEMENT

| Name of Canal | Section | Length | Accumulate Length | Elevation (m above MSL) | | | | | | | Canal Width | | | | | | | | | Height | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Left | | Channel | | | Right | | Left | Channel | | | | | Right | | | | | | | | |
| | | | | Bank | Crown | L-Bed | C-Bed | R-Bed | Crown | Bank | Road | | Left | Bottom | Right | | Road | Total | G-total | L-Bank | H-Chan. | L-Chan. | Total | R-Bank |
| | | | | EL.1 | EL.2 | EL.3 | EL4 | EL5 | EL.6 | EL.7 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | H1 | H2 | H3 | H4 | H5 |
| | | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) |
| Ben Nghe | No.0 (BP) | 0.00 | 0.00 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.00 | 0.00 | - |
| | No.1 | 50.00 | 50.00 | [2.10] | [2.15] | -0.300 | -3.448 | 0.310 | [1.92] | [1.98] | - | - | 33.00 | 30.00 | 32.00 | - | - | - | - | 0.05 | 2.45 | 3.15 | 5.60 | -0.06 |
| | No.2 | 50.00 | 100.00 | [2.20] | [2.31] | -0.970 | -3.445 | -1.470 | [2.03] | [2.03] | - | - | 28.00 | 30.00 | 14.00 | - | - | - | - | 0.11 | 3.17 | 2.48 | 5.65 | 0.00 |
| | No.3 | 50.00 | 150.00 | [2.20] | [2.04] | -1.040 | -3.443 | -0.840 | [2.04] | [1.96] | - | - | 25.00 | 30.00 | 20.00 | - | - | - | - | -0.16 | 3.08 | 2.40 | 5.48 | 0.08 |
| | BC1 | 19.47 | 169.47 | - | 2.20 | -2.000 | -3.442 | -2.000 | 2.200 | - | - | - | 24.51 | 30.00 | 24.51 | - | - | - | - | - | 4.20 | 1.44 | 5.64 | - |
| | SP1 | 20.33 | 189.80 | - | 2.20 | -2.000 | -3.441 | -2.000 | 2.200 | - | - | - | 24.49 | 30.00 | 24.49 | - | - | - | - | - | 4.20 | 1.44 | 5.64 | - |
| | No.4 | 10.20 | 200.00 | 2.020 | 2.200 | -2.000 | -3.440 | -2.000 | 2.200 | 2.540 | 5.00 | 6.30 | 24.48 | 30.00 | 24.48 | 6.30 | 5.00 | 91.56 | 101.56 | 0.18 | 4.20 | 1.44 | 5.64 | -0.34 |
| | EC1 | 10.13 | 210.13 | - | 2.200 | -2.000 | -3.439 | -2.000 | 2.200 | - | 5.00 | 6.30 | 20.44 | 30.00 | 20.44 | 6.30 | 5.00 | 83.48 | 93.48 | - | 4.20 | 1.44 | 5.64 | - |
| | No.5 | 39.87 | 250.00 | 2.040 | 2.200 | -2.000 | -3.438 | -2.000 | 2.200 | 1.990 | 5.00 | 6.30 | 19.42 | 30.00 | 19.42 | 6.30 | 5.00 | 81.43 | 91.43 | 0.16 | 4.20 | 1.44 | 5.64 | 0.21 |
| | No.6 | 50.00 | 300.00 | 2.040 | 2.200 | -2.000 | -3.435 | -2.000 | 2.200 | 1.980 | 5.00 | 6.30 | 14.35 | 30.00 | 14.35 | 6.30 | 5.00 | 71.30 | 81.30 | 0.16 | 4.20 | 1.44 | 5.64 | 0.22 |
| | No.7 | 50.00 | 350.00 | 1.980 | 2.200 | -2.000 | -3.433 | -2.000 | 2.200 | 2.090 | 5.00 | 6.30 | 14.33 | 30.00 | 14.33 | 6.30 | 5.00 | 71.25 | 81.25 | 0.22 | 4.20 | 1.43 | 5.63 | 0.11 |
| | No.8 | 50.00 | 400.00 | 2.100 | 2.200 | -2.000 | -3.430 | -2.000 | 2.200 | 2.030 | 5.00 | 6.30 | 14.30 | 30.00 | 14.30 | 6.30 | 5.00 | 71.20 | 81.20 | 0.10 | 4.20 | 1.43 | 5.63 | 0.17 |
| | BC2 | 39.47 | 439.47 | - | 2.200 | -2.000 | -3.428 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.28 | 30.00 | 14.28 | 6.30 | 5.00 | 71.16 | 81.16 | - | 4.20 | 1.43 | 5.63 | - |
| | No.9 | 10.53 | 450.00 | 2.060 | 2.200 | -2.000 | -3.428 | -2.000 | 2.200 | 1.980 | 5.00 | 6.30 | 14.28 | 30.00 | 14.28 | 6.30 | 5.00 | 71.15 | 81.15 | 0.14 | 4.20 | 1.43 | 5.63 | 0.22 |
| | SP2 | 49.78 | 499.78 | - | 2.200 | -2.000 | -3.425 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.25 | 30.00 | 14.25 | 6.30 | 5.00 | 71.10 | 81.10 | - | 4.20 | 1.43 | 5.63 | - |
| | No.10 | 0.23 | 500.00 | 2.000 | 2.200 | -2.000 | -3.425 | -2.000 | 2.200 | 2.000 | 5.00 | 6.30 | 14.25 | 30.00 | 14.25 | 6.30 | 5.00 | 71.10 | 81.10 | 0.20 | 4.20 | 1.43 | 5.63 | 0.20 |
| | No.11 | 50.00 | 550.00 | 2.080 | 2.200 | -2.000 | -3.423 | -2.000 | 2.200 | 2.010 | 5.00 | 6.30 | 14.23 | 30.00 | 14.23 | 6.30 | 5.00 | 71.05 | 81.05 | 0.12 | 4.20 | 1.42 | 5.62 | 0.19 |
| | EC2 | 10.08 | 560.08 | - | 2.200 | -2.000 | -3.422 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.22 | 30.00 | 14.22 | 6.30 | 5.00 | 71.04 | 81.04 | - | 4.20 | 1.42 | 5.62 | - |
| | No.12 | 39.92 | 600.00 | 2.130 | 2.200 | -2.000 | -3.420 | -2.000 | 2.200 | 2.040 | 5.00 | 6.30 | 14.20 | 30.00 | 14.20 | 6.30 | 5.00 | 71.00 | 81.00 | 0.07 | 4.20 | 1.42 | 5.62 | 0.16 |
| | No.13 | 50.00 | 650.00 | 1.120 | 2.200 | -2.000 | -3.418 | -2.000 | 2.200 | 1.990 | 5.00 | 6.30 | 14.18 | 25.50 | 14.18 | 6.30 | 5.00 | 66.45 | 76.45 | 1.08 | 4.20 | 1.42 | 5.62 | 0.21 |
| | No.14 | 50.00 | 700.00 | 2.080 | 2.200 | -2.000 | -3.415 | -2.000 | 2.200 | 1.940 | 5.00 | 6.30 | 14.15 | 21.00 | 14.15 | 6.30 | 5.00 | 61.90 | 71.90 | 0.12 | 4.20 | 1.42 | 5.62 | 0.26 |
| | No.15 | 50.00 | 750.00 | 1.840 | 2.200 | -2.000 | -3.413 | -2.000 | 2.200 | 1.920 | 5.00 | 6.30 | 14.13 | 21.00 | 14.13 | 6.30 | 5.00 | 61.85 | 71.85 | 0.36 | 4.20 | 1.41 | 5.61 | 0.28 |
| | BC3 | 10.73 | 760.73 | - | 2.200 | -2.000 | -3.412 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.12 | 21.00 | 14.12 | 6.30 | 5.00 | 61.84 | 71.84 | - | 4.20 | 1.41 | 5.61 | - |
| | No.16 | 39.27 | 800.00 | 1.910 | 2.200 | -2.000 | -3.410 | -2.000 | 2.200 | 1.860 | 5.00 | 6.30 | 14.10 | 21.00 | 14.10 | 6.30 | 5.00 | 61.80 | 71.80 | 0.29 | 4.20 | 1.41 | 5.61 | 0.34 |
| | SP3 | 4.44 | 804.44 | - | 2.200 | -2.000 | -3.410 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.10 | 21.00 | 14.10 | 6.30 | 5.00 | 61.80 | 71.80 | - | 4.20 | 1.41 | 5.61 | - |
| | EC3 | 43.71 | 848.14 | - | 2.200 | -2.000 | -3.408 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.08 | 21.00 | 14.08 | 6.30 | 5.00 | 61.75 | 71.75 | - | 4.20 | 1.41 | 5.61 | - |
| | No.17 | 1.86 | 850.00 | 2.040 | 2.200 | -2.000 | -3.408 | -2.000 | 2.200 | 2.420 | 5.00 | 6.30 | 14.08 | 21.00 | 14.08 | 6.30 | 5.00 | 61.75 | 71.75 | 0.16 | 4.20 | 1.41 | 5.61 | -0.22 |
| | No.18 | 50.00 | 900.00 | 2.080 | 2.200 | -2.000 | -3.405 | -2.000 | 2.200 | 2.380 | 5.00 | 6.30 | 14.05 | 21.00 | 14.05 | 6.30 | 5.00 | 61.70 | 71.70 | 0.12 | 4.20 | 1.41 | 5.61 | -0.18 |
| | No.19 | 50.00 | 950.00 | 2.040 | 2.200 | -2.000 | -3.403 | -2.000 | 2.200 | 1.960 | 5.00 | 6.30 | 14.03 | 21.00 | 14.03 | 6.30 | 5.00 | 61.65 | 71.65 | 0.16 | 4.20 | 1.40 | 5.60 | 0.24 |
| | BC4 | 6.69 | 956.69 | - | 2.200 | -2.000 | -3.402 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.02 | 21.00 | 14.02 | 6.30 | 5.00 | 61.64 | 71.64 | - | 4.20 | 1.40 | 5.60 | - |
| | SP4 | 12.90 | 969.59 | - | 2.200 | -2.000 | -3.402 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.02 | 21.00 | 14.02 | 6.30 | 5.00 | 61.63 | 71.63 | - | 4.20 | 1.40 | 5.60 | - |

## TABLE 2.2 (2/7) PROPOSED CROSS SECTION OF TAU HU - BEN NGHE CANAL IMPROVEMENT

| Name of Canal | Section | Length | Accumulate Length | Elevation (m above MSL) | | | | | | | Canal Width | | | | | | | | | Height | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Left | | Channel | | | Right | | Left | Channel | | | | | Right | | | | | | | | |
| | | | | Bank | Crown | L-Bed | C-Bed | R-Bed | Crown | Bank | Road | | Left | Bottom | Right | | Road | Total | G-total | L-Bank | H-Chan. | L-Chan. | Total | R-Bank |
| | | | | EL.1 | EL.2 | EL.3 | EL4 | EL5 | EL.6 | EL.7 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | H1 | H2 | H3 | H4 | H5 |
| | | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) |
| Ben Nghe | EC4 | 12.90 | 982.49 | - | 2.200 | -2.000 | -3.401 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.01 | 21.00 | 14.01 | 6.30 | 5.00 | 61.62 | 71.62 | - | 4.20 | 1.40 | 5.60 | - |
| | No.20 | 17.51 | 1,000.00 | 1.940 | 2.200 | -2.000 | -3.400 | -2.000 | 2.200 | 1.900 | 5.00 | 6.30 | 14.00 | 21.00 | 14.00 | 6.30 | 5.00 | 61.60 | 71.60 | 0.26 | 4.20 | 1.40 | 5.60 | 0.30 |
| | No.21 | 50.00 | 1,050.00 | 2.040 | 2.200 | -2.000 | -3.398 | -2.000 | 2.200 | 1.940 | 5.00 | 6.30 | 13.98 | 21.00 | 13.98 | 6.30 | 5.00 | 61.55 | 71.55 | 0.16 | 4.20 | 1.40 | 5.60 | 0.26 |
| | No.22 | 50.00 | 1,100.00 | 2.060 | 2.200 | -2.000 | -3.395 | -2.000 | 2.200 | 1.780 | 5.00 | 6.30 | 13.95 | 21.00 | 13.95 | 6.30 | 5.00 | 61.50 | 71.50 | 0.14 | 4.20 | 1.40 | 5.60 | 0.42 |
| | BC5 | 13.28 | 1,113.28 | - | 2.200 | -2.000 | -3.394 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.94 | 21.00 | 13.94 | 6.30 | 5.00 | 61.49 | 71.49 | - | 4.20 | 1.39 | 5.59 | - |
| | No.23 | 36.72 | 1,150.00 | 2.060 | 2.200 | -2.000 | -3.393 | -2.000 | 2.200 | 1.760 | 5.00 | 6.30 | 13.93 | 21.00 | 13.93 | 6.30 | 5.00 | 61.45 | 71.45 | 0.14 | 4.20 | 1.39 | 5.59 | 0.44 |
| | SP5 | 18.23 | 1,168.23 | - | 2.200 | -2.000 | -3.392 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.92 | 21.00 | 13.92 | 6.30 | 5.00 | 61.43 | 71.43 | - | 4.20 | 1.39 | 5.59 | - |
| | No.24 | 31.77 | 1,200.00 | 1.780 | 2.200 | -2.000 | -3.390 | -2.000 | 2.200 | 1.820 | 5.00 | 6.30 | 13.90 | 21.00 | 13.90 | 6.30 | 5.00 | 61.40 | 71.40 | 0.42 | 4.20 | 1.39 | 5.59 | 0.38 |
| | EC5 | 23.18 | 1,223.18 | - | 2.200 | -2.000 | -3.389 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.89 | 21.00 | 13.89 | 6.30 | 5.00 | 61.38 | 71.38 | - | 4.20 | 1.39 | 5.59 | - |
| | No.25 | 26.82 | 1,250.00 | 1.840 | 2.200 | -2.000 | -3.388 | -2.000 | 2.200 | 1.820 | 5.00 | 6.30 | 13.88 | 21.00 | 13.88 | 6.30 | 5.00 | 61.35 | 71.35 | 0.36 | 4.20 | 1.39 | 5.59 | 0.38 |
| | No.26 | 50.00 | 1,300.00 | 1.840 | 2.200 | -2.000 | -3.385 | -2.000 | 2.200 | 1.730 | 5.00 | 6.30 | 13.85 | 21.00 | 13.85 | 6.30 | 5.00 | 61.30 | 71.30 | 0.36 | 4.20 | 1.39 | 5.59 | 0.47 |
| | No.27 | 50.00 | 1,350.00 | 1.820 | 2.200 | -2.000 | -3.383 | -2.000 | 2.200 | 1.800 | 5.00 | 6.30 | 13.83 | 21.00 | 13.83 | 6.30 | 5.00 | 61.25 | 71.25 | 0.38 | 4.20 | 1.38 | 5.58 | 0.40 |
| | IP6 | 47.66 | 1,397.66 | - | 2.200 | -2.000 | -3.380 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.80 | 21.00 | 13.80 | 6.30 | 5.00 | 61.20 | 71.20 | - | 4.20 | 1.38 | 5.58 | - |
| | No.28 | 2.34 | 1,400.00 | 1.760 | 2.200 | -2.000 | -3.380 | -2.000 | 2.200 | 1.920 | 5.00 | 6.30 | 13.80 | 21.00 | 13.80 | 6.30 | 5.00 | 61.20 | 71.20 | 0.44 | 4.20 | 1.38 | 5.58 | 0.28 |
| | No.29 | 50.00 | 1,450.00 | 1.760 | 2.200 | -2.000 | -3.378 | -2.000 | 2.200 | 1.960 | 5.00 | 6.30 | 13.78 | 21.00 | 13.78 | 6.30 | 5.00 | 61.15 | 71.15 | 0.44 | 4.20 | 1.38 | 5.58 | 0.24 |
| | No.30 | 50.00 | 1,500.00 | 1.630 | 2.200 | -2.000 | -3.375 | -2.000 | 2.200 | 2.060 | 5.00 | 6.30 | 13.75 | 21.00 | 13.75 | 6.30 | 5.00 | 61.10 | 71.10 | 0.57 | 4.20 | 1.38 | 5.58 | 0.14 |
| | No.31 | 50.00 | 1,550.00 | 1.640 | 2.200 | -2.000 | -3.373 | -2.000 | 2.200 | 1.990 | 5.00 | 6.30 | 13.73 | 21.00 | 13.73 | 6.30 | 5.00 | 61.05 | 71.05 | 0.56 | 4.20 | 1.37 | 5.57 | 0.21 |
| | No.32 | 50.00 | 1,600.00 | 1.750 | 2.200 | -2.000 | -3.370 | -2.000 | 2.200 | 2.030 | 5.00 | 6.30 | 13.70 | 21.00 | 13.70 | 6.30 | 5.00 | 61.00 | 71.00 | 0.45 | 4.20 | 1.37 | 5.57 | 0.17 |
| | BC7 | 1.07 | 1,601.07 | - | 2.200 | -2.000 | -3.370 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.70 | 21.00 | 13.70 | 6.30 | 5.00 | 61.00 | 71.00 | - | 4.20 | 1.37 | 5.57 | - |
| | No.33 | 48.93 | 1,650.00 | 1.790 | 2.200 | -2.000 | -3.368 | -2.000 | 2.200 | 1.950 | 5.00 | 6.30 | 13.68 | 21.00 | 13.68 | 6.30 | 5.00 | 60.95 | 70.95 | 0.41 | 4.20 | 1.37 | 5.57 | 0.25 |
| | SP7 | 8.43 | 1,658.43 | - | 2.200 | -2.000 | -3.367 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.67 | 21.00 | 13.67 | 6.30 | 5.00 | 60.94 | 70.94 | - | 4.20 | 1.37 | 5.57 | - |
| | No.34 | 41.57 | 1,700.00 | 1.930 | 2.200 | -2.000 | -3.365 | -2.000 | 2.200 | 2.010 | 5.00 | 6.30 | 13.65 | 21.00 | 13.65 | 6.30 | 5.00 | 60.90 | 70.90 | 0.27 | 4.20 | 1.37 | 5.57 | 0.19 |
| | EC7 | 15.79 | 1,715.79 | - | 2.200 | -2.000 | -3.364 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.64 | 21.00 | 13.64 | 6.30 | 5.00 | 60.88 | 70.88 | - | 4.20 | 1.36 | 5.56 | - |
| | No.35 | 34.21 | 1,750.00 | 2.130 | 2.200 | -2.000 | -3.363 | -2.000 | 2.200 | 2.340 | 5.00 | 6.30 | 13.63 | 21.00 | 13.63 | 6.30 | 5.00 | 60.85 | 70.85 | 0.07 | 4.20 | 1.36 | 5.56 | -0.14 |
| | No.36 | 50.00 | 1,800.00 | 2.280 | 2.200 | -2.000 | -3.360 | -2.000 | 2.200 | 2.070 | 5.00 | 6.30 | 13.60 | 21.00 | 13.60 | 6.30 | 5.00 | 60.80 | 70.80 | -0.08 | 4.20 | 1.36 | 5.56 | 0.13 |
| | No.37 | 50.00 | 1,850.00 | 2.400 | 2.200 | -2.000 | -3.358 | -2.000 | 2.200 | 1.890 | 5.00 | 6.30 | 13.58 | 21.00 | 13.58 | 6.30 | 5.00 | 60.75 | 70.75 | -0.20 | 4.20 | 1.36 | 5.56 | 0.31 |
| | No.38 | 50.00 | 1,900.00 | 2.340 | 2.200 | -2.000 | -3.355 | -2.000 | 2.200 | 1.930 | 5.00 | 6.30 | 13.55 | 21.00 | 13.55 | 6.30 | 5.00 | 60.70 | 70.70 | -0.14 | 4.20 | 1.36 | 5.56 | 0.27 |
| | No.39 | 50.00 | 1,950.00 | 2.010 | 2.200 | -2.000 | -3.353 | -2.000 | 2.200 | 1.770 | 5.00 | 6.30 | 13.53 | 21.00 | 13.53 | 6.30 | 5.00 | 60.65 | 70.65 | 0.19 | 4.20 | 1.35 | 5.55 | 0.43 |
| | BC8 | 24.33 | 1,974.33 | - | 2.200 | -2.000 | -3.351 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.51 | 21.00 | 13.51 | 6.30 | 5.00 | 60.63 | 70.63 | - | 4.20 | 1.35 | 5.55 | - |
| | No.40 | 25.67 | 2,000.00 | 2.070 | 2.200 | -2.000 | -3.350 | -2.000 | 2.200 | 1.780 | 5.00 | 6.30 | 13.50 | 21.00 | 13.50 | 6.30 | 5.00 | 60.60 | 70.60 | 0.13 | 4.20 | 1.35 | 5.55 | 0.42 |
| | No.41 | 50.00 | 2,050.00 | 1.980 | 2.200 | -2.000 | -3.348 | -2.000 | 2.200 | 1.780 | 5.00 | 6.30 | 13.48 | 21.00 | 13.48 | 6.30 | 5.00 | 60.55 | 70.55 | - | 4.20 | 1.35 | 5.55 | - |
| | SP7 | 46.09 | 2,096.09 | - | 2.200 | -2.000 | -3.345 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.45 | 21.00 | 13.45 | 6.30 | 5.00 | 60.50 | 70.50 | - | 4.20 | 1.35 | 5.55 | - |

