2.4 Xe Katam Small-Scale Hydroelectric Power Development Project

2.4.1 Location

The Xe Katam River is one of the tributaries of the Xe Namnoy River, and it is a small river having an approximately 300 km^2 basin which runs from an elevation of approximately 1,200 m down to approximately 300 m in the southeast direction.

It is planned to install the intake dam of the Xe Katam Small-Scale Hydroelectric Power Project at a location of the upstream of two falls (a 20 m fall and a 100 m fall) located immediately upstream of its confluence with the Xe Namnoy River. The site of powerhouse will be at approximately 400 m upstream of the confluence of the Xe Namnoy River at its left bank. The intake and the powerhouse will be connected by an approximately 450 m long headrace and approximately 310 m long penstocks. The head to be utilized between these two locations is approximately 160 m. (See Fig.-1)

2.4.2 Geology

It has been confirmed by the analysis of LANDSAT imageries, aerial and ground surveys, boring surveys, and physical exploratory tests that the grounds of the intake dam, headrace channel and penstocks are made of basalt lava, and those of lower part of penstocks and the powerhouse foundation are made of sandstone, without any geological problem involved.

2.4.3 Hydrology and Meteorology

Although precipitation observation stations had existed in the Project Area and its neighboring areas before the project study was commenced, they are located outside the basin of the Xe Katam River, and there is no datum for the basin which can be directly used for formulation of the plan. (See Fig.-2)

In this study, therefore, observation works have been initiated within the Xe Katam River basin since February, 1991 by installing hydrological observation

stations inside of the Project Area. (See Fig.-2) Analyses have been conducted by using a run-off model based on the observated results so far obtained as well as the data of existing Xe Set Hydroelectric Power Plant and the observed precipitation data in Bolaven Plateau, and it has been estimated that the average run off would be 9.76 m^3/s and 95% firm flow would be 1.11 m^3/s, and the 100-year probability flood would be 830 m^3/s at the proposed intake site of the Xe Katam Project. The estimated flow for the 10 years from 1981 to 1990 is as illustrated in Fig.-3. As for the sedimentation in the intake dam, there is possibility of substantial inflow of sediments as we refer to the data of nearby rivers.

2.4.4 Electrification Status and Power Demand Projection of Sekong and Attapeu Towns

As discussed above, it is planned to supply the output of Xe Katam Small Hydroelectric Power Plant to Sekong and Attapeu. Currently, diesel power generators are installed in these two towns and power is supplied to residential areas and street lighting by distribution networks which are installed mainly in congested residential areas. Also, the two towns have small factories for lumbering, rice polishing and other industries, and these factories are equipped with in-house diesel generators, as has been described. Although the fuel can be supplied somehow in the dry seasons, the power generation is often hampered by difficulty of transporting fuel and equipment parts in the wet seasons when the road conditions are deteriorate. In both towns, the number of electric lumps is approximately 800, and the power demand is around 200 to 300 kW including the load for lumbering and rice milling. The rice fields could be irrigated, but pumping water by power is not yet commonly used.

It is not easy to project the future power demand for towns under such conditions, and the projection must be based on inference which include substantial uncertain factors. However, the power demands in the future have been estimated as presented in Fig.-4, 5 and 6 by referring to SPE-II Plan and the average records of the northern district in the past 10 years. That is, a peak demand of 1,400 kW or so can be anticipated for the two towns in 1995 when we assume that power is used for irrigation, too. Considering the diversity of the elements of projected power demand in each sector, it would

be reasonable to prepare around 2,000 kW of supply capacity of the Xe Katam Hydroelectric Power Plant by 1995. We estimated that the demand will grow as illustrated in Fig.-5 after 1995, and planned to install another 2,000 kW capacity by year 2000, and 6,000 kW altogether by 2010.

2.4.5 Power Transmission Plan

Studies on the power transmission plan have been conducted on various factors such as the transmission line route, conductor type, transmission line voltage, construction cost and procurement of materials and equipments, and it has been planned to install 22 kW transmission lines for 50 km to Sekong and for 73 km for Attapeu, to supply 2,000 kW of power to Sekong Town and 3,000 kW to Attapeu Town in the final stage. (See Fig.-7 and 8) It is estimated that the number of residents who benefit from this power transmission plan will be around 30,000 in the two towns.

2.4.6 Design

By considering the power demand status of Sekong and Attapeu Towns and the project financing, it has been planned to install a 2,000 kW generating facility in the Earlier Phase, and 4,000 kW in the Later Phase, the final installed capacity of the power plant being 6,000 kW. It has been decided to implement the Later Phase development in two stages, 2,000 kW each. However, all civil structure of the Later Phase (including penstocks and powerhouse building) will be constructed in the first stage of the Later Phase, and only one set of 2,000 kW turbine and generator will be installed in the second stage. The design standards are in accordance with the Japanese Standards. General plan and longitudinal profile of waterway of the project are illustrated in Fig.-9, and construction schedule is illustrated in Fig.-10.

2.4.7 Economic Evaluation

In the economic evaluation, a diesel generator facility which can replace this Project was assumed, and the relative economy was compared. Based on this study, we have arrived at an conclusion that, in a long run, this Project would be more economical in meeting the power demands in Sekong and Attapeu Towns. In addition, foreign currencies can be saved in the future by not depending on the diesel power.

2.4.8 Financial Evaluation

By calculating the construction cost of the 2,000 kW, Earlier Phase Project, and by conducting financial analysis on this construction cost, it has been clarified that the equivalent discount rate of this Project is substantially lower than the social discount rate of 10%, which is the financial index of a project in Laos. In realizing the level of index referred to above, a particular consideration for financing is required for the investment fund for the Earlier Phase 2,000 kW.

2.4.9 Environmental Issues

The environmental impact of this Project has been evaluated. As this Project is a small run-of-river hydroelectric power, there is no need at all to move residents from the Project Area. In addition, the destructive effect on nature during construction work and operation of the plant will be so trivial that there will not be any need to worry about. However, construction materials and goods will flow into the site by the development of Xe Katam Hydroelectric Project, and also there will be a temporary increase in labor population. These may give some direct and indirect impacts on the living style of the residents in the neighboring areas. In addition, unless care is taken for the conservation of the river basin, there may arise some fear to shorten the project life by the inflow of sediment at the dam site.

2.4.10 Conclusion

Based on studies conducted from various angles as discussed above, it can be concluded that this Project is the most appropriate development plan in this area, technically, socially, and environmentally feasible, although certain financing conditions must be met.