## TABLE 2.2 (3/7) PROPOSED CROSS SECTION OF TAU HU - BEN NGHE CANAL IMPROVEMENT

| Name of Canal | Section | Length | Accumulate Length | Elevation (m above MSL) | | | | | | | Canal Width | | | | | | | | | Height | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Left | | Channel | | | Right | | Left | Channel | | | | | Right | | | | | | | | |
| | | | | Bank | Crown | L-Bed | C-Bed | R-Bed | Crown | Bank | Road | | Left | Bottom | Right | | Road | Total | G-total | L-Bank | H-Chan. | L-Chan. | Total | R-Bank |
| | | | | EL.1 | EL.2 | EL.3 | EL4 | EL5 | EL.6 | EL.7 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | H1 | H2 | H3 | H4 | H5 |
| | | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) |
| Ben Nghe | No.42 | 3.92 | 2,100.00 | 2.130 | 2.200 | -2.000 | -3.345 | -2.000 | 2.200 | 1.960 | 5.00 | 6.30 | 13.45 | 21.00 | 13.45 | 6.30 | 5.00 | 60.50 | 70.50 | 0.07 | 4.20 | 1.35 | 5.55 | 0.24 |
| | No.43 | 50.00 | 2,150.00 | 2.270 | 2.200 | -2.000 | -3.343 | -2.000 | 2.200 | 2.150 | 5.00 | 6.30 | 13.43 | 21.00 | 13.43 | 6.30 | 5.00 | 60.45 | 70.45 | - | 4.20 | 1.34 | 5.54 | - |
| | No.44 | 50.00 | 2,200.00 | 2.160 | 2.200 | -2.000 | -3.340 | -2.000 | 2.200 | 2.000 | 5.00 | 6.30 | 13.40 | 21.00 | 13.40 | 6.30 | 5.00 | 60.40 | 70.40 | 0.04 | 4.20 | 1.34 | 5.54 | 0.20 |
| | EC8 | 17.84 | 2,217.84 | - | 2.200 | -2.000 | -3.339 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.39 | 21.00 | 13.39 | 6.30 | 5.00 | 60.38 | 70.38 | - | 4.20 | 1.34 | 5.54 | - |
| | No.45 | 32.16 | 2,250.00 | 2.250 | 2.200 | -2.000 | -3.338 | -2.000 | 2.200 | 1.950 | 5.00 | 6.30 | 13.38 | 21.00 | 13.38 | 6.30 | 5.00 | 60.35 | 70.35 | -0.05 | 4.20 | 1.34 | 5.54 | 0.25 |
| | No.46 | 50.00 | 2,300.00 | 2.040 | 2.200 | -2.000 | -3.335 | -2.000 | 2.200 | 1.970 | 5.00 | 6.30 | 13.35 | 21.00 | 13.35 | 6.30 | 5.00 | 60.30 | 70.30 | 0.16 | 4.20 | 1.34 | 5.54 | 0.23 |
| | No.47 | 50.00 | 2,350.00 | 2.100 | 2.200 | -2.000 | -3.333 | -2.000 | 2.200 | 1.890 | 5.00 | 6.30 | 13.33 | 21.00 | 13.33 | 6.30 | 5.00 | 60.25 | 70.25 | 0.10 | 4.20 | 1.33 | 5.53 | 0.31 |
| | No.48 | 50.00 | 2,400.00 | 2.060 | 2.200 | -2.000 | -3.330 | -2.000 | 2.200 | 1.950 | 5.00 | 6.30 | 13.30 | 21.00 | 13.30 | 6.30 | 5.00 | 60.20 | 70.20 | 0.14 | 4.20 | 1.33 | 5.53 | 0.25 |
| | No.49 | 50.00 | 2,450.00 | 1.920 | 2.200 | -2.000 | -3.328 | -2.000 | 2.200 | 2.020 | 5.00 | 6.30 | 13.28 | 21.00 | 13.28 | 6.30 | 5.00 | 60.15 | 70.15 | 0.28 | 4.20 | 1.33 | 5.53 | 0.18 |
| | BC9 | 8.00 | 2,458.00 | - | 2.200 | -2.000 | -3.327 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.27 | 21.00 | 13.27 | 6.30 | 5.00 | 60.14 | 70.14 | - | 4.20 | 1.33 | 5.53 | - |
| | No.50 | 42.00 | 2,500.00 | 1.980 | 2.200 | -2.000 | -3.325 | -2.000 | 2.200 | 1.920 | 5.00 | 6.30 | 13.25 | 21.00 | 13.25 | 6.30 | 5.00 | 60.10 | 70.10 | 0.22 | 4.20 | 1.33 | 5.53 | 0.28 |
| | SP9 | 1.94 | 2,501.94 | - | 2.200 | -2.000 | -3.325 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.25 | 21.00 | 13.25 | 6.30 | 5.00 | 60.10 | 70.10 | - | 4.20 | 1.32 | 5.52 | - |
| | EC9 | 43.94 | 2,545.87 | - | 2.200 | -2.000 | -3.323 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.23 | 21.00 | 13.23 | 6.30 | 5.00 | 60.05 | 70.05 | - | 4.20 | 1.32 | 5.52 | - |
| | No.51 | 4.13 | 2,550.00 | 1.840 | 2.200 | -2.000 | -3.323 | -2.000 | 2.200 | 1.820 | 5.00 | 6.30 | 13.23 | 21.00 | 13.23 | 6.30 | 5.00 | 60.05 | 70.05 | 0.36 | 4.20 | 1.32 | 5.52 | 0.38 |
| | No.52 | 50.00 | 2,600.00 | 1.830 | 2.200 | -2.000 | -3.320 | -2.000 | 2.200 | 1.930 | 5.00 | 6.30 | 13.20 | 21.00 | 13.20 | 6.30 | 5.00 | 60.00 | 70.00 | 0.37 | 4.20 | 1.32 | 5.52 | 0.27 |
| | No.53 | 50.00 | 2,650.00 | 1.830 | 2.200 | -2.000 | -3.318 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.18 | 21.00 | 13.18 | - | - | - | - | 0.37 | 4.20 | 1.32 | 5.52 | - |
| | No.54 | 50.00 | 2,700.00 | 1.900 | 2.200 | -2.000 | -3.315 | -2.000 | 2.200 | 1.600 | 5.00 | 6.30 | 13.15 | 21.00 | 13.15 | 6.30 | 5.00 | 59.90 | 69.90 | 0.30 | 4.20 | 1.32 | 5.52 | 0.60 |
| | No.55 | 50.00 | 2,750.00 | 1.950 | 2.200 | -2.000 | -3.313 | -2.000 | 2.200 | 1.580 | 5.00 | 6.30 | 13.13 | 21.00 | 13.13 | 6.30 | 5.00 | 59.85 | 69.85 | 0.25 | 4.20 | 1.31 | 5.51 | 0.62 |
| | No.56 | 50.00 | 2,800.00 | 2.150 | 2.200 | -2.000 | -3.310 | -2.000 | 2.200 | 1.620 | 5.00 | 6.30 | 13.10 | 21.00 | 13.10 | 6.30 | 5.00 | 59.80 | 69.80 | 0.05 | 4.20 | 1.31 | 5.51 | 0.58 |
| | No.57 | 50.00 | 2,850.00 | 2.390 | 2.200 | -2.000 | -3.308 | -2.000 | 2.200 | 1.910 | 5.00 | 6.30 | 13.08 | 21.00 | 13.08 | 6.30 | 5.00 | 59.75 | 69.75 | -0.19 | 4.20 | 1.31 | 5.51 | 0.29 |
| | BC10 | 26.36 | 2,876.36 | - | 2.200 | -2.000 | -3.306 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.06 | 21.00 | 13.06 | 6.30 | 5.00 | 59.72 | 69.72 | - | 4.20 | 1.31 | 5.51 | - |
| | No.58 | 23.64 | 2,900.00 | 3.240 | 2.200 | -2.000 | -3.305 | -2.000 | 2.200 | 1.530 | 5.00 | 6.30 | 13.05 | 21.00 | 13.05 | 6.30 | 5.00 | 59.70 | 69.70 | -1.04 | 4.20 | 1.31 | 5.51 | 0.67 |
| | SP10 | 21.77 | 2,921.77 | - | 2.200 | -2.000 | -3.304 | -2.000 | 2.200 | - | 5.00 | 6.30 | 13.04 | 21.00 | 13.04 | 6.30 | 5.00 | 59.68 | 69.68 | - | 4.20 | 1.30 | 5.50 | - |
| | No.59 | 28.24 | 2,950.00 | 2.340 | 2.200 | -2.000 | -3.303 | -2.000 | 2.200 | 1.450 | 5.00 | 6.30 | 13.03 | 21.00 | 13.03 | 6.30 | 5.00 | 59.65 | 69.65 | -0.14 | 4.20 | 1.30 | 5.50 | 0.75 |
| | EC10 | 17.17 | 2,967.17 | - | 2.200 | -2.000 | -3.302 | - | - | - | 5.00 | 6.30 | 13.02 | 21.00 | - | - | - | - | - | - | 4.20 | 1.30 | 5.50 | - |
| | BC11 | 9.84 | 2,977.01 | - | 2.200 | -2.000 | -3.301 | - | - | - | 5.00 | 6.30 | 13.01 | 21.00 | - | - | - | - | - | - | 4.20 | 1.30 | 5.50 | - |
| | No.60 | 22.99 | 3,000.00 | 2.040 | 2.200 | -2.000 | -3.300 | - | - | - | 5.00 | 6.30 | 13.00 | 21.00 | - | - | - | - | - | 0.16 | 4.20 | 1.30 | 5.50 | - |
| | No.61 | 50.00 | 3,050.00 | 1.930 | 2.200 | -2.000 | -3.564 | - | - | - | 5.00 | 6.30 | 12.29 | 10.50 | - | - | - | 29.09 | 34.09 | 0.27 | 4.20 | 1.56 | 5.76 | - |
| | No.62 | 50.00 | 3,100.00 | 1.880 | 2.200 | -2.000 | -5.042 | - | - | - | 5.00 | 6.30 | 11.59 | 10.50 | - | - | - | 28.39 | 33.39 | 0.32 | 4.20 | 3.04 | 7.24 | - |
| | No.63 | 50.00 | 3,150.00 | 1.850 | 2.200 | -2.000 | -5.664 | - | - | - | 5.00 | 6.30 | 10.88 | 10.50 | - | - | - | 27.68 | 32.68 | 0.35 | 4.20 | 3.66 | 7.86 | - |
| | SP11(EP,BP) | 7.42 | 3,157.42 | 1.900 | 2.200 | -2.000 | -7.462 | - | - | - | 5.00 | 6.30 | 10.78 | 10.50 | - | - | - | 27.58 | 32.58 | 0.30 | 4.20 | 5.46 | 9.66 | - |

## TABLE 2.2 (4/7) PROPOSED CROSS SECTION OF TAU HU - BEN NGHE CANAL IMPROVEMENT

| Name of Canal | Section | Length | Accumulate Length | Elevation (m above MSL) | | | | | | | Canal Width | | | | | | | | | Height | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Left | | Channel | | | Right | | Left | Channel | | | | | Right | | | | | | | | |
| | | | | Bank | Crown | L-Bed | C-Bed | R-Bed | Crown | Bank | Road | | Left | Bottom | Right | | Road | Total | G-total | L-Bank | H-Chan. | L-Chan. | Total | R-Bank |
| | | | | EL.1 | EL.2 | EL.3 | EL4 | EL5 | EL.6 | EL.7 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | H1 | H2 | H3 | H4 | H5 |
| | | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) |
| Tau Hu (Down-stream) | P11 (EP, BI | 0.00 | 3,157.42 | 1.900 | 2.200 | -2.000 | -7.946 | - | - | - | 5.00 | 6.30 | 10.78 | 10.50 | - | - | - | 27.58 | 32.58 | 0.30 | 4.00 | 1.51 | 5.51 | - |
| | No.64 | 42.58 | 3,200.00 | 1.900 | 2.200 | -2.000 | -5.532 | - | - | - | 5.00 | 6.30 | 10.18 | 10.50 | - | - | - | 26.98 | 31.98 | 0.30 | 4.00 | 1.51 | 5.51 | - |
| | No.65 | 50.00 | 3,250.00 | 1.890 | 2.200 | -2.000 | -5.840 | - | - | - | 5.00 | 6.30 | 9.47 | 10.50 | - | - | - | 26.27 | 31.27 | 0.31 | 4.20 | 3.84 | 8.04 | - |
| | No.66 | 50.00 | 3,300.00 | 2.020 | 2.200 | -2.000 | -4.624 | - | - | - | 5.00 | 6.30 | 8.77 | 10.50 | - | - | - | 25.57 | 30.57 | 0.18 | 4.20 | 2.62 | 6.82 | - |
| | EC11 | 37.83 | 3,337.83 | - | 2.200 | -2.000 | -3.497 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.24 | 21.00 | 8.24 | 6.30 | 5.00 | 50.07 | 60.07 | - | 4.20 | 1.50 | 5.70 | - |
| | No.67 | 12.17 | 3,350.00 | 1.820 | 2.200 | -2.000 | -3.497 | -2.000 | 2.200 | 1.800 | 5.00 | 6.30 | 8.23 | 21.00 | 8.23 | 6.30 | 5.00 | 50.07 | 60.07 | 0.38 | 4.20 | 1.50 | 5.70 | 0.40 |
| | No.68 | 50.00 | 3,400.00 | 2.100 | 2.200 | -2.000 | -3.494 | -2.000 | 2.200 | 1.534 | 5.00 | 6.30 | 8.22 | 21.00 | 8.22 | 6.30 | 5.00 | 50.04 | 60.04 | 0.10 | 4.20 | 1.49 | 5.69 | 0.67 |
| | No.69 | 50.00 | 3,450.00 | 2.100 | 2.200 | -2.000 | -3.492 | -2.000 | 2.200 | 1.525 | 5.00 | 6.30 | 8.21 | 21.00 | 8.21 | 6.30 | 5.00 | 50.01 | 60.01 | 0.10 | 4.20 | 1.49 | 5.69 | 0.68 |
| | No.70 | 50.00 | 3,500.00 | 2.084 | 2.200 | -2.000 | -3.489 | -2.000 | 2.200 | 1.500 | 5.00 | 6.30 | 8.19 | 21.00 | 8.19 | 6.30 | 5.00 | 49.98 | 59.98 | 0.12 | 4.20 | 1.49 | 5.69 | 0.70 |
| | No.71 | 50.00 | 3,550.00 | 2.180 | 2.200 | -2.000 | -3.487 | -2.000 | 2.200 | 1.700 | 5.00 | 6.30 | 8.18 | 21.00 | 8.18 | 6.30 | 5.00 | 49.96 | 59.96 | 0.02 | 4.20 | 1.49 | 5.69 | 0.50 |
| | BC12 | 38.95 | 3,588.95 | - | 2.200 | -2.000 | -3.485 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.17 | 21.00 | 8.17 | 6.30 | 5.00 | 49.93 | 59.93 | - | 4.20 | 1.48 | 5.68 | - |
| | No.72 | 11.05 | 3,600.00 | 2.347 | 2.200 | -2.000 | -3.484 | -2.000 | 2.200 | 1.670 | 5.00 | 6.30 | 8.16 | 21.00 | 8.16 | 6.30 | 5.00 | 49.93 | 59.93 | -0.15 | 4.20 | 1.48 | 5.68 | 0.53 |
| | SP12 | 44.98 | 3,644.98 | - | 2.200 | -2.000 | -3.482 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.15 | 21.00 | 8.15 | 6.30 | 5.00 | 49.90 | 59.90 | - | 4.20 | 1.48 | 5.68 | - |
| | No.73 | 5.03 | 3,650.00 | 2.050 | 2.200 | -2.000 | -3.482 | -2.000 | 2.200 | 1.480 | 5.00 | 6.30 | 8.15 | 21.00 | 8.15 | 6.30 | 5.00 | 49.90 | 59.90 | 0.15 | 4.20 | 1.48 | 5.68 | 0.72 |
| | No.74 | 50.00 | 3,700.00 | 2.040 | 2.200 | -2.000 | -3.479 | -2.000 | 2.200 | 1.504 | 5.00 | 6.30 | 8.14 | 21.00 | 8.14 | 6.30 | 5.00 | 49.87 | 59.87 | 0.16 | 4.20 | 1.48 | 5.68 | 0.70 |
| | EC12 | 1.00 | 3,701.00 | - | 2.200 | -2.000 | -3.479 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.14 | 21.00 | 8.14 | 6.30 | 5.00 | 49.87 | 59.87 | - | 4.20 | 1.48 | 5.68 | - |
| | No.75 | 49.00 | 3,750.00 | 2.040 | 2.200 | -2.000 | -3.477 | -2.000 | 2.200 | 1.540 | 5.00 | 6.30 | 8.12 | 21.00 | 8.12 | 6.30 | 5.00 | 49.85 | 59.85 | - | - | - | - | - |
| | No.76 | 50.00 | 3,800.00 | 2.100 | 2.200 | -2.000 | -3.474 | -2.000 | 2.200 | 1.750 | 5.00 | 6.30 | 8.11 | 21.00 | 8.11 | 6.30 | 5.00 | 49.82 | 59.82 | 0.10 | 4.20 | 1.47 | 5.67 | 0.45 |
| | No.77 | 50.00 | 3,850.00 | 2.125 | 2.200 | -2.000 | -3.472 | -2.000 | 2.200 | 1.700 | 5.00 | 6.30 | 8.10 | 21.00 | 8.10 | 6.30 | 5.00 | 49.79 | 59.79 | 0.08 | 4.20 | 1.47 | 5.67 | 0.50 |
| | BC13 | 19.28 | 3,869.28 | - | 2.200 | -2.000 | -3.471 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.09 | 21.00 | 8.09 | 6.30 | 5.00 | 49.78 | 59.78 | - | 4.20 | 1.47 | 5.67 | - |
| | SP13 | 23.04 | 3,892.32 | - | 2.200 | -2.000 | -3.470 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.08 | 21.00 | 8.08 | 6.30 | 5.00 | 49.77 | 59.77 | - | 4.20 | 1.47 | 5.67 | - |
| | No.78 | 7.68 | 3,900.00 | 2.104 | 2.200 | -2.000 | -3.469 | -2.000 | 2.200 | 1.620 | 5.00 | 6.30 | 8.08 | 21.00 | 8.08 | 6.30 | 5.00 | 49.76 | 59.76 | 0.10 | 4.20 | 1.47 | 5.67 | 0.58 |
| | EC13 | 15.36 | 3,915.36 | - | 2.200 | -2.000 | -3.469 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.08 | 21.00 | 8.08 | 6.30 | 5.00 | 49.75 | 59.75 | - | 4.20 | 1.47 | 5.67 | - |
| | No.79 | 34.64 | 3,950.00 | 2.280 | 2.200 | -2.000 | -3.467 | -2.000 | 2.200 | 1.680 | 5.00 | 6.30 | 8.07 | 21.00 | 8.07 | 6.30 | 5.00 | 49.74 | 59.74 | -0.08 | 4.20 | 1.47 | 5.67 | 0.52 |
| | BC14 | 23.09 | 3,973.09 | - | 2.200 | -2.000 | -3.466 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.06 | 21.00 | 8.06 | 6.30 | 5.00 | 49.72 | 59.72 | - | 4.20 | 1.47 | 5.67 | - |
| | No.80 | 26.91 | 4,000.00 | 2.210 | 2.200 | -2.000 | -3.464 | -2.000 | 2.200 | 1.494 | 5.00 | 6.30 | 8.05 | 21.00 | 8.05 | 6.30 | 5.00 | 49.71 | 59.71 | -0.01 | 4.20 | 1.46 | 5.66 | 0.71 |
| | No.81 | 50.00 | 4,050.00 | 2.170 | 2.200 | -2.000 | -3.462 | -2.000 | 2.200 | 1.560 | 5.00 | 6.30 | 8.04 | 21.00 | 8.04 | 6.30 | 5.00 | 49.68 | 59.68 | 0.03 | 4.20 | 1.46 | 5.66 | 0.64 |
| | SP14 | 31.69 | 4,081.69 | - | 2.200 | -2.000 | -3.460 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.03 | 21.00 | 8.03 | 6.30 | 5.00 | 49.66 | 59.66 | - | 4.20 | 1.46 | 5.66 | - |
| | No.82 | 18.32 | 4,100.00 | 2.000 | 2.200 | -2.000 | -3.459 | -2.000 | 2.200 | 1.700 | 5.00 | 6.30 | 8.03 | 21.00 | 8.03 | 6.30 | 5.00 | 49.65 | 59.65 | 0.20 | 4.20 | 1.46 | 5.66 | 0.50 |
| | No.83 | 50.00 | 4,150.00 | 2.074 | 2.200 | -2.000 | -3.457 | -2.000 | 2.200 | 1.720 | 5.00 | 6.30 | 8.01 | 21.00 | 8.01 | 6.30 | 5.00 | 49.63 | 59.63 | 0.13 | 4.20 | 1.46 | 5.66 | 0.48 |
| | EC14 | 40.28 | 4,190.28 | - | 2.200 | -2.000 | -3.455 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.00 | 21.00 | 8.00 | 6.30 | 5.00 | 49.60 | 59.60 | - | 4.20 | 1.45 | 5.65 | - |
| | No.84 | 9.72 | 4,200.00 | 2.174 | 2.200 | -2.000 | -3.454 | -2.000 | 2.200 | 1.510 | 5.00 | 6.30 | 8.00 | 21.00 | 8.00 | 6.30 | 5.00 | 49.60 | 59.60 | 0.03 | 4.20 | 1.45 | 5.65 | 0.69 |
| | BC15 | 8.82 | 4,208.82 | - | 2.200 | -2.000 | -3.454 | -2.000 | 2.200 | - | 5.00 | 6.30 | 8.00 | 21.00 | 8.00 | 6.30 | 5.00 | 49.59 | 59.59 | - | 4.20 | 1.45 | 5.65 | - |

## TABLE 2.2 (5/7) PROPOSED CROSS SECTION OF TAU HU - BEN NGHE CANAL IMPROVEMENT

| Name of Canal | Section | Length | Accumulate Length | Elevation (m above MSL) | | | | | | | Canal Width | | | | | | | | | Height | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Left | | Channel | | | Right | | Left | Channel | | | | | Right | | | | | | | | |
| | | | | Bank | Crown | L-Bed | C-Bed | R-Bed | Crown | Bank | Road | | Left | Bottom | Right | | Road | Total | G-total | L-Bank | H-Chan. | L-Chan. | Total | R-Bank |
| | | | | EL.1 | EL.2 | EL.3 | EL4 | EL5 | EL.6 | EL.7 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | H1 | H2 | H3 | H4 | H5 |
| | | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) |
| Tau Hu (Down-stream) | No.85 | 41.18 | 4,250.00 | 1.860 | 2.200 | -2.000 | -3.452 | -2.000 | 2.200 | 1.600 | 5.00 | 6.30 | 7.99 | 21.00 | 7.99 | 6.30 | 5.00 | 49.57 | 59.57 | 0.34 | 4.20 | 1.45 | 5.65 | 0.60 |
| | No.86 | 50.00 | 4,300.00 | 1.890 | 2.200 | -2.000 | -3.449 | -2.000 | 2.200 | 1.490 | 5.00 | 6.30 | 7.97 | 21.00 | 7.97 | 6.30 | 5.00 | 49.54 | 59.54 | 0.31 | 4.20 | 1.45 | 5.65 | 0.71 |
| | No.87 | 50.00 | 4,350.00 | 1.784 | 2.200 | -2.000 | -3.447 | -2.000 | 2.200 | 1.420 | 5.00 | 6.30 | 7.96 | 21.00 | 7.96 | 6.30 | 5.00 | 49.52 | 59.52 | 0.42 | 4.20 | 1.45 | 5.65 | 0.78 |
| | SP15 | 23.32 | 4,373.32 | - | 2.200 | -2.000 | -3.446 | -2.000 | 2.200 | - | 5.00 | 6.30 | 7.95 | 21.00 | 7.95 | 6.30 | 5.00 | 49.50 | 59.50 | - | 4.20 | 1.45 | 5.65 | - |
| | No.88 | 26.68 | 4,400.00 | 1.742 | 2.200 | -2.000 | -3.444 | -2.000 | 2.200 | 1.384 | 5.00 | 6.30 | 7.94 | 21.00 | 7.94 | 6.30 | 5.00 | 49.49 | 59.49 | 0.46 | 4.20 | 1.44 | 5.64 | 0.82 |
| | No.89 | 50.00 | 4,450.00 | 1.780 | 2.200 | -2.000 | -3.442 | -2.000 | 2.200 | 1.389 | 5.00 | 6.30 | 7.93 | 21.00 | 7.93 | 6.30 | 5.00 | 49.46 | 59.46 | 0.42 | 4.20 | 1.44 | 5.64 | 0.81 |
| | No.90 | 50.00 | 4,500.00 | 1.720 | 2.200 | -2.000 | -3.439 | -2.000 | 2.200 | 1.490 | 5.00 | 6.30 | 7.92 | 21.00 | 7.92 | 6.30 | 5.00 | 49.43 | 59.43 | 0.48 | 4.20 | 1.44 | 5.64 | 0.71 |
| | EC15 | 37.82 | 4,537.82 | - | 2.200 | -2.000 | -3.437 | -2.000 | 2.200 | - | 5.00 | 6.30 | 7.91 | 21.00 | 7.91 | 6.30 | 5.00 | 49.41 | 59.41 | - | 4.20 | 1.44 | 5.64 | - |
| | No.91 | 12.18 | 4,550.00 | 1.830 | 2.200 | -2.000 | -3.437 | -2.000 | 2.200 | 1.410 | 5.00 | 6.30 | 7.90 | 21.00 | 7.90 | 6.30 | 3.80 | 49.41 | 58.21 | 0.37 | 4.20 | 1.44 | 5.64 | 0.79 |
| | No.92 | 50.00 | 4,600.00 | 1.970 | 2.200 | -2.000 | -3.434 | -2.000 | 2.200 | 1.404 | 5.00 | 6.30 | 7.89 | 21.00 | 7.89 | 6.30 | 4.31 | 49.38 | 58.69 | 0.23 | 4.20 | 1.43 | 5.63 | 0.80 |
| | BC16 | 4.60 | 4,604.60 | - | 2.200 | -2.000 | -3.434 | -2.000 | 2.200 | - | 5.00 | 6.30 | 7.89 | 21.00 | 7.89 | 6.30 | 4.31 | 49.38 | 58.69 | - | 4.20 | 1.43 | 5.63 | - |
| | SP16 | 42.12 | 4,646.72 | - | 2.200 | -2.000 | -3.432 | -2.000 | 2.200 | - | 5.00 | 6.30 | 7.88 | 21.00 | 7.88 | 6.30 | 5.00 | 49.35 | 59.35 | - | 4.20 | 1.43 | 5.63 | - |
| | No.93 | 3.29 | 4,650.00 | 1.820 | 2.200 | -2.000 | -3.432 | -2.000 | 2.200 | 1.514 | 5.00 | 6.30 | 7.88 | 21.00 | 7.88 | 6.30 | 5.00 | 49.35 | 59.35 | 0.38 | 4.20 | 1.43 | 5.63 | 0.69 |
| | EC16 | 38.83 | 4,688.83 | - | 2.200 | -2.000 | -3.430 | -2.000 | 2.200 | - | 5.00 | 6.30 | 7.86 | 21.00 | 7.86 | 6.30 | 5.00 | 49.33 | 59.33 | - | 4.20 | 1.43 | 5.63 | - |
| | No.94 | 11.17 | 4,700.00 | 2.034 | 2.200 | -2.000 | -3.429 | -2.000 | 2.200 | 1.520 | 5.00 | 6.30 | 7.86 | 21.00 | 7.86 | 6.30 | 5.00 | 49.32 | 59.32 | 0.17 | 4.20 | 1.43 | 5.63 | 0.68 |
| | No.95 | 50.00 | 4,750.00 | 2.024 | 2.200 | -2.000 | -3.427 | -2.000 | 2.200 | 1.800 | 5.00 | 6.30 | 7.85 | 21.00 | 7.85 | 6.30 | 5.00 | 49.30 | 59.30 | 0.18 | 4.20 | 1.43 | 5.63 | 0.40 |
| | No.96 | 50.00 | 4,800.00 | 2.084 | 2.200 | -2.000 | -3.424 | -2.000 | 2.200 | 1.425 | 5.00 | 6.30 | 11.03 | 21.00 | 11.03 | 6.30 | 5.00 | 55.67 | 65.67 | 0.12 | 4.20 | 1.42 | 5.62 | 0.78 |
| | No.97 | 50.00 | 4,850.00 | 1.992 | 2.200 | -2.000 | -3.422 | -2.000 | 2.200 | 1.464 | 5.00 | 6.30 | 14.22 | 21.00 | 14.22 | 6.30 | 5.00 | 62.04 | 72.04 | 0.21 | 4.20 | 1.42 | 5.62 | 0.74 |
| | BC17 | 0.40 | 4,850.40 | - | 2.200 | -2.000 | -3.422 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.22 | 21.00 | 14.22 | 6.30 | 4.01 | 62.04 | 71.05 | - | 4.20 | 1.42 | 5.62 | - |
| | SP17 | 35.54 | 4,885.94 | - | 2.200 | -2.000 | -3.420 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.20 | 21.00 | 14.20 | 6.30 | 4.01 | 62.00 | 71.01 | - | 4.20 | 1.42 | 5.62 | - |
| | No.98 | 14.06 | 4,900.00 | 2.270 | 2.200 | -2.000 | -3.419 | -2.000 | 2.200 | 1.610 | 5.00 | 6.30 | 14.19 | 21.00 | 14.19 | 6.30 | 4.01 | 61.99 | 71.00 | -0.07 | 4.20 | 1.42 | 5.62 | 0.59 |
| | EC17 | 21.48 | 4,921.48 | - | 2.200 | -2.000 | -3.418 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.18 | 21.00 | 14.18 | 6.30 | 5.00 | 61.97 | 71.97 | - | 4.20 | 1.42 | 5.62 | - |
| | No.99 | 28.52 | 4,950.00 | 1.998 | 2.200 | -2.000 | -3.417 | -2.000 | 2.200 | 2.204 | 5.00 | 6.30 | 14.17 | 21.00 | 14.17 | 6.30 | 5.00 | 61.94 | 71.94 | 0.20 | 4.20 | 1.42 | 5.62 | 0.00 |
| | BC18 | 14.79 | 4,964.79 | - | 2.200 | -2.000 | -3.416 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.16 | 21.00 | 14.16 | 6.30 | 5.00 | 61.92 | 71.92 | - | 4.20 | 1.42 | 5.62 | - |
| | SP18 | 20.09 | 4,984.88 | - | 2.200 | -2.000 | -3.415 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.15 | 21.00 | 14.15 | 6.30 | 5.00 | 61.90 | 71.90 | - | 4.20 | 1.42 | 5.62 | - |
| | No.100 | 15.12 | 5,000.00 | 2.004 | 2.200 | -2.000 | -3.414 | -2.000 | 2.200 | 1.624 | 5.00 | 6.30 | 14.14 | 21.00 | 14.14 | 6.30 | 5.00 | 61.89 | 71.89 | 0.20 | 4.20 | 1.41 | 5.61 | 0.58 |
| | EC18 | 4.97 | 5,004.97 | - | 2.200 | -2.000 | -3.414 | -2.000 | 2.200 | - | 5.00 | 6.30 | 14.14 | 21.00 | 14.14 | 6.30 | 5.00 | 61.88 | 71.88 | - | 4.20 | 1.41 | 5.61 | - |
| | No.101 | 45.03 | 5,050.00 | 2.110 | 2.200 | -2.000 | -3.412 | -2.000 | 2.200 | 1.580 | 5.00 | 6.30 | 14.12 | 21.00 | 14.12 | 6.30 | 5.00 | 61.84 | 71.84 | 0.09 | 4.20 | 1.41 | 5.61 | 0.62 |
| | No.102 | 50.00 | 5,100.00 | 2.147 | 2.200 | -2.000 | -3.409 | -2.000 | 2.200 | 1.598 | 5.00 | 6.30 | 14.09 | 21.00 | 14.09 | 6.30 | 5.00 | 61.79 | 71.79 | 0.05 | 4.20 | 1.41 | 5.61 | 0.60 |
| | No.103 | 50.00 | 5,150.00 | 2.340 | 2.200 | -2.000 | -3.407 | -2.000 | 2.200 | 1.300 | 5.00 | 6.30 | 14.07 | 21.00 | 14.07 | 6.30 | 5.00 | 61.74 | 71.74 | -0.14 | 4.20 | 1.41 | 5.61 | 0.90 |

## TABLE 2.2 (6/7) PROPOSED CROSS SECTION OF TAU HU - BEN NGHE CANAL IMPROVEMENT

| Name of Canal | Section | Length | Accumulate Length | Elevation (m above MSL) | | | | | | | Canal Width | | | | | | | | | Height | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Left | | Channel | | | Right | | Left | Channel | | | | | Right | | | | | | | | |
| | | | | Bank | Crown | L-Bed | C-Bed | R-Bed | Crown | Bank | Road | | Left | Bottom | Right | | Road | Total | G-total | L-Bank | H-Chan. | L-Chan. | Total | R-Bank |
| | | | | EL.1 | EL.2 | EL.3 | EL4 | EL5 | EL.6 | EL.7 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | H1 | H2 | H3 | H4 | H5 |
| | | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) |
| Tau Hu (Down-stream) | No.104 | 50.00 | 5,200.00 | 2.104 | 2.200 | -2.000 | -3.404 | -2.000 | 2.200 | 1.525 | 5.00 | 6.30 | 14.04 | 21.00 | 14.04 | 6.30 | 5.00 | 61.69 | 71.69 | 0.10 | 4.20 | 1.40 | 5.60 | 0.68 |
| | No.105 | 50.00 | 5,250.00 | 2.284 | 2.200 | -2.000 | -3.402 | -2.000 | 2.200 | 1.567 | 5.00 | 6.30 | 14.02 | 21.00 | 14.02 | 6.30 | 5.00 | 61.64 | 71.64 | -0.08 | 4.20 | 1.40 | 5.60 | 0.63 |
| | No.106 | 50.00 | 5,300.00 | 2.174 | 2.200 | -2.000 | -3.399 | -2.000 | 2.200 | 1.830 | 5.00 | 6.30 | 13.99 | 21.00 | 13.99 | 6.30 | 5.00 | 61.59 | 71.59 | 0.03 | 4.20 | 1.40 | 5.60 | 0.37 |
| | No.107 | 50.00 | 5,350.00 | 2.110 | 2.200 | -2.000 | -3.397 | -2.000 | 2.200 | 1.784 | 5.00 | 6.30 | 10.83 | 21.00 | 10.83 | 6.30 | 5.00 | 55.26 | 65.26 | 0.09 | 4.20 | 1.40 | 5.60 | 0.42 |
| | No.108 | 50.00 | 5,400.00 | 1.890 | 2.200 | -2.000 | -3.394 | -2.000 | 2.200 | 1.770 | 5.00 | 6.30 | 7.67 | 21.00 | 7.67 | 6.30 | 5.00 | 48.94 | 58.94 | 0.31 | 4.20 | 1.39 | 5.59 | 0.43 |
| | BC19 | 18.57 | 5,418.57 | - | 2.200 | -2.000 | -3.393 | -2.000 | 2.200 | - | 5.00 | 6.30 | 7.66 | 21.00 | 7.66 | 6.30 | 5.00 | 48.93 | 58.93 | - | 4.20 | 1.39 | 5.59 | - |
| | No.109 | 31.43 | 5,450.00 | 1.750 | 2.200 | -2.000 | -3.392 | -2.000 | 2.200 | 1.794 | 5.00 | 6.30 | 7.66 | 21.00 | 7.66 | 6.30 | 5.00 | 48.91 | 58.91 | 0.45 | 4.20 | 1.39 | 5.59 | 0.41 |
| | No.110 | 50.00 | 5,500.00 | 1.610 | 2.200 | -2.000 | -3.389 | -2.000 | 2.200 | 1.900 | 5.00 | 6.30 | 7.64 | 21.00 | 7.64 | 6.30 | 2.56 | 48.88 | 56.44 | 0.59 | 4.20 | 1.39 | 5.59 | 0.30 |
| | SP19 | 22.36 | 5,522.36 | - | 2.200 | -2.000 | -3.388 | -2.000 | 2.200 | - | 5.00 | 6.30 | 7.64 | 21.00 | 7.64 | 6.30 | 5.00 | 48.87 | 58.87 | - | 4.20 | 1.39 | 5.59 | - |
| | No.111 | 27.64 | 5,550.00 | 1.810 | 2.200 | -2.000 | -3.387 | -2.000 | 2.200 | 1.870 | 5.00 | 6.30 | 7.63 | 21.00 | 7.63 | 6.30 | 5.00 | 48.86 | 58.86 | 0.39 | 4.20 | 1.39 | 5.59 | 0.33 |
| | No.112 | 50.00 | 5,600.00 | 1.970 | 2.200 | -2.000 | -3.384 | -2.000 | 2.200 | 1.648 | 5.00 | 6.30 | 7.61 | 21.00 | 7.61 | 6.30 | 5.00 | 48.83 | 58.83 | 0.23 | 4.20 | 1.38 | 5.58 | 0.55 |
| | EC19 | 26.15 | 5,626.15 | - | 2.200 | -2.000 | -3.383 | -2.000 | 2.200 | - | 5.00 | 6.30 | 7.61 | 21.00 | 7.61 | 6.30 | 5.00 | 48.81 | 58.81 | - | 4.20 | 1.38 | 5.58 | - |
| | No.113 | 23.85 | 5,650.00 | 2.000 | 2.200 | -2.000 | -3.382 | -2.000 | 2.200 | 1.680 | 5.00 | 6.30 | 7.60 | 21.00 | 7.60 | 6.30 | 5.00 | 48.80 | 58.80 | 0.20 | 4.20 | 1.38 | 5.58 | 0.52 |
| | No.114 | 50.00 | 5,700.00 | 2.284 | 2.200 | -2.000 | -3.379 | -2.000 | 2.200 | 1.725 | 5.00 | 6.30 | 7.59 | 21.00 | 7.59 | 6.30 | 5.00 | 48.77 | 58.77 | -0.08 | 4.20 | 1.38 | 5.58 | 0.48 |
| | No.115 | 50.00 | 5,750.00 | 2.140 | 2.200 | -2.000 | -3.377 | -2.000 | 2.200 | 1.698 | 5.00 | 6.30 | 7.57 | 21.00 | 7.57 | 6.30 | 5.00 | 48.75 | 58.75 | 0.06 | 4.20 | 1.38 | 5.58 | 0.50 |
| | No.116 | 50.00 | 5,800.00 | 2.065 | 2.200 | -2.000 | -3.374 | -2.000 | 2.200 | 1.798 | 5.00 | 6.30 | 7.56 | 21.00 | 7.56 | 6.30 | 5.00 | 48.72 | 58.72 | 0.14 | 4.20 | 1.37 | 5.57 | 0.40 |
| | No.117 | 50.00 | 5,850.00 | 2.063 | 2.200 | -2.000 | -3.372 | -2.000 | 2.200 | 1.784 | 5.00 | 6.30 | 7.55 | 21.00 | 7.55 | 6.30 | 5.00 | 48.69 | 58.69 | 0.14 | 4.20 | 1.37 | 5.57 | 0.42 |
| | No.118 | 50.00 | 5,900.00 | 2.064 | 2.200 | -2.000 | -3.369 | -2.000 | 2.200 | 1.654 | 5.00 | 2.10 | 10.27 | 21.00 | 10.27 | 2.10 | 5.00 | 45.74 | 55.74 | 0.14 | 4.20 | 1.37 | 5.57 | 0.55 |
| | No.119 | 50.00 | 5,950.00 | 2.048 | 2.200 | -2.000 | -3.367 | -2.000 | 2.200 | 1.784 | 5.00 | 2.10 | 10.25 | 21.00 | 10.25 | 2.10 | 5.00 | 45.70 | 55.70 | 0.15 | 4.20 | 1.37 | 5.57 | 0.42 |
| | No.120 | 50.00 | 6,000.00 | 2.130 | 2.200 | -2.000 | -3.364 | -2.000 | 2.200 | 1.748 | 5.00 | 2.10 | 10.23 | 21.00 | 10.23 | 2.10 | 5.00 | 45.67 | 55.67 | 0.07 | 4.20 | 1.36 | 5.56 | 0.45 |
| | No.121 | 50.00 | 6,050.00 | 2.434 | 2.200 | -2.000 | -3.362 | -2.000 | 2.200 | 2.092 | 5.00 | 2.10 | 10.21 | 21.00 | 10.21 | 2.10 | 5.00 | 45.63 | 55.63 | -0.23 | 4.20 | 1.36 | 5.56 | 0.11 |
| | IP20 | 35.05 | 6,085.05 | - | 2.200 | -2.000 | -3.360 | -2.000 | 2.200 | - | 5.00 | 2.10 | 10.20 | 21.00 | 10.20 | 2.10 | 5.00 | 45.60 | 55.60 | - | 4.20 | 1.36 | 5.56 | - |
| | No.122 | 14.95 | 6,100.00 | 2.351 | 2.200 | -2.000 | -3.359 | -2.000 | 2.200 | 2.404 | 5.00 | 2.10 | 10.20 | 21.00 | 10.20 | 2.10 | 5.00 | 45.59 | 55.59 | -0.15 | 4.20 | 1.36 | 5.56 | -0.20 |
| | No.123 | 50.00 | 6,150.00 | 3.242 | 2.200 | -2.000 | -3.357 | -2.000 | 2.200 | 2.625 | 5.00 | 2.10 | 10.18 | 21.00 | 10.18 | 2.10 | 5.00 | 45.55 | 55.55 | -1.04 | 4.20 | 1.36 | 5.56 | -0.43 |
| | No.124 | 50.00 | 6,200.00 | 2.370 | 2.200 | -2.000 | -3.354 | -2.000 | 2.200 | 2.150 | 5.00 | 2.10 | 10.16 | 21.00 | 10.16 | 2.10 | 4.24 | 45.52 | 54.76 | -0.17 | 4.20 | 1.35 | 5.55 | 0.05 |
| | No.125 | 50.00 | 6,250.00 | 1.804 | 2.200 | -2.000 | -3.352 | -2.000 | 2.200 | 1.940 | 5.00 | 2.10 | 10.14 | 21.00 | 10.14 | 2.10 | 2.26 | 45.48 | 52.74 | 0.40 | 4.20 | 1.35 | 5.55 | 0.26 |
| | No.126 | 50.00 | 6,300.00 | 1.904 | 2.200 | -2.000 | -3.349 | -2.000 | 2.200 | 1.950 | 5.00 | 2.10 | 10.12 | 21.00 | 10.12 | 2.10 | 3.28 | 45.44 | 53.72 | 0.30 | 4.20 | 1.35 | 5.55 | 0.25 |
| | No.127 | 50.00 | 6,350.00 | 1.924 | 2.200 | -2.000 | -3.347 | -2.000 | 2.200 | 1.750 | 5.00 | 2.10 | 10.10 | 21.00 | 10.10 | 2.10 | 5.00 | 45.40 | 55.40 | 0.28 | 4.20 | 1.35 | 5.55 | 0.45 |
| | IP21 | 21.98 | 6,371.98 | - | 2.200 | -2.000 | -3.346 | -2.000 | 2.200 | - | 5.00 | 2.10 | 10.09 | 21.00 | 10.09 | 2.10 | 5.00 | 45.39 | 55.39 | - | 4.20 | 1.35 | 5.55 | - |
| | No.128 | 28.02 | 6,400.00 | 1.984 | 2.200 | -2.000 | -3.344 | -2.000 | 2.200 | 1.960 | 5.00 | 2.10 | 10.08 | 21.00 | 10.08 | 2.10 | 5.00 | 45.37 | 55.37 | 0.22 | 4.20 | 1.34 | 5.54 | 0.24 |