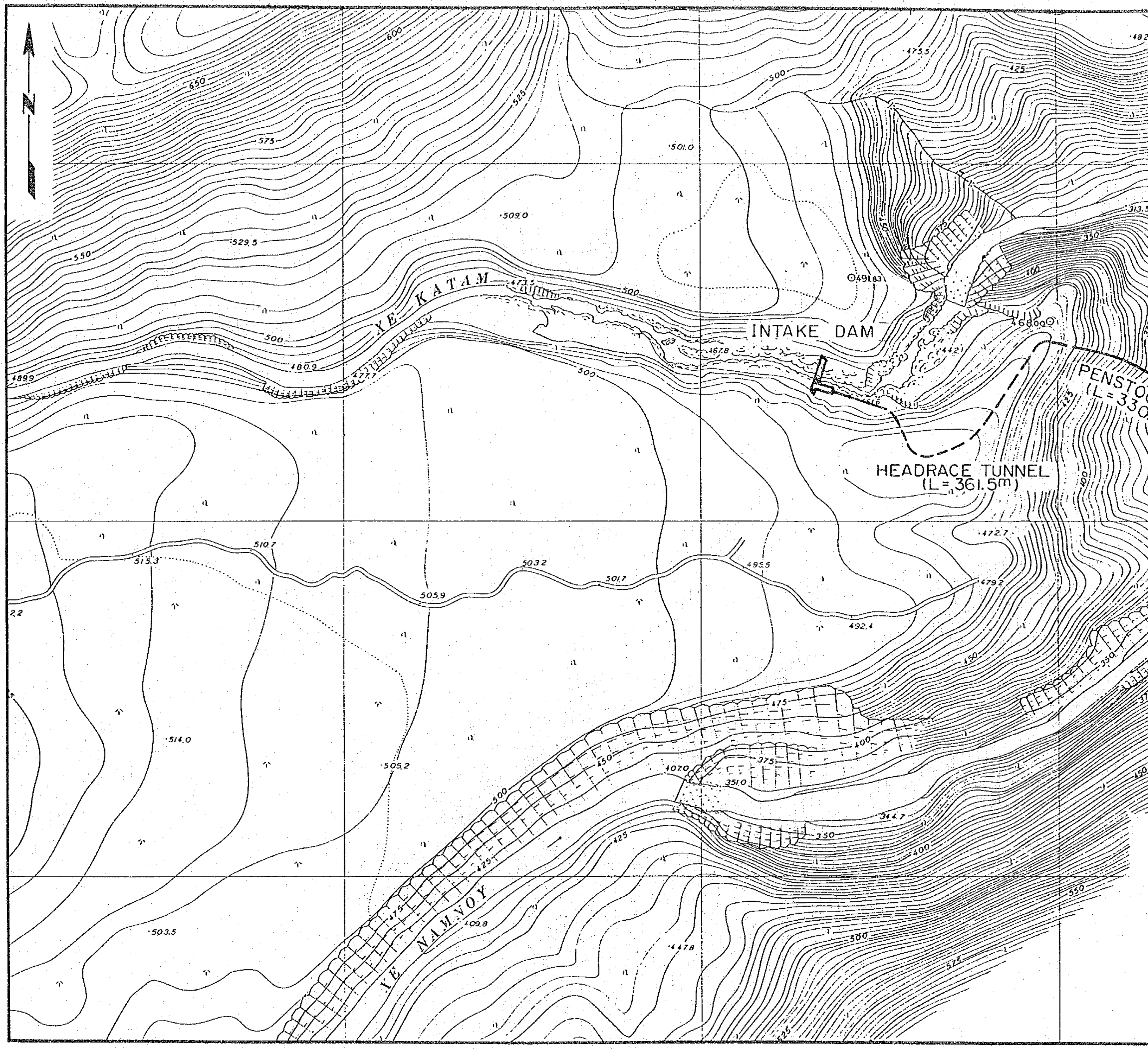
As this Project is a run-of-river power plant, stable supply of power may be hampered in the driest season as the power demand grows after commissioning of the power plant. To deal with this possibility, it is necessary to promote a plan to interconnect the enery supply areas of this Project with the adjacent existing transmission lines in the future.

2.5 Further Investigation

As the time allowed for survey of this Project was limited, the survey work had to be completed with insufficient data on meteorology and hydrology which usually must be made available by long termed observations. The river run-off simulation for this study has been conducted by analyzing the currently available information, such as the data obtained during the survey period from nearby observation stations and hydroelectric power plants as well as those obtained from meteorology and hydrology observation stations which have been established at the period of commencement of this survey, with our best efforts to analyze such data in detail. However, it is essential that more data should be accumulated in the future, and the observation of precipitation, water level and run-off, which has been started in February, 1991, must be continued. Also, additional geological surveys are required at the intake dam site, headrace route, penstock route and others. (See Fig.-11)

Concerning the study of power demand, it was not an easy task to project the development of electrification in the two towns based on the current status, and it can not be denied that substantial uncertain factors were included in our estimate. It is suggested, therefore, to conduct more detailed studies, including the trend of demand in other areas to which electrification has been introduced in earlier times, to contribute to elaborate this development plan furthermore.

Furthermore, it is to be advised that monitoring of the environmental parameters should be conducted, in parallel with the above investigations, as soon as possible from the viewpoint of conservation of the river basin, although there would not be any significant negative environmental effects caused by the Xe Katam Project.