## TABLE 2.2 (7/7) PROPOSED CROSS SECTION OF TAU HU - BEN NGHE CANAL IMPROVEMENT

| Name of Canal | Section | Length | Accumulate Length | Elevation (m above MSL) | | | | | | | Canal Width | | | | | | | | | Height | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Left | | Channel | | | Right | | Left | Channel | | | | | Right | | | | | | | | |
| | | | | Bank | Crown | L-Bed | C-Bed | R-Bed | Crown | Bank | Road | | Left | Bottom | Right | | Road | Total | G-total | L-Bank | H-Chan. | L-Chan. | Total | R-Bank |
| | | | | EL.1 | EL.2 | EL.3 | EL4 | EL5 | EL.6 | EL.7 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | H1 | H2 | H3 | H4 | H5 |
| | | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) | (m) |
| Tau Hu (Down-stream) | No.129 | 50.00 | 6,450.00 | 2.054 | 2.200 | -2.000 | -3.342 | -2.000 | 2.200 | 1.858 | 5.00 | 2.10 | 10.06 | 21.00 | 10.06 | 2.10 | 5.00 | 45.33 | 55.33 | 0.15 | 4.20 | 1.34 | 5.54 | 0.34 |
| | BC22 | 25.37 | 6,475.37 | - | 2.200 | -2.000 | -3.341 | -2.000 | 2.200 | - | 5.00 | 2.10 | 10.05 | 21.00 | 10.05 | 2.10 | 5.00 | 45.31 | 55.31 | - | 4.20 | 1.34 | 5.54 | - |
| | No.130 | 24.63 | 6,500.00 | 2.190 | 2.200 | -2.000 | -3.339 | -2.000 | 2.200 | 1.748 | 5.00 | 2.10 | 10.05 | 21.00 | 10.05 | 2.10 | 5.00 | 45.29 | 55.29 | 0.01 | 4.20 | 1.34 | 5.54 | 0.45 |
| | SP22 | 25.28 | 6,525.28 | - | 2.200 | -2.000 | -3.338 | -2.000 | 2.200 | - | 5.00 | 2.10 | 10.04 | 21.00 | 10.04 | 2.10 | 5.00 | 45.27 | 55.27 | - | 4.20 | 1.34 | 5.54 | - |
| | No.131 | 24.73 | 6,550.00 | 2.234 | 2.200 | -2.000 | -3.337 | -2.000 | 2.200 | 1.834 | 5.00 | 2.10 | 10.03 | 21.00 | 10.03 | 2.10 | 5.00 | 45.25 | 55.25 | -0.03 | 4.20 | 1.34 | 5.54 | 0.37 |
| | EC22 | 25.18 | 6,575.18 | - | 2.200 | -2.000 | -3.336 | -2.000 | 2.200 | - | 5.00 | 2.10 | 10.02 | 21.00 | 10.02 | 2.10 | 5.00 | 45.23 | 55.23 | - | 4.20 | 1.34 | 5.54 | - |
| | No.132 | 24.82 | 6,600.00 | 2.280 | 2.200 | -2.000 | -3.334 | -2.000 | 2.200 | 1.835 | 5.00 | 2.10 | 10.01 | 21.00 | 10.01 | 2.10 | 5.00 | 45.22 | 55.22 | -0.08 | 4.20 | 1.33 | 5.53 | 0.37 |
| | No.133 | 50.00 | 6,650.00 | 2.023 | 2.200 | -2.000 | -3.332 | -2.000 | 2.200 | 1.860 | 5.00 | 2.10 | 9.99 | 21.00 | 9.99 | 2.10 | 5.00 | 45.18 | 55.18 | 0.18 | 4.20 | 1.33 | 5.53 | 0.34 |
| | No.134 | 50.00 | 6,700.00 | 1.680 | 2.200 | -2.000 | -3.329 | -2.000 | 2.200 | 1.700 | 5.00 | 2.10 | 9.97 | 21.00 | 9.97 | 2.10 | 5.00 | 45.14 | 55.14 | 0.52 | 4.20 | 1.33 | 5.53 | 0.50 |
| | No.135 | 50.00 | 6,750.00 | 1.680 | 2.200 | -2.000 | -3.327 | -2.000 | 2.200 | 1.830 | 5.00 | 2.10 | 9.95 | 21.00 | 9.95 | 2.10 | 5.00 | 45.10 | 55.10 | 0.52 | 4.20 | 1.33 | 5.53 | 0.37 |
| | No.136 | 50.00 | 6,800.00 | 1.874 | 2.200 | -2.000 | -3.324 | -2.000 | 2.200 | 1.743 | 5.00 | 2.10 | 9.93 | 21.00 | 9.93 | 2.10 | 3.47 | 45.07 | 53.54 | 0.33 | 4.20 | 1.32 | 5.52 | 0.46 |
| | No.137 | 50.00 | 6,850.00 | 1.904 | 2.200 | -2.000 | -3.322 | -2.000 | 2.200 | 1.698 | 5.00 | 2.10 | 9.91 | 21.00 | 9.91 | 2.10 | 3.49 | 45.03 | 53.52 | 0.30 | 4.20 | 1.32 | 5.52 | 0.50 |
| | No.138 | 50.00 | 6,900.00 | 1.914 | 2.200 | -2.000 | -3.319 | -2.000 | 2.200 | 1.643 | 5.00 | 2.10 | 9.90 | 21.00 | 9.90 | 2.10 | 3.50 | 44.99 | 53.49 | 0.29 | 4.20 | 1.32 | 5.52 | 0.56 |
| | No.139 | 50.00 | 6,950.00 | 1.924 | 2.200 | -2.000 | -3.317 | -2.000 | 2.200 | 1.690 | 5.00 | 2.10 | 9.88 | 21.00 | 9.88 | 2.10 | 3.52 | 44.95 | 53.47 | 0.28 | 4.20 | 1.32 | 5.52 | 0.51 |
| | No.140 | 50.00 | 7,000.00 | 1.864 | 2.200 | -2.000 | -3.314 | -2.000 | 2.200 | 1.704 | 5.00 | 2.10 | 9.86 | 21.00 | 9.86 | 2.10 | 3.54 | 44.92 | 53.46 | 0.34 | 4.20 | 1.31 | 5.51 | 0.50 |
| | No.141 | 50.00 | 7,050.00 | 1.900 | 2.200 | -2.000 | -3.312 | -2.000 | 2.200 | 1.674 | 5.00 | 2.10 | 9.84 | 21.00 | 9.84 | 2.10 | 3.56 | 44.88 | 53.44 | 0.30 | 4.20 | 1.31 | 5.51 | 0.53 |
| | No.142 | 50.00 | 7,100.00 | 1.984 | 2.200 | -2.000 | -3.309 | -2.000 | 2.200 | 1.614 | 5.00 | 2.10 | 9.82 | 21.00 | 9.82 | 2.10 | 4.58 | 44.84 | 54.42 | 0.22 | 4.20 | 1.31 | 5.51 | 0.59 |
| | No.143 | 50.00 | 7,150.00 | 1.964 | 2.200 | -2.000 | -3.307 | -2.000 | 2.200 | 1.748 | 5.00 | 2.10 | 9.80 | 21.00 | 9.80 | 2.10 | 5.00 | 44.80 | 54.80 | 0.24 | 4.20 | 1.31 | 5.51 | 0.45 |
| | No.144 | 50.00 | 7,200.00 | 1.912 | 2.200 | -2.000 | -3.304 | -2.000 | 2.200 | 1.904 | 5.00 | 2.10 | 9.78 | 21.00 | 9.78 | 2.10 | 5.00 | 44.77 | 54.77 | 0.29 | 4.20 | 1.30 | 5.50 | 0.30 |
| | No.145 | 50.00 | 7,250.00 | 1.948 | 2.200 | -2.000 | -3.302 | -2.000 | 2.200 | 3.440 | 5.00 | 2.10 | 9.76 | 21.00 | 9.76 | 2.10 | 5.00 | 44.73 | 54.73 | 0.25 | 4.20 | 1.30 | 5.50 | -1.24 |
| | IP24 (EP) | 36.72 | 7,286.72 | 1.904 | 2.200 | -2.000 | -3.300 | -2.000 | - | - | 5.00 | 2.10 | 9.75 | 21.00 | - | - | - | - | - | - | - | - | - | - |

**TABLE 2.3 (1/4) CALCULATION OF PREVENTION FROM SLIDING – CASE 1**

| | | |
|---|---|---|
| Safety Factor | Fs | 1.20 |
| Central Coordination of Critical Circle (Horizontal Axis) | X(m) | 5.00 |
| Central Coordination of Critical Circle (Vertical Axis) | Y(m) | 7.00 |
| Radius of Critical Circle | R(m) | 15.00 |
| Resisting Force | SR(tf) | 38.85 |
| Resisting Moment | MR(tf ·m) | 582.74 |
| Sliding Force | SD(tf) | 35.41 |
| Sliding Moment | MD(tf ·m) | 485.25 |

| No | Name of Block | $\gamma_t$ (tf/m³) | $C_o$ (tf/m²) | $k_1$ (tf/m³) | $\phi_u$ ( °) |
|---|---|---|---|---|---|
| 1 | Fill | 1.60 | 1.50 | 0.00 | 0.00 |
| 2 | OH | 1.45 | 1.10 | 0.00 | 0.00 |
| 3 | S | 1.84 | 0.00 | 0.00 | 26.00 |
| 4 | Timber | 1.70 | 2.60 | 0.00 | 0.00 |
| 5 | OH1 | 1.45 | 1.10 | 0.00 | 0.00 |
| 6 | C | 2.20 | 4.00 | 0.00 | 0.00 |
| 7 | Timber 2 | 1.70 | 1.80 | 0.00 | 0.00 |

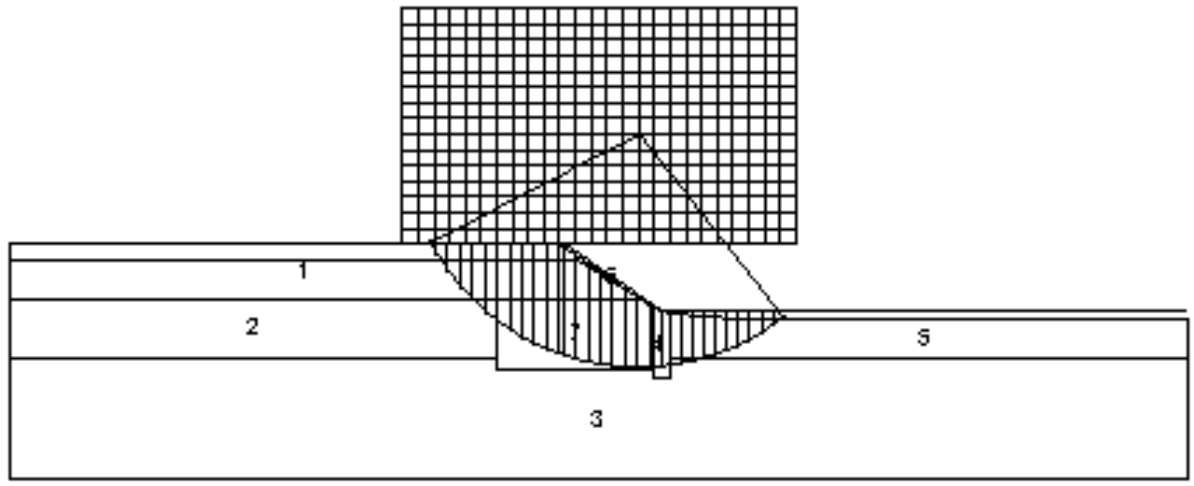


**TABLE 2.3 (2/4) CALCULATION OF PREVENTION FROM SLIDING – CASE 2**

| | | |
|---|---|---|
| Safety Factor | Fs | 1.20 |
| Central Coordination of Critical Circle (Horizontal Axis) | X(m) | 4.00 |
| Central Coordination of Critical Circle (Vertical Axis) | Y(m) | 7.00 |
| Radius of Critical Circle | R(m) | 15.00 |
| Resisting Force | SR(tf) | 37.53 |
| Resisting Moment | MR(tf ·m) | 562.94 |
| Sliding Force | SD(tf) | 34.52 |
| Sliding Moment | MD(tf ·m) | 470.44 |

| No | Name of Block | $\gamma_t$ (tf/m³) | $C_o$ (tf/m²) | $k_1$ (tf/m³) | $\phi_u$ ( °) |
|---|---|---|---|---|---|
| 1 | Fill | 1.60 | 1.50 | 0.00 | 0.00 |
| 2 | OH | 1.55 | 0.95 | 0.00 | 0.00 |
| 3 | S | 1.91 | 0.00 | 0.00 | 27.00 |
| 4 | Timber | 1.70 | 2.60 | 0.00 | 0.00 |
| 5 | OH1 | 1.55 | 0.95 | 0.00 | 0.00 |
| 6 | C | 2.20 | 2.00 | 0.00 | 0.00 |
| 7 | Timber 2 | 1.70 | 1.60 | 0.00 | 0.00 |

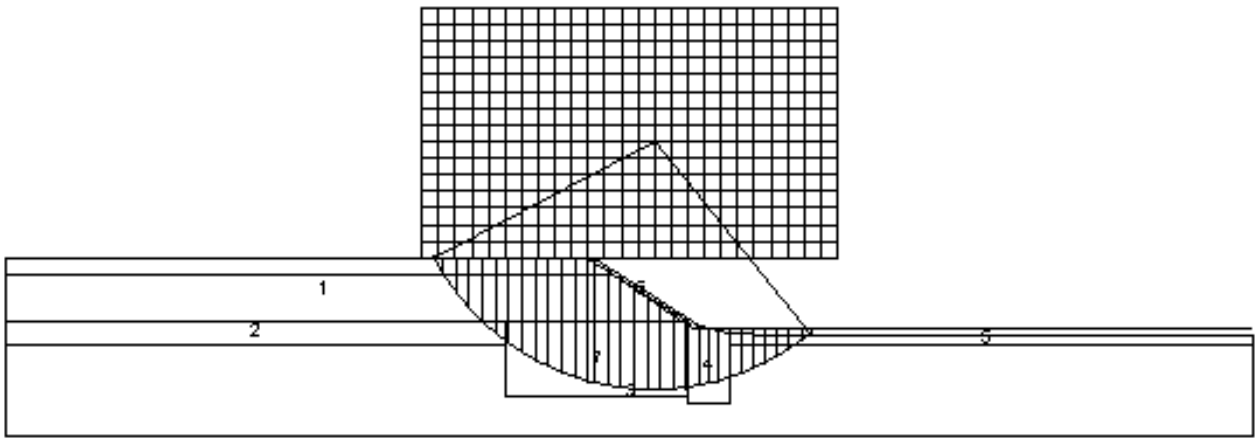


**TABLE 2.3 (3/4) CALCULATION OF PREVENTION FROM SLIDING – CASE 3**

| | | |
|---|---|---|
| Safety Factor | Fs | 1.24 |
| Central Coordination of Critical Circle (Horizontal Axis) | X(m) | 4.00 |
| Central Coordination of Critical Circle (Vertical Axis) | Y(m) | 7.00 |
| Radius of Critical Circle | R(m) | 13.50 |
| Resisting Force | SR(tf) | 29.78 |
| Resisting Moment | MR(tf ·m) | 401.99 |
| Sliding Force | SD(tf) | 25.89 |
| Sliding Moment | MD(tf ·m) | 324.35 |

| No | Name of Block | $\gamma_t$ (tf/m³) | $C_o$ (tf/m²) | $k_1$ (tf/m³) | $\phi_u$ ( °) |
|---|---|---|---|---|---|
| 1 | Fill | 1.60 | 1.50 | 0.00 | 0.00 |
| 2 | OH | 1.45 | 0.65 | 0.00 | 0.00 |
| 3 | S | 1.91 | 0.00 | 0.00 | 27.00 |
| 4 | Timber | 1.70 | 2.60 | 0.00 | 0.00 |
| 5 | OH1 | 1.45 | 0.65 | 0.00 | 0.00 |
| 6 | C | 2.20 | 2.00 | 0.00 | 0.00 |
| 7 | Timber 2 | 1.70 | 1.60 | 0.00 | 0.00 |

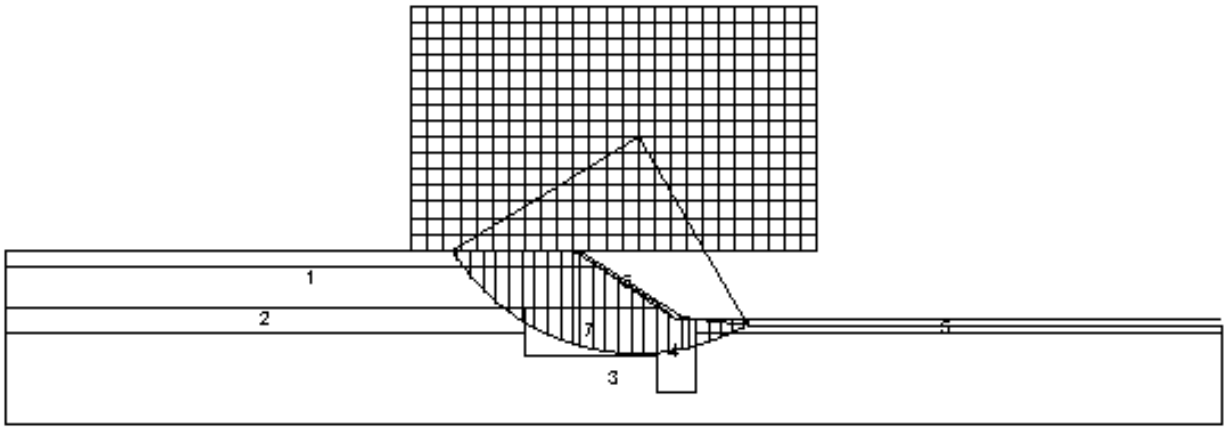
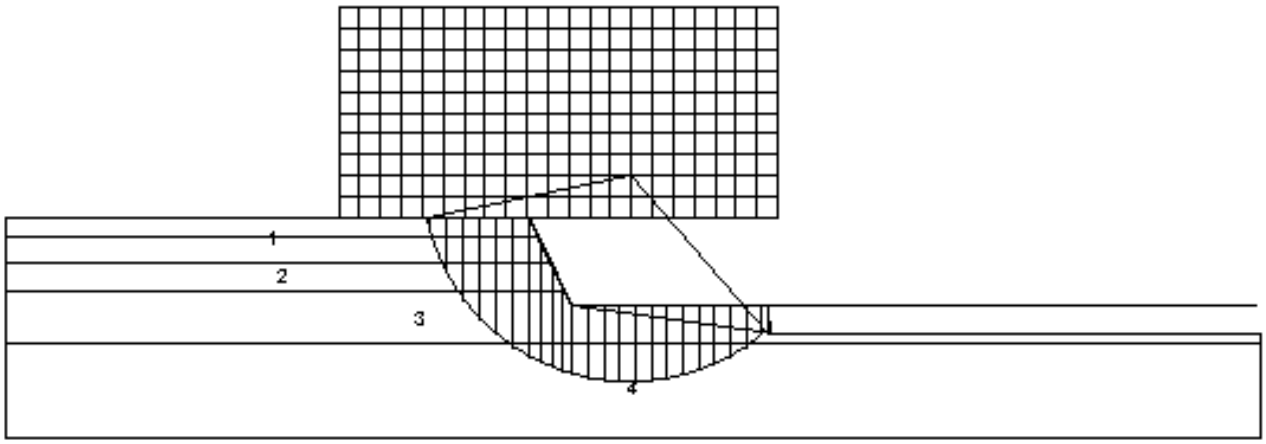


**TABLE 2.3 (4/4) CALCULATION OF PREVENTION FROM SLIDING – CASE 4**

| | | |
|---|---|---|
| Safety Factor | Fs | 1.82 |
| Central Coordination of Critical Circle (Horizontal Axis) | X(m) | 4.92 |
| Central Coordination of Critical Circle (Vertical Axis) | Y(m) | 2.00 |
| Radius of Critical Circle | R(m) | 10.00 |
| Resisting Force | SR(tf) | 46.42 |
| Resisting Moment | MR(tf ·m) | 464.16 |
| Sliding Force | SD(tf) | 29.14 |
| Sliding Moment | MD(tf ·m) | 255.29 |

| No | Name of Block | $\gamma_t$ (tf/m³) | $C_o$ (tf/m²) | $k_1$ (tf/m³) | $\phi_u$ ( °) |
|---|---|---|---|---|---|
| 1 | Fill | 1.70 | 1.50 | 0.00 | 0.00 |
| 2 | OH | 1.46 | 3.00 | 0.00 | 0.00 |
| 3 | C | 1.90 | 4.20 | 0.00 | 0.00 |
| 4 | S | 1.98 | 0.00 | 0.00 | 29.00 |



## TABLE 2.4 (1/2) REPLACEMENT LIST OF EXISTING SEWER OUTLETS ALONG TAU HU - BEN NGHE CANAL

| No.of Outlet | | Location | Dimension | | | | Additional Pipe Length (m) | Remarks |
|---|---|---|---|---|---|---|---|---|
| (New) | (Old) | | Material | Width (m) | Height (m) | Invert EL. (m) | | |
| BN-L1 | 61 | No.4 + 9.1 m | RC Pipe | 1,000 | 1,000 | -1.65 | | **EWHP** |
| BN-L2 | 60 | No.5 + 48.4 m | RC Pipe | 1,000 | 1,000 | -0.72 | 14.0 | |
| BN-L3 | 59 | No.7 + 42.3 m | RC Pipe | 1,000 | 1,000 | -0.50 | 24.0 | |
| | | | Brick | 800 | 1,500 | -1.22 | 6.0 | Arch |
| BN-L4 | 58 | No.9 + 48.9 m | **RC (Precast)** | **1,600** | **2,000** | **-1.75** | | **Box Culvert** |
| | | | Brick | 1,800 | 2,000 | -0.99 | 26.0 | Arch |
| BN-L5 | 57 | No.12 + 42.6 m | **RC (Precast)** | **1,800** | **2,000** | **-1.05** | | **Box Culvert** |
| BN-L6 | 56 | No.15 + 49.3 m | RC Pipe | 2,000 | 2,000 | -1.45 | | **EWHP** |
| BN-L7 | 55 | No.18 + 2.4 m | RC | 1,500 | 1,500 | -1.85 | 26.0 | Box Culvert |
| BN-L8 | 54 | No.21 + 8.4 m | RC Pipe | 1,000 | 1,000 | -1.77 | 30.0 | |
| BN-L9 | 53 | No.23 + 28.2 m | RC Pipe | 1,000 | 1,000 | -1.32 | 10.0 | |
| BN-L10 | 52 | No.33 + 19.0 m | RC Pipe | 1,000 | 1,000 | -0.95 | 14.0 | |
| BN-L11 | 51 | No.36 + 39.1 m | RC | 2,000 | 2,000 | -1.56 | 14.0 | Box Culvert |
| BN-L12 | 50 | No.40 + 45.2 m | RC Pipe | 1,500 | 1,500 | -1.56 | 22.0 | |
| **BN-L13** | **Addi.** | | **RC(Precast)** | **2,000** | **2,000** | **-2.10** | | **Box Culvert** |
| BN-L14 | 49 | No.48 + 3.9 m | RC Pipe | 1,000 | 1,000 | -1.18 | 24.0 | |
| BN-L15 | 48 | No.51 + 35.4 m | RC Pipe | 800 | 800 | -0.30 | 10.0 | |
| BN-L16 | 47 | No.56 + 17.0 m | RC Pipe | 1,000 | 1,000 | 0.63 | 30.0 | |
| **BN-L17** | **Addi.** | (Ba Do Bridge) | **RC(Precast)** | **2,000** | **2,000** | **-2.10** | | **Box Culvert** |
| | | | | | | | | |
| | | | Brick | 800 | 1,400 | -1.35 | | Arch 800 x 1,400 |
| BN-R1 | 62 | No.3 + 18.6 m | **RC (Precast)** | **1,500** | **1,500** | **-1.50** | | **Box Culvert, EWHP** |
| BN-R2 | 63 | No.4 + 8.2 m | RC Pipe | 600 | 600 | -1.55 | | **EWHP** |
| BN-R3 | 64 | No.9 + 44.7 m | RC Pipe | 600 | 600 | -0.16 | 6.0 | |
| BN-R4 | 65 | No.10 + 23.6 m | RC Pipe | 600 | 600 | -0.18 | 16.0 | |
| BN-R5 | 66 | No.12 + 30.0 m | RC Pipe | 400 | 400 | | 8.0 | Clogged up with soil |
| BN-R6 | 67 | No.13 + 34.2 m | RC Pipe | 400 | 400 | | 10.0 | Clogged up with soil |
| BN-R7 | 68 | No.14 + 4.0 m | RC Pipe | 1,200 | 1,200 | -0.76 | 4.0 | |
| BN-R8 | 69 | No.15 + 35.1 m | RC Pipe | 800 | 800 | -1.43 | 10.0 | |
| BN-R9 | 70 | No.17 + 5.5 m | RC | 3,000 | 1,500 | -0.75 | 26.0 | Box Culvert |
| BN-R10 | 71 | No.20 + 3.0 m | RC Pipe | 1,000 | 1,000 | -1.14 | 2.0 | |
| BN-R11 | 72 | No.21 + 1.4 m | RC Pipe | 400 | 400 | 0.65 | 2.0 | Clogged up with soil |
| BN-R12 | 73 | No.25 + 28.2 m | RC Pipe | 800 | 800 | -0.97 | 12.0 | |
| BN-R13 | 74 | No.28 + 28.2 m | RC Pipe | 800 | 800 | | 10.0 | Clogged up with soil |
| BN-R14 | 75 | No.32 + 25.9 m | RC Pipe | 800 | 800 | | 4.0 | Clogged up with soil |
| BN-R15 | 76 | No.36 + 47.2 m | RC Pipe | 600 | 600 | 0.20 | 26.0 | |
| BN-R16 | 77 | No.38 + 24.9 m | RC Pipe | 800 | 800 | -0.46 | 18.0 | |
| BN-R17 | 78 | No.40 + 45.2 m | RC Pipe | 1,000 | 1,000 | -0.16 | 14.0 | |
| BN-R18 | 79 | No.43 + 19.2 m | RC Pipe | 600 | 600 | -0.47 | 12.0 | |
| BN-R19 | 80 | No.44 + 5.3 m | RC Pipe | 400 | 400 | | 12.0 | Clogged up with soil |
| BN-R20 | 81 | No.44 + 45.7 m | RC Pipe | 400 | 400 | -0.17 | 6.0 | |
| BN-R21 | 82 | No.46 + 15.8 m | RC Pipe | 400 | 400 | 0.79 | 14.0 | Clogged up with soil |
| BN-R22 | 83 | No.46 + 35.7 m | RC Pipe | 400 | 400 | 0.99 | 24.0 | Clogged up with soil |
| | | | | | | | | |
| | | | RC Pipe | 1,000 | 1,000 | -0.31 | | |
| TH-L1 | 46 | No.67 + 5.7 m | **RC Pipe** | **2,000** | **2,000** | **-2.00** | | **EWHP & Pac.-D** |
| | | | Brick | 2,500 | 2,000 | -1.01 | | Arch 2,500 x 2,000 |
| TH-L2 | 45 | No.70 + 35.9 m | **RC (Precast)** | **2 x 2,000** | **2,000** | **-3.20** | | **Box Culvert, Pac.-D** |
| TH-L3 | 44 | No.75 + 0.0 m | RC Pipe | 1,000 | 1,000 | 0.06 | 14.0 | |
| TH-L4 | 43 | No.80 + 43.4 m | RC Pipe | 1,000 | 1,000 | -0.39 | 32.0 | |
| TH-L5 | 42 | No.81 + 4.3 m | RC Pipe | 1,000 | 1,000 | -0.40 | 44.0 | |
| | | | Brick | 800 | 1,400 | -1.03 | 48.0 | Arch 800 x 1,400 |
| TH-L6 | 41 | No.82 + 48.8 m | **RC (Precast)** | **1,500** | **1,500** | **-1.10** | | **Box Culvert** |
| TH-L7 | 40 | No.90 + 30.8 m | RC Pipe | 1,000 | 1,000 | -0.27 | 26.0 | |
| TH-L8 | 39 | No.93 + 8.1 m | RC Pipe | 800 | 800 | -0.90 | 34.0 | |
| | | | Brick | 800 | 1,400 | | | Arch, Clogged up with |
| TH-L9 | 38 | No.93 + 32.9 m | **RC (Precast)** | **1,200** | **1,200** | **-1.40** | | **Box Culvert** |
| | | | Brick | 2,500 | 2,200 | | | Arch |
| TH-L10 | **Addi** | NT Phuong Bridge | **RC (Precast)** | **2,800** | **2,400** | **-2.10** | | **Box Culvert** |
| | | | Brick | 800 | 1,400 | -1.28 | 26.0 | Arch |
| TH-L11 | 37 | No.110 + 11.3 m | **RC Pipe** | **1,500** | **1,500** | **-1.43** | | |

## TABLE 2.4 (2/2) REPLACEMENT LIST OF EXISTING SEWER OUTLETS ALONG TAU HU - BEN NGHE CANAL

| No.of Outlet | | Location | Dimension | | | | Additional Pipe Length (m) | Remarks |
|---|---|---|---|---|---|---|---|---|
| (New) | (Old) | | Material | Width (m) | Height (m) | Invert EL. (m) | | |
| TH-L12 | 36 | No.110 + 41.4 m | RC Pipe | 1,000 | 1,000 | -0.65 | 10.0 | |
| TH-L13 | 35 | No.111 + 20.3 m | RC Pipe | 1,000 | 1,000 | -0.50 | 20.0 | |
| | | | Brick | 600 | 1,200 | -0.63 | 18.0 | Arch 600 x 1,200 |
| TH-L14 | 34 | No.112 + 14.1 m | **RC (Precast)** | **1,200** | **1,200** | **-0.70** | | **Box Culvert** |
| TH-L15 | 33 | No.113 + 42.2 m | RC(Precast) | 2 x 2,000 | 2,000 | -0.89 | 3.0 | Box Culvert |
| TH-L16 | 32 | No.115 + 42.3 m | RC Pipe | 600 | 600 | -0.22 | 3.0 | |
| TH-L17 | 31 | No.117 + 14.1 m | RC Pipe | 1,000 | 1,000 | -0.06 | 2.0 | |
| | | | Brick | 600 | 1,200 | -0.30 | 2.0 | Arch 600 x 1,200 |
| TH-L18 | 30 | No.120 + 25.9 m | **RC (Precast)** | **1,500** | **1,500** | **-0.60** | | **Box Culvert** |
| TH-L19 | 29 | No.121 + 37.3 m | RC Pipe | 600 | 600 | -0.45 | 2.0 | **EWHP** |
| | | | Brick | 800 | 1,400 | -1.91 | | Arch 800 x 1,400 |
| TH-L20 | 28 | No. 122 + 19.9 m | **RC (Precast)** | **1,200** | **1,200** | **-2.00** | | **Box Culvert, EWHP** |
| | | | Brick | 600 | 1,200 | -0.71 | 4.0 | Arch 600 x 1,200 |
| TH-L21 | 27 | No.123 + 11.4 m | **RC** | **2,500** | **2,500** | **-3.30** | | **Box Culvert, Pac.-D** |
| | | | Brick | 600 | 1,200 | -0.02 | 12.0 | Arch 600 x 1,200 |
| TH-L22 | 26 | No.125 + 38.0 m | **RC (Precast)** | **1,000** | **1,000** | **-0.10** | | **Box Culvert** |
| TH-L23 | 25 | No.126 + 48.0 m | RC Pipe | 1,000 | 1,000 | -0.03 | 7.0 | |
| TH-L24 | 24 | No.128 + 29.1 m | RC Pipe | 600 | 600 | -0.13 | 2.0 | |
| TH-L25 | **Addi.** | No.130 + 26.1m | **RC (Precast)** | **2,000** | **2,000** | **-2.09** | | **Box Culvert, HBP** |
| | | | RC Pipe | 800 | 800 | -0.79 | 1.0 | |
| TH-L26 | 23 | No.133 + 35.0 m | **RC Pipe** | **1,200** | **1,200** | **-1.00** | | **HBP** |
| TH-L27 | 22 | No.134 + 21.4 m | RC Pipe | 400 | 400 | 0.89 | | Clogged up with soil |
| TH-L28 | 21 | No.135 + 7.4 m | RC Pipe | 400 | 400 | 0.49 | | |
| | | | RC Pipe | 800 | 800 | -0.41 | | |
| TH-L29 | 20 | No. 135 + 25.8 m | **RC** | **2,800** | **2,400** | **-1.86** | | **HBP** |
| TH-L30 | 19 | No.135 + 48.7 m | RC Pipe | 400 | 400 | 0.81 | | Clogged up with soil |
| TH-L31 | 18 | No.136 + 39.8 m | RC Pipe | 800 | 800 | 0.47 | | |
| TH-L32 | 17 | No.137 + 37.6 m | RC Pipe | 400 | 400 | 0.62 | | |
| | | | RC Pipe | 600 | 600 | 0.79 | | |
| TH-L33 | 16 | No. 138 + 13.2 m | **RC Pipe** | **1,200** | **1,200** | **-1.30** | | **HBP** |
| TH-L34 | 15 | No.139 + 4.4 m | RC Pipe | 400 | 400 | 0.73 | | |
| TH-L35 | 14 | No.140 + 16.6 m | RC Pipe | 400 | 400 | 0.78 | | Clogged up with soil |
| TH-L36 | 13 | No.140 + 41.9 m | RC Pipe | 400 | 400 | 0.85 | | |
| | | | RC Pipe | 1,000 | 1,000 | -1.17 | | |
| TH-L37 | 12 | No.141 + 44.8 m | **RC Pipe** | **1,200** | **1,200** | **-1.22** | | **HBP** |
| TH-L38 | 11 | No.142 + 17.7 m | RC Pipe | 400 | 400 | 0.85 | | |
| TH-L39 | 10 | No.143 + 23.3 m | RC Pipe | 400 | 400 | 0.85 | | |
| TH-L40 | 9 | No.144 + 21.6 m | RC Pipe | 400 | 400 | 0.92 | | |
| | | | RC Pipe | 400 | 400 | | | Clogged up with soil |
| TH-L41 | 8 | No.145 + 11.3 m | **RC** | **4,000** | **2,000** | **-2.51** | | **Box Culvert, HBP** |
| TH-L42 | 7 | No.145 + 28.8 m | RC Pipe | 400 | 400 | 0.60 | | Clogged up with soil |
| | | | | | | | | |
| TH-R1 | **Addi.** | No.80 + 35.3m | RC Pipe | 1,200 | 1,200 | -1.12 | | **Package B** |
| TH-R2 | 84 | No.106 + 10.0 m | RC Pipe | 1,000 | 1,000 | -0.03 | 28.0 | |
| TH-R3 | 85 | No.115 + 32.4 m | RC Pipe | 400 | 400 | 0.11 | 6.0 | |
| TH-R4 | 86 | No.116 + 49.2 m | RC Pipe | 400 | 400 | 0.00 | 6.0 | |
| TH-R5 | 87 | No.118 + 11.2 m | RC Pipe | 1,000 | 1,000 | -1.28 | 5.0 | |
| TH-R6 | 88 | No.119 + 34.3 m | RC Pipe | 800 | 800 | -2.36 | 4.0 | |
| TH-R7 | 89 | No.120 + 10.4 m | RC Pipe | 800 | 800 | -2.42 | 4.0 | |
| TH-R8 | 90 | No.120 + 31.9 m | RC Pipe | 600 | 600 | -1.58 | 3.0 | |
| TH-R9 | 91 | No.121 + 35.4 m | RC Pipe | 600 | 600 | -0.13 | | **EWHP** |
| TH-R10 | 92 | No.124 + 43.7 m | RC Pipe | 1,000 | 1,000 | -0.42 | | |
| TH-R11 | 93 | No.128 + 27.3 m | RC Pipe | 600 | 600 | 0.17 | | |
| TH-R12 | 94 | No. 128 + 34.2 m | RC Pipe | 800 | 800 | -0.12 | | |
| TH-R13 | 95 | No. 135 + 41.7 m | RC Pipe | 400 | 400 | 0.30 | | |
| TH-R14 | 96 | No.137 + 35.8 m | RC Pipe | 400 | 400 | -0.41 | | |
| TH-R15 | 97 | No.138 + 34.6 m | RC Pipe | 400 | 400 | -0.12 | | |
| TH-R16 | 98 | No.139 + 25.6 m | RC Pipe | 400 | 400 | 0.31 | | |
| TH-R17 | 99 | No.140 + 27.8 | RC Pipe | 400 | 400 | 0.36 | | |
| TH-R18 | 100 | No.141 + 19.0 m | RC Pipe | 400 | 400 | 0.20 | | |
| TH-R19 | 101 | No.141 + 19.5 m | RC Pipe | 1,000 | 1,000 | -0.45 | | |
| | | | | | | | | |

**TABLE 2.5 LIST OF CONSTRUCTION OF REVETMENT AND SEWER OUTLET ALONG TAU HU - BEN NGHE CANAL TO BE EXECUTED BY OTHER PROJECT**

| No. | Name of Canal | Start | End | Distance | Name of Project | Work Quantity to be executed by other Project | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Revetment (m) | | Outlet (No. and Name) | |
| | | (Station) | (Station) | (m) | | Left Bank | Right Bank | Left Bank | Right Bank |
| 1 | Ben Nghe | No.3 +20.0 | No.4 +10.0 | 40.0 | Replacement of Khanh Hoi Bridge by EWHP | 40.0 | 40.0 | 1 (BN-L1) | 2 (BN-R1 & R2) |
| 2 | | No.15 +37.0 | No.16 + 27.0 | 40.0 | Replacement of Calmette Bridge by EWHP | 40.0 | 40.0 | 1 (BN-L6) | - |
| 3 | Tau Hu | No.66 +26.5 | No.67 + 11.5 | 35.0 | Replacement of Chu-Y Bridge by EWHP | 35.0 | 35.0 | 1 (TH-L1) | - |
| 4 | | No.70 +30.9 | No.70 + 40.9 | 10.0 | Construction of Combined Sewer by Package D of WEIP | 10.0 | 0.0 | 1 (TH-L2) | - |
| 5 | | No.121 + 33.0 | No.122 + 33.0 | 50.0 | Replacement of Cha Va Bridge | 50.0 | 50.0 | 2 (TH-L19 & L20) | 1 (TH-R8) |
| 6 | | No.121 + 7.4 | No. 121 + 15.4 | 8.0 | Construction of Combined Sewer by Package D of WEIP | 8.0 | 0.0 | 1 (TH-L21) | - |
| 7 | | No.130 + 22.6 | No. 130 + 29.6 | 7.0 | Construction of Combined Sewer by HBDIP | 7.0 | 0.0 | 1 (TH-L25) | - |
| 8 | | No.133 + 22.8 | No.133 + 37.5 | 5.0 | Construction of Combined Sewer by HBDIP | 5.0 | 0.0 | 1 (TH-L26) | - |
| 9 | | No.135 + 18.8 | No.135 + 29.8 | 8.0 | Construction of Combined Sewer by HBDIP | 8.0 | 0.0 | 1 (TH-L29) | - |
| 10 | | No.138 + 10.7 | No.138 + 15.7 | 5.0 | Construction of Combined Sewer by HBDIP | 5.0 | 0.0 | 1 (TH-L33) | - |
| 11 | | No.137 + 42.3 | No.137 + 47.3 | 5.0 | Construction of Combined Sewer by HBDIP | 5.0 | 0.0 | 1 (TH=L37) | - |
| 12 | | No.145 + 6.3 | No.145 + 16.3 | 10.0 | Construction of Combined Sewer by HBDIP | 10.0 | 0.0 | 1 (TH=L41) | - |
| Total | | | | 223.0 | - | 223.0 | 165.0 | 12 | 3 |

Note: 1. EWHP: East-West Highway Project in Ho Chi Minh City

2. WEIP: Ho Chi Minh City Water Environmental Improvement Project

3. HBDIP: Hang Bang Drainage Improvement Project

## TABLE 2.6 (1/3) B/Q OF TAU HU - BEN NGHE CANAL IMPROVEMENT PROJECT

| No. | Item | Unit | Ben Nghe Canal | Tau Hu Canal | Total |
|---|---|---|---|---|---|
| 1. Clearing and Grubbing | | m2 | 28,435 | 39,624 | 68,059 |
| | **B/Q** | | **29,290** | **40,810** | **70,100** |
| 2. Demolition of Existing Revetment | | m3 | 0 | 1,735 | 1,735 |
| | **B/Q** | | **0** | **1,790** | **1,790** |
| 3. Earth Work | | | | | |
| 3.1 Excavation | | | | | |
| | 3.1.1 Channel Excavation | m3 | 71,090 | 130,220 | 201,310 |
| | 3.1.2 Revetment Type A | | 75,390 | 58,050 | 133,440 |
| | 3.1.3 Revetment Type B | | 0 | 44,420 | 44,420 |
| | Total | | 146,480 | 232,690 | 379,170 |
| | **B/Q** | | **146,480** | **232,690** | **379,170** |
| 3.2 Filling | | | | | |
| | 3.2.1 Channel | m3 | 0 | 0 | 0 |
| | 3.2.2 Revetment Type A | | 95,590 | 104,830 | 200,420 |
| | 3.2.3 Revetment Type B | | 0 | 7,220 | 7,220 |
| | Total | | 95,590 | 112,050 | 207,640 |
| | **B/Q** | | **95,590** | **112,050** | **207,640** |
| 4. Timber Piling | | | | | |
| 4.1 Foundation of Revetment | | | | | |
| | 4.1.1 Revetment Type A | m | 512,100 | 467,350 | 979,450 |
| | 4.1.2 Revetment Type B | | 0 | 307,500 | 307,500 |
| | Sub-total | | 512,100 | 774,850 | 1,286,950 |
| 4.2 Bank Protection for Sliding | | | | | |
| | 4.1.1 Revetment Type A | m | 929,462 | 885,938 | 1,815,400 |
| | 4.1.2 Revetment Type B | | 0 | 0 | 0 |
| | Sub-total | | 929,462 | 885,938 | 1,815,400 |
| | Total | | 1,441,562 | 1,660,788 | 3,102,350 |
| | **B/Q** | | **1,456,140** | **1,677,410** | **3,102,350** |
| 5. Gravel Bedding | | | | | |
| | 5.1.1 Revetment Type A | m3 | 455 | 415 | 870 |
| | 5.1.2 Revetment Type B | | 0 | 273 | 273 |
| | Total | | 455 | 688 | 1,143 |
| | **B/Q** | | **470** | **710** | **1,180** |
| 6. Free Draining Gravel | | | | | |
| | 6.1.1 Revetment Type A | m3 | 13,308 | 12,151 | 25,459 |
| | 6.1.2 Revetment Type B | | 0 | 4,699 | 4,699 |
| | Total | | 13,308 | 16,850 | 30,158 |
| | **B/Q** | | **13,700** | **17,360** | **31,060** |
| 7. Geotexitile Cloth | | | | | |
| | 7.1.1 Revetment Type A | m2 | 48,934 | 44,660 | 93,594 |
| | 7.1.2 Revetment Type B | | 0 | 15,578 | 15,578 |
| | Total | | 48,934 | 60,238 | 109,172 |
| | **B/Q** | | **50,400** | **62,050** | **112,450** |
| 8. Precast Concrete Toe Block | | | | | |
| | 8.1.1 Revetment Type A | No. | 1,423 | 1,298 | 2,721 |
| | 8.1.2 Revetment Type B | | 0 | 683 | 683 |
| | Total | | 1,423 | 1,981 | 3,404 |
| | **B/Q** | | **1,570** | **2,000** | **3,570** |
| 9. Concrete Type F (Backfill Concrete for Stone Masonry) | | | | | |
| | 9.1.1 Revetment Type A | m3 | 4,609 | 4,206 | 8,815 |
| | 9.1.2 Revetment Type B | | 0 | 1,968 | 1,968 |
| | Total | | 4,609 | 6,174 | 10,783 |
| | **B/Q** | | **4,750** | **6,360** | **11,110** |
| 10. Concrete type G (Leveling Concrtete) | | | | | |
| | 10.1.1 Revetment Type A | m3 | 436 | 415 | 851 |
| | 10.1.2 Revetment Type B | | 0 | 273 | 273 |
| | Total | | 436 | 688 | 1,124 |
| | **B/Q** | | **450** | **710** | **1,160** |
| 11. Wet Stone Masonry | | | | | |
| | 11.1.1 Revetment Type A | m3 | 14,111 | 12,879 | 26,990 |
| | 11.1.2 Revetment Type B | | 0 | 5,931 | 5,931 |
| | Total | | 14,111 | 18,810 | 32,921 |
| | **B/Q** | | **14,530** | **19,380** | **33,910** |
| 12. Weep Holes | | | | | |
| | 12.1.1 Revetment Type A | No. | 4,552 | 4,155 | 8,707 |
| | 11.1.2 Revetment Type B | | 0 | 2,186 | 2,186 |
| | Total | | 4,552 | 6,341 | 10,893 |
| | **B/Q** | | **4,600** | **6,400** | **11,000** |