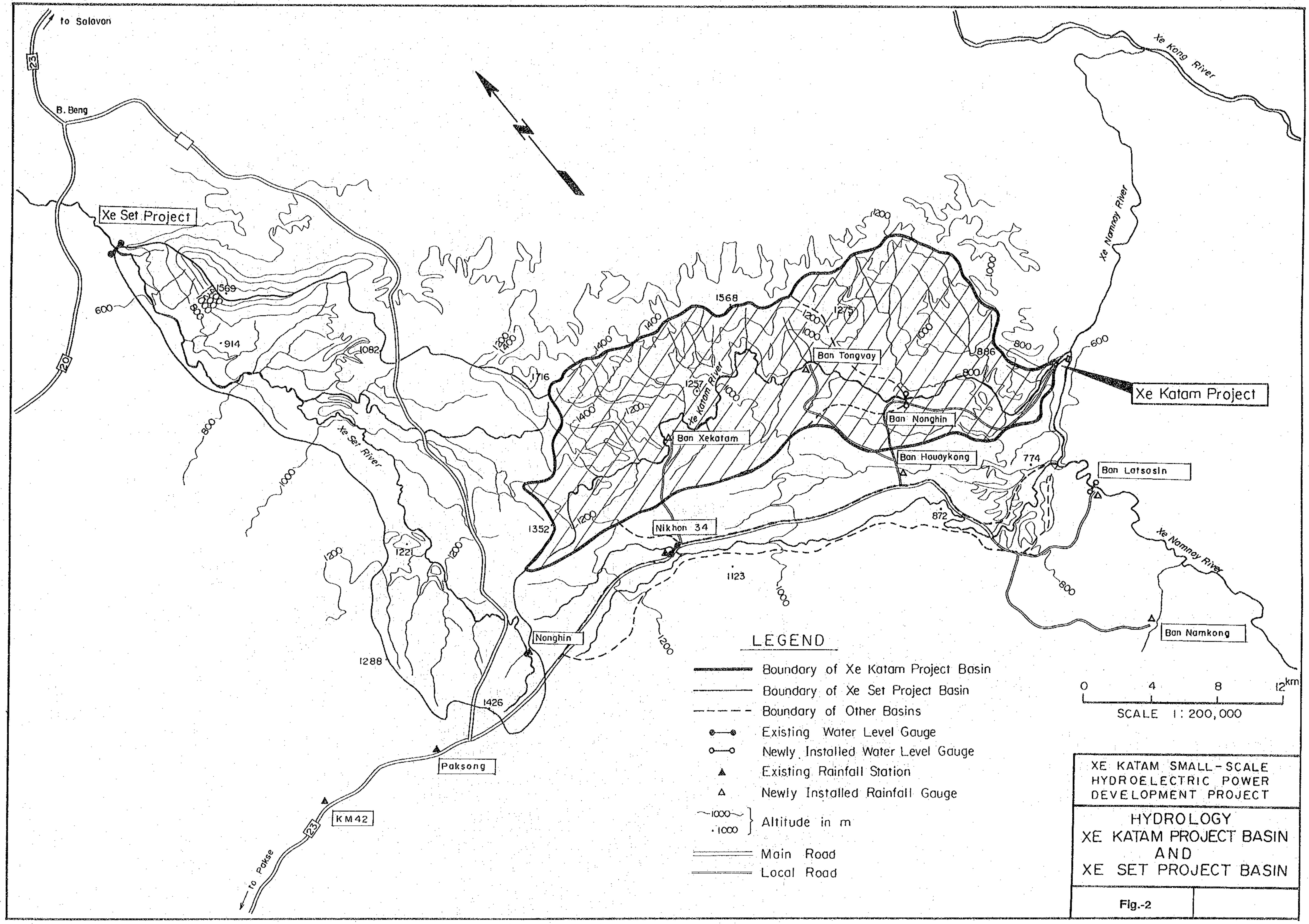


XE KATAM SMALL-SCALE HYDROELECTRIC POWER DEVELOPMENT PROJECT

XE KATAM TUNNEL PLAN

PROJECT E

Fig.-1



XE KATAM SMALL-SCALE HYDROELECTRIC POWER DEVELOPMENT PROJECT

HYDROLOGY
XE KATAM PROJECT BASIN
AND
XE SET PROJECT BASIN

Fig.-2

Fig.-3 DURATION CURVE OF CALCULATED DISCHARGE AT XE KATAM INTAKE SITE

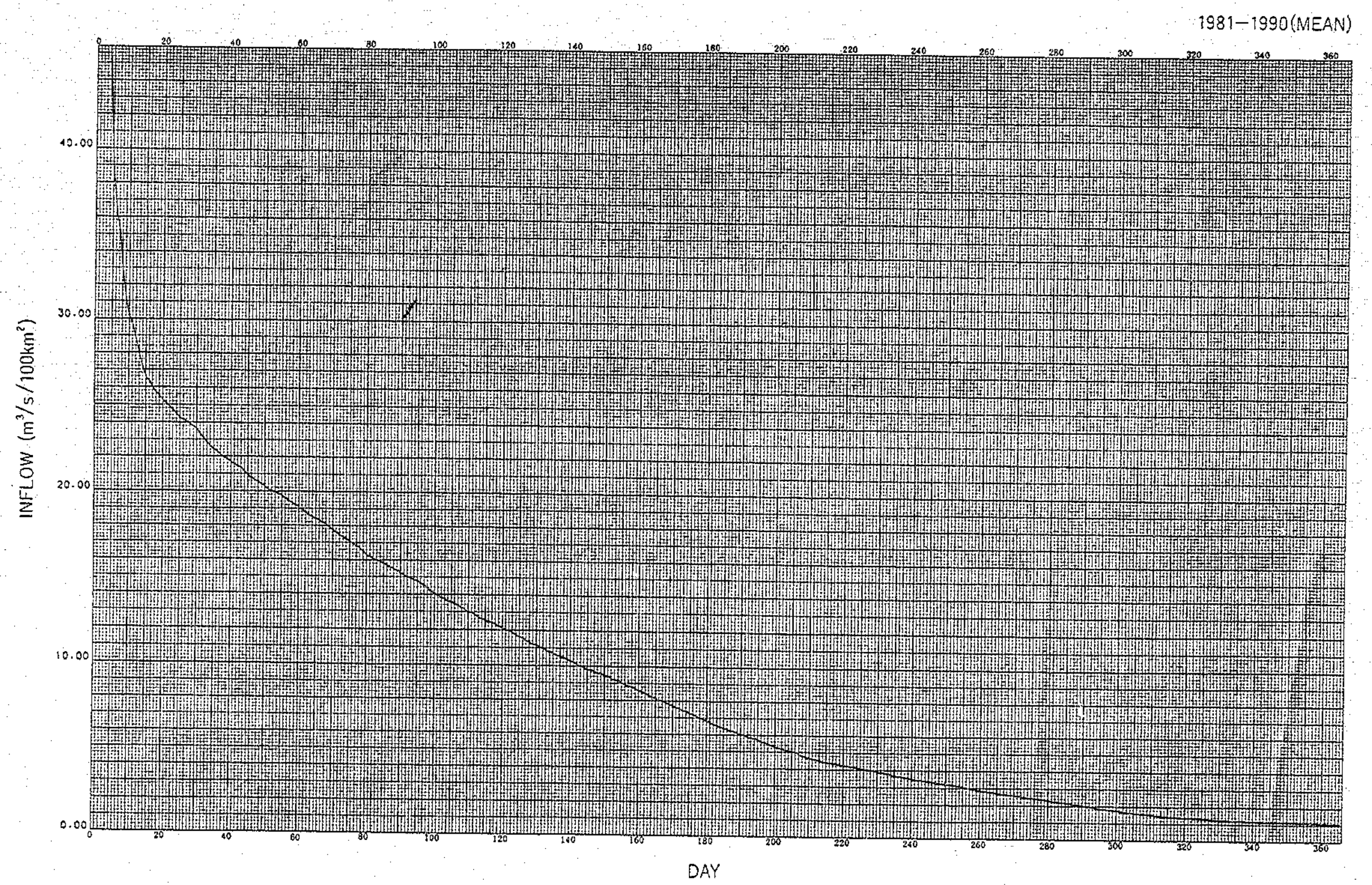


Fig.-4 **Daily Load Curve**

(as of 1995)