## TABLE 2.6 (2/3) B/Q OF TAU HU - BEN NGHE CANAL IMPROVEMENT PROJECT

| No. | Item | Unit | Ben Nghe Canal | Tau Hu Canal | Total |
|---|---|---|---|---|---|
| 13. Joint Filler | | | | | |
| | 13.1.1 Revetment Type A | m2 | 783 | 715 | 1,498 |
| | 13.1.2 Revetment Type B | | 0 | 343 | 343 |
| | Total | | 783 | 1,058 | 1,841 |
| | **B/Q** | | **810** | **1,090** | **1,900** |
| 14. Rip Rap | | | | | |
| | 14.1.1 Revetment Type A | m3 | 8,679 | 7,817 | 16,496 |
| | 14.1.2 Revetment Type B | | 0 | 4,100 | 4,100 |
| | Total | | 8,679 | 11,917 | 20,596 |
| | **B/Q** | | **8,770** | **12,030** | **20,800** |
| 15. Road Construction | | | | | |
| | 15.1 Excavation | m3 | 0 | 1,047 | 1,047 |
| | **B/Q** | | **0** | **1,100** | 1,100 |
| | 15.2 Pavement | | | | |
| | 15.2.1 Subgrade Preparation | m3 | 0 | 2,500 | 2,500 |
| | **B/Q** | | **0** | **2,530** | **2,530** |
| | 15.2.2 Sub Base Course | m3 | 0 | 375 | 375 |
| | **B/Q** | | **0** | **420** | **420** |
| | 15.2.3 Base Course | m3 | 0 | 650 | 650 |
| | **B/Q** | | **0** | **660** | **660** |
| | 15.2.4 Asphalt Binder Course | ton | 0 | 464 | 464 |
| | **B/Q** | | **0** | **470** | **470** |
| | 15.2.5 Asphalt Surface Course | ton | 0 | 330 | 330 |
| | **B/Q** | | **0** | **340** | **340** |
| | 15.2.6 Prime Coat | liter | 0 | 3,750 | 3,750 |
| | **B/Q** | | **0** | **3,790** | **3,790** |
| | 15.2.7 Tac Coat | liter | 0 | 1,125 | 1,125 |
| | **B/Q** | | **0** | **1,140** | **1,140** |
| | 15.3 Concrete Curb | m | 0 | 362 | 362 |
| | **B/Q** | | 0 | 365 | 365 |
| | 15.4 Sand Bed for Foot Path | m3 | 0 | 145 | 145 |
| | **B/Q** | | **0** | **145** | **145** |
| | 15.5 Precasdt Concrete Block | m2 | 0 | 1,444 | 1,444 |
| | **B/Q** | | **0** | **1,460** | **1,460** |
| 16. Storm Water Drainage System | | | | | |
| | 16.1 Earth Work | m3 | 0 | 1839 | 1,839 |
| | **B/Q** | | **0** | **1930** | **1,930** |
| | 16.2 Pipe Installation | | | | |
| | Precast RC Pipe (400dia) | m | 0 | 25 | **25** |
| | Precast RC Pipe (800dia) | | 0 | 346 | **346** |
| | Precast RC Pipe (1200dia) | | 0 | 12 | **12** |
| | 16.3 Construction of Manhole | | | | |
| | 16.3.1 Concrete Type E | m3 | 0 | 84.4 | 84 |
| | **B/Q** | | **0** | **90** | **90** |
| | 16.3.2 Concrete Type F | m3 | 0 | 11.3 | 11 |
| | **B/Q** | | **0** | **12** | **12** |
| | 16.3.3 Concrete Type G | m3 | 0 | 8.7 | 9 |
| | **B/Q** | | **0** | **10** | **10** |
| | 16.3.4 Sand Bedding | m3 | 0 | 17.4 | 17.4 |
| | **B/Q** | | **0** | **18** | **18** |
| | 16.3.5 Granolitic Topping | m2 | 0 | 28.2 | 28.2 |
| | **B/Q** | | **0** | **30** | **30** |
| | 16.3.6 Ladder Rungs | No. | 0 | 155 | 155 |
| | **B/Q** | | **0** | **160** | **160** |
| | 16.3.7 Deformed Reinforcing Bars | kg | 0 | 5454 | 5454 |
| | **B/Q** | | **0** | **5,620** | **5,620** |
| | 16 3.8 C.I Manhole Cover (Type A) | No. | **0** | **12** | **12** |
| | 16 3.8 C.I Manhole Cover (Type C) | | **0** | **2** | **2** |
| | 16 3.8 C.I Manhole Cover (Type E) | | **0** | **12** | **12** |
| 17. Sewer Outlet | | | | | |
| | 17.1 Excavation | m3 | 5,655 | 3,818 | 9,473 |
| | **B/Q** | | **5,940** | **4,010** | **9,950** |
| | 17.2 Sandy Soil Backfill | m3 | 4,414 | 3,108 | 7,522 |
| | **B/Q** | | **4,640** | **3,270** | **7,910** |
| | 17.3 Foundation Pile | m | 71,224 | 51,917 | 123,141 |
| | **B/Q** | | **71,940** | **52,440** | **124,380** |

## TABLE 2.6 (3/3) B/Q OF TAU HU - BEN NGHE CANAL IMPROVEMENT PROJECT

| No. | Item | Unit | Ben Nghe Canal | Tau Hu Canal | Total |
|---|---|---|---|---|---|
| | 17.4 Sand Bedding | m3 | 185 | 153 | 338 |
| | **B/Q** | | **190** | **160** | **350** |
| | 17.5 Reinforced Concrete (Concrete Type E) | m3 | 243 | 258 | 501 |
| | **B/Q** | | **250** | **270** | **520** |
| | 17.6 Leveling Concrete (Concrete Type G) | m3 | 92 | 77 | 169 |
| | **B/Q** | | **100** | **80** | **180** |
| | 17.7 Precast RC Pipe | | | | |
| | 17.7.1 400 dia | m | **77** | **124** | **201** |
| | 17.7.2 600 dia | | **49** | **17** | **66** |
| | 17.7.3 800 dia | | **69** | **105** | **174** |
| | 17.7.4 1000 dia | | **170** | **206** | **376** |
| | 17.7.5 1200 dia | | **5** | **0** | **5** |
| | 17.7. 1500 dia | | **25** | **5** | **30** |
| | 17.8 Precast RC Box Culvert | | | | |
| | 17.8.1 1000 x 1000 | m | **0** | **6** | **6** |
| | 17.8.2 1200 x 1200 | | **0** | **16** | **16** |
| | 17.8.3 1500 x 1500 | | **26** | **12** | **38** |
| | 17.8.4 1600 x 2000 | | **7** | **0** | **7** |
| | 17.8.5 1800 x 2000 | | **7** | **0** | **7** |
| | 17.8.6 2000 x 2000 | | **15** | **0** | **15** |
| | 17.8.7 2000 x 2000 x 2 | | **9** | **0** | **9** |
| | 17.8.8 2800 x 2400 | | **0** | **7** | **7** |
| | 17.8.9 3000 x 1500 | | **27** | **0** | **27** |
| 18. Landscape Work | | | | | |
| | 18.1 Excavation | m3 | 2,278 | 3,170 | 5,448 |
| | **B/Q** | | **2,390** | **3,330** | **5,720** |
| | 18.2 Sandy Soil Backfill | m3 | 1,481 | 2,061 | 3,542 |
| | **B/Q** | | **1,550** | **2,160** | **3,710** |
| | 18.3 Curb (Concrete Type E) | m3 | 1,281 | 1,784 | 3,065 |
| | **B/Q** | | **1,320** | **1,840** | **3,160** |
| | 18.4 Deformed Reinforcing Bars | kg | 10,231 | 14,235 | 24,466 |
| | **B/Q** | | **10,540** | **14,660** | **25,200** |
| | 18.5 Leveling Concrete (Concrete Type G) | m3 | 249 | 347 | 596 |
| | **B/Q** | | **260** | **360** | **620** |
| | 18.6 Sand Bedding | m3 | 1,735 | 2,280 | 4,015 |
| | **B/Q** | | **1,790** | **2,350** | **4,140** |
| | 18.7 Precast Concrete Block | m2 | 17,348 | 22,800 | 40,148 |
| | **B/Q** | | **17,520** | **23,030** | **40,550** |
| | 18.8 Gravel Bedding | m3 | 498 | 694 | 1,192 |
| | **B/Q** | | **510** | **715** | **1,225** |
| | 18.9 Sodding | m2 | 673 | 939 | 1,612 |
| | **B/Q** | | **680** | **950** | **1,630** |
| | 18.10 Flowering Shurabs/Ground Cover Plan | m2 | 1,562 | 2,178 | 3,740 |
| | **B/Q** | | **1,580** | **2,200** | **3,780** |
| | 18.11 Tree | No. | 710 | 990 | 1,700 |
| | **B/Q** | | **710** | **990** | **1,700** |
| 19. Electric Work | | | | | 0 |
| | 19.1 Installation of Power Pole | No. | 2 | 2 | 4 |
| | **B/Q** | | **2** | **2** | **4** |
| | 19.2 Installation of Lighting Pole | | 145 | 200 | 345 |
| | **B/Q** | | **145** | **200** | **345** |
| | 19.3 Installation of Cable | m | 5,710 | 7,930 | 13,640 |
| | **B/Q** | | **5,880** | **8,170** | **14,050** |
| | 19.4 Cable Connection | | | | |
| | 19.4.1 Number of Connection Site | No. | **2** | **2** | **4** |
| | 19.4.2 Transformer | set | **2** | **2** | **2** |
| | 19.4.3 Metering Cubicle | set | **2** | **2** | **4** |
| | 19.4.4 Cable | m | **200** | **200** | **400** |

Note: Bold-faced figures in the above tables include some allowance (3 to 5 % of the estimated quantity), which are applied Bill of Quantity in Tender Document.

## TABLE 2.7 CONSTRUCTION SCHEDULE OF PACKAGE A (TAU HU - BEN NGHE CANAL IMPROVEMENT)

| No. | Major Work Item | Unit | Quantity | 2002 | | | | | | | | | 2003 | | | | | | | | | | | 2004 | | | | | | | | | | | 2005 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 11 | 12 |
| 1 | Relocation and Tendering | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Preparatory Work | L.S. | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Sewer Outlet Work | places | 86 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Revetment Work | m | 13,612 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Channel Excavation Work | $m^3$ | 379,170 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Landscape Work | L.S. | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Clearning and Handing Over | L.S. | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

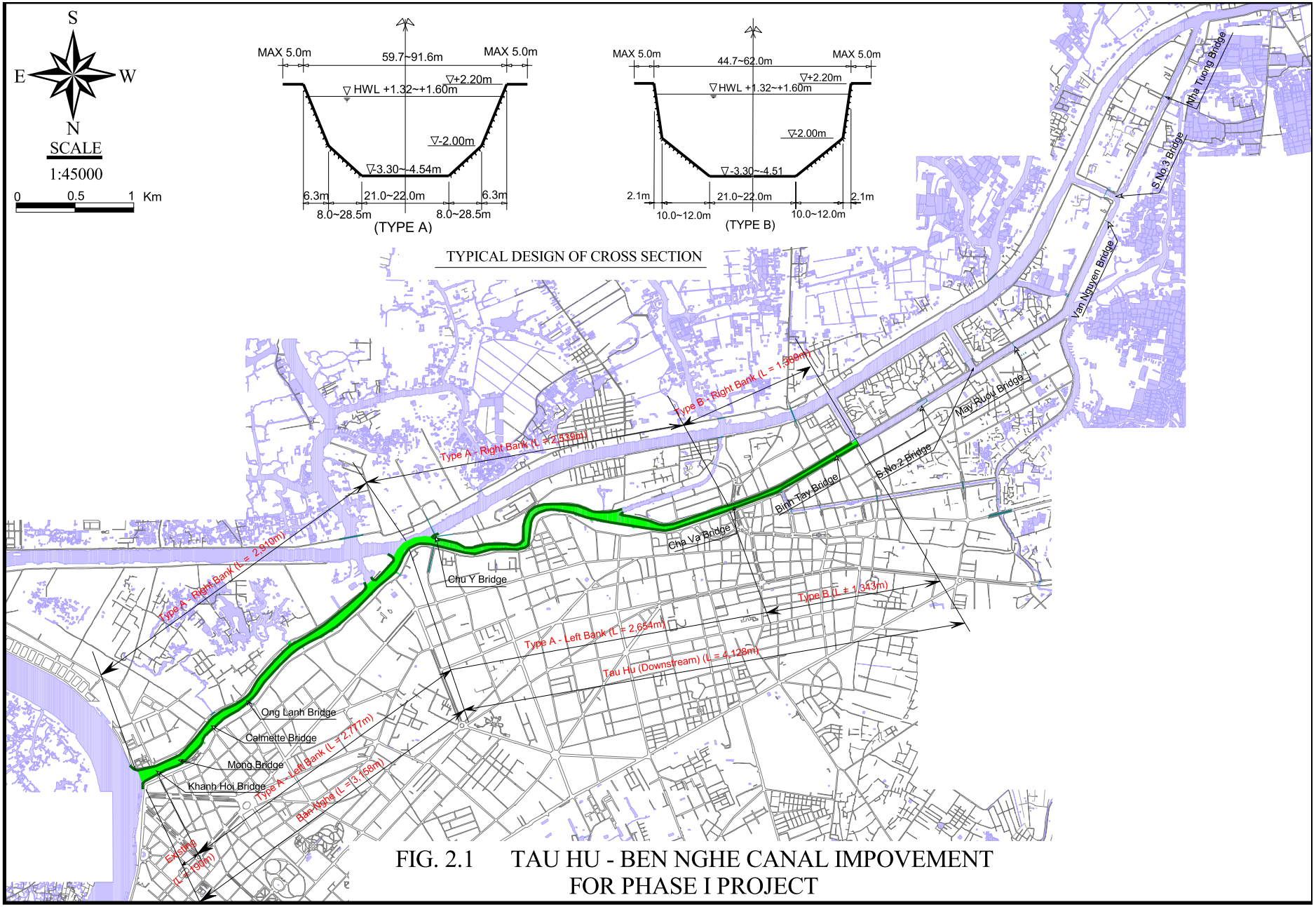
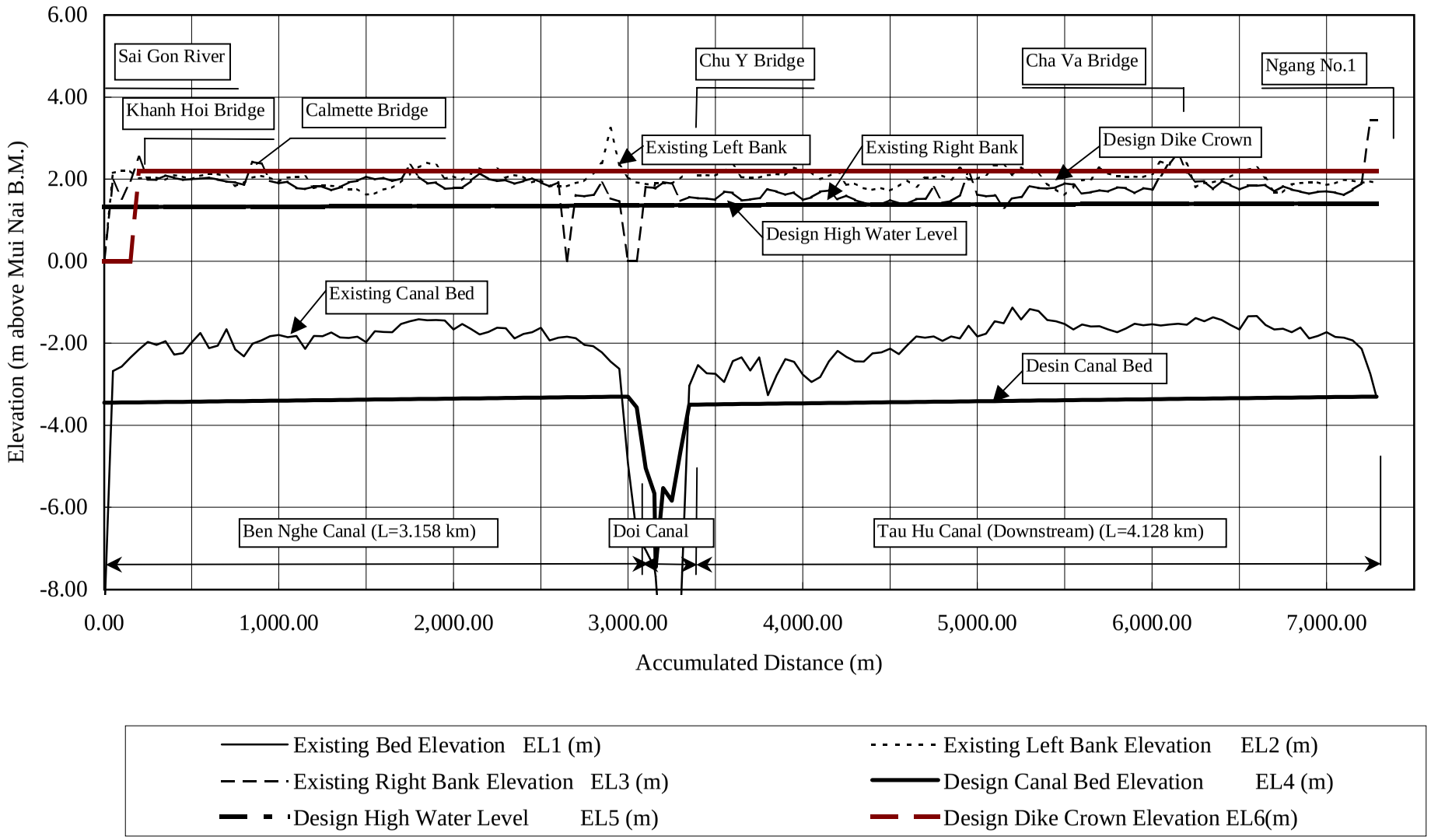



FIG. 2.1 TAU HU - BEN NGHE CANAL IMPOVEMENT FOR PHASE I PROJECT

**FIG. 2.2 PROPOSED LONGITUDINAL PROFILE OF TAU HU - BEN NGHE CANAL IMPROVEMENT**



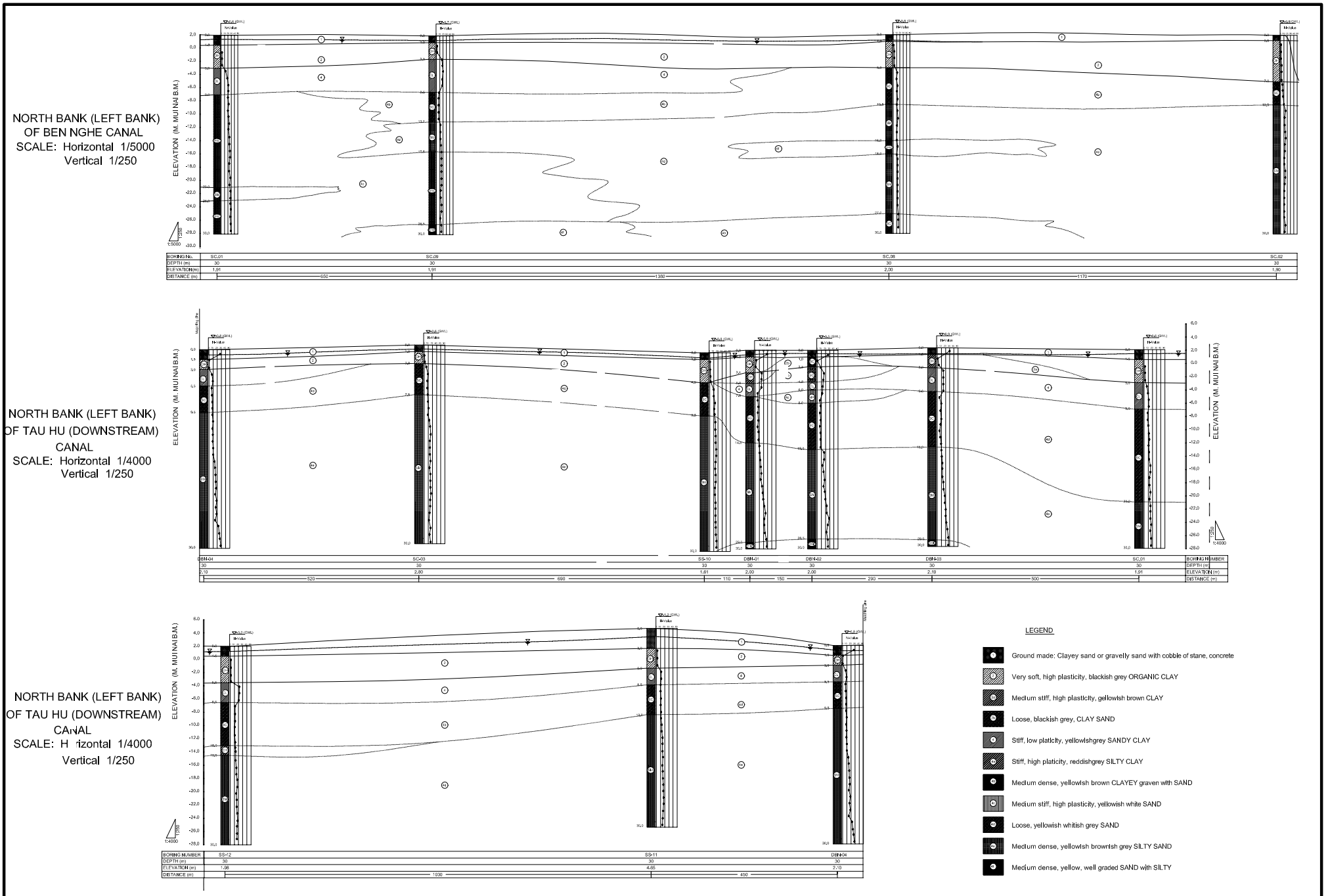



FIG. 2.3 GEOLOGICAL PROFILE ALONG TAU HU - BEN NGHE CANAL

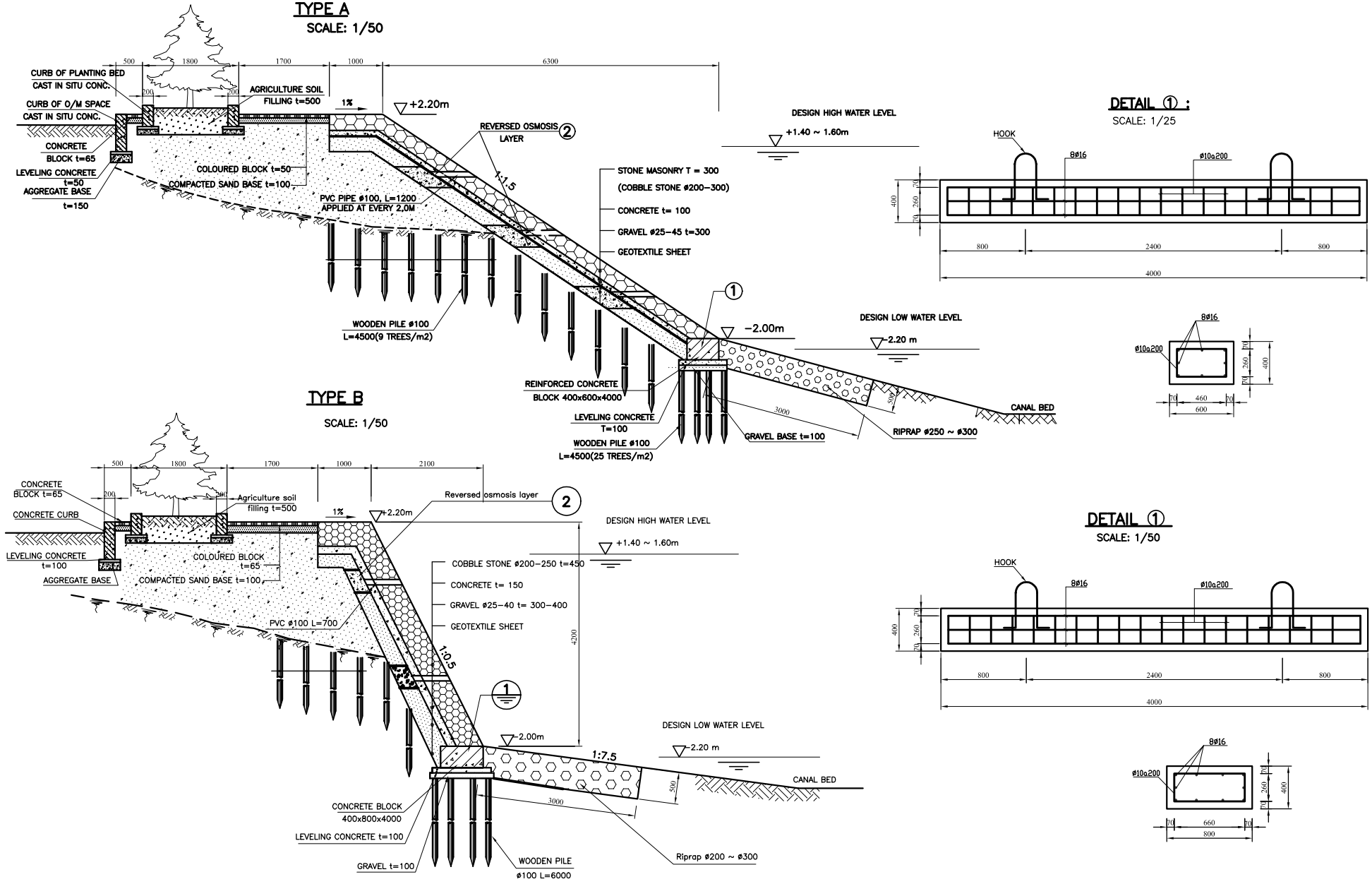



FIG 2.4 TYPICAL REVETMENTS FOR TAU HU - BEN NGHE CANAL

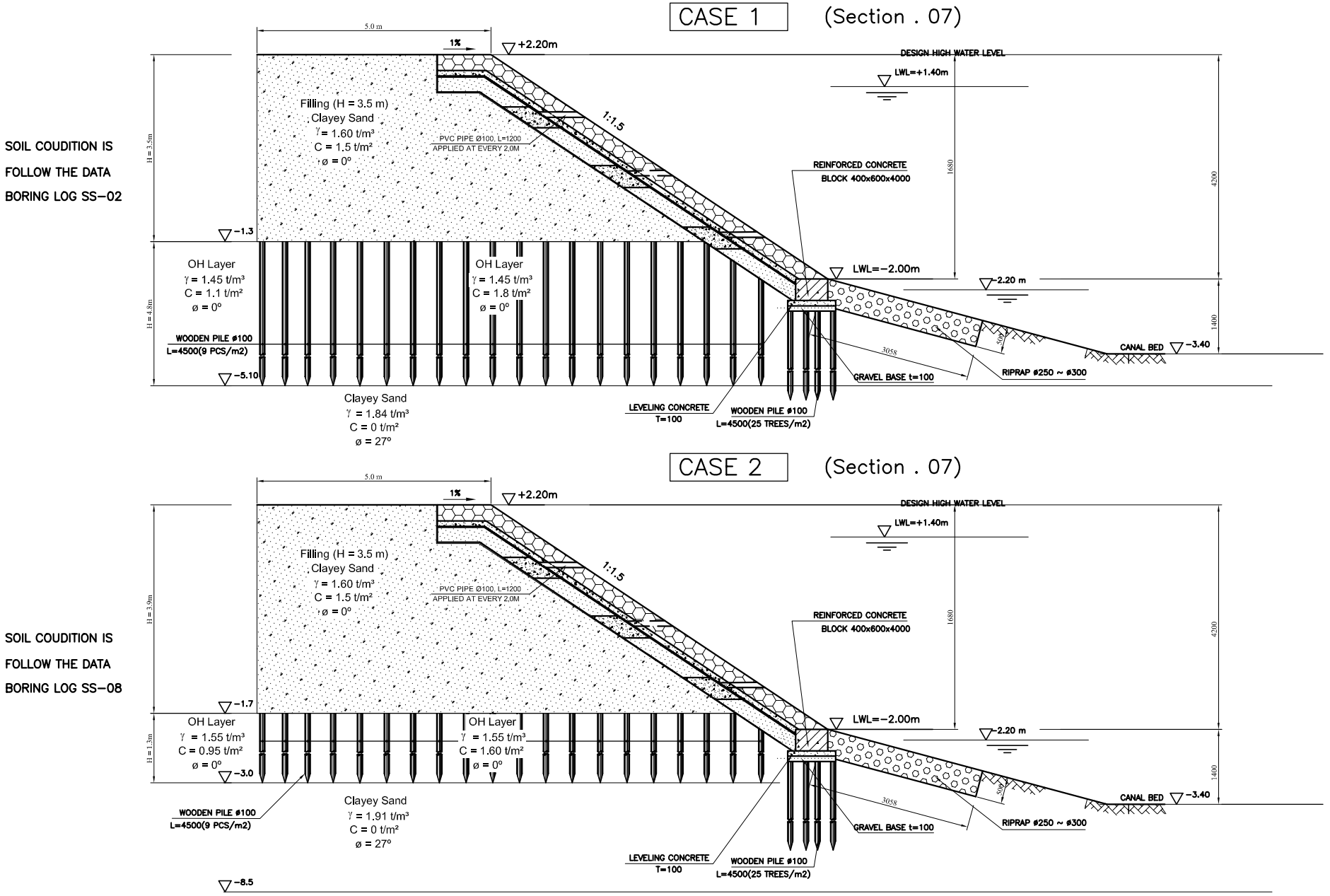



FIG 2.5 PREVENTION WORK FROM SLIDING DUE TO FILLING

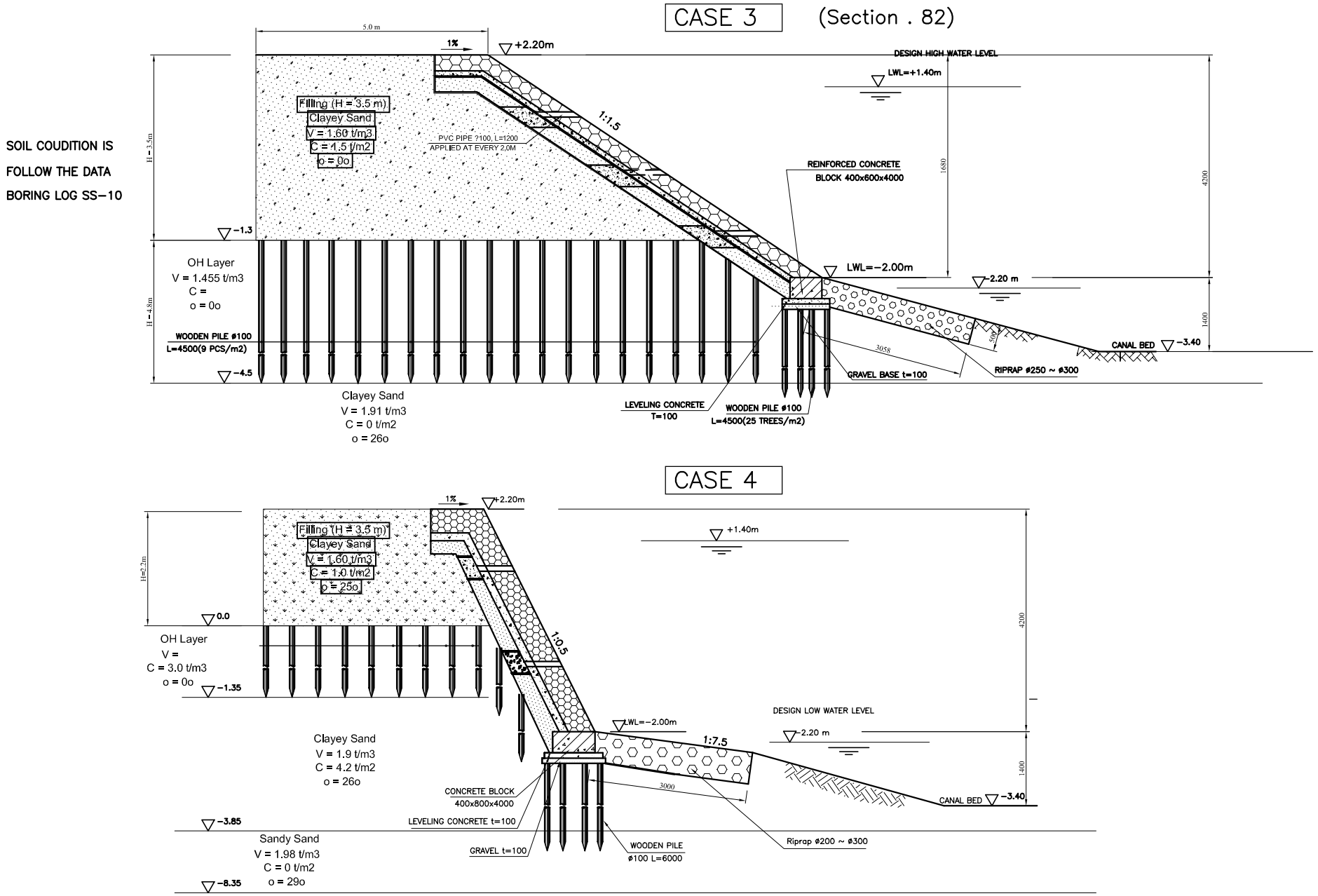



FIG 2.6 PREVENTION WORK FROM SLIDING DUE TO FILLING

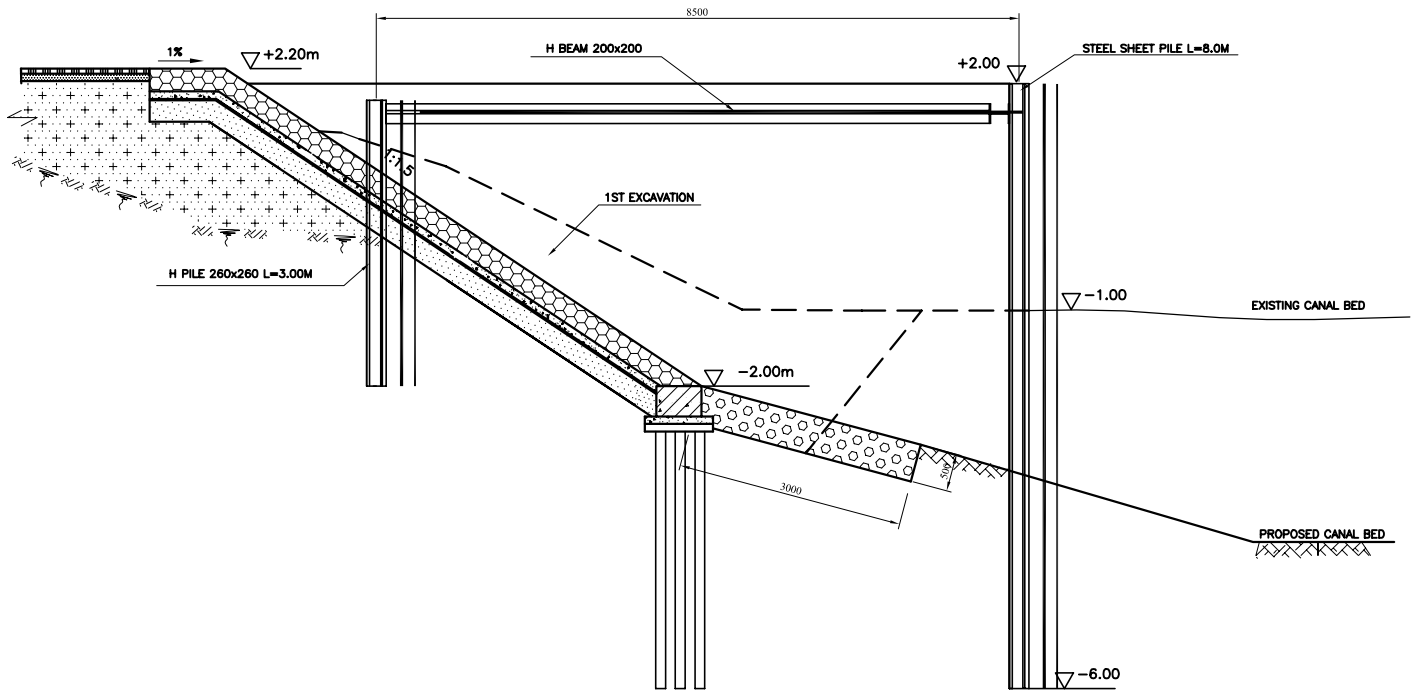



FIG 2.7 COFFER DAM ARRANGEMENT FOR REVETMENT CONSTRUCTION

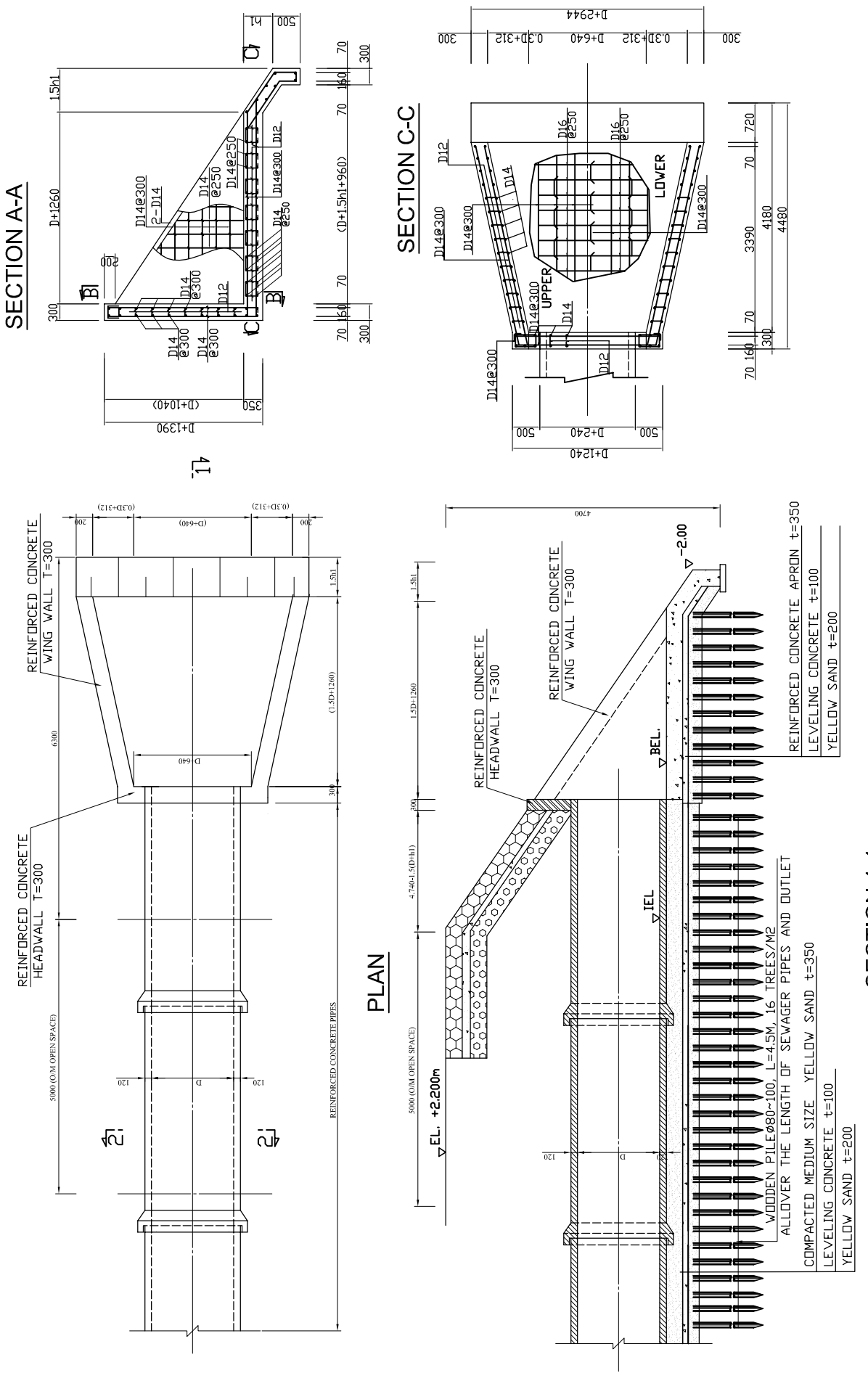



FIG 2.8 TYPICAL SEWER PIPE AND OUTLET

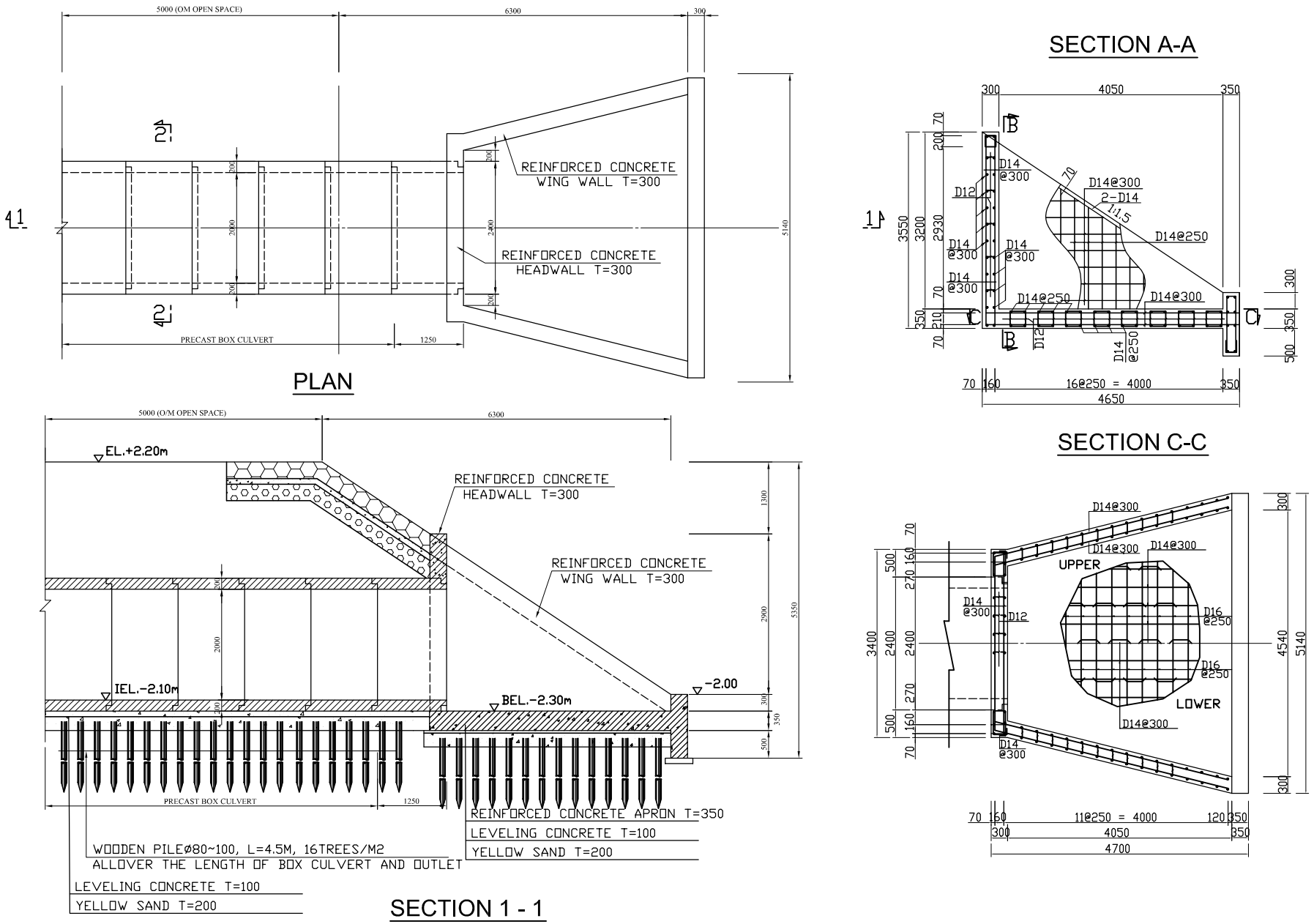



FIG 2.9 TYPICAL BOX CULVERT AND OUTLET

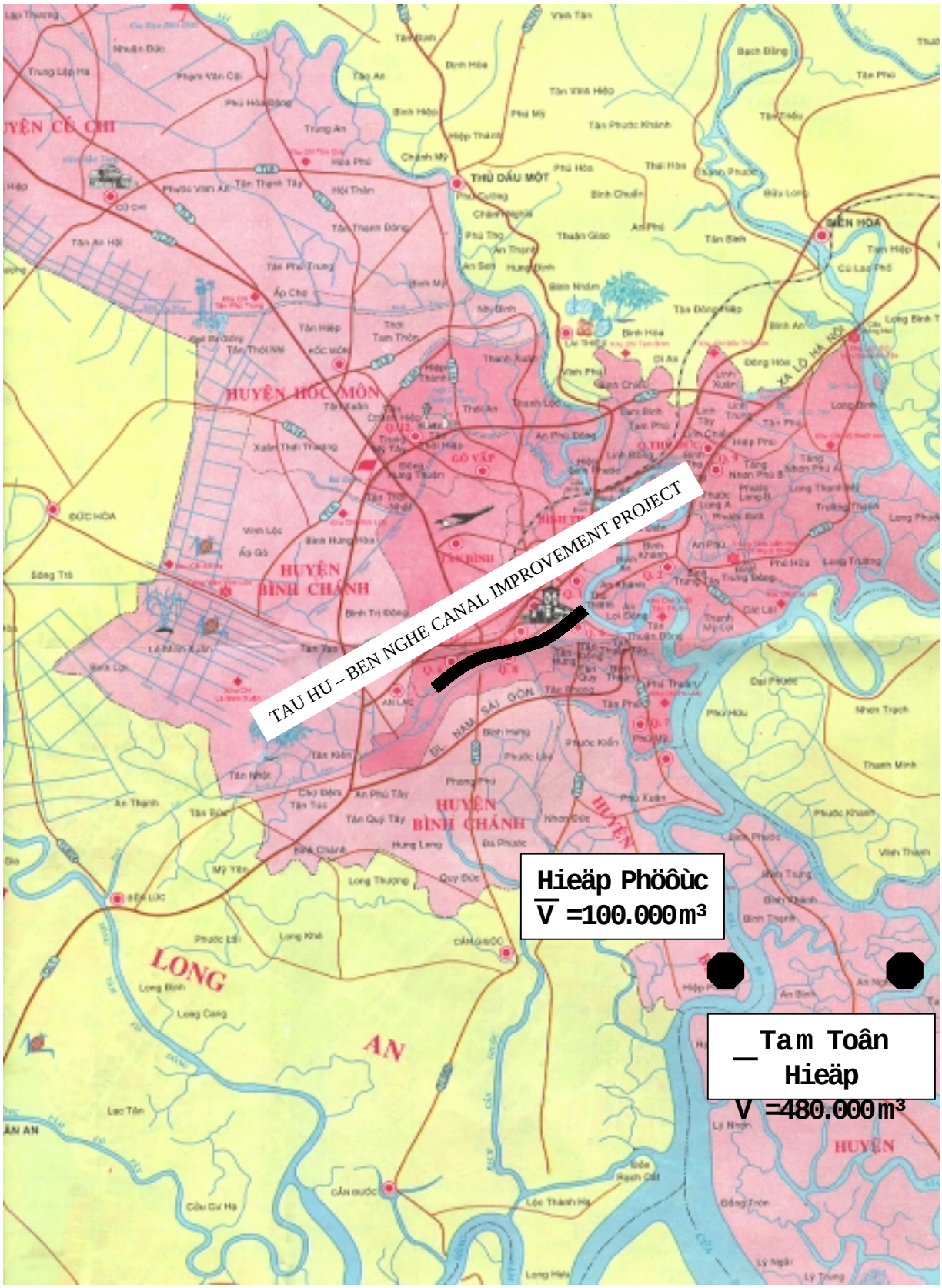



**FIG 2.10 LOCATION OF DUMPING SITE FOR TAU HU – BEN NGHE CANAL IMPROVEMENT PROJECT**

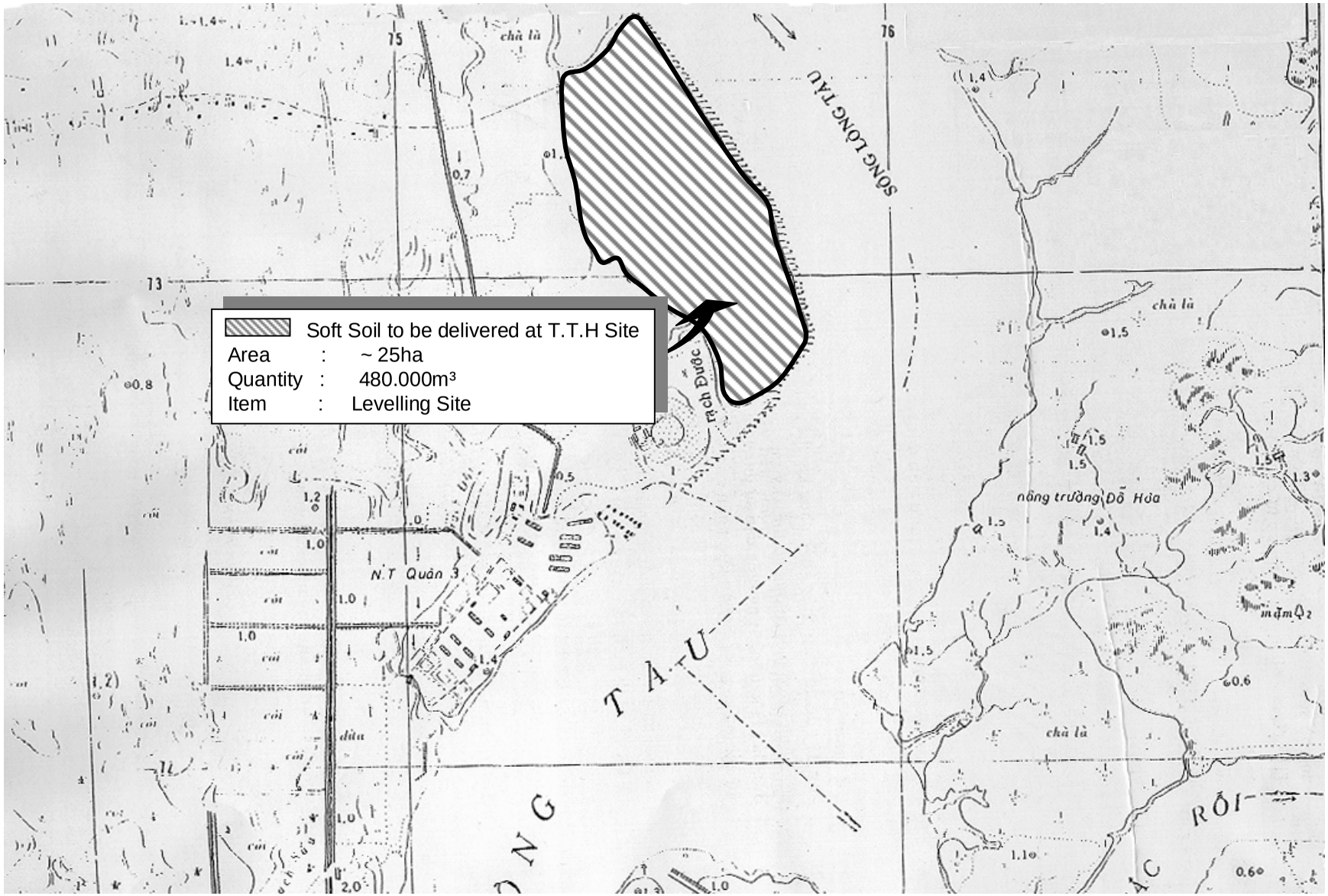



**FIG 2.11 LOCATION OF PROPOSED TAM THON HIEP DUMPING SITE**

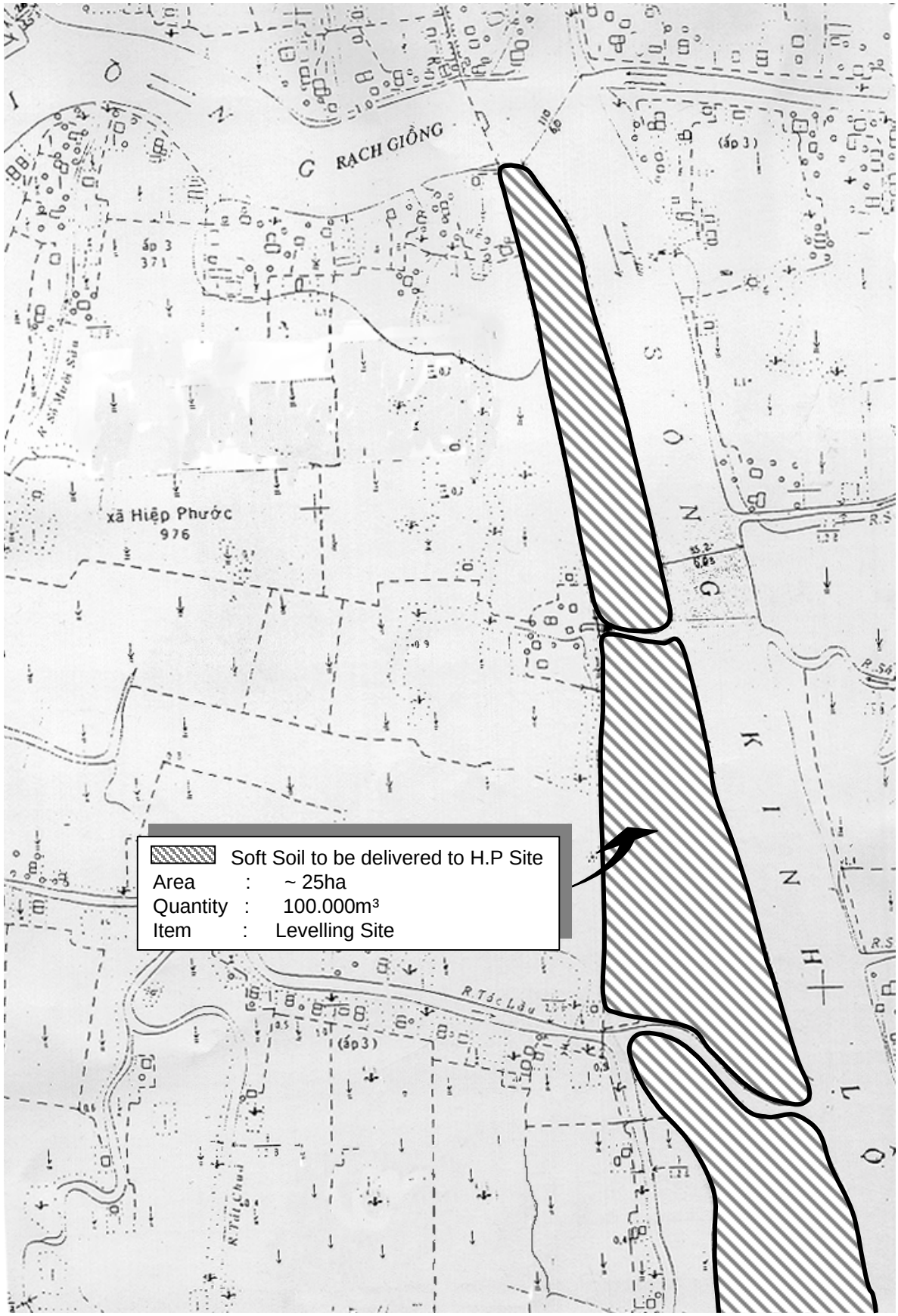
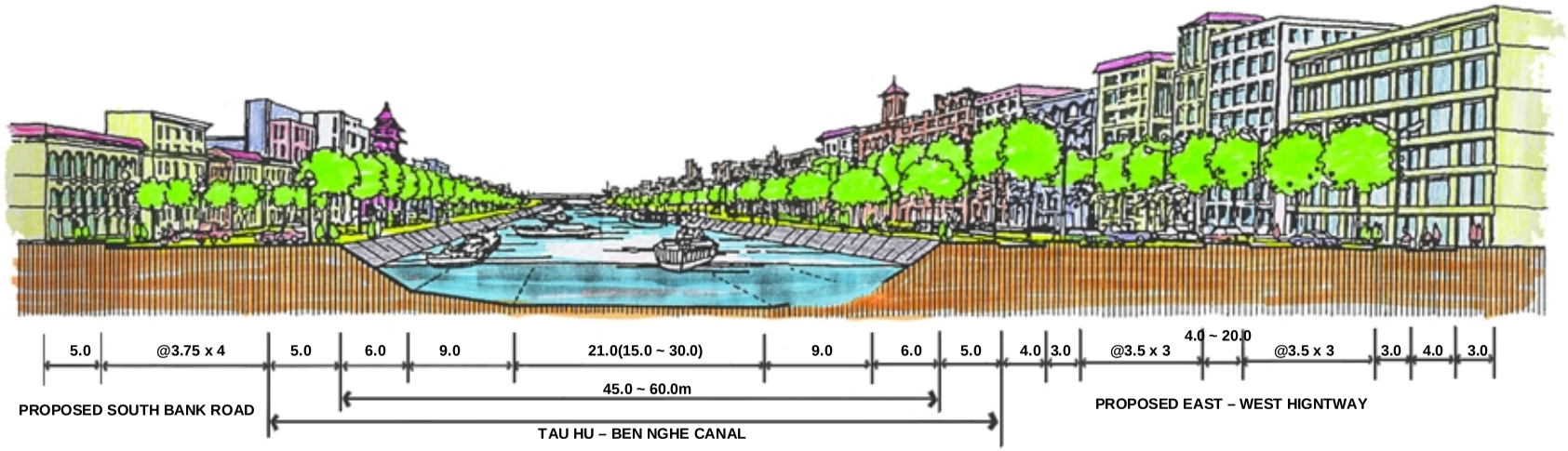
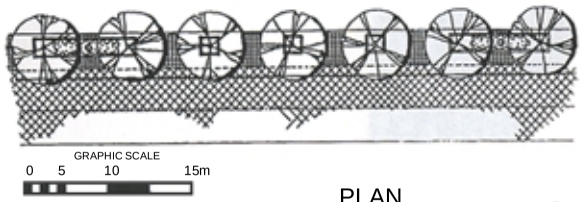


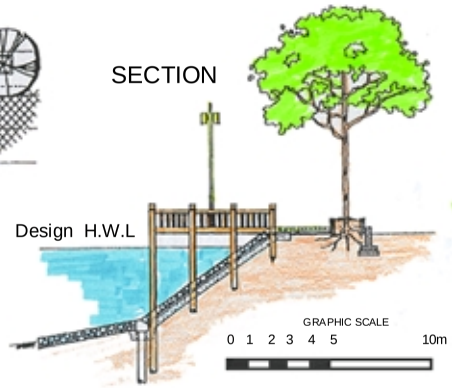