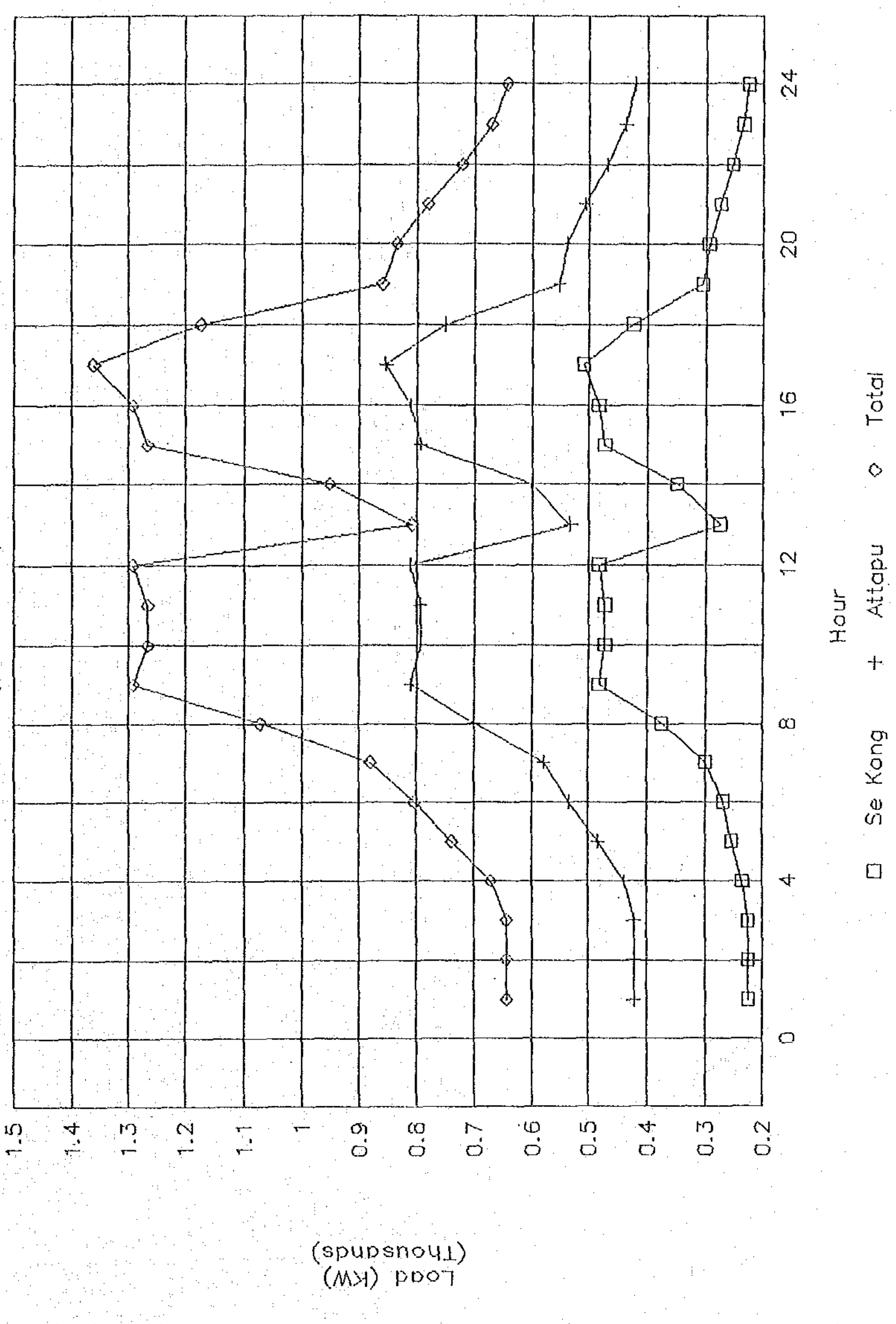


Fig.-5

Electricity Demand Forecast

(From 1995 to 2034)

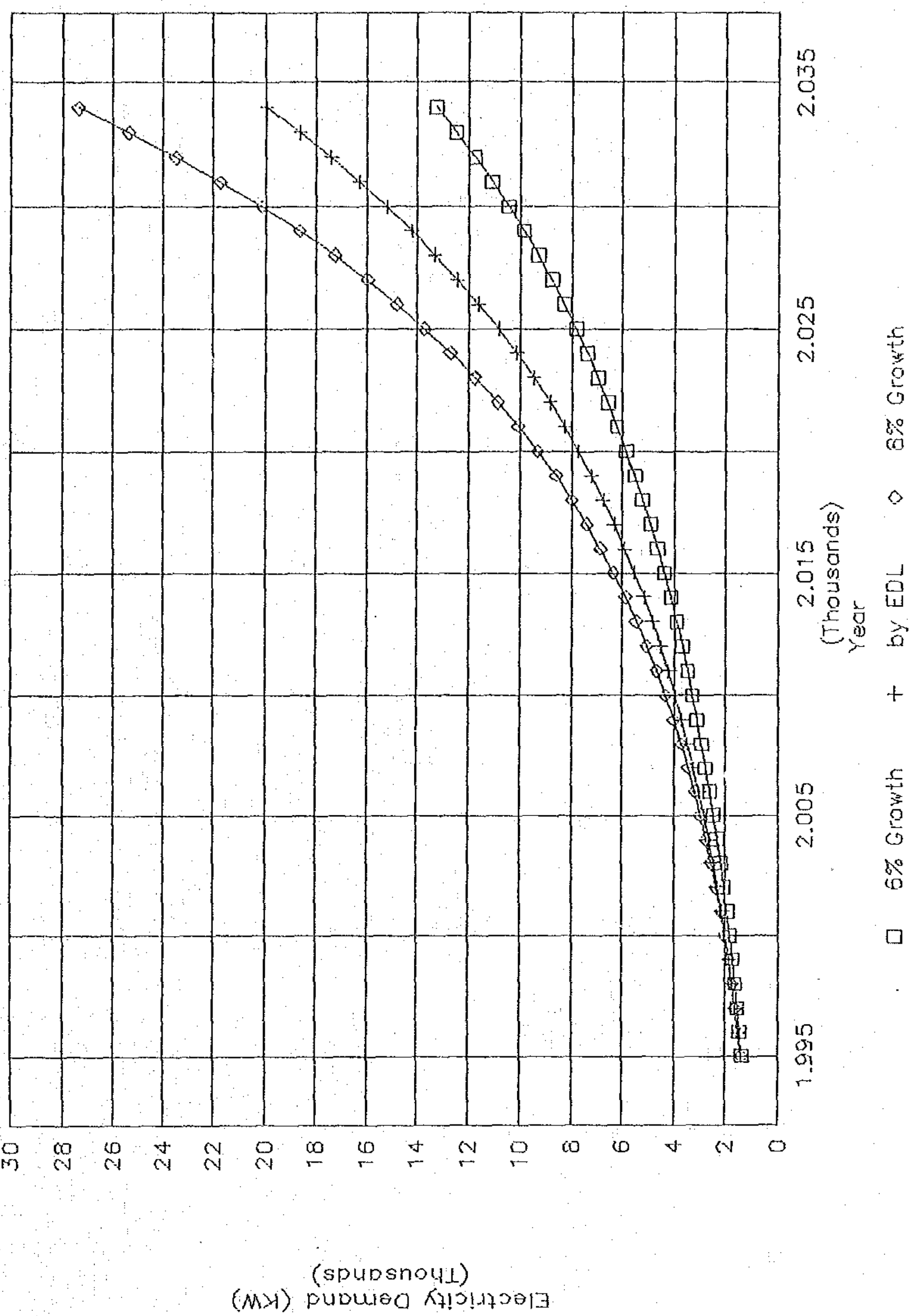


Fig.-6 **Annual Energy Demand Forecast**

(From 1995 to 2034)