**FIG 2.12 LOCATION OF PROPOSED HIEP PHUOC DUMPING SITE**




Typical section of Tau Hu – Ben Nghe canal together with future development scheme of the East – West Highway and South Bank Road. Pavement of the canal shall have 5.0m of maintenance space on the born top, this space shall be used for pedestrian walk as well as sidewalk of the both of the Highway and the Road. This space shall be furnished with concrete block paving and canopy trees for shadow provision and street lightings.




PLAN




**Planting of canopy trees along the canal**

Medium size canopy trees are planed along the revetment born top space, interval of each planting tree location is 8.0m in general for consideration of future growth of the planed trees. 1.8m × 1.8m square planting box shall be applied for each planting location. Each interval of 24.0m rectangular formed planting box is applied as for a visual accent, are there turf grass, flowering lower shrubs are planted. In installed center of this planting space. Street pole light is installed for safety pedestrian's walk as well as aesthetic point of view.

**Jetty as a temporary work on the revetment**

Jetty and pontoon may be facilitated at some priority location of the canal side for supporting tourism activities, also for various type of loading and unloading commercial activities in time to time during and after the canal improvement project

FIG. 2.13 PROPOSED LANDSCAPE DEVELOPMENT SCHEME ALONG TAU HU – BEN NGHE CANAL

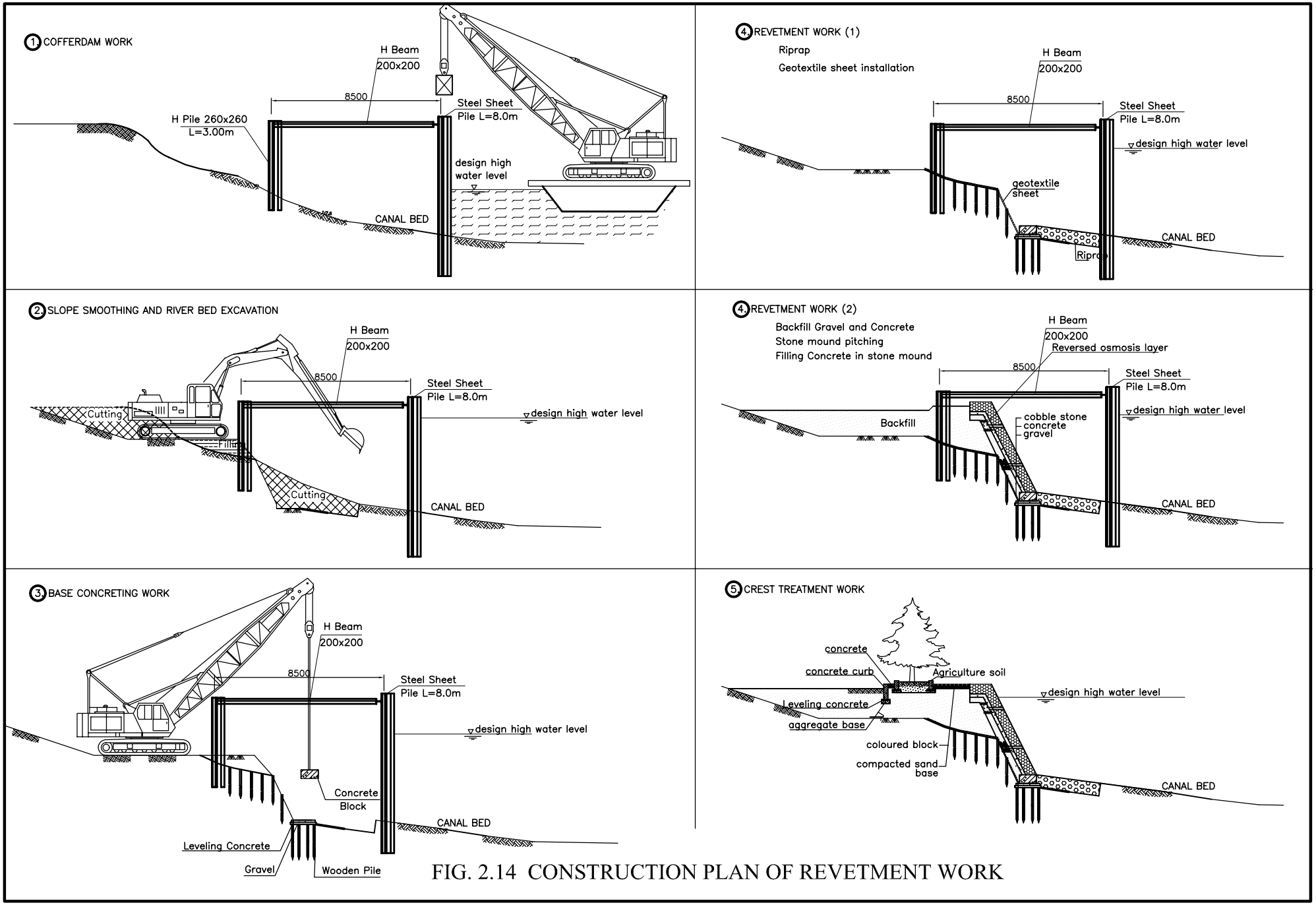



FIG. 2.14 CONSTRUCTION PLAN OF REVETMENT WORK