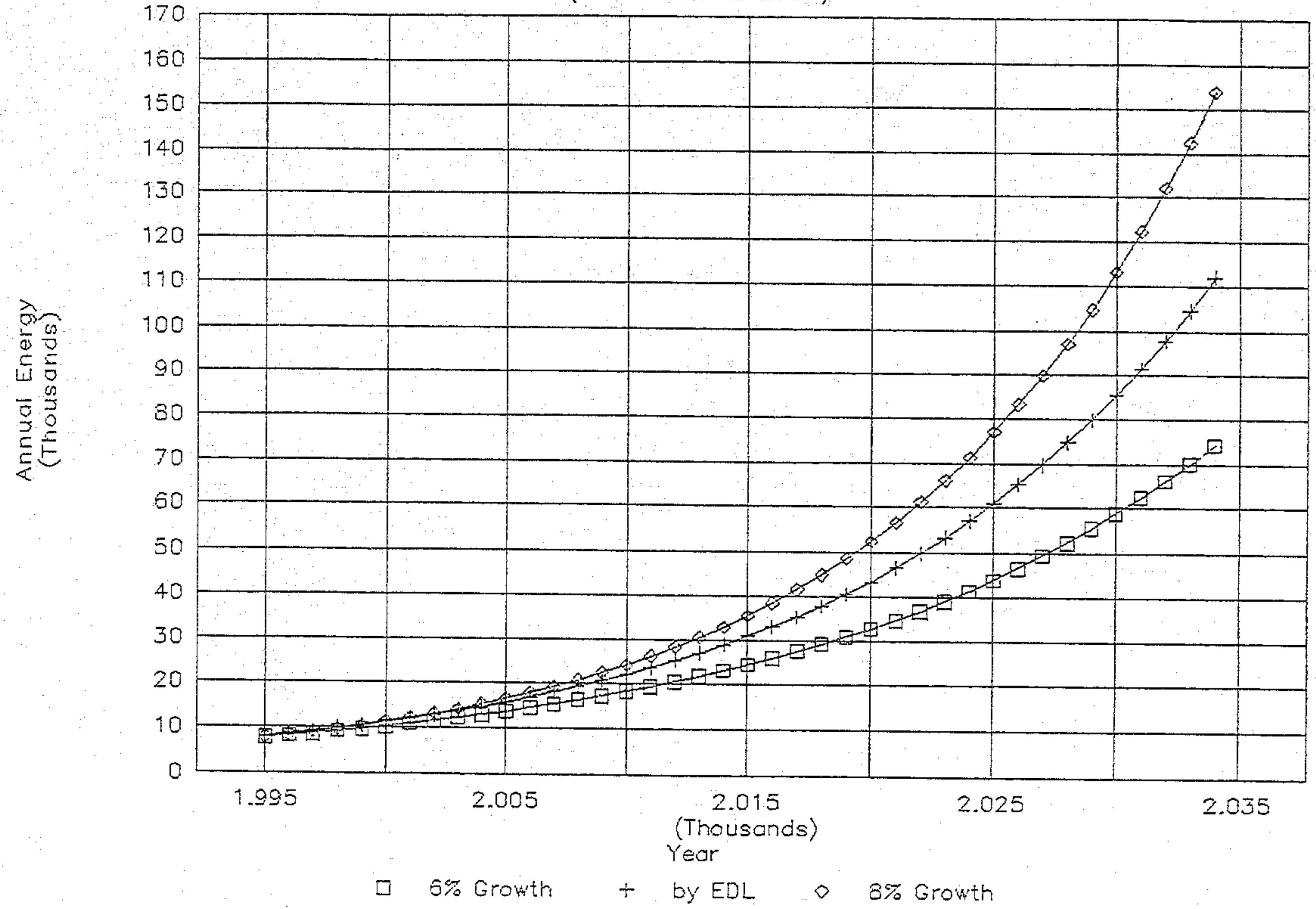


Fig.-6

Fig.-7 Present Situation of Related Power Systems

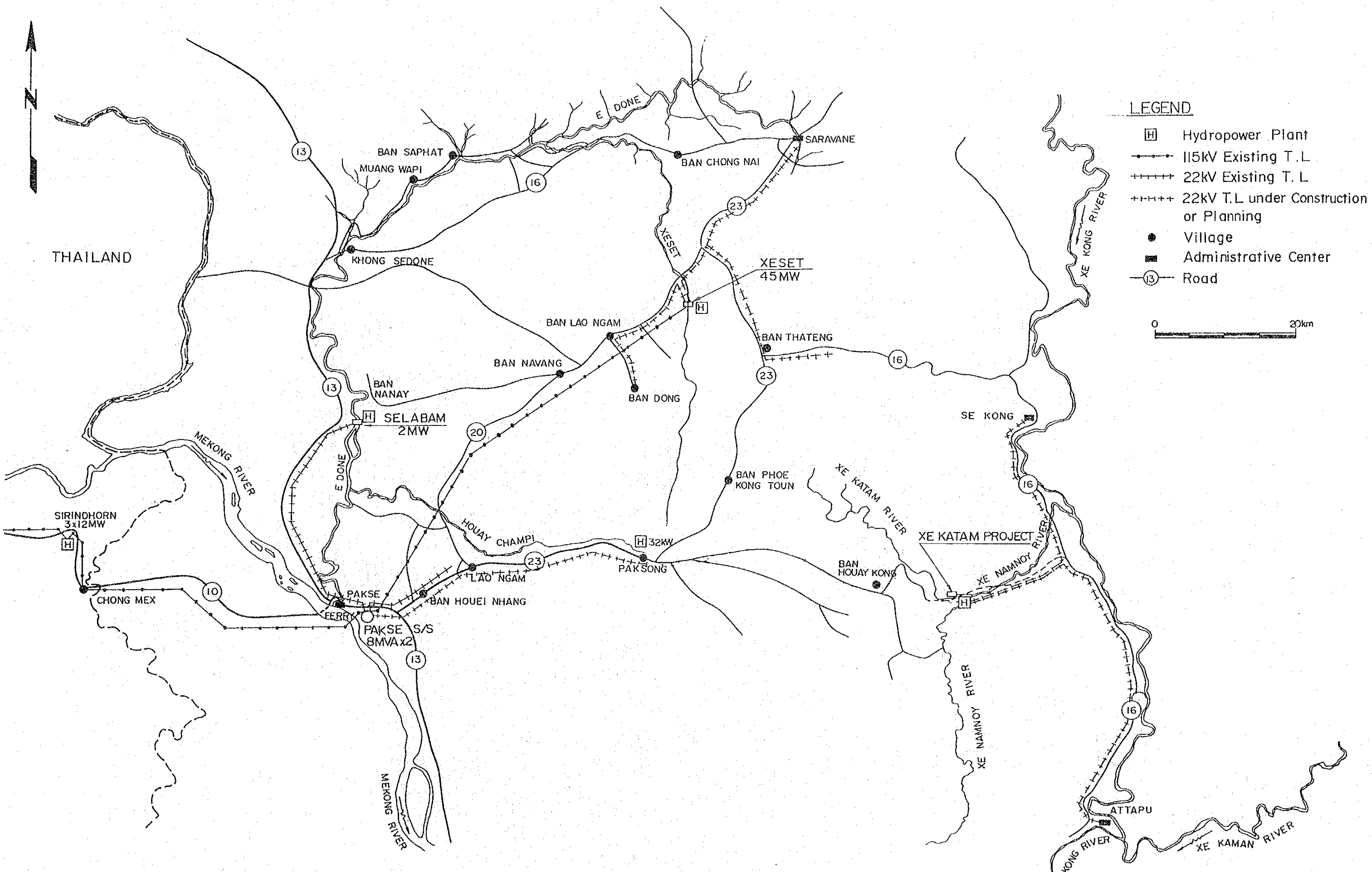
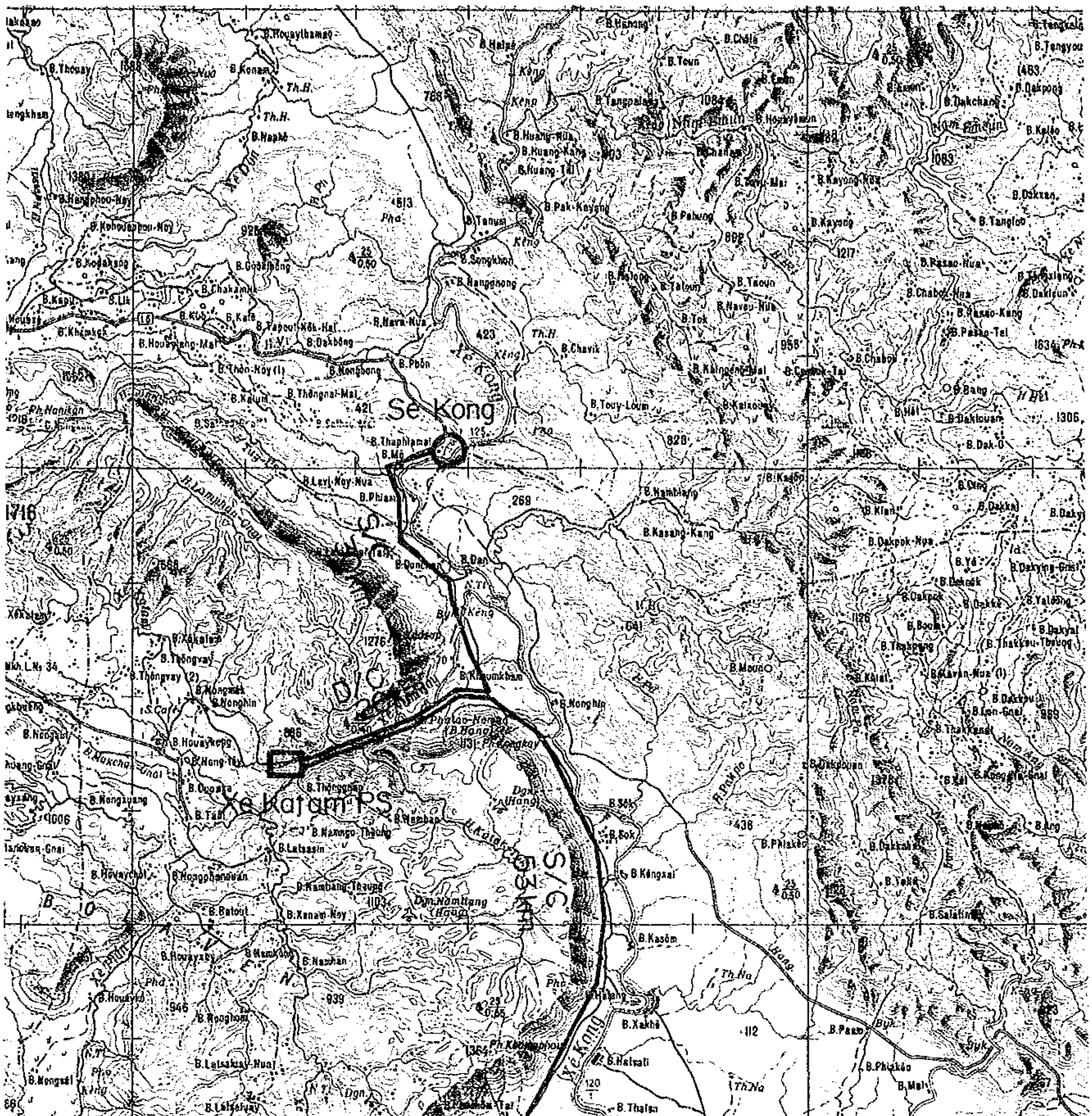
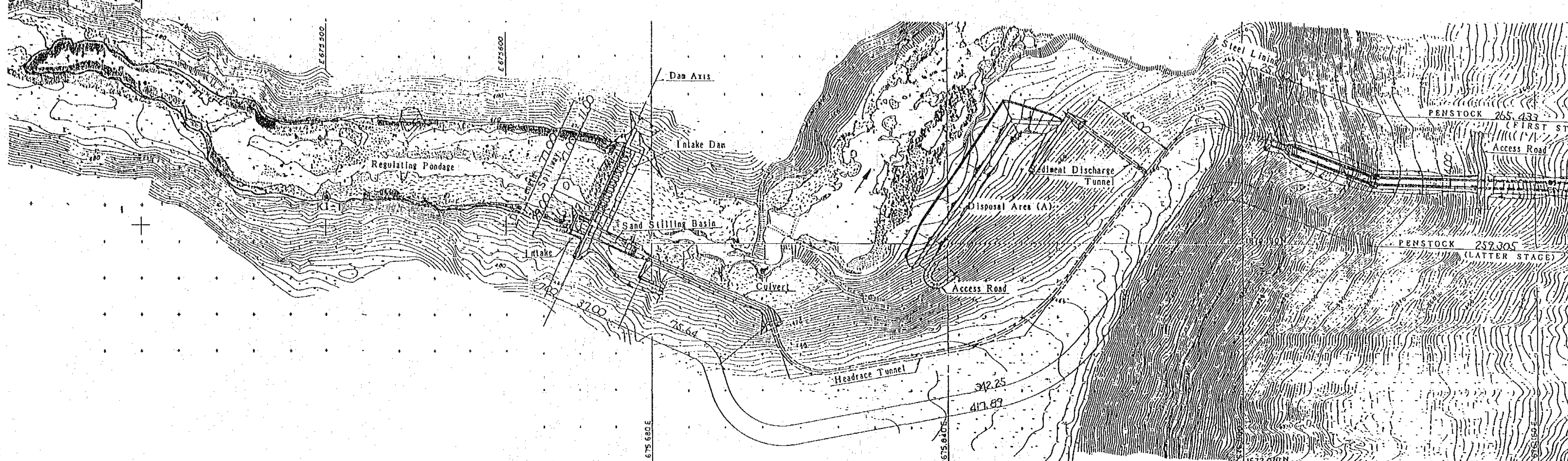


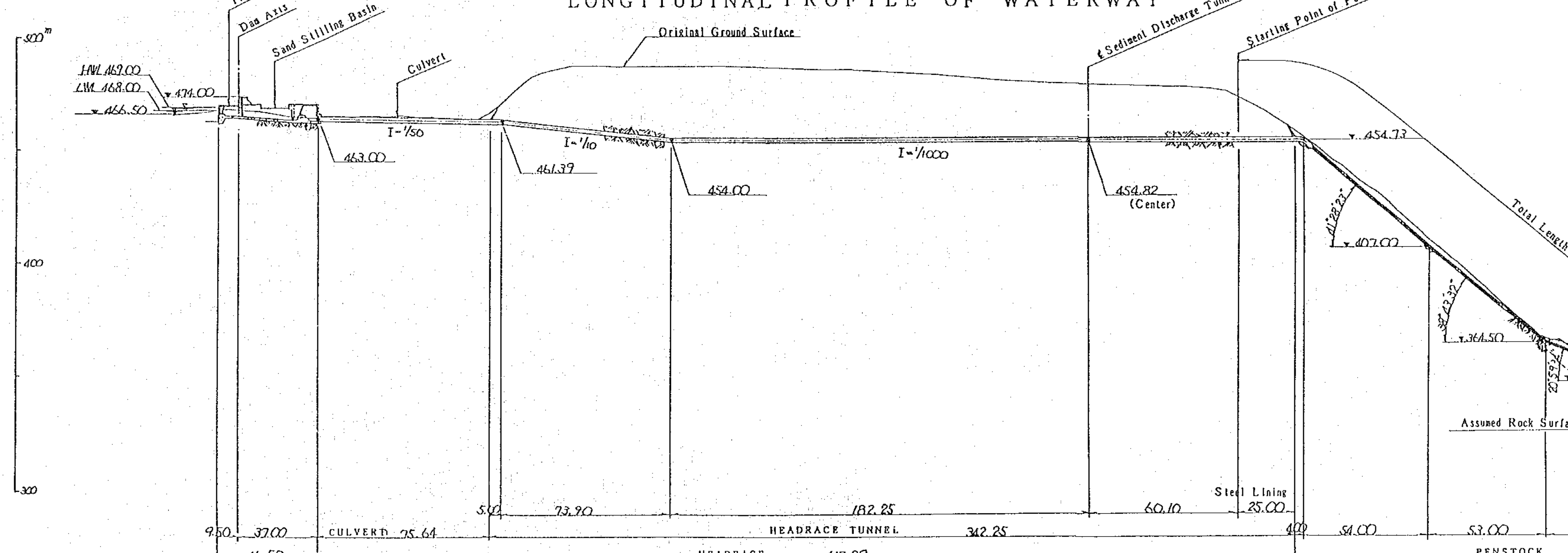
Fig.-8 TRANSMISSION LINE ROUTE



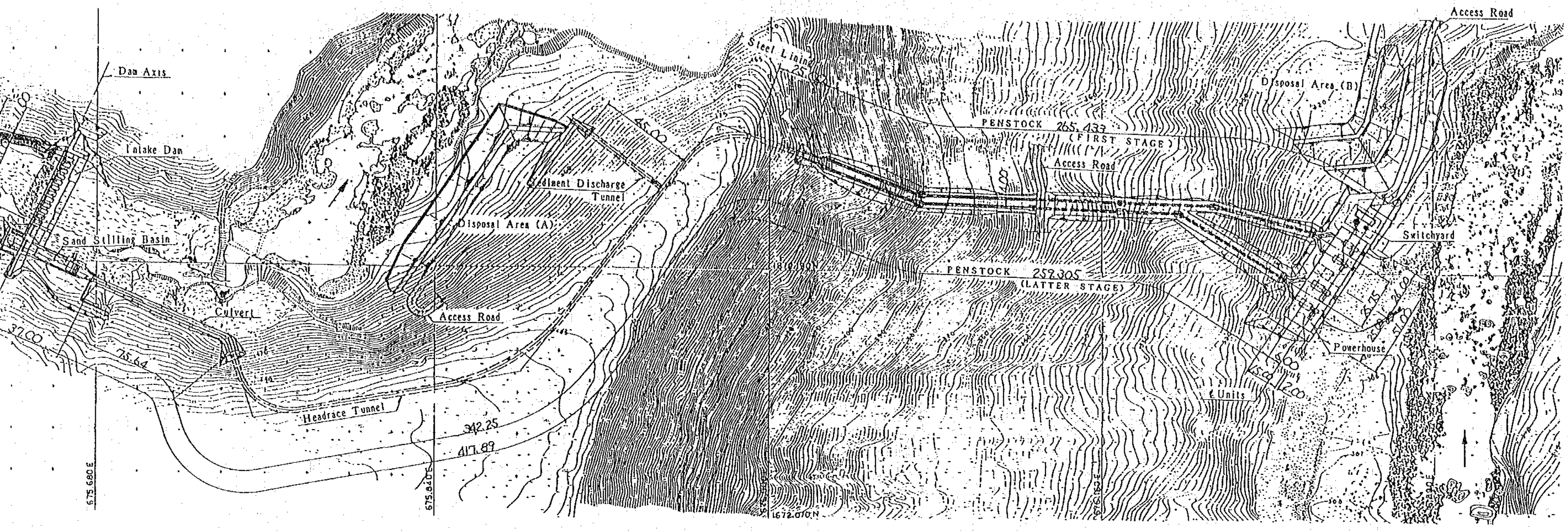
PLAN



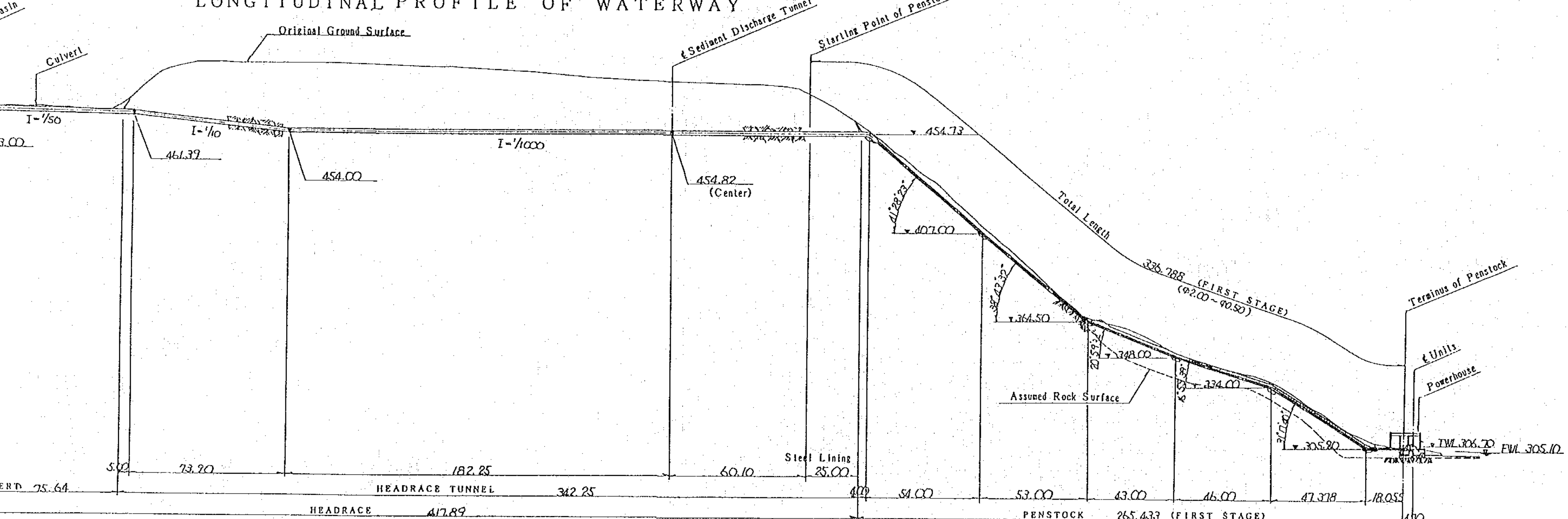
LONGITUDINAL PROFILE OF WATERWAY



PLAN



LONGITUDINAL PROFILE OF WATERWAY



0 100m

XE KATAM SMALL-SCALE HYDROELECTRIC POWER DEVELOPMENT PROJECT

GENERAL PLAN
LONGITUDINAL PROFILE OF WATERWAY

Fig.-9

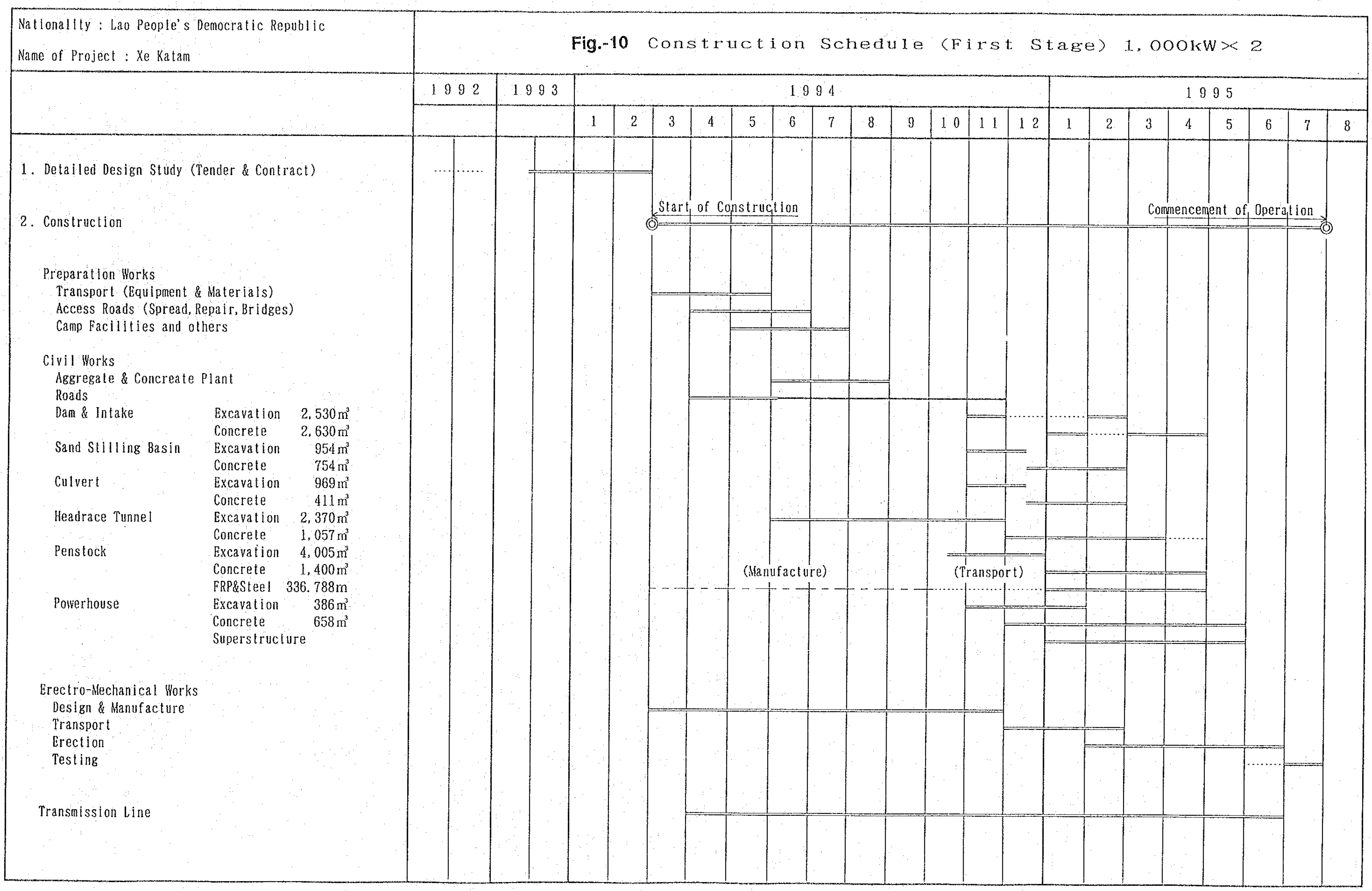
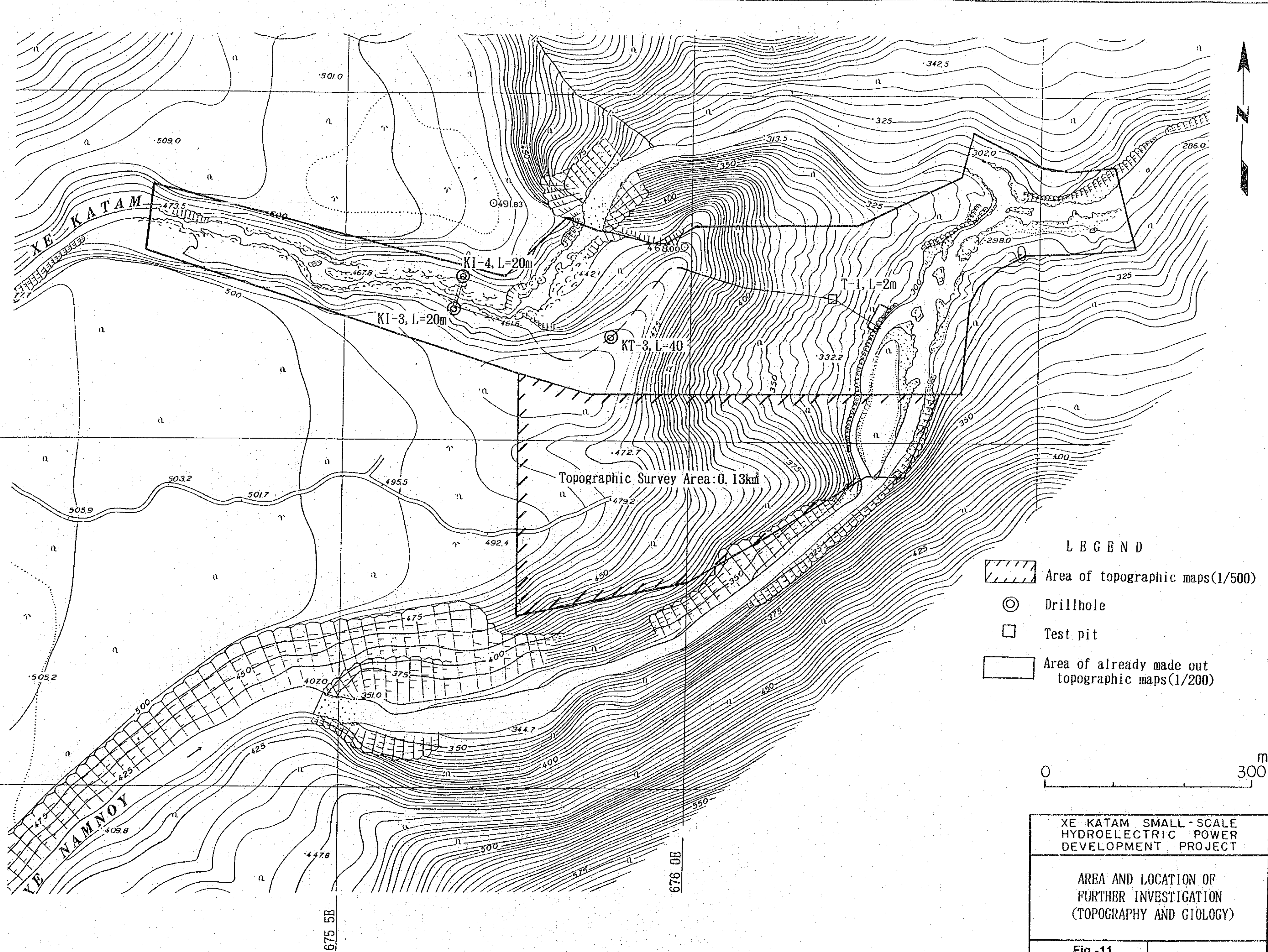


Fig.-10 Construction Schedule (First Stage) 1,000kW× 2



XE KATAM SMALL-SCALE HYDROELECTRIC POWER DEVELOPMENT PROJECT

AREA AND LOCATION OF FURTHER INVESTIGATION (TOPOGRAPHY AND GIOLOGY)

Fig.-11

JICA